Chapter 296-880 WAC
Safety Standards for Fall Protection

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WAC 296-880-080 Scope
This chapter sets forth requirements for employers to provide and enforce the use of fall protection for employees performing activities covered under this chapter.

WAC 296-880-095 Definitions
For the purposes of this chapter the following definitions apply:

**Affected area** is the distance away from the edge of an excavation equal to the depth of the excavation up to a maximum distance of 15 feet. For example, an excavation 10 feet deep has an affected area extending 10 feet from the edge of any side of the excavation.

**Anchorage** is a secure point of attachment for lifelines, lanyards, or deceleration devices which is capable of withstanding the forces specified in this part.

**Catch platform** is a type of fall arrest system that consists of a platform installed within four vertical feet of the fall hazard, is at least 45 inches wide and is equipped with a standard guardrail system on all exposed sides.

**Catenary line** - See horizontal lifeline.

**Competent person** is an individual knowledgeable of fall protection equipment, including the manufacturer's recommendations and instructions for the proper use, inspection, and maintenance; and who is capable of identifying existing and potential fall hazards; and who has the authority to take prompt corrective action to eliminate those hazards; and who is knowledgeable of the rules contained in this part regarding the installation, use, inspection, and maintenance of fall protection equipment and systems.

**Connector** is a device which is used to connect parts of the personal fall arrest system and positioning device systems together. It may be an independent component of the system, such as a carabiner, or it may be an integral component of part of the system (such as a buckle or D-ring sewn into a harness, or a snap hook spliced or sewn to a lanyard or self-retracting lanyard).

**Construction work** is all or any part of excavation, construction, erection, alteration, repair, demolition, and dismantling, of buildings and other structures and all operations in connection therewith; the excavation, construction, alteration and repair of sewers, trenches, caissons, conduits, pipe lines, roads and all operations pertaining thereto; the moving of buildings and other structures, and to the construction, alteration, repair, or removal of wharfs, docks, bridges, culverts, trestles, piers, abutments or any other construction, alteration, repair or removal work related thereto.

**Deceleration device** is any mechanism, such as a rope grab, ripstitch lanyard, specifically woven lanyard, tearing or deforming lanyards, automatic self-retracting lifelines/lanyards, etc., which serves to dissipate a substantial amount of energy during a fall arrest, or otherwise limit the energy imposed on an employee during fall arrest.
Deceleration distance is the additional vertical distance a falling employee travels, excluding lifeline elongation and free fall distance, before stopping, from the point at which the deceleration device begins to operate. It is measured as the distance between the location of an employee’s full body harness attachment point at the moment of activation (at the onset of fall arrest forces) of the deceleration device during a fall, and the location of that attachment point after the employee comes to a full stop.

Dropline is a vertical lifeline secured to an upper anchorage for the purpose of attaching a lanyard or device.

Equivalent is alternative designs, materials, or methods to protect against a hazard which the employer can demonstrate and will provide an equal or greater degree of safety for employees than the methods, materials or designs specified in this standard.

Fall arrest system is a fall protection system that will arrest a fall from elevation. Fall arrest systems include personal fall arrest systems that are worn by the user, catch platforms, and safety nets.

Fall distance is the actual distance from the worker’s support to the level where a fall would stop.

Fall protection work plan is a written planning document in which the employer identifies all areas on the job site where a fall hazard of 4 feet or more exists. The plan describes the method or methods of fall protection to be used to protect employees, and includes the procedures governing the installation, use, inspection, and removal of the fall protection method or methods which are selected by the employer. See WAC 296-880-110.

Fall restraint system is a system in which all necessary components function together to restrain/prevent an employee from falling to a lower level. Types of fall restraint systems include standard guardrail systems, personal fall restraint systems, warning line systems, or a warning line system and safety monitor.

Free fall is the act of falling before a personal fall arrest system begins to apply force to arrest the fall.

Free fall distance is the vertical displacement of the fall arrest attachment point on the employee’s full body harness between onset of the fall and just before the system begins to apply force to arrest the fall. This distance excludes deceleration distance, and lifeline/lanyard elongation, but includes any deceleration device slide distance or self-retracting lifeline/lanyard extension before they operate and fall arrest forces occur.

Full body harness is a configuration of connected straps that meets the requirements specified in ANSI Z359.1, that may be adjustable to distribute a fall arresting force over at least the thighs, shoulders and pelvis, with provisions for attaching a lanyard, lifeline, or deceleration devices.

Full body harness system is a full body harness and lanyard which is either attached to an anchorage meeting the requirements of this part; or it is attached to a horizontal or vertical lifeline which is properly secured to an anchorage(s) capable of withstanding the forces specified in this part.

Handrail is a rail used to provide employees with a handhold for support.

Hardware is Snap hooks, D-rings, bucklers, carabiners, adjusters, or O-rings, that are used to attach the components of a fall protection system together.
Hazardous slope is a slope, from which construction work is performed where normal footing cannot be maintained without the use of devices due to the pitch of the surface, weather conditions, or surface material.

Hole is an opening measuring less than 12 inches but more than one inch in its least dimension in any floor, roof, platform, or surface through which materials but not persons may fall, such as a belt hole, pipe opening, or slot opening.

Horizontal lifeline is a rail, rope, wire, or synthetic cable that is installed in a horizontal plane between two anchorages and used for attachment of a worker's lanyard or lifeline device while moving horizontally; used to control dangerous pendulum like swing falls.

Lanyard is a flexible line of webbing, rope, or cable used to secure a positioning harness or full body harness to a lifeline or an anchorage point usually two, 4 or 6 feet long.

Leading edge is the advancing edge of a floor, roof, or formwork which changes location as additional floor, roof, or formwork sections are placed, formed, or constructed. A leading edge is considered to be an “unprotected side or edge” during periods when it is not actively and continuously under construction.

Lifeline is a vertical line from a fixed anchorage or between two horizontal anchorages, independent of walking or working surfaces, to which a lanyard or device is secured. Lifeline as referred to in this text is one which is part of a fall protection system used as back-up safety for an elevated worker or as a restraint for workers on a flat or sloped surface.

Locking snap hook is a connecting snap hook that requires two separate forces to open the gate; one to deactivate the gatekeeper and a second to depress and open the gate which automatically closes when released; used to minimize roll out or accidental disengagement.

Low pitched roof is a roof having a slope equal to or less than 4 in 12.

Mechanical equipment is all motor or human propelled wheeled equipment except for wheelbarrows, mopcarts, robotic thermoplastic welders and robotic crimpers.

Opening is an opening measuring 12 inches or more in its least dimension in any floor, roof, platform, or surface through which persons may fall.

Personal fall arrest system is a fall arrest system that is worn by the employee to arrest the employee in a fall from elevation. It consists of an anchor point, connectors, a full body harness, and may include a lanyard, deceleration device, lifeline, or suitable combinations of these.

Personal fall restraint system is a fall restraint system that is worn by the employee to keep the employee from reaching a fall point, such as the edge of a roof or elevated work surface. It consists of an anchor point, hardware assemblies, a full body harness and may include a lanyard, restraint lines, or suitable combinations of these.

Platform is a work surface elevated above the surrounding floor or ground.
Positioning device system is a full body harness or positioning harness that is worn by an employee, and is rigged to allow an employee to be supported on an elevated vertical or inclined surface, such as a wall, pole or column and work with both hands free from the body support.

Positioning harness is a body support that meets the requirements specified in ANSI Z359.1 that encircles and closes around the waist and legs with attachment elements appropriate for positioning work.

Qualified person is one who, by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training, and experience, has successfully demonstrated his/her ability to solve or resolve problems related to the subject matter, the work, or the project.

Restraint line is a line from a fixed anchorage or between two anchorages to which an employee is secured in such a way as to prevent the worker from falling to a lower level.

Roof is the exterior surface on the top of a building. This does not include floors or formwork which, because a building has not been completed, temporarily become the top surface of a building.

Roofing work is the hoisting, storage, application, and removal of roofing materials and equipment, including related insulation, sheet metal, and vapor barrier work, but not including the construction of the roof deck.

Rope grab is a fall arrester that is designed to move up or down a lifeline suspended from a fixed overhead or horizontal anchorage point, or lifeline, to which the full body harness is attached. In the event of a fall, the rope grab locks onto the lifeline rope through compression to arrest the fall. The use of a rope grab device is restricted for all restraint applications. See WAC 296-880-220.

Runway is a passageway for persons, elevated above the surrounding floor or ground level, such as a footwalk along shafting or a walkway between buildings.

Safety line - See lifeline.

Safety monitoring system is a type of fall restraint system in which a competent person whose only job responsibility is to recognize and warn employees of their proximity to fall hazards when working between the warning line and the unprotected sides and edges, including the leading edge of a low pitch roof or other walking/working surface.

Safety net system is a type of fall arrest system, as described in WAC 296-880-250.

Safety watch system is a fall protection system as described in WAC 296-880-245, in which a competent person monitors one worker who is engaged in repair work or servicing equipment on low pitch roofs only.

Self-rescue device is a piece of equipment designed to allow a person, who is suspended in a personal fall arrest system, to independently rescue themselves after the fall by moving the device up or down until they reach a surface and are no longer suspended.

Self-retracting lifeline is a deceleration device which contains a wound line which may be slowly extracted from, or retracted onto, the device under slight tension during normal employee movement, and which after onset of a fall, automatically locks the drum and arrests the fall.
**Shock absorbing lanyard** is a flexible line of webbing, cable, or rope used to secure a full body harness to a lifeline or anchorage point that has an integral shock absorber.

**Snap hook** - See "locking snap hook."

**Standard guardrail system** is a type of fall restraint system that is a vertical barrier consisting of a top rail and mid rail, and toe board when used as falling object protection for persons who may work or pass below, that is erected along all open sides or edges of a walking/working surface, a floor opening, a floor hole, wall opening, ramp, platform, or runway.

**Standard strength and construction** is any construction of railings, covers, or other guards that meets the requirements of this part.

**Static line** - See horizontal lifeline.

**Steep pitched roof** is a roof having a slope greater than 4 in 12.

**Toe board** is a vertical barrier at floor level erected along all open sides or edges of a floor opening, platform, runway, ramp, or other walking/working surface to prevent materials, tools, or debris from falling onto persons passing through or working in the area below.

