



AMERICAN NATIONAL STANDARD

ANSI/ASSE A1264.1-2007
Safety Requirements for Workplace
Walking/Working
Surfaces and Their Access; Workplace,
Floor, Wall and Roof Openings; Stairs
and Guardrails Systems

ANSI/ASSE A1264.1-2007



AMERICAN SOCIETY OF
SAFETY ENGINEERS

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 A1264 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 A1264 Committee does not ensure that adherence to these recommendations will protect the safety or health of any persons, or preserve property.

ANSI®
ANSI A1264.1 – 2007

American National Standard

**Safety Requirements for Workplace Walking/Working
Surfaces and Their Access; Workplace, Floor, Wall and
Roof Openings; Stairs and Guardrails Systems**

Secretariat

American Society of Safety Engineers
1800 East Oakton Street
Des Plaines, Illinois 60018-2187

Approved January 18, 2007

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 April 1, 2007 by:

American Society of Safety Engineers
1800 East Oakton Street
Des Plaines, Illinois 60018-2187
(847) 699-2929 • www.asse.org

Copyright ©2007 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 A1264.1 – 2007.)

This standard was developed by an American National Standards Committee, national in scope, functioning under the procedures of the American National Standards Institute with the American Society of Safety Engineers (ASSE) as Secretariat. This standard establishes minimum safety requirements for workplace floor and wall openings, stairs and railing systems.

It is intended that the procedures and performance requirements detailed herein will be adopted by every employer whose operations fall within the scope and purpose of the standard.

Neither the standards committee, nor the Secretariat, feel 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 art progresses and further experience is gained. It is felt, however, that uniform requirements are very much needed and that the standard in its present form provides for the minimum performance requirements necessary for the protection of personnel regarding workplace floor and wall openings, stairs and railing systems.

In addition to technical improvements, this revision contains two new definitions and four new illustrations to help clarify text in the standard.

Suggestions for improvements of this standard will be welcome. They should be sent to the American Society of Safety Engineers, 1800 East Oakton Street, Des Plaines, Illinois 60018.

This standard was processed and approved for submittal to ANSI by American National Standards Committee A1264. 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 A1264 Committee had the following members:

Keith Vidal, P.E., Chairperson
 Lawrence E. Oldendorf, P.E., Vice Chairperson
 Timothy R. Fisher, CSP, ARM, CPEA, Secretary
 Jennie Dalesandro, Administrative Technical Support

Organization Represented

Name of Representative

American Institute of Steel Construction	Tom Schlafly
American Society of Safety Engineers	Lawrence E. Oldendorf, P.E.
Arthur J. Gallagher & Co.	James D. Smith, CSP
Association for Manufacturing Technology	David Felinski
Bayer MaterialScience, LLC	Terry L. Ketchum
Bay Nets Safety Systems	Robert Martin
Dynamic Scientific Controls	J. Nigel Ellis, Ph.D., P.E., CSP, CPE
ESIS Risk Control Services	Steve Di Pilla
International Association of Bridge, Structural, Ornamental & Reinforcing Iron Workers	Frank Migliaccio
Kleen-Tex Industries	Leslie Schwartz
William Marletta Safety Consultants	William Marletta, Ph.D., CSP
Muirfield Underwriters, Ltd.	Robert Majeski
National Association of Government Labor Officials	Earl Everett
National Elevator Industry, Inc.	Edward A. Donoghue, CPCA
	Frederick J. Wilt, CIH, CSP
	Ron Coté, P.E.
National Fire Protection Association	J. Todd Daniel
National Ornamental and Miscellaneous Metals Association	Emory Knowles, III, CSP, CIH
Northrop Grumman Corporation	Jeffrey Meddin, CSP, CHCM
Railworks Corporation	Mike C. Wright
Safety Through Engineering	Roger L. Grant, Jr., P.E.
St. Paul Travelers	David Bondor
David Underwood	David Underwood, Ph.D.
U.S. Department of Labor – OSHA	Ginny Fitzner
U.S. Postal Service	John H. Bridges, III, REM, CHMM, CSHM, CPEA
United Auto Workers	John Rupp, Jr.
	John Shepard
Vidal Engineering, LLC	Keith Vidal, P.E.
Westar Energy Inc.	Patrick E. Bush, CUSA

Contents

SECTION.....	PAGE
1. Scope, Purpose, and Application.....	8
1.1 Scope.....	8
1.2 Purpose.....	8
1.3 Application.....	8
2. Definitions.....	9
3. Protection of Floor Openings and Floor Holes, Roof Openings and Roof Holes.....	14
3.1 Stairway Floor Opening.....	14
3.2 Ladderway Floor Opening.....	14
3.3 Hatchway and Chute Floor Opening.....	14
3.4 Skylight.....	15
3.5 Floor Opening or Hole.....	15
3.6 Pit, Trap-Door, and Manhole Floor Opening.....	16
3.7 Pit Safety Nets.....	16
3.8 Floor Opening or Hole.....	17
4. Protection of Wall Openings and Wall Holes.....	17
4.1 Wall Opening.....	17
4.2 Chute Wall Opening.....	18
4.3 Window Wall Opening.....	18
4.4 Temporary Wall Opening.....	18
4.5 Wall Hole.....	18
5. Protection of Open-Sided Floors, Platforms, Runways, and Ramps.....	18
5.1 Open-Sided Floor and Platform.....	18
5.2 Runway.....	19
5.3 Hazardous Location.....	19
5.4 Guardrail System.....	19
5.5 Stair Railing System.....	20
5.6 Railing System Design Requirements.....	20
5.7 Toeboard.....	21
5.8 Handrail.....	21
5.9 Clearance.....	22
5.10 Floor Opening Cover.....	22
5.11 Skylight Screen.....	22
5.12 Barrier for Wall Opening.....	22
6. Requirements for Fixed Stairs.....	22
6.1 Fixed Stairs for Access.....	22
6.2 Load Criteria.....	24
6.3 Clearance.....	24
6.4 Slope.....	24
6.5 Tread Depth and Riser Height.....	24
6.6 Nosing.....	25
6.7 Slip Resistance.....	25
6.8 Uniformity of Risers and Treads.....	25
6.9 Long Flight of Stairs.....	25
6.10 Stair Landing.....	25
6.11 Door and Gate Openings.....	25
6.12 Vertical Clearance.....	26
6.13 Open Risers.....	26
7. Requirements for Use of Railing Systems, Rails, and Handrails.....	26
7.1 Provision and Design.....	26
7.2 Stair-Railing System/Handrail Required Use.....	26
8. References.....	28

Explanation of Standard

American National Standard A1264.1 uses a two-column format to provide both specific requirements and supporting information.

