AMENDATORY SECTION (Amending Order 90-10, filed 8/13/90, effective 9/24/90)

WAC 296-36-170 Stairs and ladders. The requirements of chapter 296-155 WAC Parts ((~~K~~)) C-1 and J shall apply.

AMENDATORY SECTION (Amending WSR 12-01-086, filed 12/20/11, effective 2/1/12)

WAC 296-45-25510 Fall protection. (1) Personal fall arrest equipment shall meet the requirements of chapter 296-155 WAC ((~~296-155-245~~)), Part C-1, Fall protection requirements for construction.

(2) Specific requirements for lineman's belts, safety straps and lanyards.

(a) All fabric used for safety straps must withstand an A.C. dielectric test of not less than 25,000 volts per foot "dry" for 3 minutes, without visible deterioration.

(b) All fabric and leather used must be tested for leakage current and must not exceed 1 milliampere when a potention of 3,000 volts is applied to the electrodes positioned 12 inches apart.

(c) Direct current tests may be permitted in lieu of alternating current tests.

(d) The cushion part of the body belt must:

(i) Contain no exposed rivets on the inside;

(ii) Be at least three (3) inches in width;

(iii) Be at least five thirty-seconds (5/32) inch thick, if made of leather; and

(iv) Have pocket tabs that extended at least 1 1/2 inches down and three (3) inches back of the inside of circle of each D ring for riveting on plier or tool pockets. On shifting D belts, this measurement for pocket tabs must be taken when the D ring section is centered.

(e) A maximum of four (4) tool loops must be so situated on the body belt that four (4) inches of the body belt in the center of the back, measuring from D ring to D ring, must be free of tool loops, and any other attachments.

(f) Suitable copper, steel, or equivalent liners must be used around bar of D rings to prevent wear between these members and the leather or fabric enclosing them.

(g) All stitching must be of a minimum 42-pound weight nylon or equivalent thread and must be lock stitched. Stitching parallel to an edge must not be less than three-sixteenths (3/16) inch from edge of narrowest member caught by the thread. The use of cross stitching on leather is prohibited.

(h) The keeper of snaphooks must have a spring tension that will not allow the keeper to begin to open with a weight of 2 1/2 pounds or less, but the keeper of snaphooks must begin to open with a weight of four (4) pounds, when the weight is supported on the keeper against the end of the nose.

(i) Testing of lineman's safety straps, body belts and lanyards must be in accordance with the following procedure:

(i) Attach one end of the safety strap or lanyard to a rigid support, the other end must be attached to a 250-pound canvas bag of sand;

(ii) Allow the 250-pound canvas bag of sand to free fall 4 feet for (safety strap test) and 6 feet for (lanyard test); in each case stopping the fall of the 250-pound bag;

(iii) Failure of the strap or lanyard must be indicated by any breakage, or slippage sufficient to permit the bag to fall free of the strap or lanyard. The entire "body belt assembly" must be tested using one D ring. A safety strap or lanyard must be used that is capable of passing the "impact loading test" and attached as required in (i)(i) of this subsection. The body belt must be secured to the 250-pound bag of sand at a point to simulate the waist of a man and allowed to drop as stated in (i)(ii) of this subsection. Failure of the body belt must be indicated by any breakage, or slippage sufficient to permit the bag to fall free of the body belt.

(3) Body belts, safety straps, lanyards, lifelines, and body harnesses shall be inspected before use each day to determine that the equipment is in safe working condition. Defective equipment may not be used.

(4) Employees shall not wear climbers while doing work where they are not required. Employees shall not continue to wear their climbers while working on the ground; except for momentary or short periods of time on the ground.

(5) Employees, when working from a hook ladder, must either belt themselves securely to the ladder, attach themselves to the structures by means of a safety line, or belt themselves to ladder safety equipment, which shall consist of a safety rope or belting threaded through the rungs or secured to the ladder at intervals of not more than three feet.

(6) Before an employee throws his/her weight on a belt, the employee shall determine that the snap or fasteners are properly engaged.

(7) Safety straps shall not be placed around poles above the cross-arm except where it is not possible for the strap to slide or be slipped over the top of the pole by inadvertence of the employee. Neither end of the strap shall be allowed to hang loose or dangle while the employee is ascending or descending poles or other structures.

(8) Body belts and safety straps shall not be stored with sharp-edged tools or near sharp objects. When a body belt, safety strap and climbers are kept in the same container, they shall be stored in such a manner as to avoid cutting or puncturing the material of the body belt or safety strap with the gaffs or climbers.

(9) Employees shall not attach metal hooks or other metal devices to body belts. Leather straps or rawhide thongs shall have hardwood or fibre crossbars. Leather straps and rawhide thongs shall not have metal or other conductive crossbars on them.

(10) Climbing gaffs shall be kept properly sharpened and shall be at least 1-1/8 inches in length.

(11) Lifelines shall be protected against being cut or abraded.

(12) Fall arrest equipment, work positioning equipment, or travel restricting equipment shall be used by employees working at

elevated locations more than 4 feet (1.2 m) above the ground on poles, towers, or similar structures if other fall protection has not been provided. Fall protection equipment is not required to be used by a qualified employee climbing or changing location on poles, towers, or similar structures, unless conditions, such as, but not limited to, ice, high winds, the design of the structure (for example, no provision for holding on with hands), or the presence of contaminants on the structure, could cause the employee to lose his or her grip or footing.

Note 1: This subsection applies to structures that support overhead electric power generation, transmission, and distribution lines and equipment. It does not apply to portions of buildings, such as loading docks, to electric equipment, such as transformers and capacitors, nor to aerial lifts. Requirements for fall protection associated with walking and working surfaces are contained in chapter 296-155 WAC ((~~296-155-245;~~)), Part C-1, Fall protection requirements for construction requirements for fall protection associated with aerial lifts are contained in chapter 296-869 WAC, Elevating work platforms.

Note 2: Employees undergoing training are not considered "qualified employees" for the purposes of this provision. Unqualified employees (including trainees) are required to use fall protection any time they are more than 4 feet (1.2 m) above the ground.

(13) The following requirements apply to personal fall arrest systems:

(a) When stopping or arresting a fall, personal fall arrest systems shall limit the maximum arresting force on an employee to 1800 pounds (8 kN) if used with a body harness.

(b) Personal fall arrest systems shall be rigged such that an employee can neither free fall more than 6 feet (1.8 m) nor contact any lower level.

(14) If vertical lifelines or droplines are used, not more than one employee may be attached to any one lifeline.

(15) Snaphooks may not be connected to loops made in webbing-type lanyards.

(16) Snaphooks may not be connected to each other.