**Unprotected sides and edges** is any open side or edge of a floor, roof, balcony/deck, platform, ramp, runway, or walking/working surface where there is no standard guardrail system, or parapet wall of solid strength and construction that is at least 39 inches in vertical height.

**Walking/working surface** means any surface, horizontal or vertical on which an employee walks or works, including, but not limited to, floors, roofs, ramps, bridges, runways, formwork, reinforcing steel or the ground. A walking/working surface does not include vehicles or rolling stock on which employees must be located in order to perform job duties covered under the scope of Chapter 296-155 WAC Safety Standards for Construction Work.

**Wall opening** is an opening at least 30 inches high and 18 inches wide, in any wall or partition, through which persons may fall, such as an opening for a window, a yard arm doorway or chute opening.

**Warning line system** is a barrier erected on a walking and working surface or a low pitch roof (four in twelve or less), to warn employees that they are approaching an unprotected fall hazard(s).
WAC 296-880-100 Training

(1) Provide fall protection training to employees exposed to fall hazards.
You must:
Communicate your fall protection selection decision to each at-risk employee.
Provide training to each employee who is required to use fall protection on the job. Each affected employee must be trained to know at least the following:
(a) When fall protection is necessary;
(b) What fall protection is necessary;
(c) How to put on, take off, adjust, and wear fall protection;
(d) Limitations of fall protection; and
(e) Proper care, maintenance, useful life, and disposal of fall protection.

(2) Make sure before an employee is allowed to perform work requiring the use of fall protection that the employee can:
(a) Demonstrate an understanding of the training specified above; and
(b) Demonstrate the ability to use fall protection properly.

(3) Retrain employees who use fall protection, if necessary.
You must:
Retrain an employee when you have reason to believe the understanding, motivation, and skills required to use fall protection has not been retained. Circumstances where retraining is required include:
(a) Changes in the workplace that make previous training out of date.
(b) Changes in the types of fall protection to be used make previous training out of date.
(c) Work habits or demonstrated knowledge indicate that the employee has not retained the necessary understanding, skill, or motivation to use fall protection.

(4) Document fall protection training.
You must:
Document in writing that each employee using fall protection has received and understood the required training.
This documentation must include:
(a) Name of each employee
(b) Date(s) of training
(c) Subject(s) of the training
(d) Name of the individual or entity who performed the training.

Note: Documentation may be stored on a computer as long as it is available to safety and health personnel from the Department of Labor and Industries.
WAC 296-880-105 General requirements

General requirements.

(1) You must ensure that all surfaces on which employees will be working or walking on are structurally sound and will support them safely prior to allowing employees to work or walk on them.

(2) Inspection criteria.

(a) You must inspect all components (including hardware, lanyards, and positioning harnesses or full body harnesses depending on which system is used) of personal fall arrest systems, personal fall restraint systems and positioning device systems prior to each use according to manufacturer's specifications for mildew, wear, damage, and other deterioration. You must remove defective components from service if their function or strength has been adversely affected.

(b) You must inspect safety nets at least once a week according to manufacturer's specifications for wear, damage, and other deterioration. You must also inspect safety nets after any occurrence which could affect the integrity of the safety net system. You must remove defective components from service. You must not use defective nets.

(3) You must only use personal fall arrest systems, personal fall restraint system, positioning device systems, and their components for employee protection and not to hoist materials.

(4) You must plan for and provide prompt rescue of employees in the event of a fall or must assure the self-rescue capability of employees.

WAC-296-880-110 Fall protection work plan

Fall protection work plan.

You must develop and implement a written fall protection work plan including each area of the work place where the employees are assigned and where fall hazards of four feet or more exist.

(1) The fall protection work plan must:

(a) Identify all fall hazards in the work area;

(b) Describe the method of fall arrest or fall restraint to be provided;

(c) Describe the proper procedures for the assembly, maintenance, inspection, and disassembly of the fall protection system to be used;

(d) Describe the proper procedures for the handling, storage, and securing of tools and materials;

(e) Describe the method of providing overhead protection for workers who may be in, or pass through the area below the work area;

(f) Describe the method for prompt, safe removal of injured workers; and
(g) Be available on site for inspection by the department.

(2) Prior to permitting employees into areas where fall hazards exist you must ensure employees are trained and instructed in the items described in (a) through (g) of this subsection.

WAC 296-880-115 Fall protection required regardless of height

(1) Regardless of height, you must guard open sided floors, walkways, platforms, or runways above or adjacent to dangerous equipment, such as dip tanks and material handling equipment, and similar hazards with a standard guardrail system.

(2) You must guard floor holes or floor openings, into which persons can accidentally walk, by either a standard railing with standard toe board on all exposed sides, or a cover of standard strength and construction that is secured against accidental displacement. While the cover is not in place, you must protect the floor hole opening by a standard railing.

Note: Requirements for when guarding floor openings at heights of four feet or more are located in WAC 296-880-210.

(3) Regardless of height you must protect employees from falling into or onto impalement hazards, such as: Reinforcing steel (rebar), or exposed steel or wood stakes used to set forms.

WAC 296-880-120 Fall protection required at four feet or more

(1) You must ensure that the appropriate fall protection system is provided, installed, and implemented according to the requirements in this part when employees are exposed to fall hazards of 4 feet or more to the ground or lower level when on a walking/working surface.

(2) Guarding of walking/working surfaces with unprotected sides and edges. You must guard every open sided walking/working surface or platform four feet or more above adjacent floor, ground level or at a waterside edge by one of the following fall protection systems.

(a) A standard guardrail system, or the equivalent, as specified in WAC 296-880-200, on all open sides, except where there is entrance to a ramp, stairway, or fixed ladder. The railing must be provided with a standard toe board wherever, beneath the open sides, persons can pass, there is moving machinery, or there is equipment with which falling materials could create a hazard.

(i) When employees are using stilts, the height of the top rail or equivalent member of the standard guardrail system must be increased (or additional railings may be added) an amount equal to the height of the stilts while maintaining the strength specifications of the guardrail system.

(ii) Where employees are working on platforms or ladders above the protection of the guardrail system, the employer must either increase the height of the guardrail system as specified in (a) of this subsection, or select and implement another fall protection system as specified in (b), (c), (d), (e), or (f) of this subsection.
(iii) When guardrails must be temporarily removed to perform a specific task, the area must be constantly attended by a monitor until the guardrail is replaced. The only duty the monitor must perform is to warn persons entering the area of the fall hazard.

(b) A fall restraint system;
(c) A personal fall arrest system;
(d) A safety net system;
(e) A catch platform;
(f) A warning line.

(3) Guarding of ramps, runways, and inclined walkways.

(a) Ramps, runways, and inclined walkways that are four feet or more above the ground or lower level must be equipped with a standard guardrail system or the equivalent, as specified in WAC 296-880-200, along each open side. Wherever tools, machine parts, or materials are likely to be used on the runway, a toe board must also be installed on each open side to protect persons working or passing below.

(b) 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 not less than 18 inches wide.

Note: See WAC 296-880-205 for other specific criteria for ramps, runways, and inclined walkways.

(4) Guarding of floor openings.

(a) You must guard openings by one of the following fall restraint systems.

(b) A standard guardrail system, or the equivalent, as specified in WAC 296-880-200, on all open sides, except where there is entrance to a ramp, stairway, or fixed ladder. The railing must be provided with a standard toe board wherever, beneath the open sides, persons can pass, or there is moving machinery, or there is equipment with which falling materials could create a hazard.

(c) A cover, as specified in WAC 296-880-210.

(d) A warning line system erected at least fifteen feet from all unprotected sides or edges of the opening and meets the requirements of WAC 296-880-235.

(e) If it becomes necessary to remove the cover, the guardrail system, or the warning line system, then an employee must remain at the opening until the cover, guardrail system, or warning line system is replaced. The only duty the employee must perform is to prevent exposure to the fall hazard by warning persons entering the area of the fall hazard.

(f) You must guard ladderway openings or platforms by a standard guardrail system with standard toe boards on all exposed sides, except at entrance to opening, with the passage through the railing either provided with a swinging gate or so offset that a person cannot walk directly into the opening.

(g) You must guard hatchways and chute openings by one of the following:
(i) Hinged covers of standard strength and construction and a standard guardrail system with only one exposed side. When the opening is not in use, the cover must be closed or the exposed side must be guarded at both top and intermediate positions by removable standard guardrail systems.

(ii) A removable standard guardrail system with toe board on not more than two sides of the opening and fixed standard guardrail system with toe boards on all other exposed sides. The removable railing must be kept in place when the opening is not in use and must be hinged or otherwise mounted so as to be conveniently replaceable.

(h) You must guard skylight openings, or if the skylight has been installed and is not capable of sustaining the weight of a two hundred pound person with a safety factor of four by one of the following fall protection systems:
   (i) Covers;
   (ii) Guardrail systems;
   (iii) Personal fall restraint systems; or
   (iv) Personal fall arrest systems.

(i) You must guard pits and trap door openings by covers of standard strength and construction. While the cover is not in place, the pit or trap openings must be protected on all exposed sides by removable standard guardrail system.

(j) You must guard repair pits, service pits, and assembly pits by a cover, a guardrail system, a fall restraint system or fall arrest system.

(k) You must guard manhole openings by standard covers which need not be hinged in place. While the cover is not in place, the manhole opening must be protected by standard guardrail system.

(5) Guarding of wall openings.

(a) You must guard wall openings, from which there is a fall hazard of four feet or more, and the bottom of the opening is less than thirty-nine inches above the working surface, as follows:

   (i) When the height and placement of the opening in relation to the working surface is such that either a standard rail or intermediate rail will effectively reduce the danger of falling, one or both must be provided;

   (ii) The bottom of a wall opening, which is less than four inches above the working surface, regardless of width, must be protected by a standard toe board or an enclosing screen either of solid construction or as specified in WAC 296-880-210.

   (iii) An extension platform, outside a wall opening, onto which materials can be hoisted for handling must have standard guardrails on all exposed sides or equivalent. One side of an extension platform may have removable railings in order to facilitate handling materials.

