

# Northwestern

## FACILITIES

### FALL PROTECTION

#### Introduction

A fall hazard is present when an individual is located within 15 feet of an unprotected edge, 4 feet or more above a lower level, and whenever there is a possibility of falling onto dangerous equipment or into a hazardous environment. The primary goal is to eliminate fall hazards where feasible and prevent exposure to fall hazards when elimination is not feasible.

Permanent fall prevention and protection measures must be included as an integral part of the design phase for all construction, renovation, repair, and roofing projects, including the installation of new equipment at heights. All walking/working surfaces where individuals are exposed to fall hazards (e.g., roof systems, HVAC equipment, ladders, stairways, catwalks, pipe chases, and wall and floor openings) must be permanently guarded or have compliant anchorages for personal fall restraint or arrest systems.

#### Safe Access by Design

Designs must ensure safe, permanent access to all equipment and work areas associated with operations and maintenance, including, but not limited to, HVAC equipment, windows, lighting, drains, theater equipment, solar panels, and fire safety equipment. Access must not put personnel at risk. In general, access should not require maintenance personnel to utilize equipment such as portable ladders or mobile elevated work platforms. Façade access (e.g., exterior window washing) is an exception to this rule.

All safe access and fall hazards associated with operations and maintenance must be identified as part of the design phase and design measures should be instituted to mitigate these hazards.

When feasible, equipment and access routes must be located at least 15 feet away from fall hazards to avoid the need for fall protection. If unavoidable, fall protection is required.

#### General Requirements

All fall protection designs and equipment must comply with the applicable OSHA and ANSI regulations, applicable building codes, and Northwestern's [Fall Protection Program](#). If there are any conflicts, the more stringent requirements govern.

#### Fall Protection System Design – General

A qualified person with extensive experience in fall protection is required to plan, evaluate, design, and select the most appropriate fall prevention/protection solution. Building anchorages, tie-downs, lifelines, and any other fall protection system must be designed and certified by an Illinois-registered Professional Engineer (PE) with expertise in fall protection systems. A variety of fall protection solutions are available, and it is important to select a system based on the specific building type, roof system, work application (operations, maintenance, and façade access), rescue procedures, and anticipated users. Project teams should consider façade access requirements when designing rooftop fall protection systems since often

they can be designed to accommodate both façade access and rooftop operations and maintenance. It is imperative that designers consult Northwestern Environmental Health and Safety (EHS) and system end-users (e.g., Facilities Operations) in the design phase. Consideration must be given to the continuity of the fall protection systems selected throughout the campus – as such, fall protection systems must be designed and installed similarly with compatible components to reduce variability in fall protection systems on campus. Consideration must also be given to the selection of materials to ensure they can withstand local harsh environments. Users of these systems must be trained on how to properly use, inspect, and maintain the selected fall protection systems.

Generally, fall protection systems should be of the permanent type and connected to the building structure (i.e., roof membrane-penetrating). However, certain ‘ballasted’ non-penetrating systems may have applications in temporary situations.

### Hierarchy of Controls

Project teams must understand that fall protection control measures are not always intended to be used independently but, in many cases, a combination of controls must be implemented to prevent exposure to fall hazards. The hierarchy of controls must be considered, where hazard elimination is the first line of protection and fall arrest systems are the last resort.

**Hazard elimination:** This is the preferred solution as it eliminates exposure to fall hazards (e.g., relocation of rooftop equipment to the ground level).

**Passive Fall Protection:** Physical barriers such as guardrails and parapets (minimum 42” height) around roof edges and catwalks. This is the preferred method to address fall hazards that are not eliminated.

**Fall Restraint Systems:** The use of personal protective equipment to restrict a worker’s range of movement so they cannot fall. This requires qualified anchorages or lifelines, connecting devices (e.g., lanyards), body harnesses, user training, and equipment inspections.

**Fall Arrest Systems:** The use of personal protective equipment to arrest a fall within acceptable force and clearance margins. This requires qualified anchorages or lifelines, connecting devices (e.g., lanyards), body harnesses, user training, and equipment inspections.

### Anchorages and Lifelines

#### **General**

Careful consideration must be given to the selection of anchorages and lifelines, factoring in access routes and equipment locations. Anchorages and lifelines must be easily accessible to avoid fall hazards while connecting to the fall protection system. Installing lifelines and anchorages at least 15 feet from fall hazards is an effective strategy. All essential components must meet OSHA and ANSI standards, be adequately labeled, and be designed and tested as part of the system to provide a complete and fully operational fall restraint or arrest system.

#### **Façade Access**

Façade access anchorages and tie-backs for equipment such as swing stages and bosun’s chairs must be load-tested and certified, and designed to ensure adequate façade access. Anchorages used to attach to personal fall protection equipment must be independent of any anchorage used to suspend workers or platforms on which they work.

**Lifelines**

Lifelines may be designed as fall arrest or fall restraint systems. Systems must provide uninterrupted access to the entire length of the area without having to disconnect from the system to pass through intermediate support points.

**Fall Restraint Systems**

System anchorages must be capable of supporting at least 1,000 pounds for each employee attached, and configured such that workers will not be exposed to fall hazards while connecting/disconnecting from the system.

**Fall Arrest Systems**

The system must be designed to arrest a fall while preventing the user from free falling more than six feet. Anchorages must be capable of supporting at least 5,000 pounds for each worker attached, or designed, installed, and used, under the supervision of qualified person, as part of a complete personal fall protection system that maintains a safety factor of at least two. Fall arrest systems must be configured such that workers will not be exposed to fall hazards while connecting/disconnecting from the system.

**Swing and Fall Clearances**

Swing and fall clearances must be considered when designing any fall arrest system. In general, a minimum of 18 feet of fall clearance is required, but this number can increase in specific situations.

**Documentation**

Projects that include fall restraint and arrest systems, including lifeline systems and façade access systems, must include as-built drawings (with a stamped PE seal and name) of a reduced roof plan showing all fall protection system locations, load ratings, number of authorized users, system use and limitations, inspection criteria, date of initial certification. Drawings must be posted at all roof access points.

**Specific Requirements (not all-inclusive)****Skylights**

Skylights, or skylight screens, must be capable of supporting, without failure, at least twice the weight of employees, equipment, and materials that may be imposed on them at any one time, or must be guarded by a guardrail system on all exposed sides.

**Floor Openings and Holes**

Individuals must be protected from tripping or stepping into or through holes or floor openings greater than 2 inches in their least dimension with covers or guardrail systems.

**Wall Openings**

Individuals must be protected from gaps or open spaces in walls, partitions, vertical surfaces, or similar surfaces that are at least 30 inches high and at least 18 inches wide.

**Fixed Ladders**

Every effort must be made to avoid fixed ladder heights of more than 24 feet. If unavoidable, ladders over 24 feet in height must be equipped with a ladder safety system, which requires body harnesses, user training, and equipment inspections.

**Dangerous Equipment**

Regardless of the potential fall distance, individuals must be protected from falling into or onto dangerous equipment by a fall protection system, unless it is covered or guarded.

### Closing

The strategies included here are not comprehensive; these guidelines are intended to provide ideas and not exclude any from consideration. The project team is encouraged to develop additional strategies and refer to current documents published by OSHA's fall protection regulations (29 CFR 1910.22-29, 1910.66, and 1910.140), ANSI Z359, and the Northwestern [Fall Protection Program](#).

For additional information or questions contact [ehs@northwestern.edu](mailto:ehs@northwestern.edu).