NEW SECTION

WAC 296-155-24601 Scope and application. Chapter 296-155 WAC, Part C-1 sets forth requirements for employers to provide and enforce the use of fall protection for employees performing activities covered under this chapter.

Note: Additional standards requiring fall protection include:
- Chapter 296-869 WAC, vehicle mounted aerial platforms, and boom supported elevating work platforms.
- Chapter 296-874 WAC, Scaffolds.
- Chapter 296-876 WAC, Ladders, portable and fixed.
- Chapter 296-155 WAC, Part J: Stairways; Part L: Cranes, rigging, and personnel lifting; Part M: Pile driving; Part O: Placing and removal of forms, and vertical slip forms; Part P: Steel erection temporary floors.

NEW SECTION

WAC 296-155-24603 Definitions. Affected area means the distance away from the edge of an excavation equal to the depth of the excavation up to a maximum distance of fifteen feet. For example, an excavation ten feet deep has an affected area extending ten feet from the edge of any side of the excavation.

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

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

Catenary line - See horizontal lifeline.

Competent person means 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 means 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).

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

Equivalent means 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 means 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 means the actual distance from the worker's support to the level where a fall would stop.

Fall protection work plan means a written planning document in which the employer identifies all areas on the job site where a fall hazard of ten 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 296-155-24611(2).

Fall restraint system means 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.

Floor hole means an opening measuring less than twelve 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.

Floor opening means an opening measuring twelve inches or more in its least dimension in any floor, roof, platform, or surface through which persons may fall.

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

Free fall distance means 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 means a configuration of connected straps that meets the requirements specified in ANSI Z359.1-2007, 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 means 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 means a rail used to provide employees with a handhold for support.

Hardware means snap hooks, D-rings, bucklers, carabiners, adjusters, O-rings, that are used to attach the components of a fall protection system together.

Hazardous slope means a slope where normal footing cannot be maintained without the use of devices due to the pitch of the surface, weather conditions, or surface material.

Horizontal lifeline means 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 means 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, four, or six feet long.

Leading edge means the advancing edge of a floor, roof, or formwork which changes location as additional floor, roof, or formwork sections are placed, formed, or constructed.

Lifeline means 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 means 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 means a roof having a slope equal to or less than four in twelve.

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

Personal fall arrest system means 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 means 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 means a work surface elevated above the surrounding floor or ground.

Positioning device system means 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 means a body support that meets the requirements specified in ANSI Z359.3-2007 that encircles and closes around the waist and legs with attachment elements appropriate for positioning work.

Qualified person means 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 means 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 means 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 means 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 means 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 296-155-24615 (1)(f).

Runway means 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 means 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 means a type of fall arrest system, as

described in WAC 296-155-24613(2).

Safety watch system means a fall protection system as described in WAC 296-155-24615(6), 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 means 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 means 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 means 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 means 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 means any construction of railings, covers, or other guards that meets the requirements of this part.

Static line - See horizontal lifeline.

Steep pitched roof means a roof having a slope greater than four in twelve.

Toe board means 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 means 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 thirty-nine inches in vertical height.

Walking/working surface means any area including, but not limited to, floors, a roof surface, bridge, the ground, and any other surfaces whose dimensions are forty-five inches or more in all directions, through which workers can pass or conduct work. A walking/working surface does not include vehicles or rolling stock on which employees must be located in order to perform their job duties.

Wall opening means an opening at least thirty inches high and eighteen 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 means 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).

NEW SECTION

WAC 296-155-24605 General requirements. (1) The employer shall 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) 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 shall be inspected prior to each use according to manufacturer's specifications for mildew, wear, damage, and other deterioration. Defective components shall be removed from service if their function or strength has been adversely affected.

(b) Safety nets shall be inspected at least once a week according to manufacturer's specifications for wear, damage, and other deterioration. Safety nets shall also be inspected after any occurrence which could affect the integrity of the safety net system. Defective components shall be removed from service. Defective nets shall not be used.

(3) Personal fall arrest systems, personal fall restraint system, positioning device systems, and their components shall be used only for employee protection and not to hoist materials.

(4) Exemptions. Employees are exempt from WAC 296-155-24609 and 296-155-24611 only under the following conditions:

(a) 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.

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

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

- Measuring a roof to determine the amount of materials needed for a project.
- Inspecting the roof for damage without removing equipment or components.
- 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:

- Delivering, staging or storing materials on a roof.
- Persons estimating or inspecting on roofs that would be considered a "hazardous slope" by definition.

Fall Arrest	**Stopped after the fall with a 6 ft. maximum free fall distance**
	WAC 296-155-24613
•Personal fall arrest	WAC 296-155-24613(1)
•Safety nets	WAC 296-155-24613(2)
•Catch platforms	WAC 296-155-24613(3)
Fall Restraint	**Restrained from falling**
	WAC 296-155-24615
•Personal fall restraint	WAC 296-155-24615(1)
•Guardrails	WAC 296-155-24615(2)
•Covers	WAC 296-155-24615(3)
•Warning line system	WAC 296-155-24615(4)
•Safety monitor	WAC 296-155-24615(5)
•Safety watch	WAC 296-155-24615(6)
Positioning Device	**WAC 296-155-24617**
•Positioning harness/full body harness with a 2 ft. maximum free fall distance.	
•Vertical walls, columns, poles, hazardous slopes, and steep pitches.	

Examples of what personal fall arrest, personal fall restraint and positioning device systems look like:

Fall Arrest

Fall Restraint

Positioning

NEW SECTION

WAC 296-155-24607 Fall protection required regardless of height. (1) Regardless of height, open sided floors, walkways, platforms, or runways above or adjacent to dangerous equipment, such as dip tanks and material handling equipment, and similar hazards shall be guarded with a standard guardrail system.

(2) Floor holes or floor openings, into which persons can accidentally walk, shall be guarded 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, the floor hole opening shall be protected by a standard railing.

Note: Requirements for when guarding floor openings at heights of four feet or more are located in WAC 296-155-24609(4).

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

NEW SECTION

WAC 296-155-24609 Fall protection required at four feet or more. (1) The employer shall 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 four 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. Every open sided walking/working surface or platform four feet or more above adjacent floor or ground level shall be guarded by one of the following fall protection systems.

(a) A standard guardrail system, or the equivalent, as specified in WAC 296-155-24615(2), on all open sides, except where there is entrance to a ramp, stairway, or fixed ladder. The railing shall 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 above the protection of the guardrail system, the employer must either increase the height of the guardrail system as specified in (a)(i) 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 shall be constantly attended by a monitor until the guardrail is replaced. The only duty the monitor shall 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; and

(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 shall be equipped with a standard guardrail system or the equivalent, as specified in WAC 296-155-24615(2), along each open side. Wherever tools, machine parts, or materials are likely to be used on the runway, a toe board shall 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 eighteen inches wide.