   (iv) When a chute is attached to an opening, the provisions of subsection (5)(a) of this section apply, except that a toe board is not required.
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(6) Fall protection during form and rebar work. You must ensure that employees exposed to fall hazards of four feet or more while placing or tying reinforcing steel on a vertical face are required to be protected by personal fall arrest systems, safety net systems, or positioning device systems.

(7) Fall protection on steep pitched roofs. Regardless of the work activity, you must ensure that employees exposed to fall hazards of four feet or more while working on a roof with a pitch greater than four in twelve use one of the following:
   (a) Fall restraint system. Safety monitors and warning line systems are prohibited on steep pitched roofs;
   (b) Fall arrest system; or
   (c) Positioning device system.

(8) Fall protection on low pitched roofs. You must ensure that employees exposed to fall hazards of four feet or more while engaged in work, other than roofing work or leading edge work, on low pitched roofs use one of the following:
   (a) Fall restraint system;
   (b) Fall arrest system;
   (c) Positioning device system;
   (d) Warning line system.

(9) Roofing work on low pitch roofs or constructing a leading edge on a low pitch surface. Employees exposed to fall hazards of four feet or more while performing roofing work on a low pitch roof or constructing a leading edge on a low pitch surface use one of the following:
   (a) Fall restraint system;
   (b) Fall arrest system;
   (c) Warning line system;
   (d) Safety monitor and warning line system.

(10) Safety watch system. When one employee is conducting any repair work or servicing equipment on a roof that has a pitch no greater than four in twelve, employers are allowed to use a safety watch system. See specifications for use in WAC 296-880-245.

(11) Hazardous slopes. Employees exposed to falls of four feet or more while performing construction work on a hazardous slope must use personal fall restraint systems or positioning device systems.

(12) Employees exposed to fall hazards of four feet or more while working on any surface not already addressed in WAC 296-880-120 must be protected by a fall restraint system or fall arrest system.

(13) Engaged in excavation and trenching operations. Employees exposed to fall hazards of four feet or more when engaged in excavation and trenching operations must be protected by fall restraint system, or fall arrest system.
   (a) Exceptions. Fall protection is not required at excavations when employees are:
      (i) Directly involved with the excavation process and on the ground at the top edge of the excavation; or
      (ii) Working at an excavation site where appropriate sloping of side walls has been implemented as the excavation protective system.
(b) Fall protection is required for employees standing in or working in the affected area of a trench or excavation exposed to fall hazards of four feet or more and:

(i) The employees are not directly involved with the excavation process; or

(ii) The employees are on the protective system or any other structure in the excavation.

Note: Persons considered directly involved in the excavation process include:

(i) Foreman of the crew;
(ii) Signal person;
(iii) Employee hooking on pipe or other materials;
(iv) Grade person;
(v) State, county, or city inspectors inspecting the excavation or trench; or
(vi) An engineer or other professional conducting a quality-assurance inspection.

WAC 296-880-125 Exemptions from the fall protection requirements in this chapter

Exemptions from fall protection requirements.

Employees are exempt from WAC 296-880-115 and WAC 296-880-120 only under the following conditions:

(1) During initial installation of the fall protection anchor (prior to engaging in any work activity), or the disassembly of the fall protection anchor after the work has been completed.

(2) An employee directly involved with inspecting or estimating roof-level conditions only on low pitched roofs prior to the actual start of work or after all work has been completed.

Examples of activities the department recognizes as inspecting or estimating include:

(a) Measuring a roof to determine the amount of materials needed for a project.

(b) Inspecting the roof for damage without removing equipment or components.

(c) Assessing the roof to determine what method of fall protection will be provided to employees.

Examples the department does not recognize as inspecting or estimating under this exemption include:

(d) Delivering, staging or storing materials on a roof.

(e) Persons estimating or inspecting on roofs that would be considered a "hazardous slope" by definition.

(3) An employee involved in longshore, stevedore or waterfront related operations working at a waterside edge used for cargo or mooring line handling.
WAC 296-880-200 Guardrail system requirements

Guardrail systems and their use must conform to the following provisions:

(1) A standard guardrail system must consist of top rail, intermediate rail, and posts, and must have a vertical height of thirty-nine to forty-five inches from upper surface of top rail to floor, platform, runway, or ramp level. When conditions warrant, the height of the top edge may exceed the forty-five inch height, provided the guardrail system meets all other criteria of this subsection. The intermediate rail must be halfway between the top rail and the floor, platform, runway, or ramp. The ends of the rails must not overhang the terminal posts except where such overhang does not constitute a projection hazard.

(2) Minimum requirements for standard guardrail systems under various types of construction are specified in the following items:

(a) For wood railings, the posts must be of at least two-inch by four-inch stock spaced not to exceed eight feet; the top rail must be of at least two-inch by four-inch stock and each length of lumber must be smooth surfaced throughout the length of the railing. The intermediate rail must be of at least one-inch by six-inch stock. Other configurations may be used for the top rail when the configuration meets the requirements of (2)(g) of this subsection.

(b) For pipe railings, posts and top and intermediate railings must be at least one and one-half inches nominal OD diameter with posts spaced not more than eight feet on centers. Other configurations may be used for the top rail when the configuration meets the requirements of (2)(g) of this subsection.

(c) For structural steel railings, posts and top and intermediate rails must be of two-inch by two-inch by three-eighths inch angles or other metal shapes of equivalent bending strength, with posts spaced not more than eight feet on centers. Other configurations may be used for the top rail when the configuration meets the requirements of (2)(g) of this subsection.

(d) For wire rope railings, the top and intermediate railings must meet the strength factor and deflection of (2)(g)(ii) of this subsection. The top railing must be flagged at not more than six foot intervals with high-visibility material. Posts must be spaced not more than eight feet on centers. The rope must be stretched taut and must be between thirty-nine and forty-five inches in height at all points. Other configurations may be used for the top rail when the configuration meets the requirements of (2)(g)(i) of this subsection.

(e) The anchoring of posts and framing of members for railings of all types must be of such construction that the completed structure must be capable of withstanding a load of at least two hundred pounds applied in any direction at any point on the top rail. The top rail must be between thirty-nine and forty-five inches in height at all points when this force is applied.

(f) Railings receiving heavy stresses from employees trucking or handling materials must be provided additional strength by the use of heavier stock, closer spacing of posts, bracing, or by other means.

(g) Other types, sizes, and arrangements of railing construction are acceptable, provided they meet the following conditions:
(h) A smooth surfaced top rail at a height above floor, platform, runway, or ramp level between thirty-nine and forty-five inches inches;

(i) When the two hundred pound (890 N) load specified in (b)(v) of this subsection is applied in a downward direction, the top edge of the guardrail must not deflect to a height less than thirty-nine inches (1.0 m) above the walking/working level. Guardrail system components selected and constructed in accordance with this part will be deemed to meet this requirement;

(j) Protection between top rail and floor, platform, runway, ramp, or stair treads, equivalent at least to that afforded by a standard intermediate rail;

(k) Elimination of overhang of rail ends unless such overhang does not constitute a hazard.

(3) Toe board specifications.

(a) A standard toe board must be a minimum of four inches nominal in vertical height from its top edge to the level of the floor, platform, runway, or ramp. It must be securely fastened in place with not more than one-quarter inch clearance above floor level. It may be made of any substantial material, either solid, or with openings not over one inch in greatest dimension.

(b) Where material is piled to such height that a standard toe board does not provide protection, paneling, or screening from floor to intermediate rail or to top rail must be provided.

WAC 296-880-205 Ramps, runways and inclined walkway requirements

(1) Ramps, runways and inclined walkways must conform to the following provisions:

(a) Be at least eighteen inches wide; and

(b) Not be inclined more than twenty degrees from horizontal and when inclined, they must be cleated or otherwise treated to prevent a slipping hazard on the walking surface.

Note: See WAC 296-880-120 for guarding ramps, runways, and inclined walkways that are four feet or more above the ground or lower level.

WAC 296-880-210 Cover requirements – Holes, Openings

Covers – Holes and Openings

Covers and their use must conform to the following provisions:

(1) Floor opening or floor hole covers must be of any material that meets the following strength requirements:
(a) Conduits, trenches, and manhole covers and their supports, when located in roadways, and vehicular aisles must be designed to carry a truck rear axle load of at least two times the maximum intended load;

(b) All opening and hole covers shall be capable of supporting a minimum of eight hundred pounds or the maximum potential load, with a safety factor of four.

(2) All covers must be secured when installed so as to prevent accidental displacement by the wind, equipment, or employees.

(3) All temporary covers must be color coded or they must be marked with the word "hole" or "cover" to provide warning of the hazard.

(4) Barriers and screens used to cover wall openings must meet the following requirements:

   (a) Barriers must be of such construction and mounting that, when in place at the opening, the barrier is capable of withstanding a load of at least two hundred pounds applied in any direction (except upward), with a minimum of deflection at any point on the top rail or corresponding member.

   (b) Screens must be of such construction and mounting that they are capable of withstanding a load of at least two hundred pounds applied horizontally at any point on the near side of the screen. They may be of solid construction of either grill work with openings not more than eight inches long, or of slat work with openings not more than four inches wide with length unrestricted.

WAC 296-880-215 Personal fall arrest system requirements

Personal fall arrest systems and their use must conform to the following provisions:

(1) Personal fall arrest systems:

   (a) You must use a full body harness.

   (b) You must immediately remove from service full body harness systems or components subject to impact loading and you must not use them again for employee protection unless inspected and determined by a competent person to be undamaged and suitable for reuse.

   (c) Anchorages for full body harness systems must be capable of supporting (per employee):

      (i) Three-thousand pounds when used in conjunction with:

         (1) A self-retracting lifeline that limits the maximum free fall distances to two feet or less; or

         (2) A shock absorbing lanyard that restricts the forces on the body to nine-hundred pounds or less.

      (ii) five-thousand pounds for all other personal fall arrest system applications, or they must be designed, installed, and used:
(1) As a part of a complete personal fall arrest system which maintains a safety factor of at least two; and

(2) Under the supervision of a qualified person.

(d) When stopping a fall, personal fall arrest systems must:

(i) Be rigged to allow a maximum free fall distance of six feet nor contact any lower level;

(ii) Limit maximum arresting force on an employee to eighteen-hundred pounds (8 kN);

(iii) Bring an employee to a complete stop and limit maximum deceleration distance an employee travels to three and one-half feet (1.07 m); and

(iv) Have sufficient strength to withstand twice the potential impact energy of an employee free falling a maximum distance of six feet (1.8 m).