The left column, designated "Standard Requirements," is confined solely to these requirements. Where supporting photographs or sketches are required, they are designated as "figures."

The right column, designated "Explanatory Information," contains only information that is intended to clarify the standards. This column is not a part of the standard.

Operating rules (safe practices) are not included in either column, unless they are of such a nature as to be vital safety requirements, equal in weight to other requirements, or guides to assist in compliance with the standard.

**AMERICAN NATIONAL STANDARD A1264.1
SAFETY REQUIREMENTS FOR WORKPLACE WALKING/WORKING
SURFACES AND THEIR ACCESS; WORKPLACE, FLOOR, WALL AND
ROOF OPENINGS; STAIRS AND GUARDRAILS SYSTEMS**

STANDARD REQUIREMENTS

EXPLANATORY INFORMATION

*(Not part of American National
Standard A1264.1)*

**1. SCOPE, PURPOSE, AND APPLI-
CATION**

1.1 Scope. This standard sets forth safety requirements in industrial and workplace situations for protecting persons in areas/places where danger exists of persons or objects falling through floor, roof or wall openings, or from platforms, runways, ramps, and fixed stairs, or roof edges in normal, temporary, and emergency conditions.

1.1.1 Excluded from this standard are: private residences; escalators; moving walks; stairs or ramps serving floating roof tanks; floor openings occupied by elevators, manlifts, dumbwaiters, conveyors, machinery, containers; the loading and unloading areas of truck, railroad, and marine docks; self-propelled motorized mobile equipment; platforms; scaffolds; and construction work areas.

1.2 Purpose. The purpose of this standard is to establish minimum safety requirements for working and walking areas to provide reasonable safety of persons pursuing their foreseeable duties.

1.3 Application.

1.3.1 The requirements of this standard apply to new and existing installations and workplace exposures to fall hazards.

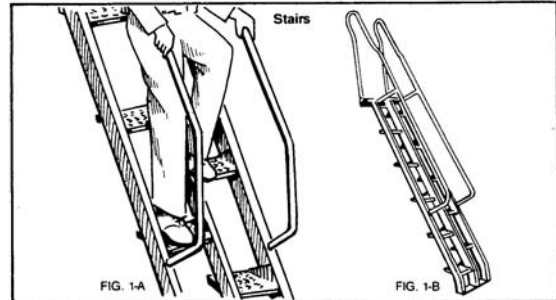
E1.1.1 Recognizing that the special safety requirements necessary for stages, orchestra pits, churches, school auditoriums, and athletic assembly occupancies may not be adequately covered by other codes or standards, this standard may provide the minimum safety performance requirements to protect the occupants. See ANSI/ASSE A10.18, *Safety Requirements for Temporary Floors, Holes, Wall Openings, Stairways and Other Unprotected Edges in Construction and Demolition Operations*.

E1.3.1 The requirements of this standard can be effectively applied during alterations of existing facilities or when major changes are made to work areas.

2. DEFINITIONS

2.1 Alternating Tread Type Stair. Series of treads usually attached to a center support in an alternating manner so that a user of the stair normally does not have both feet on the same level (see Figure 2.1:A and Figure 2.1:B).

E2.1 For more information please review Figures 2.1:A and 2.1:B.



Figures 2.1:A and 2.1:B

2.2 Deflection, Maximum Allowable. Deflection of whole system at design load.

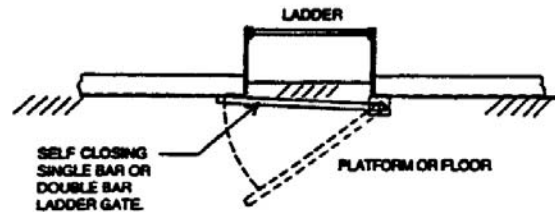
2.3 Failure. Excessive or permanent deformation or breakage.

2.4 Floor Hole/Opening. Floor hole/opening measuring over two inches (51mm) in any direction of a walking/working surface which persons may trip or fall into or where objects may fall to the level below.

E2.4 Skylights located in floors or roofs are considered floor or roof hole/openings.

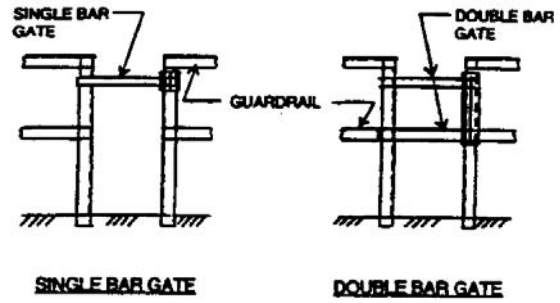
2.5 Gate. A swinging or portable member, which acts as a safety barrier. It is commonly used at roof openings, floor openings, ladder openings, and hatchways, through which people might fall. (See Figures 2.5:A and 2.5:B.)

E2.5 For more information refer to Figures 2.5:A and 2.5:B.



PLAN

Figure 2.5:A



ELEVATION

Figure 2.5:B

2.6 Guardrail/Railing System/Stair Railing System. Framework of vertical, horizontal, or inclined members, grillwork or panels, or combinations thereof, supporting a handrail and acting as a safety barrier for protection of persons at or near the outer edge of stair, ramp, landing, platform, hatchway, manhole, or floor opening. (See Figure 2.6:A & 2.6:B.)

E2.6 For more information refer to Figures 2.6:A and 2.6:B.