Note: See WAC 296-155-24619(1) for other specific criteria for ramps, runways, and inclined walkways.

(4) Guarding of floor openings.

(a) Floor openings shall be guarded by one of the following fall restraint systems.

(i) A standard guardrail system, or the equivalent, as specified in WAC 296-155-24615(2), on all open sides, except where there is entrance to a ramp, stairway, or fixed ladder. The railing shall 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.

(ii) A cover, as specified in WAC 296-155-24615(3).

(iii) A warning line system erected at least fifteen feet from all unprotected sides or edges of the floor opening and meets the requirements of WAC 296-155-24615(4).

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

(b) Ladderway floor openings or platforms shall be guarded by 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.

(c) Hatchways and chute floor openings shall be guarded 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 shall be closed or the exposed side shall 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 shall be kept in place when the opening is not in use and shall be hinged or otherwise mounted so as to be conveniently

replaceable.

(d) Wherever there is a danger of falling through an unprotected skylight opening, or 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, standard guardrails shall be provided on all exposed sides in accordance with WAC 296-155-24615(2) or the skylight shall be covered in accordance with WAC 296-155-24615(3). Personal fall arrest equipment may be used as an equivalent means of fall protection when worn by all employees exposed to the fall hazard.

(e) Pits and trap door floor openings shall be guarded by floor opening covers of standard strength and construction. While the cover is not in place, the pit or trap openings shall be protected on all exposed sides by removable standard guardrail system.

(f) Manhole floor openings shall be guarded by standard covers which need not be hinged in place. While the cover is not in place, the manhole opening shall be protected by standard guardrail system.

(5) Guarding of wall openings.

(a) 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, shall be guarded 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 shall be provided;

(ii) The bottom of a wall opening, which is less than four inches above the working surface, regardless of width, shall be protected by a standard toe board or an enclosing screen either of solid construction or as specified in WAC 296-155-24615 (2)(c).

(b) An extension platform, outside a wall opening, onto which materials can be hoisted for handling shall 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.

(c) When a chute is attached to an opening, the provisions of subsection (5)(c) of this section shall apply, except that a toe board is not required.

(6) Fall protection during form and rebar work. When exposed to a fall height of four feet or more, employees 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 and low pitched roofs.

(a) Steep pitched roofs. Regardless of the work activity, employers shall 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:

(i) Fall restraint system. Safety monitors and warning line systems are prohibited on steep pitched roofs;

(ii) Fall arrest system; or

(iii) Positioning device system.

(b) Low pitched roofs. Employers shall 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:

(i) Fall restraint system;

(ii) Fall arrest system;

(iii) Positioning device system;

(iv) Safety monitor and warning line system; or

(v) Safety watch system.

(8) Hazardous slopes. Employees exposed to falls of four feet or more while working on a hazardous slope shall use personal fall restraint systems or positioning device systems.

NEW SECTION

WAC 296-155-24611 Fall protection required at ten feet or more. (1) The employer shall 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 ten feet or more to the ground or lower level, while:

(a) Engaged in roofing work on a low pitched roof;

(b) Constructing a leading edge;

Note: Employees not directly involved with constructing the leading edge, or are not performing roofing work must comply with WAC 296-155-24609, Fall protection required at four feet or more.

(c) Working on any surface that does not meet the definition of a walking/working surface not already covered in WAC 296-155-24609;

(d) Engaged in excavation and trenching operations.

(i) Exceptions. Fall protection is not required at excavations when employees are:

(A) Directly involved with the excavation process and on the ground at the top edge of the excavation; or

(B) Working at an excavation site where appropriate sloping of side walls has been implemented as the excavation protective system.

(ii) Fall protection is required for employees standing in or working in the affected area of a trench or excavation exposed to a fall hazard of ten feet or more and:

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

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

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

- Foreman of the crew.
- Signal person.
- Employee hooking on pipe or other materials.
- Grade person.
- State, county, or city inspectors inspecting the excavation or trench.
- An engineer or other professional conducting a quality-assurance inspection.

(2) Fall protection work plan. The employer shall 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 ten feet or more exist.

(a) The fall protection work plan shall:

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

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

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

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

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

(vi) Describe the method for prompt, safe removal of injured workers; and

(vii) Be available on the job site for inspection by the department.

(b) Prior to permitting employees into areas where fall hazards exist the employer shall ensure employees are trained and instructed in the items described in (a)(i) through (vii) of this subsection.

NEW SECTION

WAC 296-155-24613 Fall arrest specifications. Fall arrest protection shall conform to the following provisions:

(1) Personal fall arrest system shall consist of:

(a) A full body harness shall be used.

(b) Full body harness systems or components subject to impact loading shall be immediately removed from service and shall not be used 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 shall be capable of supporting (per employee):

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

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

(B) 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 shall be designed, installed, and used:

(A) As a part of a complete personal fall arrest system which maintains a safety factor of at least two; and

(B) 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 so an employee will not contact any lower level;

(ii) Limit maximum arresting force on an employee to one thousand eight 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 Z359.1-2007 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 one thousand eight hundred pounds or less.
- To calculate fall clearance distance using a shock absorbing lanyard and D-ring anchorage connector, see WAC 296-155-24624, Appendix B.

(e) All safety lines and lanyards shall be protected against being cut or abraded.

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

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

(h) Hardware shall have a corrosion resistant finish, and all surfaces and edges shall 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 shall 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 296-24-88050, Appendix C, Part II.

(j) Vertical lifelines (droplines) shall 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 shall have a minimum breaking strength of three thousand pounds (13.3 kN).

(k) Horizontal lifelines shall 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, shall be a minimum of seven-eighths inch wire core manila rope or equivalent. For all other lifeline applications, a minimum of three-fourths inch manila rope or equivalent, with a minimum breaking strength of five thousand pounds, shall be used.

(m) Lanyards shall 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 shall 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 shall be proof-tested to a minimum

tensile load of three thousand six hundred pounds (16 kN) without cracking, breaking, or taking permanent deformation.

(p) Snap hooks shall 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 shall 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.

(2) Safety net systems. Safety net systems and their use shall comply with the following provisions:

(a) Safety nets shall 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 shall be unobstructed.

(b) Safety nets shall 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

(c) Safety nets shall be installed 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 (d) of this subsection.

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

(i) Except as provided in (d)(ii) of this subsection, safety nets and safety net installations shall 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 six-month intervals if left in one place. The drop-test shall consist of a four hundred pound (180 kg) bag of sand 30 ± 2 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.

(ii) When the employer can demonstrate that it is unreasonable

to perform the drop-test required by (d)(i) of this subsection, the employer (or a designated competent person) shall certify that the net and net installation is in compliance with (c) and (d)(i) 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 (c) 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 shall be available at the job site for inspection.

