

California Institute of Technology

WALKING/WORKING SURFACES GUIDELINES



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Overview

One of the most common safety hazards at Caltech is slips, trips, and falls (STFs). Although many people think of falls as occurring from one level to another level (e.g., falling off a ladder or roof), the majority of STFs occur on the same level. As a result, the guidelines in this walking/working surfaces document primarily focus on the prevention of STFs on the same level, such as public sidewalks on campus and work platforms, in addition to stairways and ramps.

Incidents involving slips, trips, and falls (STFs) can frequently result in serious disabling and costly injuries. After ergonomics or overexertion injuries (i.e., strains and sprains), STFs are the second most common cause of injuries in the workplace, with the lower extremities (e.g., knees and ankles) being the body parts most commonly injured. However, many STFs result in injury to multiple body parts.

Following are some of the top causes of STFs on walking/working surfaces:

- Contaminants on the floor or ground (e.g., water, grease, oil, fluids, food)
- Poor drainage of water and other liquids from walking/working surfaces
- Irregularities in walking/working surfaces (e.g., uneven floor or ground)
- Projections, obstructions, cracks, and holes in walkways or grassy areas
- Debris, stones, rocks, wet leaves, and tree droppings in walkways
- Inadequate lighting in walkways, stairways, and parking lots/garages
- Loose cords, cables, wires, and hoses in walkways
- Improper selection and use of floor mats, runners, and rugs
- Improper use of portable ladders and step stools

These STFs hazards can be controlled in a number of different ways:

- Good housekeeping/cleaning practices, and use of “Wet Floor” signs
- Wearing of slip-resistant shoes in wet areas (e.g., kitchens, boiler rooms)
- Use of non-slip, beveled-edge, rubber floor mats in wet areas (e.g., kitchens)
- Provision of absorbent floor mats at building entrances during rainy season
- Provision of umbrella bags and spill pads at building entrances
- Keeping floor drains and roof down spouts clear of debris (e.g., leaves)
- Repair water sprinkler system breaks and leaks immediately
- Repair and maintenance of loose or damaged metal floor grating
- Repair and maintenance of holes and cracks greater than ½-inch in walkways
- Repair and maintenance of stairways, ramps, carpets, and floor tiles
- Repair and maintenance of uneven walking/working surface transitions with a change in elevation of greater than ½-inch
- Highlight tripping hazards or changes in walkway elevations with yellow paint
- Install rough-surface flooring materials in areas with slipping hazards
- Replace burnt-out lights immediately, and keep light fixtures clean
- Provision of step-over ramps or platforms over pipes and other tripping hazards

- Use of handrails when going up or down stairways or steps
- Replace any damaged or defective portable ladders and step stools
- Use of tie wraps or plastic outer sleeves to bundle cords, cables, wires, etc.
- Use of beveled cord covers on floor
- Use of retractable cord holders, hose reels or spools
- Organize storage areas to eliminate clutter

Caltech performs multiple activities for the protection of students, faculty, employees, and visitors from slips, trips, and falls (STFs) incidents.

Facilities Design and Construction

A campus-wide survey was performed evaluating Americans with Disabilities Act (ADA) routes from the parking lots to the entrances of each building. Scheduled repairs were determined for each route using a priority system.

Priorities A to D (A being the highest priority) were assigned using the following guidelines:

- Occupancy
- Proximity
- Distance to travel
- Path of travel

Higher priorities were addressed first, and lower priorities were scheduled when resources were available. The ADA survey is re-assessed annually or as needed (e.g., new student, faculty or staff member who needs accommodation). Any identified corrective actions are the responsibility of Facilities Design and Construction Project Managers and Building Inspectors.

Facilities Management

Facilities Management has the following responsibilities:

- Performs an annual survey of campus walkways, including exterior stairways
- Identifies hazards associated with slips, trips, and falls (STFs)
 - Trip hazards are those walking/working surface transitions with a change in elevation of greater than ½-inch
 - Slip hazards are those walking/working surfaces with a static coefficient of friction of less than 0.60 dry or 0.42 wet, or those situations where the person performing the survey demonstrates a slippery unsafe condition

Facilities Management also has a system for receiving suggestions and observations from the campus community, immediately investigating them, and implementing corrective actions if necessary based on the following priorities:

- High traffic and high-risk areas (corrected immediately)
- Low traffic and low-risk areas (corrected by scheduled maintenance)

In addition,

- All Facilities employees have been instructed to report any unsafe conditions, including walking/working surfaces, to their supervisors for corrective actions.
- All Facilities employees receive annual online Slip, Trip, and Fall training.

Environment, Health, and Safety

Environment, Health, and Safety (EHS) has a digital American Slip Meter (Model ASM 825) in its equipment lab which can be used to test the static coefficient of friction of various walking/working surfaces (e.g., to investigate an incident resulting in a slip, trip, and/or fall injury).

EHS will periodically review the last three years of employee (workers' compensation) and public (general liability) claims resulting from slips, trips, and falls incidents to identify trends in the types and locations of injuries (i.e., injury hot spots) so that future efforts can focus on those problem areas and commonalities.

Grounds

The Grounds Department employees are assigned quadrants on campus, and are responsible for reporting any slips, trips, and falls (STFs) hazards in their assigned areas. Each team knows and is very familiar with the day-to-day conditions of their respective quadrant.

Security

An annual evening (after dark) outdoor lighting survey is performed by Caltech Security to identify inadequate or burnt-out lighting. The lighting levels in working areas, walkways, stairways, and parking lots/garages, measured in foot-candles (fc), are compared to the regulatory requirements of Cal/OSHA Section 3317, and the recommended guidelines of the American National Standards Institute (ANSI) and the Illuminating Engineering Society (IES) in their standards: ANSI/IES RP-7-1991, Practice for Industrial Lighting; and ANSI/IES RP-1-1993, Practice for Office Lighting.

In addition, Caltech Security Officers and Caltech Service Mechanics have been instructed to report any lighting issues during their evening rounds, so that the issues can be corrected in a timely manner.

Appendix I

Regulatory References

1. **California Occupational Safety and Health Administration (Cal/OSHA)**, Title 8, California Code of Regulations (CCR), General Industry Safety Orders (GISO), Section 3231, and Stairways.
2. **California Occupational Safety and Health Administration (Cal/OSHA)**, Title 8, California Code of Regulations (CCR), General Industry Safety Orders (GISO), Section 3232, Ramps.
3. **California Occupational Safety and Health Administration (Cal/OSHA)**, Title 8, California Code of Regulations (CCR), General Industry Safety Orders (GISO), Section 3272, Aisles, Walkways, and Crawlways.
4. **California Occupational Safety and Health Administration (Cal/OSHA)**, Title 8, California Code of Regulations (CCR), General Industry Safety Orders (GISO), Section 3273, Working Area.
5. **California Occupational Safety and Health Administration (Cal/OSHA)**, Title 8, California Code of Regulations (CCR), General Industry Safety Orders (GISO), Section 3317, Illumination.

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