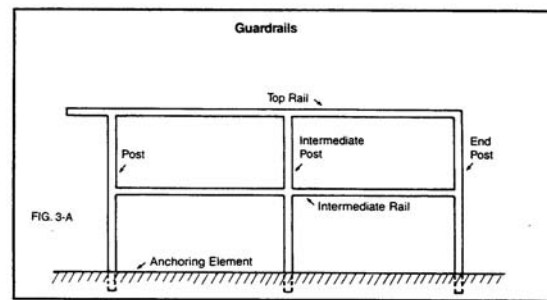


Figure 2.6:A

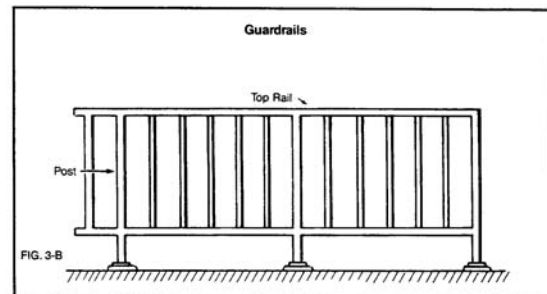


Figure 2.6B

2.7 Handrail. Horizontal, sloping, or vertical member normally grasped by hand for support. This member may be part of a railing system and is often, but need not be, a top member (top rail) of a railing system. When part of a stair railing system, it is a member parallel to the pitch of a stair flight.

2.8 Landing. Platform between runs of stairs.

2.9 Load Bearing Element. Component or surface designed to support twice the anticipated load, including dynamic effects. Safety factors shall be applied based on the anticipated use and consistent with engineering methodologies or other related requirements.

2.10 Nosing. Leading edge of a tread or platform. (See Figure 2.10.)

E2.10 For more information refer to Figure 2.10.

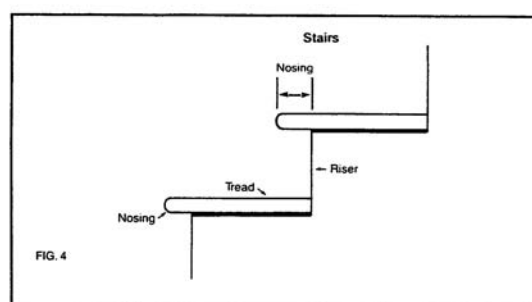


Figure 2.10

2.11 Open Riser. Space between the treads of stairs without upright or inclined members.

2.12 Personal Fall Arrest (PFAS). Personal fall arrest in the terms of this standard means the use of a fall arrest system in accordance with ANSI/ASSE Z359.1, *Safety Requirements for Personal Fall Arrest Systems, Subsystems and Components*.

2.13 Pit. A recessed opening in the floor used for workers to stand in while servicing vehicles or equipment from below.

E2.13 A recessed opening in the floor intended for transferring materials would also be considered a pit. A pit would be considered as a floor hole/opening.

2.14 Platform. A walking/working surface elevated above the surrounding floor or ground, including landings between stair runs.

2.15 Rail. Horizontal, inclined, or vertical member of a railing system, such as top

rail, intermediate rail, or bottom rail.

2.16 Ramp. Sloped walking surface for access from one level to another.

E2.16 Ramps generally are any walking surface with a slope greater than 1:20.

2.17 Riser. Vertical or inclined member or distance between the top of one tread or platform and the adjacent tread or platform/landing.

2.18 Roof Hole/Opening. Roof hole/openings measuring over two inches (51mm) in any direction of walking/working surface, which persons may trip or fall or where objects may fall to the level below.

2.19 Runway. Elevated passageway/walking surface, such as a catwalk or walkway between buildings.

2.20 Shall. Denotes mandatory item.

2.21 Should. Denotes advisory item.

2.22 Ship Stairs (Ship Ladders). Typically a series of treads angled at between 50 and 70 degrees with open risers (see Figure 2.22).

E2.22 For more information refer to Figure 2.22.

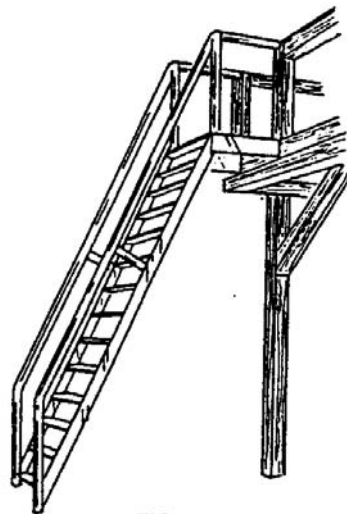


Figure 2.22

2.23 Spiral Stairs. One or more series of treads attached to a vertical pole and progressing from one level or floor to another in a helical fashion within a cylindrical space (see Figure 2.23).

E2.23 For more information refer to Figure 2.23.

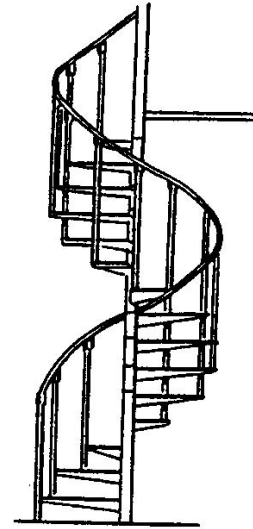


Figure 2.23

2.24 Stairway. One or more flights of stairs, either exterior or interior, with the necessary landings and platforms connecting them, to form a continuous and uninterrupted passage from one level to another.

2.25 Toeboard. (Also referred to as Toeplate or Kickplate.) Vertical barrier at floor level, erected along exposed edges of a floor or wall opening, platform/landing, runway, or ramp to prevent objects from falling over the edge.

2.26 Tread. Horizontal member of a stair on which a person steps.

2.27 Tread Depth. The distance measured horizontally between the vertical planes of the foremost projection of adjacent treads and at a right angle to the tread's leading edge, but excluding beveled or rounded tread surfaces that slope more than 20 degrees (a slope of 1 in 2.75).

2.28 Walking/Working Surface. Any surface (including roofs) walked on by persons or used to gain access to a work area.

2.29 Wall Opening. An opening at least 30 inches (762mm) high and 18 inches

E2.24 Scaffolds, ladders and other like devices are not considered stairs.

E2.28 An example would be a maintenance/inspection surface related to the facility or any equipment installed on roofs.

(457mm) wide, in any wall or partition, through which persons may fall; such as a yardarm doorway or chute opening.

2.30 Wall Hole. An opening less than 30 inches (762mm), but more than one inch (25mm) high, of unrestricted width, in any wall or partition; such as a ventilation hole or drainage scupper.