(e) Materials, scrap pieces, equipment, and tools which have fallen into the safety net shall be removed as soon as possible from the net and at least before the next work shift.

(f) The maximum size of each safety net mesh opening shall not exceed thirty-six square inches (230 cm^2) nor be longer than six inches (15 cm) on any side, and the opening, measured center-to-center of mesh ropes or webbing, shall not be longer than six inches (15 cm). All mesh crossings shall be secured to prevent enlargement of the mesh opening.

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

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

(3) Catch platforms.

(a) A catch platform shall be installed within four vertical feet of the work area.

(b) The catch platform's width shall be a minimum of forty-five inches wide and shall be equipped with standard guardrails and toe boards on all open sides.

NEW SECTION

WAC 296-155-24615 Fall restraint specifications. Fall restraint protection shall conform to the following provisions:

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

(a) A full body harness shall be used.

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

(c) All hardware assemblies for full body harness shall be capable of withstanding a tension loading of four thousand pounds without cracking, breaking, or taking a permanent deformation.

(d) The employer shall ensure component compatibility.

(e) Anchorage points used for fall restraint shall 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.

(2) Guardrail specifications.

(a) A standard guardrail system shall consist of top rail, intermediate rail, and posts, and shall 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 shall be halfway between the top rail and the floor, platform, runway, or ramp. The ends of the rails shall not overhang the terminal posts except where such overhang does not constitute a projection hazard.

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

(i) For wood railings, the posts shall be of at least two-inch by four-inch stock spaced not to exceed eight feet; the top rail shall be of at least two-inch by four-inch stock and each length of lumber shall be smooth surfaced throughout the length of the railing. The intermediate rail shall 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 (b)(vii) of this subsection.

(ii) For pipe railings, posts and top and intermediate railings shall 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 (b)(vii) of this subsection.

(iii) For structural steel railings, posts and top and intermediate rails shall 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 (b)(vii) of this subsection.

(iv) For wire rope railings, the top and intermediate railings shall meet the strength factor and deflection of (b)(v) of this subsection. The top railing shall be flagged at not more than six foot intervals with high-visibility material. Posts shall be spaced not more than eight feet on centers. The rope shall be stretched taut and shall 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 (b)(vii) of this subsection.

(v) The anchoring of posts and framing of members for railings of all types shall be of such construction that the completed structure shall 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 shall be between thirty-nine and forty-five inches in height at all points when this force is applied.

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

(vii) Other types, sizes, and arrangements of railing construction are acceptable, provided they meet the following conditions:

(A) A smooth surfaced top rail at a height above floor, platform, runway, or ramp level between thirty-nine and forty-five inches;

(B) 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 shall 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;

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

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

(c) Toe board specifications.

(i) A standard toe board shall 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 shall 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.

(ii) 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 shall be provided.

(3) Cover specifications.

(a) Floor opening or floor hole covers shall be of any material that meets the following strength requirements:

(i) Conduits, trenches, and manhole covers and their supports, when located in roadways, and vehicular aisles shall be designed to carry a truck rear axle load of at least two times the maximum intended load;

(ii) All floor opening and floor hole covers shall be capable of supporting the maximum potential load but never less than two hundred pounds (with a safety factor of four).

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

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

(b) Barriers and screens used to cover wall openings shall meet the following requirements:

(i) Barriers shall 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.

(ii) Screens shall 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.

(4) Warning line system specifications on pitches four in twelve or less for roofing work, leading edge work, and on low pitched open sided surfaces for work activities other than roofing work or leading edge work. The employer shall ensure the following:

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

(i) Warning lines used during roofing work.

(A) When roofing work is taking place or when mechanical equipment is not being used, the warning line shall 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 shall 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 shall 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. The employer shall 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 296-155-24613, or fall restraint systems as described in subsections (1) and (2) of this section are not used, a safety monitor system as described in subsection (5) of this section shall be implemented to protect employees engaged in constructing the leading edge who are working between the forward edge of the warning line and the leading edge.

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

(b) The warning line shall consist of a rope, wire, or chain and supporting stanchions erected as follows:

(i) The rope, wire, or chain shall 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 (b)(iv) of this subsection, does not need to be flagged.

(ii) The rope, wire, or chain shall 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 shall 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 shall have a minimum tensile strength of two hundred pounds (90 k), and after being attached to the stanchions, shall 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 shall 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) Access paths shall be erected as follows:

(i) Points of access, materials handling areas, and storage areas shall 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, a rope, wire, or chain, equal in strength and height to the warning line, shall be placed across the path at the point where the path intersects the warning line erected around the work area.

(5) Safety monitor system specifications.

(a) 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 fifty feet wide. For information on determining roof widths, see WAC 296-155-24623, Appendix A, determining roof widths.

(b) When selected, the employer shall 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. The employer shall ensure that the following requirements are met:

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

(ii) 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), shall 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.

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

(iv) A person acting in the capacity of safety monitor(s) shall be trained in the function of both the safety monitor and warning line systems, and shall:

(A) Be a competent person as defined in WAC 296-155-24603.

(B) Have control authority over the work as it relates to fall protection.

(C) Be instantly distinguishable over members of the work crew.

(D) Perform no other duties while acting as safety monitor.

(E) 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.

(F) Not supervise more than eight exposed workers at one time.

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

(6) Safety watch system specifications.

(a) 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.

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

(i) 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;

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

(iii) Mechanical equipment is not used; and

(iv) The safety watch system is not used when weather conditions create additional hazards.

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

(i) Is a competent person as defined in WAC 296-155-24603;

(ii) Has full control over the work as it relates to fall protection;

(iii) Has a clear, unobstructed view of the worker;

(iv) Is able to maintain normal voice communication; and

(v) Performs no other duties while acting as the safety watch.

NEW SECTION

WAC 296-155-24617 Positioning device system specifications. Positioning device systems and their use shall conform to the following provisions:

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

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

(3) Positioning devices shall 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 shall be drop forged, pressed or formed steel,

or made of equivalent materials.

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

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

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

(8) Snap hooks shall 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 shall 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.

NEW SECTION

WAC 296-155-24619 Other specifications. (1) Ramps, runways and inclined walkways shall:

(a) Be at least eighteen inches wide; and

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

Note: See WAC 296-155-24609(3) for guarding ramps, runways, and inclined walkways that are four feet or more above the ground or lower level.

(2) Self-rescue devices. Self-rescue devices are not a fall protection system. Self-rescue devices used to self-rescue after a fall shall meet the following requirements:

(a) Use self-rescue devices according to the manufacturer's instructions; and

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

(3) Canopy. Canopies, when used as falling object protection, shall be strong enough to prevent collapse and to prevent penetration by any objects which may fall onto the canopy.

