

# Regulations and Standards for Fall Protection and Pedestrian Safety

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Appendix to *The Law of Slip & Fall*, Daniel R. Denton, 2014

Below are summaries of some of the most relevant sections from various governmental regulations and industry standards relating to safe walking surfaces and fall protection, including those from International Codes Council (IBC, IPMC), Federal Regulations (ADA & OSHA), private organizations (ANSI, ASTM, NFSI, UL) and South Carolina codes.

## INTERNATIONAL

### **International Code Council (ICC)**<sup>1</sup>

The ICC was formed in 1994 by merging three regional model code associations which separately published the *National Building Code* that governed the East and parts of the Midwest; the *Standard Building Code* that governed the Southeast; and the *Uniform Building Code* that governed the West and parts of the Midwest. Drawing upon the three regional codes, the ICC worked to create model codes that would have nationwide application, resulting in 15 International Model Codes, or I-Codes, published by ICC. In addition to building, these codes included codes for electrical, plumbing, mechanical, fire, etc. The I-Codes provide minimum standards for the design, construction, and inspection of safe, sustainable structures for housing, schools, and workplaces. All fifty states and the District of Columbia have adopted the I-Codes at the state or local level, as have a number of federal agencies and more than a dozen countries. Among the 15 I-Codes is the *International Building Code* (IBC), first published in 1997. The IBC applies to all structures, except for one and two family dwellings, which is covered by the International Residential Code (IRC).

Pursuant to S.C. Code § 6-9-50, every city and county in South Carolina that does not “opt out” of the Code Enforcement Program must enforce the latest edition of the reference mandatory building codes, which are the various codes issued by the IBC. (See “South Carolina” at end of this Appendix.)

- **IBC § 101.2 Scope.** The provisions apply to the construction, alteration, repair, equipment, use and occupancy of every building or structure or attachments.
- **IBC § 101.3 Intent.** “The purpose of this code is to establish the minimum requirements to safeguard the public health, safety and general welfare through

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<sup>1</sup> 2002-2012 versions of the IBC and other I-Codes are available online at:  
<http://publicecodes.cyberregs.com/icod/ibc/>.

structural strength, means of egress facilities . . . and safety to life and property from fire and other hazards attributed to the built environment . . . .”

- **IBC § 1003.4 Floor surface.** Walking surfaces of the means of egress shall have a slip-resistant surface and be securely attached.
- **IBC § 1003.5 Elevation change.** Where changes in elevation of less than 12 inches exist in the means of egress, sloped surfaces shall be used. Where the slope is greater than 5%, ramps shall be used. Where the difference in elevation is 6 inches or less, the ramp shall be equipped with either handrails or floor finish materials that contrast with adjacent floor finish materials. Certain exceptions apply involving use of a single step.
- **IBC § 1003.6 Means of egress continuity.** The path along a means of egress shall not be interrupted by any building element, except as specified and no obstructions are allowed.
- **IBC § 1008.1.3.1 Revolving doors.** Specifies location and RPM speed limitations for power-assisted and manual revolving doors.
- **IBC § 1008.1.3.2 Power-operated doors.** Has power failure and opening and closing force requirements. Full-power-operated doors shall comply with BHMA A156.10. Power-assisted and low-energy doors shall comply with BHMA A156.19. (See Section, Private/ANSI).
- **IBC § 1009 Stairways.** For interior and exterior stairways, specifies width, dimensions and construction details of treads, risers, landings and headroom.
- **IBC § 1009.9.1 Stairway walking surface.** Treads and landings shall not be sloped more than 2% and shall have a solid surface, with finish floor surfaces securely attached.
- **IBC § 1009.15 Handrails.** Stairways shall have handrails on each side. Dwelling units only require one handrail and none are required for three or fewer steps. Other exceptions apply.
- **IBC § 2103.6 Ceramic Tile.** The IBC does not specify coefficient of friction (COF) values or refer to any slip resistance standard. However, ceramic tiles shall conform to the requirements of ANSI A137.1, which specifies a minimum dynamic COF of 0.42 “for level interior spaces expected to be walked upon when wet.”