2.31 Winder. A tapered tread used to change the direction of stair runs.

2.32 Winding Stair/Curved Stair. One or more series of treads which follow the curvature of a tank or similar rounded structure at least five feet (1.5m) in diameter.

3. PROTECTION OF FLOOR OPENINGS AND FLOOR HOLES, ROOF OPENINGS AND ROOF HOLES

3.1 Stairway Floor Opening. Every stairway floor opening shall be guarded by a guardrail system as specified in Section 5.4. The guardrail shall be provided on all exposed sides, except at entrance to stairway.

3.2 Ladderway Floor Opening. Every ladderway floor opening or platform shall be guarded by a guardrail system with toeboards on all exposed sides, except at entrance to opening. The entrance way shall be guarded so that a person cannot walk directly into the opening.

3.3 Hatchway and Chute Floor Opening. Every hatchway and chute floor opening shall be guarded by one of the following:

3.3.1 A load bearing cover and permanently attached railing system guarding the opening with only one side left exposed.

E3.1 A load bearing cover or guardrail system is required over infrequently used stairways which are located in passageways (such as aisle spaces). The guardrail system would then require the use of removable railing systems on all exposed sides, except at entrance to stairways. The removable railing system should be hinged or otherwise mounted so as to come into position automatically with the opening of the cover.

E3.2 Methods of guarding may be offsetting the opening through use of a guardrail system or by a self closing gate swinging in the direction away from the ladder.

When the opening is not in use, the cover shall be closed or the exposed side shall be guarded at both top and intermediate position by removable railing system.

3.3.2 A removable guardrail system with toeboard along all sides of the opening as required by usage and a fixed railing system with toeboards on all other exposed sides. The removable guardrail systems shall be kept in place when the opening is not in use.

3.3.3 Where operating conditions require the feeding of material into a hatchway or chute opening, protection shall be provided to prevent a person from falling through the opening.

3.4 Skylight. Non-load-bearing skylights shall be guarded by a load-bearing skylight screen, cover, or a railing system along all exposed sides.

3.4.1 Warning labeling shall comply with requirements set forth in ANSI Z535, *Safety Color Code*, and shall be tested for durability in expected environmental conditions. Labels identifying the manufacturer, date of manufacturer shall be placed on all skylights, so as to be readable when installed.

3.5 Floor Opening or Hole. Every roof, floor opening, or hole into which persons can accidentally walk, shall be

E3.3.3 Types of protection to consider may include PPE (adequately installed fall arrest or restraint) or barrier protection for protection from falling

E3.4 The durability of light-transmitting plastic panels and smoke vents should be equivalent to the durability of similarly sized tempered glass glazing. The A1264 ASC suggests that skylights be tested to provide reasonable durability. ASTM E661, *Standard Test Method for Performance of Wood and Wood-Based Floor and Roof Sheathing Under Concentrated Static and Impact Loads*, provides some guidance to testing of skylight materials, but compliance with this standard may not prevent a person from falling through a skylight.

The A1264 ASC also suggests that skylights in new construction be tested in accordance with the ASTM E695, *Standard Method for Measuring Relative Resistance of Wall, Floor, and Roof Construction to Impact Loading*.

E3.4.1 Warning labels should be legible for the life of the product and remain attached unless forcibly removed.

There is a Z535 family of American National Standards addressing signs and symbols. Please refer to the series for the appropriate standard to use.

guarded by either a railing system with toeboards along all exposed sides or a load-bearing cover. When the cover is not in place, the roof, floor opening, or hole shall be protected by a removable guard railing system or shall be attended when the guarding system has been removed.

3.5.1 Every roof, floor opening, or hole into which persons cannot accidentally walk (e.g. because of pipes, fixed machinery, equipment, or walls) shall be protected by a securely fastened cover or toeboards that leave no openings which permit tools or objects from passing through.

3.6 Pit, Trap Door, and Manhole Floor Opening. Every pit, trap door, and manhole floor opening shall be guarded by a secure load-bearing cover. When the cover is not in place, the pit, trap or manhole openings shall be protected along the exposed perimeter by a removable railing system.

3.7 Pit Safety Nets. Pit safety nets are acceptable alternatives when other protective systems included in this standard are not feasible or practical for use. The safety net system shall be installed per the manufacturers installation instructions.

Pit safety nets included in this standard shall comply with:

CFR 1926.502(c), *Safety Net Systems* (as applicable).

This may not cover all of the safety considerations under all applications or environment. However, the following requirements include, but are not limited to:

3.7.1 The safety net system shall be resistant to chemicals and exposure to other foreseeable degradation sources.

3.7.2 When the pit is not in use, the pit

E3.6 The load-bearing cover should not create a tripping hazard. Consideration should be given as to the ease of unintended displacement of a load bearing cover, depending on its securement method. The opening would require attendance until the protection system is installed. When a removable railing is not practical somebody should be constantly attending the opening with the intent of preventing somebody from falling in.

E3.7 It is important for users to follow the manufacturer's instructions. Periodic visual inspections are needed to guard against fraying, ripping, or degradation of pit safety nets and the hardware.

For more information please review:

CFR 1926.502(c)(4)(i), *Safety Net Systems*

shall be protected completely by either the net system or by other means covered in this standard.

3.7.3 The color of the net shall be in a contrasting color with the surroundings.

3.7.4 The safety net system shall be inspected at least once per week for wear, damage, or other deterioration. Defective components shall be removed from service.

3.7.5 The safety net system shall be inspected after any occurrence, which could affect the integrity of the safety net system.

3.8 Floor Opening or Hole. Every roof opening, floor opening, or hole into which persons can accidentally walk, shall be guarded by either a railing system with toeboards along all exposed sides or with a load-bearing cover secured in place. When the cover is not in place, the roof opening, floor opening, or hole shall be protected by a removable guard railing system or shall be attended when guarding system has been removed.

E3.8 The provision of administrative controls, such as providing an attendant, should not be used in lieu of proper engineering controls such as railings, covers or other methods discussed in this standard. Attendance at a floor opening is only intended to provide an oral warning by the attendant to stay a safe distance (preferably) from the opening until a barrier or cover has been placed in position to adequately secure the opening from fall through hazards. Floor openings designed into restricted walkways such as catwalks should not be placed so as to obstruct the walking surface.