Notes: Shock absorbers that meet the requirements of ANSI Z359.1 that are used as a part of a personal fall arrest system in accordance with manufacturer's recommendations and instructions for use and installation will limit the maximum arresting forces on an employee's body to eighteen-hundred pounds or less.

To calculate fall clearance distance using a shock absorbing lanyard and D-ring anchorage connector, see WAC 296-880-290, Appendix B.

(e) You must protect all safety lines and lanyards against being cut or abraded.

(f) The attachment point of the full body harness must be located in the center of the wearer's back near shoulder level, or above the wearer's head.

(g) Hardware must be drop forged, pressed or formed steel, or made of materials equivalent in strength.

(h) Hardware must have a corrosion resistant finish, and all surfaces and edges must be smooth to prevent damage to the attached full body harness or lanyard.

(i) When vertical lifelines (droplines) are used, not more than one employee must be attached to any one lifeline.

Note: The system strength needs in the following items are based on a total combined weight of employee and tools of no more than three-hundred and ten pounds. If combined weight is more than three-hundred and ten pounds, appropriate allowances must be made or the system will not be in compliance. For more information on system testing see WAC 296-880-215.

(j) Vertical lifelines (droplines) must have a minimum breaking strength of five-thousand pounds (22.2 kN), except that self-retracting lifelines and lanyards which automatically limit free fall distance to two feet (.61 m) or less must have a minimum breaking strength of three-thousand pounds (13.3 kN).
(k) Horizontal lifelines must be designed, installed, and used, under the supervision of a qualified person, as part of a complete personal fall arrest system, which maintains a safety factor of at least two.

(l) Droplines or lifelines used on rock scaling operations, or in areas where the lifeline may be subjected to cutting or abrasion, must be a minimum of seven-eighths inch wire core manila rope or equivalent. For all other lifeline applications, a minimum of three-quarter inch manila rope or equivalent, with a minimum breaking strength of five-thousand pounds, must be used.

(m) Lanyards must have a minimum breaking strength of five-thousand pounds (22.2 kN).

(n) All components of full body harness systems whose strength is not otherwise specified in this subsection must be capable of supporting a minimum fall impact load of five-thousand pounds (22.2 kN) applied at the lanyard point of connection.

(o) D-rings and snap hooks must be proof-tested to a minimum tensile load of thirty-six hundred pounds (16 kN) without cracking, breaking, or taking permanent deformation.

(p) Snap hooks must be a locking type snap hook designed and used to prevent disengagement of the snap hook by the contact of the snap hook keeper by the connected member.

(q) Unless the snap hook is designed for the following connections, snap hooks must not be engaged:

   (i) Directly to the webbing, rope or wire rope;

   (ii) To each other;

   (iii) To a D-ring to which another snap hook or other connector is attached;

   (iv) To a horizontal lifeline; or

   (v) To any object which is incompatibly shaped or dimensioned in relation to the snap hook such that unintentional disengagement could occur by the connected object being able to depress the snap hook keeper and release itself.

WAC 296-880-220 Personal fall restraint system requirements

Personal fall restraint systems and their use must conform to the following provisions:

(1) Personal fall restraint systems must be rigged to allow the movement of employees only as far as the unprotected sides and edges of the walking/working surface, and must consist of:

   (a) A full body harness must be used.

   (b) The full body harness must be attached to securely rigged restraint lines.

   (c) All hardware assemblies for full body harness must be capable of withstanding a tension loading of four-thousand pounds without cracking, breaking, or taking a permanent deformation.
(d) You must ensure component compatibility.

(e) Anchorage points used for fall restraint must be capable of supporting four times the intended load.

(f) Rope grab devices are prohibited for fall restraint applications unless they are part of a fall restraint system designed specifically for the purpose by the manufacturer, and used in strict accordance with the manufacturer’s recommendations and instructions.

WAC 296-880-225 Self-rescue device requirements

(1) Self-rescue devices and their use must conform to the following provisions:

(a) Self-rescue devices are not to be used as a fall protection system;

(b) Use self-rescue devices according to the manufacturer’s instructions;

(c) Self-rescue devices must be addressed by the fall protection work plan.

WAC 296-880-230 Positioning device system requirements

Positioning device systems and their use must conform to the following provisions:

(1) Positioning harnesses or full body harnesses must be used.

(2) Positioning devices must be rigged to prevent an employee from a free fall greater than two feet.

(3) Positioning devices must be secured to an anchorage capable of supporting at least twice the potential impact load of an employee's fall or three-thousand pounds (13.3 kN), whichever is greater.

(4) Connectors must be drop forged, pressed or formed steel, or made of equivalent materials.

(5) Connectors must have a corrosion-resistant finish, and all surfaces and edges must be smooth to prevent damage to interfacing parts of this system.

(6) Connecting assemblies must have a minimum breaking strength of five-thousand pounds (22.2 kN).

(7) D-rings and snap hooks must be proof-tested to a minimum tensile load of thirty-six hundred pounds (16 kN) without cracking, breaking, or taking permanent deformation.

(8) Snap hooks must be a locking type snap hook designed and used to prevent disengagement of the snap hook by the contact of the snap hook keeper by the connected member.

(9) Unless the snap hook is designed for the following connections, snap hooks must not be engaged:

(a) Directly to webbing, rope or wire rope;

(b) To each other;

(c) To a D-ring to which another snap hook or other connector is attached;
(d) To a horizontal lifeline; or

(e) To any object which is incompatibly shaped or dimensioned in relation to the snap hook such that unintentional disengagement could occur by the connected object being able to depress the snap hook keeper and release itself.

WAC 296-880-235 Warning line system requirements

Warning line systems and their use must conform to the following provisions:

(1) Warning line system specifications used on roofs with a pitch of four in twelve or less for roofing work, leading edge work, telecommunications work and on low pitched open sided surfaces for work activities other than roofing work or leading edge work. You must ensure the following:

(a) Warning lines must be erected around all unprotected sides and edges of the work area.

   (i) Warning lines used during roofing and telecommunications work.

      (A) When roofing work or telecommunications work is taking place or when mechanical equipment is not being used, the warning line must be erected not less than six feet (1.8 m) from the edge of the roof.

      (B) When mechanical equipment is being used, the warning line must be erected not less than six feet (1.8 m) from the roof edge which is parallel to the direction of mechanical equipment operation, and not less than ten feet (3.1 m) from the roof edge which is perpendicular to the direction of mechanical equipment operation.

   (ii) Warning lines erected for leading edge work. Warning lines must be erected to separate employees who are engaged in leading edge work (between the forward edge of the warning line and the leading edge), from other work areas on the low pitched surface. You must ensure:

      (A) The warning line is erected not less than six feet nor more than twenty-five feet from the leading edge; and

      (B) When fall arrest systems as described in WAC 296-880-215, or fall restraint systems as described in WAC 296-880-220 are not used, you must implement a safety monitor system as described in WAC 296-880-240 to protect employees engaged in constructing the leading edge are working between the forward edge of the warning line and the leading edge.

   (ii) Warning lines erected on low pitched open sided surfaces for work activities other than roofing work, telecommunications work or leading edge work, must be erected not less than fifteen feet from the unprotected sides or edges of the open sided surface.

(b) The warning line must consist of a rope, wire, or chain and supporting stanchions erected as follows:
(i) The rope, wire, or chain must be flagged at not more than six foot (1.8 m) intervals with high visibility material. Highly visible caution or danger tape as described in (a)(iv) of this subsection, does not need to be flagged.

(ii) The rope, wire, or chain must be rigged and supported in such a way that its lowest point (including sag) is no less than thirty-six inches from the surface and its highest point is no more than forty-five inches from the surface.

(iii) After being erected, with the rope, wire or chain attached, stanchions must be capable of resisting, without tipping over, a force of at least sixteen pounds (71 N) applied horizontally against the stanchion, thirty inches (0.76 m) above the surface, perpendicular to the warning line, and in the direction of the unprotected sides or edges of the surface.

(iv) The rope, wire, or chain must have a minimum tensile strength of five hundred pounds (2.22kN), and after being attached to the stanchions, must be capable of supporting, without breaking, the loads applied to the stanchions. Highly visible caution or danger tape may be used in lieu of rope, wire, or chain as long as it is at least three inches wide and three mils thick, and has a tensile strength of at least two hundred pounds.

(v) The line must be attached at each stanchion in such a way that pulling on one section of the line between stanchions will not result in slack being taken up in adjacent sections before the stanchion tips over.

(c) You must erect access paths as follows:

(i) Points of access, materials handling areas, and storage areas must be connected to the work area by a clear access path formed by two warning lines.

(ii) When the path to a point of access is not in use, you must place a rope, wire, or chain, equal in strength and height to the warning line, across the path at the point where the path intersects the warning line erected around the work area.

WAC 296-880-240 Safety monitor system requirements

Safety monitor systems and their use must conform to the following provisions:

(1) A safety monitor system may be used in conjunction with a warning line system as a method of fall protection during roofing work on low pitched roofs or leading edge work on low pitched surfaces.

Note: The warning line is not required when performing roofing work on low pitched roofs less than 50 feet wide. For information on determining roof widths, see WAC 296-880-285, Appendix A, Determining roof widths.

(2) When selected, you must ensure that the safety monitor system is addressed in the fall protection work plan, including the name of the safety monitor(s) and the extent of their training in both the safety monitor and warning line systems. You must ensure that the following requirements are met:

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(a) The safety monitor system must not be used when adverse weather conditions create additional hazards.

(b) Employees working outside of the warning line system, (between the forward edge of the warning line and the unprotected sides or edges of a low pitched surface), must be readily distinguishable from other members of the crew that are working inside the warning line system by wearing highly visible, distinctive, and uniform apparel.

(c) Employees must promptly comply with fall hazard warnings from the safety monitor.