### **The International Property Maintenance Code (IPMC)**

Published by the ICC, “[t]he IPMC is a model code that regulates the minimum maintenance requirements for existing buildings. It is a maintenance document intended to establish minimum maintenance standards for basic equipment . . . sanitation and fire safety. Responsibility is fixed among owners, operators and occupants for code compliance. The IPMC provides for the regulation and safe use of existing structures in the interest of the social and economic welfare of the community. This code is founded on principles intended to establish provisions consistent with the scope of a property maintenance code that adequately protects public health, safety and welfare.” As of this book's publication, the IPMC has not been adopted as one of the mandatory codes under S.C. Code § 6-9-50. See last section of this Appendix for South Carolina codes.

- **§ 101.2 Scope.** Applies to all existing residential and nonresidential structures and constitute minimum requirements and standards for premises, structures, equipment and facilities for building elements and for life safety, safety from fire and other hazards, and for safe and sanitary maintenance; the responsibility of owners, operators and occupants; the occupancy of existing structures and *premises*, and for administration, enforcement and penalties.
- **§ 102.3 Application of other codes.** Repairs, additions or alterations to a structure, or changes of occupancy, shall be done in accordance with the procedures and provisions of the *International Building Code*.
- **§ 102.5 Workmanship.** Repairs, maintenance work, alterations or installations shall be executed and installed in a *workmanlike* manner and installed in accordance with the manufacturer's instructions.
- **§ 108.1.1 Unsafe structures.** Those found to be dangerous to the life, health, property or safety of the public or the occupants of the structure.
- **§ [A] 108.1.2 Unsafe equipment.** Includes any boiler, heating equipment, elevator, moving stairway, or other equipment on the premises or within the structure which is in such disrepair or condition that such equipment is a hazard to life, health, property or safety of the public or occupants of the premises or structure.
- **§ 108.1.5 Dangerous structure or premises.** Any structure or premises that have any of these conditions or defects shall be considered dangerous:
  1. Any door, aisle, passageway, stairway, exit or other means of egress that does not conform to the approved building or fire code.
  2. The walking surface of any aisle, passageway, stairway, exit or other means of egress is so warped, worn loose, torn or otherwise unsafe as to not provide safe and adequate means of egress.
- **§ 302.3 Sidewalks and driveways.** Sidewalks, walkways, stairs, driveways, parking spaces and similar areas "shall be kept in a proper state of repair, and maintained free from hazardous conditions."
- **§ 304.10 Stairways, decks, porches and balconies.** Every exterior stairway, deck, porch and balcony, and all appurtenances attached thereto, shall be maintained structurally sound, in good repair
- **§ 304.12 Handrails and guards.** Every handrail and guard shall be firmly fastened and capable of supporting normally imposed loads and shall be maintained in good condition.
- **§ 304.15 Doors.** All exterior doors, door assemblies, operator systems if provided, and hardware shall be maintained in good condition.

## **FEDERAL**

### **Americans with Disabilities Act (ADA)**<sup>2</sup>

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<sup>2</sup> The 2010 ADA Standards for Accessible Design are available online in html and pdf at [http://www.ada.gov/2010ADASTandards\\_index.htm](http://www.ada.gov/2010ADASTandards_index.htm).