4. PROTECTION OF WALL OPENINGS AND WALL HOLES

4.1 Wall Opening. Every wall opening from which there is a drop of more than four feet (1.22m) shall be guarded by a:

4.1.1 Wall-opening barrier in accordance with Section 5.1. Where there is a potential of exposure to falling objects, a removable toeboard or its equivalent shall be provided. When the opening is not in use for handling objects, the guardrail system shall be kept in position even if there is a door at the opening.

4.1.2 When there is a platform extension onto which objects can be hoisted for handling, such a platform extension shall

E4.1.1 The guardrail system may be removable, but should preferably be hinged or otherwise mounted so as to be conveniently put back in service.

have a guardrail system or appropriate fall protection shall be used.

4.2 Chute Wall Opening. Every chute wall opening from which there is a drop of more than four feet (1.22m) shall be guarded by one or more of the barriers specified in 4.1 or as required by prevailing conditions.

4.3 Window Wall Opening. Every window wall opening at a stairway landing, from which there is a drop of more than four feet (1.22m), and where the bottom of the opening is less than 43 inches (1.1m) above the platform or landing, shall be guarded as specified in 5.12 & 5.13, or by a guardrail system or other equivalent protection.

4.3.1 Toeboard Required. Where the window opening is less than four inches (102mm) above the landing, floor or platform, a toeboard shall be provided.

4.4 Temporary Wall Opening. Every temporary wall opening shall be guarded as required in 4.1 or shall be attended.

4.5 Wall Hole. Where there is a hazard of persons or objects falling through a wall hole and the lower edge of the near side of the hole is less than four inches (102mm) above the floor, and the far side of the hole is more than four feet (1.22m) above the next lower level, the hole shall be protected by a toeboard or an enclosing screen either of solid construction or as specified in Section 5.13.

5. PROTECTION OF OPEN-SIDED FLOORS, PLATFORMS, RUNWAYS, AND RAMPS

5.1 Open-Sided Floor and Platform. Every open-sided floor or platform four feet (1.22m) or more above adjacent floor or ground level shall be guarded by a railing system (or equivalent as specified in 5.6) along all open sides, except where excluded as specified in 1.2 or where there is entrance to a ramp, stairway or fixed ladder.

The railing system shall be provided with a toeboard wherever, beneath the open sides, (1) persons can pass, (2) there is moving machinery, or (3) there is equipment with which falling objects could create a hazard.

5.2 Runway. Every runway shall be guarded by a railing system (or the equivalent as specified in Section 5.6) along all open sides four feet (1.22m) or more above floor or ground level. Wherever tools, machine parts or objects are likely to be used on the runway, a toeboard shall also be provided along each exposed side. Runways used exclusively for special purposes may have the railing on one side omitted where operating conditions necessitate such omission provided the falling hazard is minimized by using a runway of not less than 18 inches (457mm) in width. In such situations persons shall be required to use an appropriate fall arrest system.

5.3 Hazardous Location. Regardless of height, open sided floors, walkways, platforms, or runways above or adjacent to dangerous equipment, pickling or galvanizing tanks, degreasing unit, and similar hazards, such as regular work space at the edge of roofs, shall be guarded with a railing system and toeboard. Where routine access is required, a removable railing system shall be provided and persons shall be required to use an appropriate fall arrest system.

5.4 Guardrail System. A railing system shall consist of top rail, intermediate rail or equivalent protection, and posts, and shall have a minimum vertical height of 42 inches (1.1m) from upper surface of top rail to floor, platform, runway, stair landing, or ramp level. The top rail shall be smooth surfaced throughout the length of the railing. The intermediate rail shall be approximately halfway between the top rail and the floor, platform, runway, stair, or ramp. The ends of the rails shall not overhang the terminal posts, except where such overhang does not constitute a projection hazard. Spacing between guardrail system(s) and adjacent

E5.2 For more information about fall arrest please review ANSI/ASSE Z359.1, *Safety Requirements for Personal Fall Arrest Systems, Sub-Systems, and Components.*

E5.3 For more information about fall protection please review ANSI/ASSE Z359.1, *Safety Requirements for Personal Fall Arrest Systems, Sub-Systems, and Components.*

E5.4 Generally speaking, guardrails are 42 inches to 45 inches in height. However, guardrails that are higher than 42 inches may need additional horizontal intermediate rails. Guardrail systems are for guarding open-sided floors, platforms, ramps, runways, and stair landings.

Where vertical or horizontal barriers are not effective a personal fall arrest system should be considered.

structure(s) shall not exceed two inches (51mm), where a fall hazard exists.

5.5 Stair Railing System. A stair railing system shall be of construction similar to a guardrail system except it shall be made from round pipe for the graspable handrail sections, but the vertical height shall be not more than 42 inches (1067mm) or less than 34 inches (864mm) from the upper surface of the top rail to the surface of the tread in line with the face of the riser at the forward edge of the tread.

5.6 Railing System Design Requirements. Minimum requirements for railing systems are as specified in the following subsections.

5.6.1 The anchorage of posts and framing members for railing systems of all types shall be designed using standard engineering practices and safety factors. The completed railing systems shall be designed using standard engineering practices and safety factors. The completed railing systems shall be designed and constructed for its intended use to preclude system failure. As a minimum, it shall withstand a concentrated load of 200 pounds (90.7kg) applied in any direction, except upward, at the midpoint between posts without exceeding maximum allowable deflection. The intermediate rail shall be capable of withstanding a horizontal load of 160 pounds force applied perpendicularly at midpoint and midheight without exceeding the maximum allowable deflection of three inches (76mm). The end or terminal post shall be capable of withstanding a load of 200 pounds (90.7kg) applied in any direction at the top of the post. The above loads are not additive.

5.6.2 A removable railing system constructed of a flexible material, chain, or wire rope, shall be anchored by rigid supports spaced no more than eight feet (2.44m) apart. The maximum deflection of the flexible barrier, prior to the load application, shall be three inches (76mm).

E5.5 On open-sided stairs the stair railing system is also the guardrail and generally is not more than 42 inches in height. A separate handrail may be required depending on the width of the stairway.

E5.6.1 For more information please reference ASTM E985-00e1, *Standard Specification for Permanent Metal Railing Systems and Rails for Buildings*, Section 6, for metal railings.