(d) You must train a person acting in the capacity of safety monitor(s) in the function of both the safety monitor and warning line systems, and they must:

   (i) Be a competent person as defined in WAC 296-880-095;

   (ii) Have control authority over the work as it relates to fall protection;

   (iii) Be instantly distinguishable over members of the work crew;

   (iv) Perform no other duties while acting as safety monitor;

   (v) Be positioned in relation to the workers under their protection, so as to have a clear, unobstructed view and be able to maintain normal voice communication;

   (vi) Not supervise more than eight exposed workers at one time;

   (vii) Warn the employee when it appears that the employee is unaware of a fall hazard or is acting in an unsafe manner.

WAC 296-880-245 Safety watch system requirements

Safety watch systems and their use must conform to the following provisions:

(1) When one employee is conducting any repair work or servicing equipment on a roof that has a pitch no greater than four in twelve, and the work is not within six feet of the edge, employers are allowed to use a safety watch system.

(2) Ensure the safety watch system meets the following requirements:

   (a) There can only be two people on the roof while the safety watch system is being used: The one employee acting as the safety watch and the one employee engaged in the repair work or servicing equipment;

   (b) The employee performing the task must comply promptly with fall hazard warnings from the safety watch;

   (c) Mechanical equipment is not used; and

   (d) The safety watch system is not used when weather conditions create additional hazards.
(e) The safety watch system can be used if the mechanical unit being serviced is at least fifteen feet away from the roof edge or fall hazard.

(3) Ensure the employee acting as the safety watch meets all of the following:

(a) Is a competent person as defined in WAC 296-880-095;
(b) Has full control over the work as it relates to fall protection;
(c) Has a clear, unobstructed view of the worker;
(d) Is able to maintain normal voice communication; and
(e) Performs no other duties while acting as the safety watch.

WAC 296-880-250 Safety net system requirements

Safety net systems and their use must conform with the following provisions:

(1) Safety nets must be installed as close as practicable under the surface on which employees are working, but in no case more than thirty feet (9.1 m) below such level unless specifically approved in writing by the manufacturer. The potential fall area to the net must be unobstructed.

(2) Safety nets must extend outward from the outermost projection of the work surface as follows:

Vertical distance from working levels to horizontal plane of net | Minimum required horizontal distance of outer edge of net from the edge of the working surface |
---|---|
Up to 5 feet | 8 feet |
More than 5 feet up to 10 feet | 10 feet |
More than 10 feet | 13 feet |

(3) You must install safety nets with sufficient clearance under them to prevent contact with the surface or structures below when subjected to an impact force equal to the drop test specified in (5) of this subsection.

(4) Safety nets and their installations must be capable of absorbing an impact force equal to that produced by the drop test.

(a) Except as provided in (6) of this subsection, safety nets and safety net installations must be drop-tested at the job site after initial installation and before being used as a fall protection system, whenever relocated, after major repair, and at 6-month intervals if left in one place. The drop-test must consist of a four-hundred pound (180 kg) bag of sand 30 ± two inches (76 ± 5 cm) in diameter dropped into the net from the highest walking/working surface at which
employees are exposed to fall hazards, but not from less than forty-two inches (1.1 m) above that level.

(b) When the employer can demonstrate that it is unreasonable to perform the drop-test required by (5) of this subsection, you (or a designated competent person) must certify that the net and net installation is in compliance with (2) and (3) of this subsection by preparing a certification record prior to the net being used as a fall protection system. The certification record must include an identification of the net and net installation for which the certification record is being prepared; the date that it was determined that the identified net and net installation were in compliance with (5) of this subsection and the signature of the person making the determination and certification. The most recent certification record for each net and net installation must be available at the job site for inspection.

(5) You must remove materials, scrap pieces, equipment, and tools which have fallen into the safety net as soon as possible from the net and at least before the next work shift.

(6) The maximum size of each safety net mesh opening must not exceed thirty-six square inches (230 cm²) nor be longer than six inches (15 cm) on any side, and the opening, measured center-to-center of mesh ropes or webbing, must not be longer than six inches (15 cm). All mesh crossings must be secured to prevent enlargement of the mesh opening.

(7) Each safety net (or section of it) must have a border rope or webbing with a minimum breaking strength of five-thousand pounds (22.2 kN).

(8) Connections between safety net panels must be as strong as integral net components and must be spaced not more than six inches (15 cm) apart.

WAC 296-880-255 Catch platform requirements

Catch platforms and their use must comply with the following provisions:

(1) You must install a catch platform within four vertical feet of the work area.

(2) The catch platform's width must be a minimum of forty-five inches wide and must be equipped with standard guardrails and toe boards on all open sides and must be capable of supporting a minimum of eight-hundred pounds or the maximum potential load, with a safety factor of four.

WAC 296-880-260 Canopy requirements

Canopies and their use must comply with the following provisions:

(1) Canopies, when used as falling object protection, must be strong enough to prevent collapse and to prevent penetration by any objects which may fall onto the canopy.
WAC 296-880-265 Roof bracket requirements

Roof brackets and their use must comply with the following provisions:

(1) Roofing brackets are not a fall protection system.

(a) Roofing brackets must be constructed to fit the pitch of the roof.

(b) In addition to securing brackets using the pointed metal projections, brackets must also be secured in place by nailing. When it is impractical to nail brackets, rope supports must be used. When rope supports are used, they must consist of first grade manila of at least three-quarter inch diameter, or equivalent.

WAC 296-880-270 Crawling board and chicken ladder requirements

Crawling boards, chicken ladders, and their use must conform with the following provisions:

(1) Crawling boards and chicken ladders are not fall protection systems.

(a) Crawling boards must be not less than ten inches wide and one inch thick, having cleats one by one and one-half inches.

(i) The cleats must be equal in length to the width of the board and spaced at equal intervals not to exceed twenty-four inches.

(ii) Nails must be driven through and clinched on the underside.

(iii) The crawling board must extend from the ridge pole to the eaves when used in connection with roof construction, repair, or maintenance.

(b) Crawling boards must be secured to the roof using ridge hooks or other equivalent means.

WAC 296-880-275 Roof edge materials handling and material storage requirements

Roof edge materials handling areas and materials storage must conform with the following provisions:

(1) When guardrails are used at hoisting areas, a minimum of four feet of guardrail must be erected along each side of the access point through which materials are hoisted.

(2) A chain or gate must be placed across the opening between the guardrail sections when hoisting operations are not taking place.

(3) When guardrails are used at bitumen pipe outlet, a minimum of four feet of guardrail must be erected along each side of the pipe.

(4) Mechanical equipment must be used or stored only in areas where employees are protected using a fall arrest system as described in WAC 296-880-215, or a fall restraint system as described in WAC 296-
880-220. Mechanical equipment may not be used or stored where the only protection is provided by the use of a safety monitor.

(5) The hoist must not be used as an attachment/anchorage point for fall arrest or fall restraint systems.

(6) Materials must not be stored within six feet of a roof edge unless guardrails are erected at the roof edge. Guardrails must include a toe board if employees could be working or passing below.

**WAC 296-880-280 Fall protection requirements for specific equipment**

In addition to the requirement for the use of fall protection addressed in this chapter, the following requirements apply:

**WAC 296-880-28010 Order pickers (PITS)**

(1) You must ensure all persons operating an order picker are protected by standard guardrails on all open sides; or

(2) A full body harness and lanyard that are connected to a tie off point that has been approved by the PIT manufacturer.

Additional requirements for powered industrial trucks can be found in WAC 296-863.

**WAC 296-880-28015 Elevating work platforms**

(1) This subsection applies to vehicle mounted aerial devices. Before elevating the platform, you must ensure all persons on the platform wear a full body harness with a lanyard attached to either:

   (a) The manufacturer’s recommended attachment point; or

   (b) The boom or platform if the manufacturer does not specify an attachment point.

   You must never attach a lanyard to an adjacent pole, structure, or equipment.

(2) This subsection applies to manually propelled and self-propelled elevating work platforms.

   (a) Before elevating the platform, you must ensure all persons on the platform are wearing fall protection devices and other safety gear if required.

(3) This subsection applies to boom supported elevating work platforms.

   (a) Before elevating the platform, you must ensure all persons on the platform of boom-supported elevating work platforms wear a full body harness and lanyard fixed to manufacturer provided and approved attachment points.

Additional requirements for elevating work platforms can be found in WAC 296-869.
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WAC 296-880-28020 Powered Platforms
This section covers permanent powered platform installations dedicated to interior or exterior building maintenance of a specific structure or group of structures.

(1) Building owner certifications.
   You must obtain written certification from the building owner of any building with a powered platform installation that was completed or had major modification done after July 23, 1990, that the building and equipment meets the requirements of new installations-buildings, WAC 296-870-600 and new installations-equipment, WAC 296-870-700.

Note: The building owner needs to base the certification on:
   (a) The field test of the installation done before it is first placed into service or following any major modification to an existing installation; and
   (b) All other relevant available information, including but not limited to:
       (c) Test data;
       (d) Equipment specifications;
       (e) Verification by a registered professional engineer.

(2) You must obtain written certification from the building owner that the installation:
   (a) Has been inspected, tested, and maintained as required by inspection, testing, and maintenance, WAC 296-870-300; and
   (b) All fall protection anchorages meet the requirements of WAC 296-880-215.

(3) You must prohibit employees from using the installation until the building owner has provided the required written certifications.

(4) You must protect employees on working platforms with a personal fall arrest system that meets the requirements of WAC 296-880-220.

(5) You must make sure employees working on a roof or other elevated working area four feet or more above a lower level are protected according to WAC 296-880-255.

Additional requirements for powered platforms can be found in WAC 296-870.

WAC 296-880-28025 Window Cleaning

(1) You must make sure employees working on a roof or other elevated working area four feet or more above a lower level are protected according to WAC 296-880-255.

(2) You must make sure all workers suspended from a boatswain’s chair or rope descent system use an independent fall arrest system where the fall arrest anchorage is separate from the suspension system anchorage.
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(3) You must make sure workers assemble and wear their personal fall arrest equipment before they approach the point of suspension.

(4) You must make sure workers are connected at all times to the fall arrest system while they are suspended.

(5) You must prohibit use of the following equipment for window-cleaning operations:
   (a) Portable sills;
   (b) Window jacks;
   (c) Capstan devices to suspend workers;
   (d) Suspension or fall-arrest ropes that are made entirely of polypropylene.

Additional requirements for window cleaning can be found in WAC 296-878.