The ADA requires certain public and private facilities to be accessible to persons with disabilities. In 2010 the Justice Department adopted new Standards for Accessible Design (ADASAD). The ADA does not cover residential facilities, which is under the jurisdiction of the Federal Fair Housing Act. The companion Advisory Guidelines (ADAAG) generally apply to new construction and to certain alterations of structures and are for both State and local government facilities (Title II) and public accommodations and commercial facilities. The stated purpose of the handicapped access standard is to make buildings and facilities accessible and usable by people with physical disabilities. While the standard is drafted to be adopted as a model code by governmental agencies, it is also intended to be used by nongovernmental parties as technical design guidelines. The ADA requirements “were promulgated for the benefit of physical impaired individuals, making their relevance to the ambulation of the able-bodied arguable.”<sup>3</sup>

- **28 CFR § 36.403(e).** A "path of travel" includes a continuous, unobstructed way of pedestrian passage. An accessible path of travel consists of walks and sidewalks, curb ramps and other interior or exterior pedestrian floor paths and ramps.
- **§ 302.1 Floor or Ground Surfaces.** Shall be stable, firm and slip-resistant.
  - **Advisory 302.1 General.** A stable surface is one that remains unchanged by contaminants or applied force, so that when the contaminant or force is removed, the surface returns to its original condition. A firm surface resists deformation by either indentations or particles moving on its surface. A slip-resistant surface provides sufficient frictional counterforce to the forces exerted in walking to permit safe ambulation.
  - **ADAAG** recommends that walking surfaces have certain COF slip resistance, but no standards or methods of measurement are specified in scoping or technical provisions.
- **§ 303 Changes in Level.** Changes in level between 1/4 and 1/2 inch shall be beveled with a slope no greater than 1:2. Changes in level greater than 1/2 inch shall be accomplished by means of a ramp that complies with certain standards.
- **§ 302.2 Carpet.** Carpet used on a floor or ground surface shall be securely attached; have a firm cushion, pad, or backing, or no cushion or pad; and have a specified loop, pile and thickness. Exposed edges of carpet shall be fastened to floor surfaces and have specified trim.
- **§ 504 Stairways.** Specifies dimensions for uniform riser heights and tread depths. Stair treads and landings subject to wet conditions shall be designed to prevent the accumulation of water.
- **§ 505 Handrails.** Generally, handrails are required on both sides of stairs and ramps. Top of gripping surfaces shall be 34-38 inches.

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<sup>3</sup> Steven Pi Dilla, *Slip, Trip, and Fall Prevention: A Practical Handbook*, 165 (2<sup>nd</sup> Ed. 2010). This book is intended for use by safety professionals and concentrates on the principles and measurement of slip resistance, but includes extensive coverage of fall protection standards, best practices for facility design, hazard recognition and prevention guidelines, checklists, case studies, online resources, and an extensive bibliography. The 2003 first edition of this book is available for free download at several websites, including [www.bookbay.org](http://www.bookbay.org) and [www.docstoc.com](http://www.docstoc.com).

- **§ 609 Grab Bars.** Size, spacing, location and structural strength requirements specified for toilet and bathing facilities; and shall be free of sharp or abrasive elements and shall have rounded edges.

## **Occupational Safety and Health Administration (OSHA)<sup>4</sup>**

OSHA implemented fall protection and walking surface standards for general, construction and other industries requiring employers to ensure fall restrictive or limiting devices are used to prevent inadvertent falls. Twenty-five states, including South Carolina, have OSHA-approved state plans, which for the most part adopt standards that are identical to Federal OSHA. While the standards apply to employers, arguably the inspection requirements should reasonably include hazards that may be presented to the general public by the conditions at the job site where non-employees may encounter the conditions on the premises.