Horizontal test would be applied at potentially weakest point of ornamental railing systems.

From a safety viewpoint, a residual deflection in excess of one half inch may indicate potential failure.

E5.6.2 Reference ASTM E985-00e1, *Standard Specification for Permanent Metal Railing Systems and Rails for Buildings*, Section 6.2, for deflection criteria.

Once the horizontal flexible material is properly attached and anchored to

All members shall be capable of withstanding a concentrated load of 200 pounds (90.7kg) applied at any point, in any direction except upward.

5.6.3 Overhang of rail ends shall be eliminated unless such overhang does not constitute a hazard, such as in the case of baluster railings, scrollwork railings, and panel railings.

5.7 Toeboard. A toeboard shall be a minimum three and one-half inches (89mm) in height and securely fastened in place, with not more than one-fourth inch (6mm) clearance above floor level. Toeboards shall be made of a substantial material, either solid or with openings not over one inch (25mm) in their greatest dimension.

The height of the toeboard shall be increased if materials are stored adjacent to the railing and additional protection is required. Additional toeboards shall be added above the required unit, or metal screening of at least 18-gauge thickness shall be installed between the floor and the intermediate or upper rail.

5.8 Handrail. A handrail shall consist of a lengthwise member mounted directly on a wall or partition by means of brackets attached so as to offer no obstruction to the smooth surface along the top and both sides of the handrail. The handrail shall be rounded with cross sectional design that furnishes an adequate handhold for any one grasping it to avoid falling. The ends of the handrail shall be turned into the supporting wall or partition or otherwise arranged so as not to constitute a projection hazard. The height of handrails shall be not more than 38 inches (965mm) or less than 34 inches (864mm) as measured vertically from the upper surface of the handrail to the surface of the tread in line with the face of the riser or to the surface of the ramp. Handrails shall be continuously graspable along their entire length. Handrails shall extend

withstand forces noted in Section 5.6.1, the sag at midpoint should be maintained at less than three inches (76mm). Rope, chain, or cable are acceptable materials in certain applications where deflection requirements are met.

E5.7 A curb may be used in lieu of a toeboard. Toeboards are used with guard-rails to reasonably help prevent debris, tools, nuts, and bolts, etc. from falling to a lower level and provide protection to workers below.

E5.8 Handrails should be continuous. However, obstructions and other building appurtenances may not permit construction of uninterrupted continuous handrails.

Handrail cross sections should be one and one-fourth to two inches (32 to 51mm) in diameter for circular shapes. For handrails of other than circular cross section, the perimeter dimension should not be less than four inches (10.2cm) and not more than six and one-fourth inches (15.9cm). The largest cross-sectional dimension should not be more than two and one-fourth inch (5.7cm), and all edges should be rounded so as to provide a radius of not less than one-eighth inch (0.3cm) (See NFPA 101®, *Life Safety Code*® for more information).

horizontally, at the required height, not less than 12 inches (305mm) beyond the top riser, and continue to slope for a depth of one tread beyond the bottom riser.

5.9 Clearance. All handrails and stair railing systems shall be provided with a clearance of not less than two and one-fourth inches (57mm) between the handrail or railing and any other object.

5.10 Floor Opening Cover. Floor opening covers shall be of any material that meets the strength requirements of the surrounding floor.

5.11 Skylight Screen. Skylight screens shall be of such construction and mounting that they are capable of withstanding a concentrated load of at least 200 pounds (90.7kg) applied perpendicular to any one area of one square foot dimension of the screen. They shall also be of such construction and mounting that, under ordinary loads or impacts, they will not deflect downward sufficiently to break the skylight or glass below them.

5.12 Barrier for Wall Opening. Wall opening barriers shall be of such construction and mounting that, when in place at the opening, the barrier is capable of withstanding a load, as specified in 5.6.1.

6. REQUIREMENTS FOR FIXED STAIRS

6.1 Fixed Stairs for Access. Fixed stairs shall be provided for access from one level to another where operations necessitate normal travel between levels, and for access to operating platforms for any equipment that requires routine attention. Changes in level (elevation) of less than 21 inches (533mm) shall be achieved either by a ramp or stair. Stairs serving as a required means of egress for life safety (evacuation) shall comply with NFPA 101, *Life Safety Code*, the International Building Code (IBC), and/or applicable building codes, regulations,

E5.11 The skylight construction may be of grillwork with openings not more than four inches (102mm), or of slat work with openings not more than two inches (51mm) wide, with length unrestricted. The screen should be tested by the manufacturer to show its capacity meets the requirements of the application.

E6.1 Single risers and flights of three risers or less (short flights) are considered stairs and should meet all requirements for stairs. Treads of short flights should not be less than 13 inches (330mm) of tread depth, and their presence and location should be facilitated to improve step identification through the use of visual cues, which include: handrails; delineated nosing edges; tactile cues; warning signs; contrast in surface colors; and accent lighting.

standards, or ordinances, or all of these.

6.1.1 Spiral stairs, ship ladders, or alternating tread devices shall not be permitted in new construction, unless space limitations make it unfeasible to use conventional stair designs.

Exception: For special limited usage and secondary access situations where it is not practical to provide a conventional stairway, spiral stairs, ship ladders, or alternating tread devices are permitted (see Figures 6.1.1:A, 6.1.1:B, and 6.1.1:C).

E6.1.1 Three point contact should be used at all times when ascending or descending spiral stairs, ship stairs or alternating tread stairs. Some alternating tread stairs are built to be descended facing away from the stair, making three point contact a necessity. Three point contact means that either both hands and one foot, or both feet and one hand are in contact with the climbing device at all times.

For more information refer to Figures 6.1.1:A, 6.1.1:B, and 6.1.1:C.