(4) Roofing bracket specifications. Roofing brackets are not a fall protection system.

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

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

(5) Crawling board and chicken ladder specifications. Crawling boards and chicken ladders are not fall protection systems.

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

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

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

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

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

(6) Roof edge materials handling areas and materials storage specifications.

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

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

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

(d) Mechanical equipment shall be used or stored only in areas where employees are protected using a fall arrest system as described in WAC 296-155-24613, or a fall restraint system as described in WAC 296-155-24615 (1), (2), or (4). Mechanical equipment may not be used or stored where the only protection is provided by the use of a safety monitor.

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

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

NEW SECTION

WAC 296-155-24621 Training. (1) All training required by this part, must be documented and documentation kept on file.

(2) "Retraining." When the employer has reason to believe that any affected employee who has already been trained does not have the understanding and skill required by subsection (1) of this section, the employer shall retrain each such employee. Circumstances where retraining is required include, but are not limited to, situations where:

- Changes in the workplace render previous training obsolete; or
- Changes in the types of fall protection systems or equipment to be used render previous training obsolete; or
- Inadequacies in an affected employee's knowledge or use of fall protection systems or equipment indicate that the employee has not retained the requisite understanding or skill.

NEW SECTION

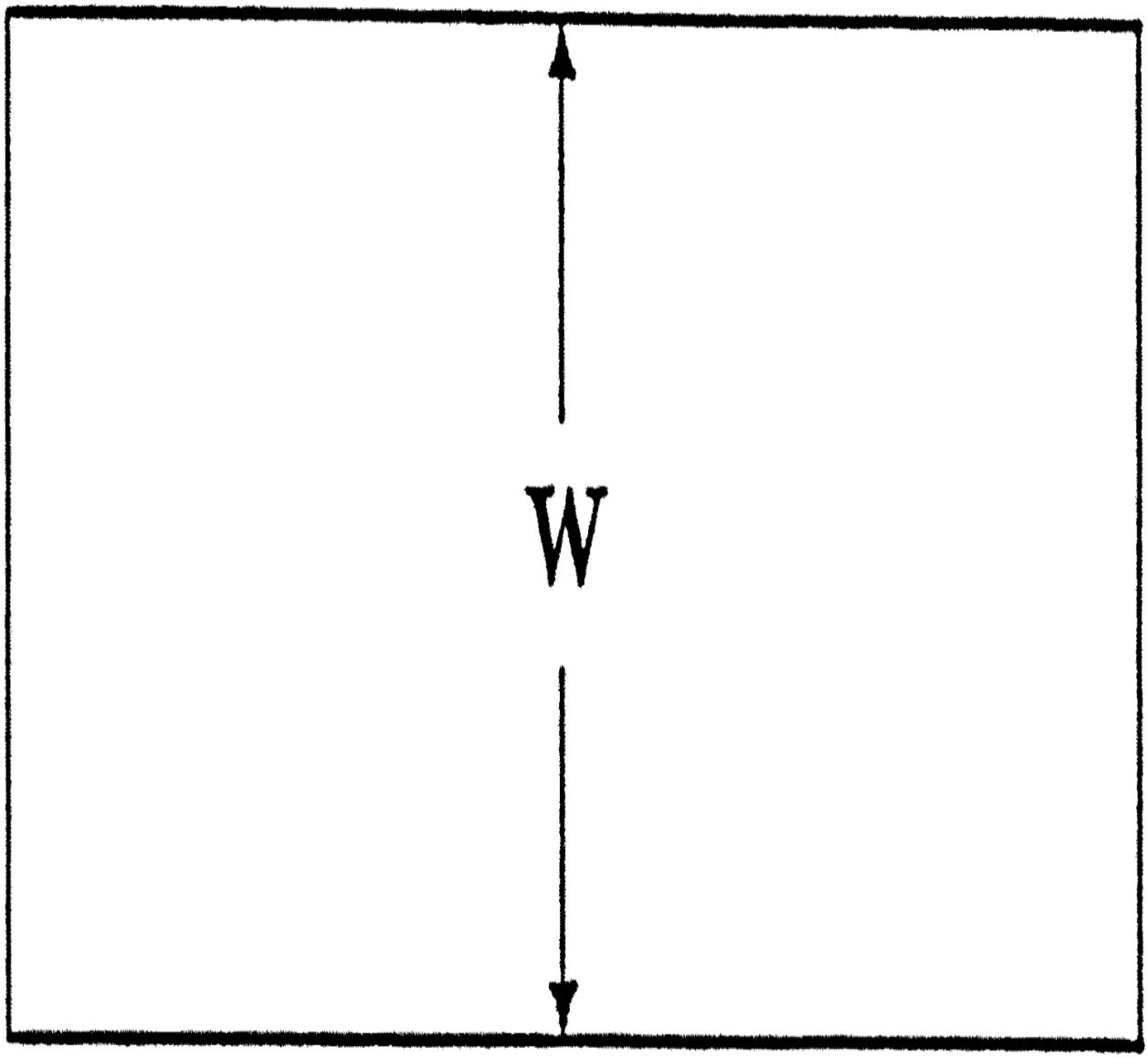
WAC 296-155-24623 Appendix A--Determining roof widths--Nonmandatory guidelines for complying with WAC 296-155-24615. (1) This appendix serves as a guideline to assist employers complying with the requirements of WAC 296-155-24615 which allows the use of a safety monitoring system alone as a means of 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