- **Typical OSHA Fall Protection Areas Include:**
  - Walkways, stairways, ladders and floor openings
  - Scaffolding and elevated work platforms
  - Rooftops and all leading edge locations
  - All baskets and powered man-lifts
- **Fall Protection Regulations**
  - 29 CFR 1910 Subpart D – Walking and Working Surfaces (General Industry)
  - 29 CFR 1926 Subpart M – Fall Protection (Construction Industry)
  - 29 CFR 1926 Subpart L – Scaffolding
  - 29 CFR 1926 Subpart X – Ladders
- **Summary of Relevant Fall Protection Standards**
  - Floors must be kept dry and free of obstructions (1910.22(a)(2)).
  - Slip resistance for walking surfaces – No mandate, but recommends a COF of 0.5; no specification of a test method, standard, or test instrument (1910.22).
  - Mats or other dry standing places should be provided where practicable (1910.22).
  - Aisles and passageways shall be kept clear and in good repairs, with no obstruction across or in aisles that could create a hazard (1910.22(b)(1)).
  - Provide warning signs for wet floor areas. Accident Prevention Signs and Tags Standard (1910.145(c)(2)).
  - Every flight of stairs having four or more risers shall be equipped with standard stair railings or standard handrails (1910.23).
  - Employees exposed to fall risks must be trained and equipped in the prevention of injuries associated with slip, trip and fall hazards (1926.21 & 1926.503).
  - Stairway openings, ramps, walkways and other work areas exposed to greater than 6 feet height must be guarded (1926.501).

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<sup>4</sup> The OSHA law and regulations are available online at <https://www.osha.gov/law-regs.html>.

- Open sided floors or platforms 4 feet or more above adjacent surfaces must be appropriately guarded (1910.23).
- Ladders and scaffolding must be designed, constructed and used per applicable standards.
- Ladders shall extend at least 3 feet above the working surface (1926.1053(b)(1)).
- A proposed rule change for 29 CFR, 1910, Subpart D, would require a “qualified person” – one with special training – to inspect, maintain, and repair walking and working surfaces.

## **PRIVATE**

The following private organizations publish voluntary standards and have no role in requiring or enforcing compliance with its standards. Any of the standards, however, may become mandatory, and/or constitute standards of care owed to others, when incorporated by contract, or when adopted by a company or other entity, or adopted by a governmental agency or political subdivision.

### **American National Standards Institute (ANSI)**

A nonprofit organization that oversees the development of standards and guidelines across a wide array of business sectors to enhance global competitiveness of American businesses while assuring the safety and health of consumers and the protection of the environment.<sup>5</sup>

- **ANSI/ASSE A1264.2-2012.** *Provision of Slip Resistance on Walking/Working Surfaces.*
  - Applies only to workplaces rather than the general public.
  - Has provisions for “protecting persons where there is potential for slips and falls as a result of surface characteristics or conditions.”
  - Addresses floor surface characteristics, footwear traction properties, environmental factors, and human factors.
  - Selection of walkway surface material.
  - Pre-accident (and post) warnings, including signage and placement.
  - Recommends that mats or runners be used in some locations to reduce slipping hazards.
  - Addresses housekeeping training and maintenance, surface testing and floor selection.
  - Recommends that floors meet a minimum dry SCOF of 0.5.
- **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.*

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<sup>5</sup> The copyrighted ANSI standards may be purchased online at <http://webstore.ansi.org/>.

- Provides safety requirements for workplace areas where danger exists of persons from objects falling through floor or wall openings, platforms, runways, ramps and fixed stairs.
- Includes requirements for slip resistance
- **ANSI/ASSE TR-A1264.3-2007.** *ANSI Technical Report: Using Variable Angle Tribometers (VAT) for Measurement of the Slip Resistance of Walkway Surfaces.*
  - Provides guidance for slip resistance testing.
- **ANSI/NFSI B101.1-2009.** *Test Method for Measuring Wet SCOF of Common Hard-Surface Floor Materials.*
  - First uniform test for all walkway surfaces.
  - Specifies the procedures and devices used for testing to measure the wet static COF of common hard-surface floor materials.
  - Rather than categorizing walkways as safe or unsafe based upon a single COF value, the standard identifies three wet SCOF risk categories, or “traction ranges”: high traction (0.6 and higher), moderate traction (0.4 to 0.6), and low traction (less than 0.4).
  - Recommends remediation plans for each level.
- **ANSI/ASSE A10.18-2007.** *Temporary Roof & Floor Holes, Wall Openings, Stairways Safety Requirements for, & Other Unprotected Edges in Construction & Demolition Operations.*
- **ANSI/BHMA A156.10:** *Standard for Power Operated Pedestrian Doors.*
- **ANSI/BHMA A156.19:** *Standard for Power Assist and Low Energy Power Operated Doors*
- **ANSI/MHNA A156.27-2011** *Standard for Power and Manual Operated Revolving Pedestrian Doors*