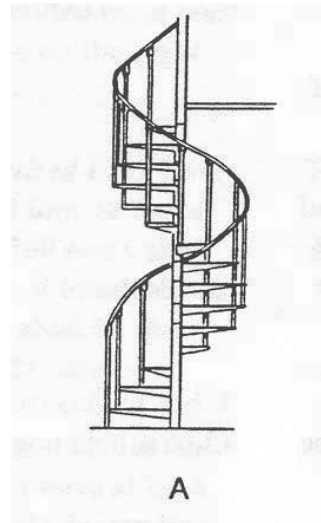


Figure 6.1.1:A

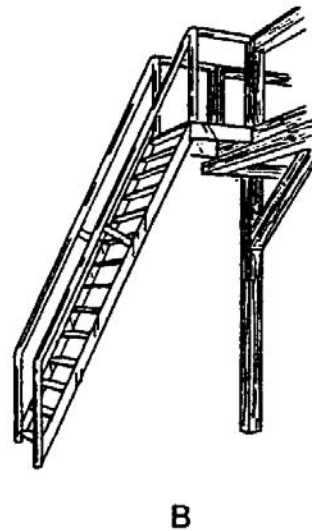
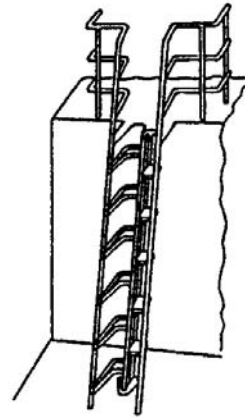


Figure 6.1.1:B



C

Figure 6.1.1:C

6.2 Load Criteria. Fixed stairs shall be designed and constructed to carry a load of five times the normal anticipated live load, but never less than a concentrated load of 1,000 pounds (453.6kg) applied at any point.

6.3 Clearance. Fixed stairs shall have a minimum clear width of 22 inches (559mm).

6.4 Slope. Fixed stairs shall be installed, depending upon their type, at angles to the horizontal of thirty and seventy degrees.

E6.4 The preferred slope for a stairway is 30 to 35 degrees from the horizontal (see Figure 6.4). The International Building Code (IBC), and/or applicable building codes, regulations, standards or ordinances should also be considered.

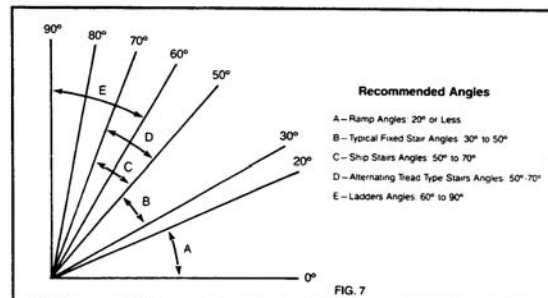


Figure 6.4

6.5 Tread Depth and Riser Height. Any uniform combination of tread-riser dimensions shall be used that results in a

E6.5 Depending on the stair type, certain riser and tread dimensions could be limited. The International Building Code

stairway at an angle to the horizontal within the permissible range; but minimum tread depth and maximum riser height shall be nine and one-half inches (241mm).

6.6 Nosing. Nosings shall have an even leading edge and not extend more than one and one-half inches (38mm) beyond the face of the lower riser.

6.7 Slip Resistance. All treads and nosings shall be of slip resistant material.

6.8 Uniformity of Risers and Treads. Riser height and tread depth shall be uniform throughout any flight of stairs including any foundation structure used as one or more treads of the stairs.

6.9 Long Flight of Stairs. Flights of stairs, uninterrupted by landings, or intermediate platforms shall be avoided.

6.10 Stair Landing. Stair landings shall be no less than the width of the stair and a minimum of 30 inches (762mm) in length measured in the direction of travel along the centerline of the landing (see Section 6.11).

6.11 Door and Gate Openings. Stairs shall have landings at door openings and

(IBC), NFPA 101, *Life Safety Code*, OSHA regulations, and/or building codes, regulations, standards or ordinances should also be considered.

E6.6 Any add-on nosings should be of construction as to be adequately secured and maintained so that it does not present tripping or falling hazards. Any add-on nosings should be of a contrasting color or its equivalent to make the edge of the stair clearly visible. The International Building Code (IBC), NFPA 101, *Life Safety Code*, OSHA regulations, building codes, regulations, standards or ordinances should also be considered.

E6.7 For more information about slip resistance please review ANSI/ASSE A1264.2, *Standard for the Provision of Slip Resistance on Walking/Working Surfaces*. The International Building Code (IBC), NFPA 101, *Life Safety Code*, OSHA regulations, building codes, regulations, standards or ordinances should also be considered.

E6.8 Variation in excess of 3/16 inches (4.8 mm) in the depth of adjacent treads or in the height of adjacent risers should be avoided. The tolerance between the largest and smallest riser or between the largest and smallest tread should not exceed 3/8 inches (9.5 mm) in any flight.

E6.9 Flights (runs) of stairs are generally 12 feet (3.66m) vertical between landing, but not more than 15 feet (4.5m). The International Building Code (IBC), NFPA 101, *Life Safety Code*, building codes, regulations, standards or ordinances should also be considered.

E6.11 For more information please review Figure 6.11.

gate openings. During its swing, the door shall leave not less than one-half of the required width of the landing unobstructed. The door shall project not more than seven inches (180mm) into the required width of the landing when the door is fully open.

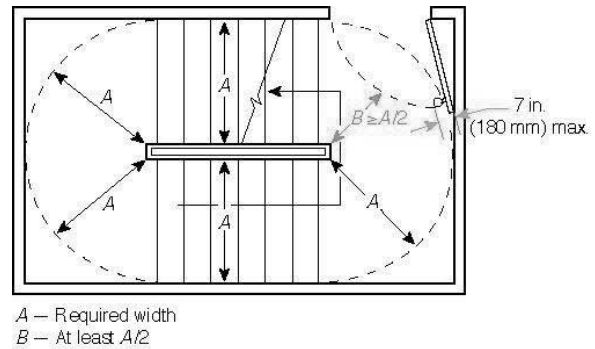


Figure 6.11

6.12 Vertical Clearance. Vertical clearance (headroom) above any stair shall be at least 80 inches (2032mm) measured vertically from the edge of the nosing to the overhead obstruction. The vertical clearance shall be continuous above the stairway to the point where the line intersects the landing below, one tread depth beyond the bottom riser. The clearance shall be maintained the full width of the stairway and landing.

6.13 Open Risers. Spiral stairs, ship ladders, or alternating tread devices having tread depth of less than nine and one-half inches (241mm) shall have open risers.