WAC 296-880-28030 Scaffolds
(1) You must protect each employee on a scaffold from falling four feet or more to a lower level, by providing either:
   (a) A personal fall arrest system; or
   (b) Guardrails.

(2) You must make sure personal fall arrest systems are attached by a lanyard to one of the following:
   (a) Vertical lifeline;
   (b) Horizontal lifeline;
   (c) Appropriate structural member of the scaffold.

Specifications for these personal fall arrest systems can be found in WAC 296-880-215. Specifications for guardrail systems used with scaffolds can be found in (8) of this subsection. Specifications for vertical lifelines can be found in (9) of this subsection. Specifications for horizontal lifelines can be found in (10) of this subsection.

(3) Provide fall protection for persons erecting or dismantling supported scaffolds.
   (a) You must have a competent person determine the feasibility of providing fall protection for persons erecting or dismantling supported scaffolds.
   (b) You must provide fall protection if the installation and use of fall protection is:
      (i) Feasible; and
      (ii) Does not create a greater hazard.

(4) You must make sure employees erecting the scaffold install the guardrail system, if required, before the scaffold is used by any other employees.

(5) Provide fall protection if a scaffold is too far from the work face.
(a) You must provide a guardrail system along the front edge of the platform, or have employees use a personal fall arrest system, if the distance from the front edge of the platform to the work face is greater than:
   (i) Eighteen inches (46 cm) for scaffolds used for plastering and lathing operations;
   (ii) Fourteen inches (36 cm) for all other scaffolds.

(6) Provide specific types of fall protection for specific types of scaffolds at four feet or more.
   (a) You must use a personal fall arrest system to protect employees on the following scaffolds:
      (i) Boatswain's chair;
      (ii) Catenary scaffold;
      (iii) Float scaffold;
      (iv) Ladder jack scaffold;
      (v) Needle beam scaffold.

   (b) You must use a personal fall arrest system and a guardrail system to protect employees on:
      (i) Single-point adjustable suspension scaffolds; and
      (ii) Two-point adjustable suspension scaffolds.

(7) You must protect employees working on a self-contained adjustable scaffold that has the platform:
   (a) Supported by the frame structure, using a guardrail system with a minimum two-hundred pound toprail capacity.
   (b) Suspended by ropes, using:
      (i) A guardrail system with a minimum two-hundred pound toprail capacity; and
      (ii) A personal fall arrest system.

(8) You must protect employees on walkways located within a scaffold by using a guardrail system that meets all of the following:
   (a) Has a minimum two-hundred pound toprail capacity;
   (b) Is installed within nine and one-half inches (24.1 cm) of the walkway;
   (c) Is installed along at least one side of the walkway.

(9) Make sure vertical lifelines used with personal fall arrest systems meet these requirements
   (a) You must make sure vertical lifelines are all of the following:
      (i) Fastened to a fixed, safe point of anchorage;
      (ii) Independent of the scaffold;
      (iii) Protected from sharp edges and abrasion.

   Note: Safe points of anchorage include structural members of buildings, but do not include:
      (1) Standpipes, vents, or other piping systems;
      (2) Electrical conduit;
      (3) Outrigger beams;
      (4) Counterweights.

   (b) You must make sure vertical lifelines, independent support lines, and suspension ropes are not attached to any of the following:
      (i) Each other;
      (ii) The same point of anchorage;
(iii) The same point on the scaffold.

(c) You must make sure vertical lifelines, independent support lines, and suspension ropes do not use the same point of anchorage.

(d) You must make sure independent support lines and suspension ropes are not attached to a personal fall arrest system.

(e) You must make sure vertical lifelines are not used with single-point or two-point adjustable suspension scaffolds that have overhead components such as overhead protection or additional platform levels.

(10) Make sure horizontal lifelines used with personal fall arrest systems meet these requirements:

(a) You must equip single-point or two-point adjustable suspension scaffolds that use horizontal lifelines or structural members of the scaffold for fall protection with both of the following:
   (i) Additional independent support lines that are equal in number and equivalent in strength to the suspension ropes;
   (ii) Automatic locking devices capable of stopping the scaffold from falling if one or both of the suspension ropes fail.

(b) You must make sure horizontal lifelines are secured to either:
   (i) Two or more structural members of the scaffold; or
   (ii) Looped around both the suspension ropes and independent support lines above the hoist and brake attached to the end of the scaffold.

(c) You must make sure independent support lines and suspension ropes are not:
   (i) Attached to each other or the same point on the scaffold;
   (ii) Attached to or use the same point of anchorage.

(d) You must make sure independent support lines and suspension ropes are not attached to either:
   (i) A personal fall arrest system; or
   (ii) The same point on the scaffold as a personal fall arrest system.

(e) You must make sure, if a horizontal lifeline is used where it may become a vertical lifeline, that the device used to connect a lanyard to the horizontal lifeline is capable of locking in both directions on the lifeline.

(11) You must make sure independent support lines and suspension ropes are not:

(a) Attached to each other or the same point on the scaffold;

(b) Attached to or use the same point of anchorage.

(12) You must make sure independent support lines and suspension ropes are not attached to either:

(a) A personal fall arrest system; or

(b) The same point on the scaffold as a personal fall arrest system.

(13) You must make sure, if a horizontal lifeline is used where it may become a vertical lifeline, that the device used to connect a lanyard to the horizontal lifeline is capable of locking in both directions on the lifeline.
(14) Make sure guardrail systems meet these requirements
   (a) You must make sure guardrails, if required, are installed along all open sides and ends of platforms.

EXEMPTION:
(15) For employees doing overhand bricklaying operations from a supported scaffold, a guardrail is not required on the side next to the wall.

(16) You must make sure the height of the toprail top edge, or the equivalent member, of supported scaffolds is:
   (a) At least thirty-six inches (0.9 m) and not more than forty-five inches (1.2 m) above the platform surface for scaffolds manufactured or first placed in service before January 1, 2000;
   (b) At least thirty-eight inches (0.97 m) and not more than forty-five inches (1.2 m) above the platform surface for scaffolds manufactured or first placed in service after January 1, 2000.
   (c) You must make sure the height of the toprail top edge, or the equivalent member, of suspended scaffolds that require guardrails and personal fall arrest systems, is at least thirty-six inches (0.9 m) and not more than forty-five inches (1.2 m) above the platform surface.

EXEMPTION:
(17) When conditions warrant, the height of the top edge of the toprail may be greater than forty-five inches if the guardrail meets all other criteria of this section.

(18) You must make sure the top edge of the toprail does not drop below the required height when the minimum load, shown in Table 2, Minimum Toprail and Midrail Strength Requirements, is used.

(19) You must make sure each toprail and midrail, or equivalent member, of a guardrail system is able to withstand, without failure, the force shown in Table 2, Minimum Toprail and Midrail Strength Requirements, when the force is applied as follows:
    (a) To the toprail in a downward or horizontal direction at any point along its top edge;
    (b) To the midrail in a downward or horizontal direction at any point.

Note: Midrail includes screens, mesh, intermediate vertical members, solid panels, and equivalent structural members of the guardrail system.

<table>
<thead>
<tr>
<th>Table 2 Minimum Toprail and Midrail Strength Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type of Scaffold</strong></td>
</tr>
<tr>
<td>Single-point adjustable suspension scaffolds</td>
</tr>
<tr>
<td>Two-point adjustable suspension scaffolds</td>
</tr>
<tr>
<td>All other scaffolds</td>
</tr>
<tr>
<td>Walkways within a scaffold</td>
</tr>
</tbody>
</table>
(20) You must install midrails, screens, mesh, intermediate vertical members, solid panels, or equivalent structural members as follows:

(a) Midrails at a height approximately midway between the top edge of the guardrail system and the platform surface;
(b) Screens and mesh:
   (i) From the top edge of the guardrail system to the scaffold platform; and
   (ii) Along the entire opening between the supports.
(c) Intermediate members, such as balusters or additional rails, not more than nineteen inches (48 cm) apart.

(21) You must make sure steel or plastic banding is not used as a toprail or midrail.

(22) You must have a competent person inspect manila rope and plastic or other synthetic rope that is used as a toprail or midrail as frequently as necessary to make sure it continues to meet the strength requirements for a toprail or midrail.

Note: Crossbraces may be used as a toprail or midrail in a guardrail system if they meet the following requirements:
1. The crossing point of the two braces is between:
   a. 20” and 30” above the work platform when used as a midrail.
   b. 38” and 48” above the work platform when used as a toprail.
2. The end points at each upright are not more than 48” apart.

Additional requirements for scaffolds can be found in WAC 296-874.

**WAC 296-880-28035 Cranes**

(1) Anchorages for personal fall arrest and positioning device systems

(a) Personal fall arrest systems may be anchored to any apparently substantial part of the crane unless a competent person, from a visual inspection, without an engineering analysis, would conclude that the criteria in (a) of this subsection would not be met.

(b) Positioning device systems must be anchored to any apparently substantial part of the crane unless a competent person, from a visual inspection, without an engineering analysis, would conclude that the criteria in (b) of this subsection would not be met.

(c) Attachable anchor devices (portable anchor devices that are attached to the crane) must meet the anchorage criteria in (a) of this subsection for personal fall arrest systems and (b) of this subsection for positioning device systems.

Note: If the equipment is running and the employee is at or near the draw-works, precautions should be taken to ensure the fall protection gear will not become entangled.
(2) Anchorages for fall restraint systems

(a) Fall restraint systems may be anchored to any part of the crane that is capable of withstanding twice the maximum load that an employee may impose on it during reasonably anticipated conditions of use.

Note: If the equipment is running and the employee is at or near the draw-works, precautions should be taken to ensure the fall protection gear will not become entangled.

(3) Anchoring to the load line. A personal fall arrest system is permitted to be anchored to the crane/derrick's hook (or other part of the load line) where all of the following requirements are met:

(a) A qualified person has determined that the set-up and rated capacity of the crane/derrick (including the hook, load line and rigging) meets or exceeds the requirements in subsection (a) of this section.

(b) The crane operator must be at the worksite and informed that the crane is being used for this purpose.

(c) No load is suspended from the load line when the personal fall arrest system is anchored to the crane/derrick's hook (or other part of the load line).