### **ASTM International**

An international standards organization (formerly known as the American Society of Testing Materials) that develops voluntary consensus technical standards for a variety of products, materials and services. ASTM members, more than 30,000 of the world’s top technical experts and business professionals representing 150 countries, provide the test methods, specifications and standards that support industries and governments worldwide. ASTM is the most active in the development of pedestrian safety related standards in the U.S.<sup>6</sup>

- **ASTM F1637-13.** *Standard Practice for Safe Walking Surfaces.*
  - **§ Scope** – Covers design and construction guidelines and minimum maintenance criteria for new and existing buildings and structures.

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<sup>6</sup> Purchase copyrighted standards online at <http://www.astm.org/Standard/>.

- **§ 5.1 & 5.2. Walkways** – Shall be stable, planar, flush, even and slip resistant under expected environmental conditions and use; if interior walkways are not slip resistant when wet, then they shall be maintained dry during periods of pedestrian use. Changes in levels greater than 1/2 in. shall be transitioned by means of a ramp or stairway.
  - **§ 5.3. Carpet** – Shall be maintained so as not to create pedestrian hazard by being firmly secured and not having loose or frayed edges, wrinkles or other trip hazards that may cause trip.
  - **§ 5.4. Mats** – To be placed at building entrances and interior walkways where needed to keep them dry during inclement weather and shall be maintained so as not to create pedestrian hazards, as shall area rugs.
  - **§ 5.5. Illumination** – Minimum walkway illumination governed by the requirements of local codes; shall be designed to be glare free to avoid casting of obscuring shadows on walkways and stairs; pedestrian use areas, including parking lots, shall be properly illuminated.
  - **§ 5.7. Exterior walkways** – Shall be maintained so as to provide safe walking conditions and shall be slip resistant; and repaired or replaced where there is an abrupt variation in elevation between surfaces.
  - **§ 7.1. Stairways** – Distracting views shall be avoided that can attract the stair user’s attention, i.e., advertisements and store displays; step nosings shall be readily discernible and slip resistant; short flight stairs shall be avoided where possible, but if used, obvious visual cues shall be provided, such as handrails, delineated nosing edges, contrast in surface colors, etc.
  - **§ 8. Speed Bumps** – To be avoided when designing; if in foreseeable pedestrian paths they shall comply with § 5.2 (walkway changes in level) and if not, they shall have safety color coding to contrast with surroundings.
  - **§ 9. Wheel Stops** – Parking lots should be designed to avoid their use; they shall not be placed in pedestrian walkways or foreseeable pedestrian paths; and shall be in contrast with their surroundings.
- **ASTM F1694-09.** *Standard Guide for Composing Walkway Surface Evaluation & Incident Report Forms for Slips, Stumbles, Trips & Falls.*
    - “This guide provides recommendations for recording walkway surface investigation, evaluation, and incident report data pertaining to slips, trips, stumbles, and falls.”
  - **ASTM F2965 – 13.** *Standard Guide for Selection of Walkway Surfaces and Treatments When Considering Aggressive Contaminant Conditions in Commercial and Industrial (Not Including Construction) Environments.*
    - **§ 1.1.** Intended to assist in the selection of walking surfaces and treatments where the foreseeable presence of aggressive contaminants produces the danger of slip and falls in commercial and industrial (not including construction) environments, for persons wearing appropriate footwear.