E6.13 Open risers are needed on certain narrow tread and steep angled stair systems and exterior structures. Spiral stairs, ship ladders, and alternating tread devices are permissible by Section 6.1.1 under certain conditions.

7. REQUIREMENTS FOR USE OF RAILING SYSTEMS, RAILS AND HANDRAILS

7.1 Provision and Design. Railing systems as specified in this standard, shall be provided on all open sides of all exposed stairways, stair landings and platforms. Railing systems shall be designed and installed in accordance with 5.5 and 5.6.

7.2 Stair Railing System/Handrail Required Use. Every flight of stairs shall be equipped with a handrail system as specified in 7.2.1 through 7.2.6. Stair width, for the purposes of applying the provisions of this section shall be nominal width of the stair.

E7.2 Single risers and flights of three risers or less (short flights) are considered stairs and should meet all requirements for stairs. Treads of short flights should not be less than 13 inches (330mm), and their presence and location should be facilitated to improve step identification through the use of visual cues, which include: handrails;

delineated nosing edges; tactile cues; warning signs; contrast in surface colors; and accent lighting.

Nominal stair width is depicted below in Figure 7.2.

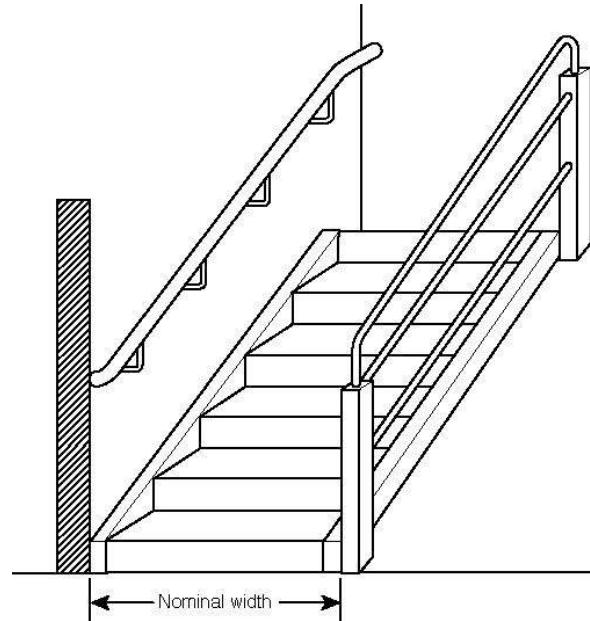


Figure 7.2

7.2.1 Stairways not exceeding 44 inches (1.1m) in width, having both sides enclosed, shall have at least one handrail preferably on the right side descending.

7.2.2 Stairways not exceeding 44 inches (1.1m) in width, having one side open, shall have at least one stair-railing system on the open side.

7.2.3 Stairways not exceeding 44 inches (1.1m) in width, and having both sides open, shall have one stair-railing system on each side.

7.2.4 Stairways of more than 44 inches (1.1m) in width, but not exceeding 88 inches (2.2m) in width, shall have one handrail on each enclosed side and one stair-railing system on each open side.

7.2.5 Stairways more than 88 inches

E7.2.1 If feasible, handrails should be installed on both sides of stairs.

E7.2.2 If feasible, handrails should be installed on both sides of stairs.

E7.2.4 Any stairway more than 75 inches (1.9 m) in width should have an intermediate handrail. Additional intermediate handrails should be provided so that all portions of the stairway width are within 30 inches (762mm) of a handrail.

E7.2.5 Additional intermediate handrails

(2.2m) in width, shall have one handrail on each enclosed side, one stair-railing system on each open side, and one intermediate stair-railing system located approximately midway of the width of the stairway.

7.2.6 Exterior stairways that have earth built up on both sides shall have a railing system on both sides.

8. REFERENCES. The following standards and documents can be reviewed as supporting documents for this standard. It is recommended that the most current version of the standard cited below be used:

ANSI/ASSE A10.18, *Safety Requirements for Temporary Floors, Holes, Wall Openings, Stairways and Other Unprotected Edges in Construction and Demolition Operations.*

ANSI/ASSE A1264.2, *Provision of Slip Resistance on Walking/Working Surfaces*

ANSI/ASSE Z490.1, *Accepted Practices for Safety, Health, and Environmental Training*

ANSI/ASSE Z359.1, *Safety Requirements for Personal Fall Arrest Systems, Sub-systems, and Components*

ASTM E661, *Standard Test Method for Performance of Wood and Wood-Based Floor and Roof Sheathing Under Concentrated Static and Impact Loads*

ASTM E695, *Standard Method for Measuring Relative Resistance of Wall, Floor, and Roof Construction to Impact Loading*

ASTM E985, *Standard Specification for Permanent Metal Railing Systems and Rails for Buildings*

ASTM F1637, *Standard Practice for Safe Walking Surfaces*

should be provided so that all portions of the stairway width are within 30 inches (762mm) of a handrail.

E7.2.6 Additional intermediate handrails should be provided so that all portions of the stairway width are within 30 inches (762mm) of a handrail.

E8. Readers often ask for information regarding construction and demolition sites since the standard excludes them from A1264.1. Those with an interest from the construction and demolition perspective should review A10.18.

Readers of the standards interested in walking/working surfaces should review A1264.2 for more information. The scope of the A1264.2 is: "Scope. This standard sets forth provisions for protecting persons where there is potential for slips and falls as a result of surface characteristics or conditions."

The 1264 ASC believes that training is a critical component of a safety and health program. Writing such programs is outside the scope of the A1264 ASC. As an alternative, a reference is being made to ANSI/ASSE Z490.1.

The A1264 ASC believes that floor maintenance is a critical issue. Writing such programs is outside the scope of the A1264 ASC. As an alternative, a reference is being made to ASTM F1637-02e1.

The A1264 ASC believes safety management is a critical issue. Writing such programs is outside the scope of the A1264 ASC. As an alternative, a reference is being made to ANSI/AIHA Z10.

ANSI/AIHA Z10, *American National Standard for Occupational Health and Safety Management Systems*

NFPA 101®, *Life Safety Code*®

ANSI Z535.1, *Safety Color Code*

ANSI Z535.2, *Environmental and Facility Safety Signs*

CFR 1926.502(c)(4)(i), *Safety Net Systems*

IBC, *International Building Code*

