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## Five Types of Same-Level Falls

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*Same-level or same-surface* falls, that include falls on relatively level surfaces, ramps, and stairs (opposed to fall-from-elevation or fall-to-below type falls) are caused by a disruption of normal or expected walking gait that results in a sudden lose of balance, and may be separated into five different categories based on the underlying mechanism of the fall process:

1. **Slip-type falls** (slip-and-fall) incidents in which the interface (coefficient of friction) between a pedestrian's foot and the floor, typically at the moment of *heel strike*, results in a sliding motion, causing one's center of gravity to move beyond its base of support,<sup>1</sup> producing imbalance, and a potential fall.<sup>2</sup>

2. **Trip-type falls** (trip-and-fall) incidents in which the pedestrian encounters an unseen raised object in his walking path.<sup>1,2</sup>

During the walking process, a trip-type-fall may occur when an object or other raised characteristic of the walking surface prevents or even momentarily delays the trailing leg from swinging forward to achieve a timely and accurate positioning of the foot on the surface in the direction of travel in order to support and balance the upper body at the critical moment of anticipated foot contact.

3. **Stump-type falls** (stump-and-fall) incidents in which a moving foot encounters an impediment in the walking surface (raised object or even a sticky surface) that interrupts the normal movement of the foot.<sup>1, 2</sup> Expecting to continue at the established pace, a person falls when his or her foot is unable to respond properly.<sup>2</sup>

A "stump" is the part of a tree trunk left protruding from the ground after the tree has fallen or has been felled. One definition of "to stump" is to catch, snag, or "**st**ub one's toe or foot."<sup>3</sup>

Stump-type falls may be thought of as a sub-set of trip-type falls involving defects in flooring that are relatively close to (*on or above*) a walking surface that disrupt one's normal or anticipated gait, preventing the normal foot swing that is necessary to maintain balance during the walking process.

4. **Step-down-type fall** incidents in which the foot encounters an unexpected step down in a walking surface,<sup>2</sup> such as a hole,<sup>1</sup> depression, or weak spot that gives way in the walking surface.<sup>2</sup>

A step-and-fall occurs when one encounters an unnoticed single step down (curb or a inconspicuous 2 step stair) in a normally anticipated level surface. This can also happen when someone thinks that he or she has reached the bottom of a set of stairs when, in reality, there is one more step.

5. **Forced-rotation-type fall** incidents occur when someone's foot encounters an unexpected object or the edge of a change in surface elevation (hole, depression, curb, step, stone, or uneven surface crack or floor plate) that causes a person to *turn an ankle* or otherwise be unable to place their foot on a walking surface as anticipated to support one's weight.

<sup>1</sup>Miller, Barrett C., "Falls: A Cast of Thousands Cost of Millions," *Safety & Health*, February 1988, pp. 22-26.

<sup>2</sup>Goetsch, David L., *Industrial Safety and Health in the Age of High Technology*, 1993, p. 160.

<sup>3</sup>American Heritage® Dictionary of the English Language, Fourth Edition, 2000, Houghton Mifflin Company, Merriam-Webster, Inc.

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