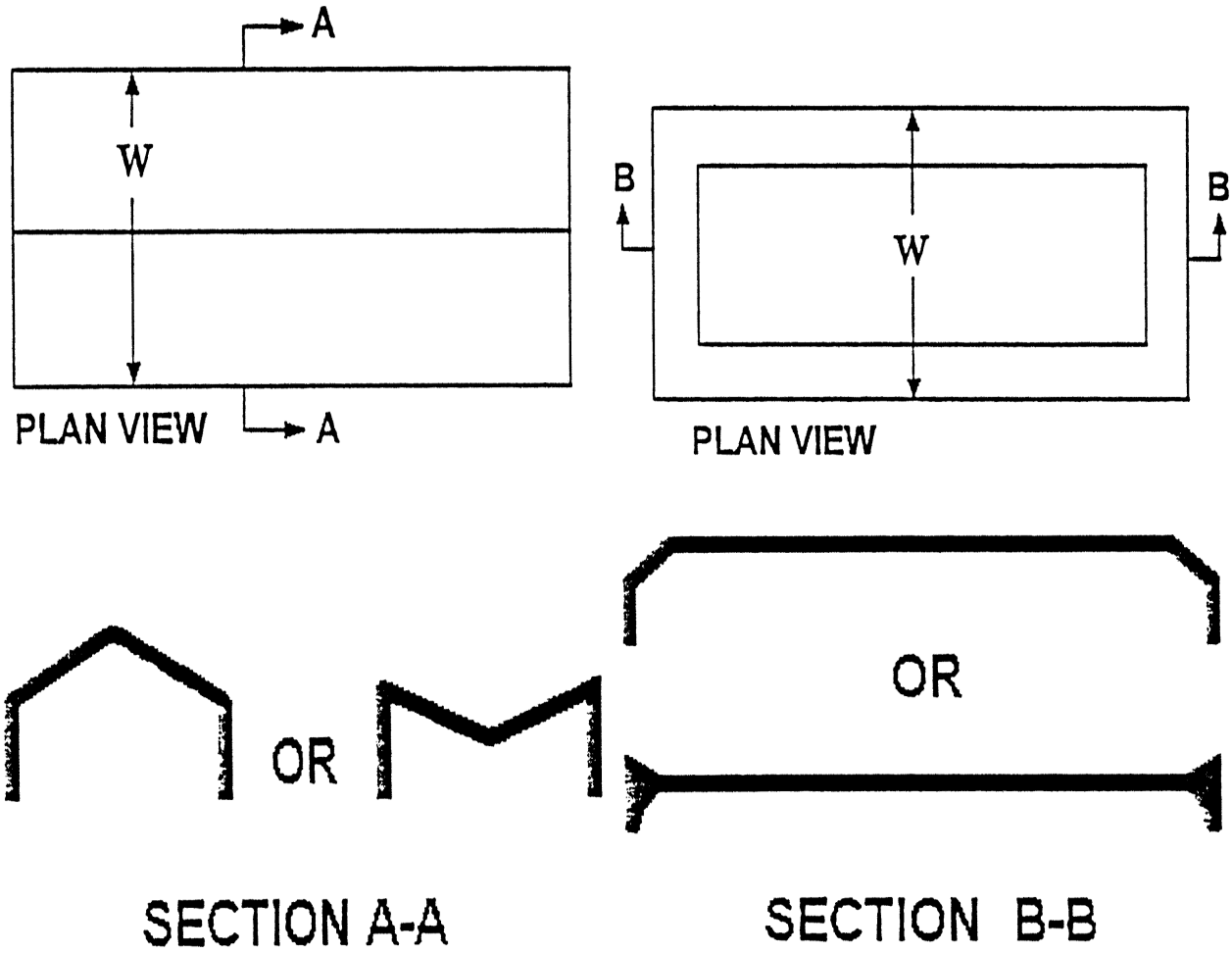
series of individual roofs. Some roofs have penthouses, additional floors, courtyard openings, or similar architectural features; Example E shows how the rule for dividing roofs into subareas is applied to such configurations. Irregular, nonrectangular roofs must be considered on an individual basis, as shown in Example F.

Example A
Rectangular Shaped Roof

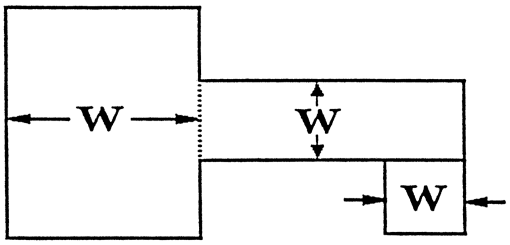


PLAN VIEW

Example B
Sloped Rectangular Shaped Roofs



Example C
Irregularly Shaped Roofs With Rectangular Shaped Sections



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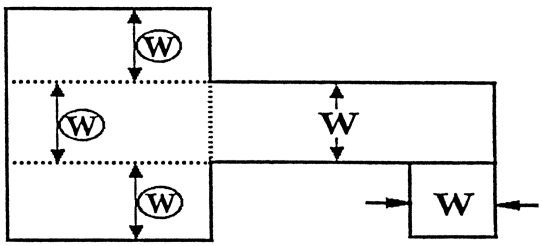

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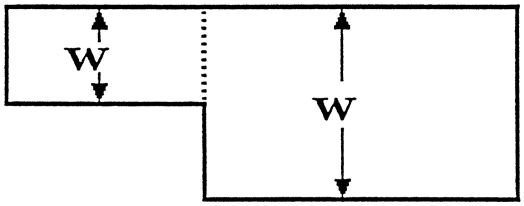
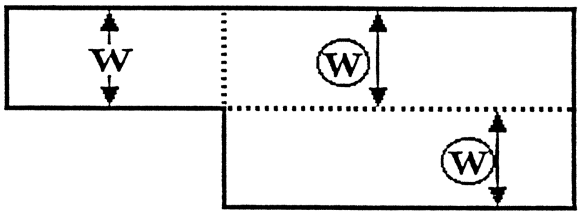


Correct



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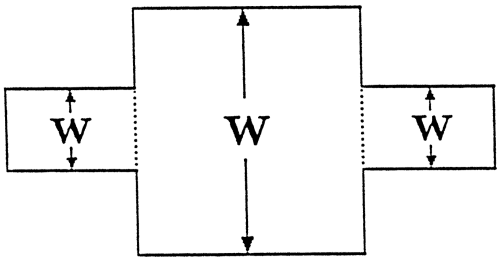
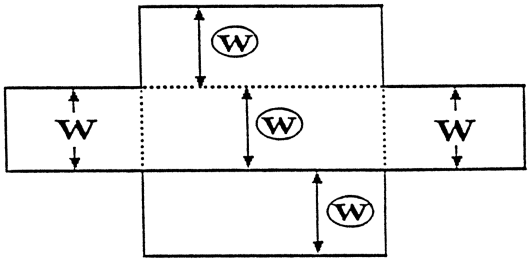


Correct



Incorrect

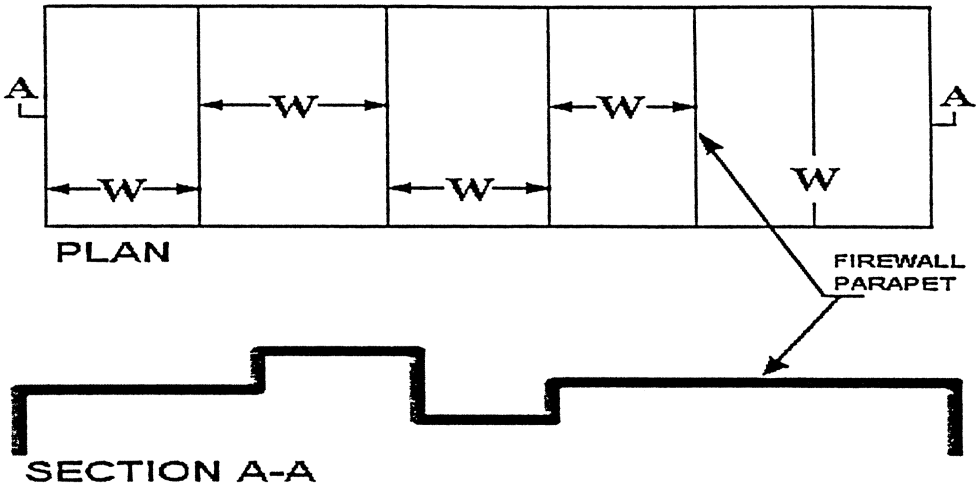
Such roofs are to be divided into subareas by using dividing lines of minimum length to minimize the size and number of the areas which are potentially less than or equal to fifty feet (15.25 m) in width, in order to limit the size of roof areas where the safety monitoring system alone can be used (WAC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

Ⓦ denotes incorrect measurements of width.