- § 5.1 The slip hazard from aggressive contaminants on walkway surfaces is often found in commercial and industrial (not including construction) settings including fresh fruits and vegetables open display areas, manufacturing processes, food preparation and processing areas....
- § 5.2 Ladder rungs, steps and other similar means of access and egress should be considered as walkway surfaces in slip-resistance analyses in commercial and industrial (not including construction) environments where aggressive contaminants are determined to be a factor.

### **National Floor Safety Institute (NFSI)**

A nonprofit organization focused on slip, trip, and fall prevention through education, research, and standards development. NFSI provides organizations with an opportunity to have their floors assessed and certified. In 2006, NFSI was accredited to be an ANSI standards developer.

The NFSI also provides product testing and certifies flooring materials, coatings, cleaning materials, and treatments according to these standards:

- **NFSI 101-A.** *Standard for Measuring Wet SCOF of Common Walkway Materials and Coatings.*
- **NFSI 101-B.** *Standard for Measuring Wet SCOF of Chemical Floor-Cleaning Agents and Treatments.*
- **NFSI 101-C.** *Test Method for Measuring Dry TCOF of Floor Mat Backing Materials.*

### **Underwriters Laboratories (UL)**

A nonprofit product safety testing and certification organization.

- **UL-410. Slip Resistance of Floor Surface Materials**
  - “These requirements cover the testing of floor and finishing materials to determine if their minimum average and minimum individual static coefficients of friction meet or exceed the specified requirements with respect to slip resistance only.”
  - Similar to ASTM D-2047.

## **SOUTH CAROLINA**

### **S.C. Code § 6-9-5. Public policy for building codes**

“(A) The public policy of South Carolina is to maintain reasonable standards of construction in buildings and other structures in the State consistent with the public health, safety, and welfare of its citizens. To secure these purposes, a person performing building codes enforcement must be certified by the South Carolina Building Codes Council, and this act is necessary to provide for certification.”

## **Building Codes in Effect for South Carolina**<sup>7</sup>

Every city and county in South Carolina that does not “opt out” of the Code Enforcement Program must enforce the latest edition of the mandatory building codes referenced in S.C. Code § 6-9-50 after they have been reviewed and adopted by the Building Code Council. Mandatory building codes adopted for current use in South Carolina which must be enforced by local jurisdictions include:

- 2003 International Building Code (IBC) with S.C. modifications.
- 2003 International Residential Code (IRC) with S.C. modifications.
- 2003 International Fire Code with S.C. modifications.
- 2003 International Plumbing Code.
- 2003 International Mechanical Code.
- 2003 International Energy Conservation Code.
- 2003 International Fuel Gas Code with S.C. modifications.
- 2002 National Electrical Code.

Jurisdictions that have legally opted out of the code enforcement program at this time include the Towns of Richburg, Ehrhardt, and Pamplico, and the County of Union.

## **Permissive Codes**

As allowed by S.C. § 6-9-60, other “nationally recognized codes” may be adopted as needed by a local jurisdiction, but the codes must be adopted by ordinance before enforcement can begin. The permissive codes include:

- 2003 International Property Maintenance Code.
- 2003 International Existing Building Code.
- 2003 International Performance Code for Buildings and Facilities.

## **Accessibility Act and Other Accessibility Laws**

The Accessibility Act required adoption of the 1998 ICC/ANSI A117.1, *Accessible and Useable Buildings and Facilities*, and is mandatory for use in all jurisdictions within the state. Additional accessibility laws that apply in South Carolina include:

- Americans with Disabilities Act (ADA).
- Fair Housing Act Amendments of 1988.
- South Carolina Fair Housing Law.

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<sup>7</sup> The IBC Codes adopted in South Carolina are available online for free viewing at <http://publicecodes.cyberregs.com/st/sc/>. For implementation history and other information, see South Carolina Building Codes Council at <http://www.llr.state.sc.us/pol/bcc/>.

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