Additional requirements for cranes can be found in WAC 296-155 Part L
Appendix A Determining roof widths – Non-mandatory guidelines

(1) This appendix serves as a guideline to assist employers complying with the requirements of WAC 296-880-240 which allows the use of a safety monitoring system alone as a means of providing fall protection during the performance of roofing operations on low-sloped roofs fifty feet (15.25 m) or less in width. Each example in the appendix shows a roof plan or plans and indicates where each roof or roof area is to be measured to determine its width. Section views or elevation views are shown where appropriate. Some examples show "correct" and "incorrect" subdivisions of irregularly shaped roofs divided into smaller, regularly shaped areas. In all examples, the dimension selected to be the width of an area is the lesser of the two primary dimensions of the area, as viewed from above. Example A shows a simple rectangular roof. The width is the lesser of the two primary overall dimensions, which is also the case with roofs sloped toward or away from the roof center, as shown in Example B.

(2) Many roofs are not simple rectangles. Such roofs may be broken down into subareas as shown in Example C. The process of dividing a roof area can produce many different configurations. Example C gives the general rule of using dividing lines of minimum length to minimize the size and number of the areas which are potentially less than fifty feet (15.25 m) wide. The intent is to minimize the number of roof areas where safety monitoring systems alone are sufficient protection.

(3) Roofs which are comprised of several separate, noncontiguous roof areas, as in Example D, may be considered as a series of individual roofs. Some roofs have penthouses, additional floors, courtyard openings, or similar architectural features; Example E shows how the rule for dividing roofs into subareas is applied to such configurations. Irregular, nonrectangular roofs must be considered on an individual basis, as shown in Example F.
Example B
*Sloped Rectangular Shaped Roofs*

PLAN VIEW

OR

SECTION A-A

SECTION B-B
Such roofs are to be divided into subareas by using dividing lines of minimum length to minimize the size and number of the areas which are potentially less than or equal to 50 feet (15.25 m) in width, in order to limit the size of roof areas where the safety monitoring system alone can be used (WAC 296-155-24615 (2)(b)). Dotted lines are used in the examples to show the location of dividing lines.

\( \text{\textbullet} \) denotes incorrect measurements of width.
Example D
Separate, Noncontiguous Roof Areas

1.

2.
Such roofs are to be divided into subareas by using dividing lines of minimum length to minimize the size and number of the areas which are potentially less than or equal to 50 feet (15.25 m) in width in order to limit the size of roof areas where the safety monitoring system alone can be used. Dotted lines are used in the examples to show the location of dividing lines.

 sociedad denota incorrect measurements of width.
Example F

Irregular, Nonrectangular Shaped Roofs

PLAN

PLAN

PLAN
WAC 296-880-290 Appendix B Calculating fall clearance distance – non-mandatory guidelines

Appendix B-Calculating fall clearance distance using a shock-absorbing lanyard and D-ring anchorage connector - Non-mandatory guidelines for complying with WAC 296-880-220.

Do the following to calculate the fall clearance distance using a shock-absorbing lanyard and D-ring anchorage connector:

1. First, add the length of the shock-absorbing lanyard (six feet) to the maximum elongation of the shock absorber during deceleration (three and one-half feet) to the average height of a worker (six feet).

2. Then, add a safety factor of three feet to allow for the possibility of an improperly fit full body harness, a taller than average worker and/or a miscalculation of distance.

- The suggested safe fall clearance distance for this example is eighteen and one-half feet.
Appendix C- Test methods and additional guidelines for personal fall arrest systems – Non-mandatory guidelines.

(1) General. Subsections (2), (3), (4) and (5) of this appendix set forth test procedures which may be used to determine compliance with the requirements in WAC 296-880-215.

(2) General conditions for all tests.

(a) Lifelines, lanyards and deceleration devices should be attached to an anchorage and connected to the body harness in the same manner as they would be used to protect employees.

(b) The anchorage should be rigid, and should not have a deflection greater than .04 inches (1 mm) when a force of two-thousand two-hundred and fifty pounds (10 kN) is applied.

(c) The frequency response of the load measuring instrumentation should be 120 Hz.

(d) The test weight used in the strength and force tests should be a rigid, metal, cylindrical or torso-shaped object with a girth of thirty-eight inches plus or minus four inches (96 cm plus or minus 10 cm).

(e) The lanyard or lifeline used to create the free fall distance should be supplied with the system, or in its absence, the least elastic lanyard or lifeline available to be used with the system.

(f) The test weight for each test should be hoisted to the required level and should be quickly released without having any appreciable motion imparted to it.

(g) The system’s performance should be evaluated taking into account the range of environmental conditions for which it is designed to be used.

(h) Following the test, the system need not be capable of further operation.

(3) Strength test.

(a) During the testing of all systems, a test weight of three hundred pounds plus or minus five pounds (135 kg plus or minus 2.5 kg) should be used. (See subsection (2)(d) of this appendix.)

(b) The test consists of dropping the test weight once. A new unused system should be used for each test.

(c) For lanyard systems, the lanyard length should be six feet plus or minus two inches (1.83 m plus or minus 5 cm) as measured from the fixed anchorage to the attachment on the body belt or body harness.

(d) For rope-grab-type deceleration systems, the length of the lifeline above the centerline of the grabbing mechanism to the lifeline’s anchorage point should not exceed two feet (0.61 m).
(e) For lanyard systems, for systems with deceleration devices which do not automatically limit free fall distance to two feet (0.61 m) or less, and for systems with deceleration devices which have a connection distance in excess of one foot (0.3 m) (measured between the centerline of the lifeline and the attachment point to the body harness), the test weight should be rigged to free fall a distance of seven and one-half feet (2.3 m) from a point that is one and one-half feet (46 cm) above the anchorage point, to its hanging location (six feet below the anchorage). The test weight should fall without interference, obstruction, or hitting the floor or ground during the test. In some cases a non-elastic wire lanyard of sufficient length may need to be added to the system (for test purposes) to create the necessary free fall distance.

(f) For deceleration device systems with integral lifelines or lanyards which automatically limit free fall distance to two feet (0.61 m) or less, the test weight should be rigged to free fall a distance of four feet (1.22 m).

(g) Any weight which detaches from the harness should constitute failure for the strength test.

(4) Force test.

(a) General. The test consists of dropping the respective test weight specified in (b)(i) or (c)(i) of this subsection once. A new, unused system should be used for each test.

(b) For lanyard systems:

(i) A test weight of two-hundred twenty pounds plus or minus three pounds (100 kg plus or minus 1.6 kg) should be used. (See subsection (2)(d) above.)

(ii) Lanyard length should be six feet plus or minus two inches (1.83 m plus or minus 5 cm) as measured from the fixed anchorage to the attachment on the body harness.

(iii) The test weight should fall free from the anchorage level to its hanging location (a total of six feet (1.83 m) free fall distance) without interference, obstruction, or hitting the floor or ground during the test.

(c) For all other systems.

(i) A test weight of two hundred and twenty pounds plus or minus three pounds (100 kg plus or minus 1.6 kg) should be used. (See subsection (2)(d) above.)

(ii) The free fall distance to be used in the test should be the maximum fall distance physically permitted by the system during normal use conditions, up to a maximum free fall distance for the test weight of six feet (1.83 m), except as follows:

(A) For deceleration systems which have a connection link or lanyard, the test weight should free fall a distance equal to the connection distance (measured between the centerline of the lifeline and the attachment point to the body harness).

(B) For deceleration device systems with integral lifelines or lanyards which automatically limit free fall distance to two feet (0.61 m) or less, the test weight should free fall a distance equal to that permitted by the system in normal use.
(For example, to test a system with a self-retracting lifeline or lanyard, the test weight should be supported and the system allowed to retract the lifeline or lanyard as it would in normal use. The test weight would then be released and the force and deceleration distance measured).

(d) A system fails the force test if the recorded maximum arresting force exceeds two-thousand five hundred pounds (11.2 kN) when using a body harness.

(e) The maximum elongation and deceleration distance should be recorded during the force test.

(5) Deceleration device tests.

(a) General. The device should be evaluated or tested under the environmental conditions, (such as rain, ice, grease, dirt, type of lifeline, etc.), for which the device is designed.

(b) Rope-grab-type deceleration devices.

(i) Devices should be moved on a lifeline one thousand times over the same length of line a distance of not less than one foot (30.5 cm), and the mechanism should lock each time.

(ii) Unless the device is permanently marked to indicate the type(s) of lifeline which must be used, several types (different diameters and different materials), of lifelines should be used to test the device.

(c) Other self-activating-type deceleration devices. The locking mechanisms of other self-activating-type deceleration devices designed for more than one arrest should lock each of one thousand times as they would in normal service.

Additional non-mandatory guidelines for personal fall arrest systems. The following information constitutes additional guidelines for use in complying with requirements for a personal fall arrest system.

(6) Selection and use considerations. The kind of personal fall arrest system selected should match the particular work situation, and any possible free fall distance should be kept to a minimum. Consideration should be given to the particular work environment. For example, the presence of acids, dirt, moisture, oil, grease, etc., and their effect on the system, should be evaluated. Hot or cold environments may also have an adverse effect on the system. Wire rope should not be used where an electrical hazard is anticipated. As required by the standard, the employer must plan to have means available to promptly rescue an employee should a fall occur, since the suspended employee may not be able to reach a work level independently.

Where lanyards, connectors, and lifelines are subject to damage by work operations such as welding, chemical cleaning, and sandblasting, the component should be protected, or other securing systems should be used. The employer should fully evaluate the work conditions and environment (including seasonal weather changes) before selecting the appropriate personal fall protection system. Once in use, the system’s effectiveness should be monitored. In some cases, a program for cleaning and maintenance of the system may be necessary.
(7) Testing considerations. Before purchasing or putting into use a personal fall arrest system, an employer should obtain from the supplier information about the system based on its performance during testing so that the employer can know if the system meets this standard. Testing should be done using recognized test methods. Part II of this Appendix C contains test methods recognized for evaluating the performance of fall arrest systems. Not all systems may need to be individually tested; the performance of some systems may be based on data and calculations derived from testing of similar systems, provided that enough information is available to demonstrate similarity of function and design.