Example D

Separate, Noncontiguous Roof Areas

1.



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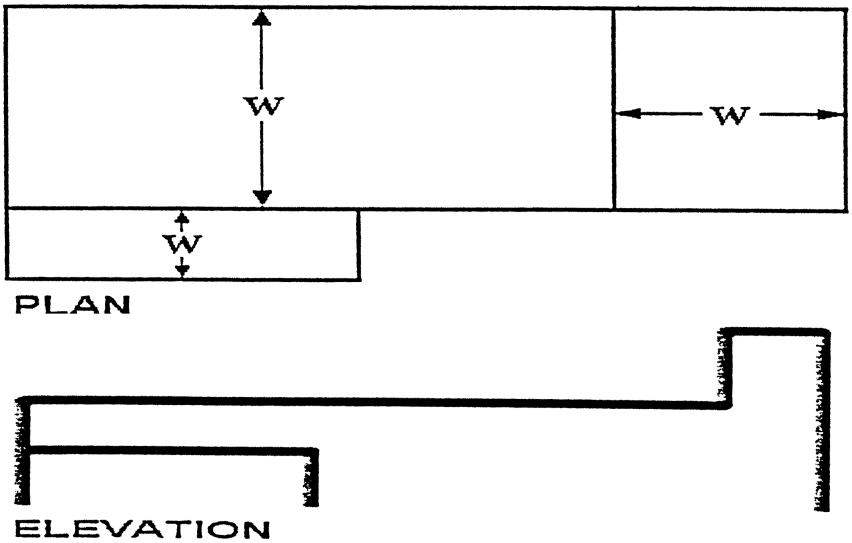
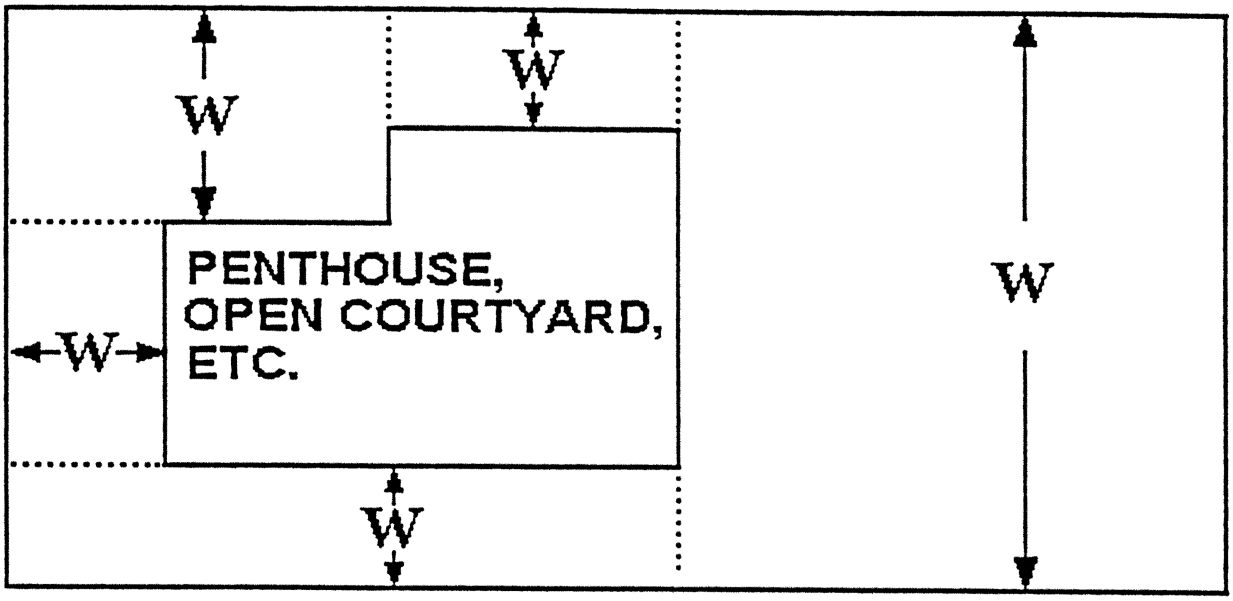
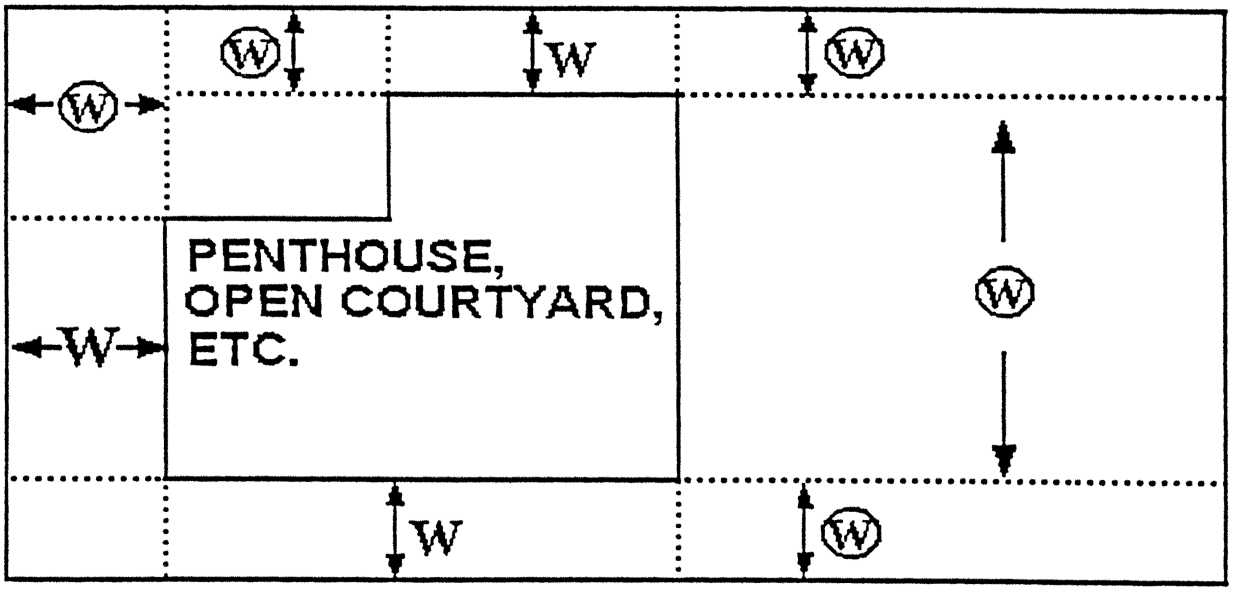


Example E

Roofs with Penthouses, Open Courtyards, Additional Floors, etc.