(8) Component compatibility considerations. Ideally, a personal fall arrest system is designed, tested, and supplied as a complete system. However, it is common practice for lanyards, connectors, lifelines, deceleration devices, and body harnesses to be interchanged since some components wear out before others. The employer and employee should realize that not all components are interchangeable. For instance, a lanyard should not be connected between a body harness and a deceleration device of the self-retracting type since this can result in additional free fall for which the system was not designed. Any substitution or change to a personal fall arrest system should be fully evaluated or tested by a competent person to determine that it meets the standard, before the modified system is put in use.

(9) Employee training considerations. Thorough employee training in the selection and use of personal fall arrest systems is imperative. As stated in the standard, before the equipment is used, employees must be trained in the safe use of the system. This should include the following: Application limits; proper anchoring and tie-off techniques; estimation of free fall distance, including determination of deceleration distance, and total fall distance to prevent striking a lower level; methods of use; and inspection and storage of the system. Careless or improper use of the equipment can result in serious injury or death. Employers and employees should become familiar with the material in this Appendix, as well as manufacturer's recommendations, before a system is used. Of uppermost importance is the reduction in strength caused by certain tie-offs (such as using knots, tying around sharp edges, etc.) and maximum permitted free fall distance. Also, to be stressed are the importance of inspections prior to use, the limitations of the equipment, and unique conditions at the worksite which may be important in determining the type of system to use.

(10) Instruction considerations. Employers should obtain comprehensive instructions from the supplier as to the system's proper use and application, including, where applicable:

   (a) The force measured during the sample force test;
   (b) The maximum elongation measured for lanyards during the force test;
   (c) The deceleration distance measured for deceleration devices during the force test;
   (d) Caution statements on critical use limitations;
   (e) Application limits;
   (f) Proper hook-up, anchoring and tie-off techniques, including the proper D-ring or other attachment point to use on the body harness for fall arrest;
   (g) Proper climbing techniques;
   (h) Methods of inspection, use, cleaning, and storage; and
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(i) Specific lifelines which may be used. This information should be provided to employees during training.

(11) Inspection considerations. As stated in WAC 296-880-215, personal fall arrest systems must be regularly inspected. Any component with any significant defect, such as cuts, tears, abrasions, mold, or undue stretching; alterations or additions which might affect its efficiency; damage due to deterioration; contact with fire, acids, or other corrosives; distorted hooks or faulty hook springs; tongues unfitted to the shoulder of buckles; loose or damaged mountings; nonfunctioning parts; or wearing or internal deterioration in the ropes must be withdrawn from service immediately, and should be tagged or marked as unusable, or destroyed.

(12) Rescue considerations. As required by WAC 296-880-215 when personal fall arrest systems are used, the employer must assure that employees can be promptly rescued or can rescue themselves should a fall occur. The availability of rescue personnel, ladders or other rescue equipment should be evaluated. In some situations, equipment which allows employees to rescue themselves after the fall has been arrested may be desirable, such as devices which have descent capability.

(13) Tie-off considerations.

(a) One of the most important aspects of personal fall protection systems is fully planning the system before it is put into use. Probably the most overlooked component is planning for suitable anchorage points. Such planning should ideally be done before the structure or building is constructed so that anchorage points can be incorporated during construction for use later for window cleaning or other building maintenance. If properly planned, these anchorage points may be used during construction, as well as afterwards.

(b) Employers and employees should at all times be aware that the strength of a personal fall arrest system is based on its being attached to an anchoring system which does not significantly reduce the strength of the system (such as a properly dimensioned eye-bolt/snap-hook anchorage). Therefore, if a means of attachment is used that will reduce the strength of the system, that component should be replaced by a stronger one, but one that will also maintain the appropriate maximum arrest force characteristics.

(c) Tie-off using a knot in a rope lanyard or lifeline (at any location) can reduce the lifeline or lanyard strength by 50% or more. Therefore, a stronger lanyard or lifeline should be used to compensate for the weakening effect of the knot, or the lanyard length should be reduced (or the tie-off location raised) to minimize free fall distance, or the lanyard or lifeline should be replaced by one which has an appropriately incorporated connector to eliminate the need for a knot.

(d) Tie-off of a rope lanyard or lifeline around an "H" or "I" beam or similar support can reduce its strength as much as 70% due to the cutting action of the beam edges. Therefore, use should be made of a webbing lanyard or wire core lifeline around the beam; or the lanyard or lifeline should be protected from the edge; or free fall distance should be greatly minimized.

(e) Tie-off where the line passes over or around rough or sharp surfaces reduces strength drastically. Such a tie-off should be avoided or an alternative tie-off rigging should be used. Such
alternatives may include use of a snap-hook/D-ring connection, wire rope tie-off, an effective padding of the surfaces, or an abrasion-resistance strap around or over the problem surface.

(f) Horizontal lifelines may, depending on their geometry and angle of sag, be subjected to greater loads than the impact load imposed by an attached component. When the angle of horizontal lifeline sag is less than 30 degrees, the impact force imparted to the lifeline by an attached lanyard is greatly amplified. For example, with a sag angle of fifteen degrees, the force amplification is about 2:1 and at five degrees sag, it is about 6:1. Depending on the angle of sag, and the line’s elasticity, the strength of the horizontal lifeline and the anchorages to which it is attached should be increased a number of times over that of the lanyard. Extreme care should be taken in considering a horizontal lifeline for multiple tie-offs. The reason for this is that in multiple tie-offs to a horizontal lifeline, if one employee falls, the movement of the falling employee and the horizontal lifeline during arrest of the fall may cause other employees to also fall. Horizontal lifeline and anchorage strength should be increased for each additional employee to be tied-off. For these and other reasons, the design of systems using horizontal lifelines must only be done by qualified persons. Testing of installed lifelines and anchors prior to use is recommended.

(g) The strength of an eye-bolt is rated along the axis of the bolt and its strength is greatly reduced if the force is applied at an angle to this axis (in the direction of shear). Also, care should be exercised in selecting the proper diameter of the eye to avoid accidental disengagement of snap-hooks not designed to be compatible for the connection.

(h) Due to the significant reduction in the strength of the lifeline/lanyard (in some cases, as much as a 70% reduction), the sliding hitch knot should not be used for lifeline/lanyard connections except in emergency situations where no other available system is practical. The "one-and-one" sliding hitch knot should never be used because it is unreliable in stopping a fall. The "two-and-two," or "three-and-three" knot (preferable), may be used in emergency situations; however, care should be taken to limit free fall distance to a minimum because of reduced lifeline/lanyard strength.

(14) Vertical lifeline considerations. As required by the standard, each employee must have a separate lifeline when the lifeline is vertical. The reason for this is that in multiple tie-offs to a single lifeline, if one employee falls, the movement of the lifeline during the arrest of the fall may pull other employees’ lanyards, causing them to fall as well.

(15) Snap-hook considerations.

(a) Required by this standard for all connections, locking snap-hooks incorporate a positive locking mechanism in addition to the spring loaded keeper, which will not allow the keeper to open under moderate pressure without someone first releasing the mechanism. Such a feature, properly designed, effectively prevents roll-out from occurring.

(b) As required by WAC 296-880-215 the following connections must be avoided (unless properly designed locking snap-hooks are used) because they are conditions which can result in roll-out when a non-locking snap-hook is used:

   (i) Direct connection of a snap-hook to a horizontal lifeline.
(ii) Two (or more) snap-hooks connected to one D-ring.

(iii) Two snap-hooks connected to each other.

(iv) A snap-hook connected back on its integral lanyard.

(v) A snap-hook connected to a webbing loop or webbing lanyard.

(vi) Improper dimensions of the D-ring, rebar, or other connection point in relation to the snap-hook dimensions which would allow the snap-hook keeper to be depressed by a turning motion of the snap-hook.

(16) Free fall considerations. The employer and employee should at all times be aware that a system's maximum arresting force is evaluated under normal use conditions established by the manufacturer, and in no case using a free fall distance in excess of six feet (1.8 m). A few extra feet of free fall can significantly increase the arresting force on the employee, possibly to the point of causing injury. Because of this, the free fall distance should be kept at a minimum, and, as required by the standard, in no case greater than six feet (1.8 m). To help assure this, the tie-off attachment point to the lifeline or anchor should be located at or above the connection point of the fall arrest equipment to harness. (Since otherwise additional free fall distance is added to the length of the connecting means (i.e. lanyard).) Attaching to the working surface will often result in a free fall greater than six feet (1.8 m). For instance, if a six foot (1.8 m) lanyard is used, the total free fall distance will be the distance from the working level to the body harness attachment point plus the six feet (1.8 m) of lanyard length. Another important consideration is that the arresting force which the fall system must withstand also goes up with greater distances of free fall, possibly exceeding the strength of the system.

(17) Elongation and deceleration distance considerations. Other factors involved in a proper tie-off are elongation and deceleration distance. During the arresting of a fall, a lanyard will experience a length of stretching or elongation, whereas activation of a deceleration device will result in a certain stopping distance. These distances should be available with the lanyard or device's instructions and must be added to the free fall distance to arrive at the total fall distance before an employee is fully stopped. The additional stopping distance may be very significant if the lanyard or deceleration device is attached near or at the end of a long lifeline, which may itself add considerable distance due to its own elongation. As required by the standard, sufficient distance to allow for all of these factors must also be maintained between the employee and obstructions below, to prevent an injury due to impact before the system fully arrests the fall. In addition, a minimum of twelve feet (3.7 m) of lifeline should be allowed below the securing point of a rope grab type deceleration device, and the end terminated to prevent the device from sliding off the lifeline. Alternatively, the lifeline should extend to the ground or the next working level below. These measures are suggested to prevent the worker from inadvertently moving past the end of the lifeline and having the rope grab become disengaged from the lifeline.

(18) Obstruction considerations. The location of the tie-off should also consider the hazard of obstructions in the potential fall path of the employee. Tie-offs which minimize the possibilities of exaggerated swinging should be considered.

(19) Other considerations. Because of the design of some personal fall arrest systems, additional considerations may be required for proper tie-off. For example, heavy deceleration devices of the self-retracting type should be secured overhead in order to avoid the weight of the device having to be
supported by the employee. Also, if self-retracting equipment is connected to a horizontal lifeline, the sag in the lifeline should be minimized to prevent the device from sliding down the lifeline to a position which creates a swing hazard during fall arrest. In all cases, manufacturer's instructions should be followed.