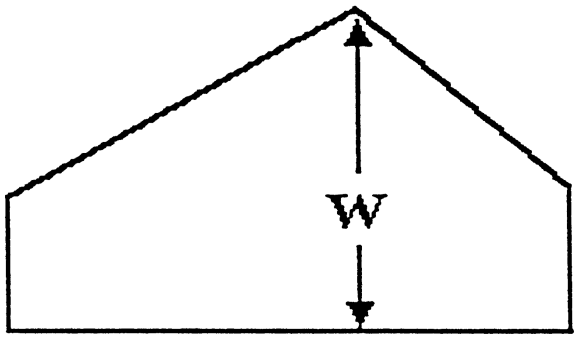
CORRECT



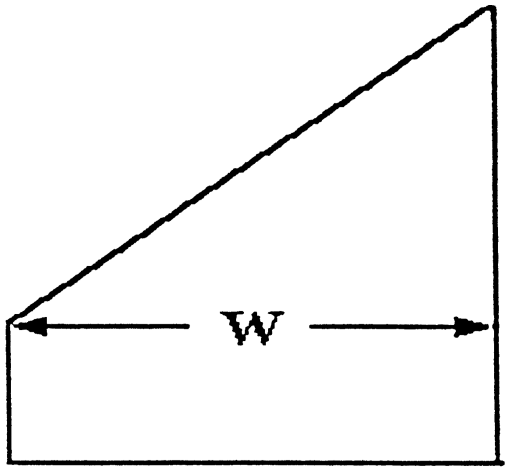
INCORRECT

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 fifty 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.
Ⓦ denotes incorrect measurements of width.

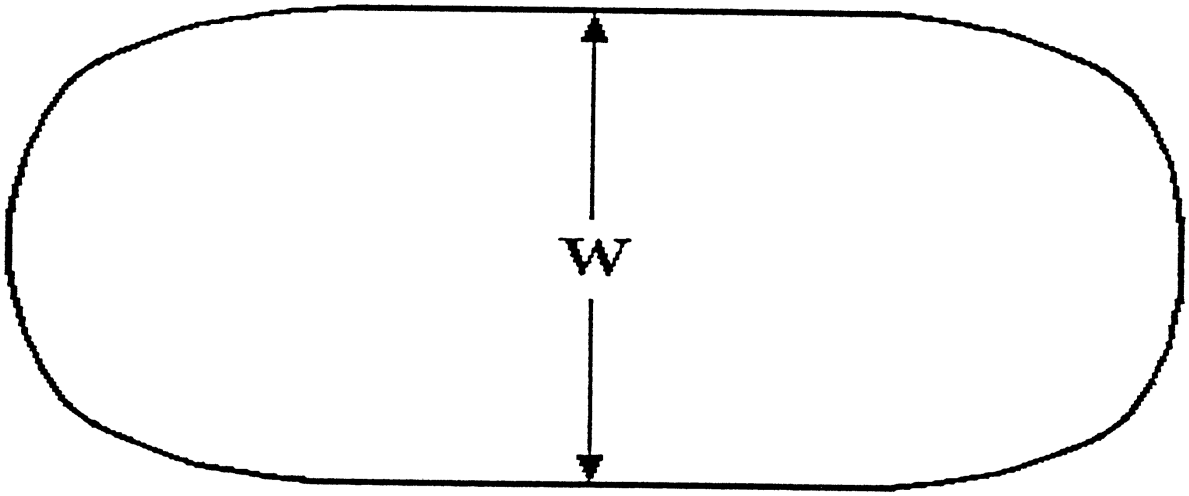
Example F
Irregular, Nonrectangular Shaped Roofs



PLAN



PLAN



PLAN

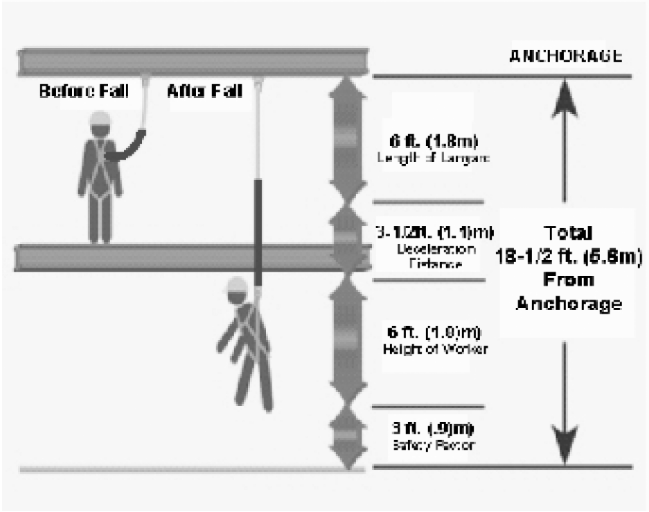
NEW SECTION

WAC 296-155-24624 Appendix B--Calculating fall clearance distance using a shock-absorbing lanyard and D-ring anchorage connector--Nonmandatory guidelines for complying with WAC 296-155-24613 (1)(d). Do the following to calculate the fall clearance distance using a shock-absorbing lanyard and D-ring anchorage connector:

- 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).

- 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.



PART C-1
FALL ((~~RESTRAINT AND FALL ARREST~~)) PROTECTION REQUIREMENTS FOR CONSTRUCTION

AMENDATORY SECTION (Amending WSR 96-24-051, filed 11/27/96, effective 2/1/97)

WAC 296-155-477 Stairways. (1) General. The following requirements apply to all stairways as indicated:

(a) Stairways that will not be a permanent part of the structure on which construction work is being performed shall have landings of not less than thirty inches (76 cm) in the direction of travel and extend at least twenty-two inches (56 cm) in width at every twelve feet (3.7 m) or less of vertical rise.

(b) Stairs shall be installed between 30 deg. and 50 deg. from horizontal.

(c) In all buildings or structures two or more stories or twenty-four feet or more in height or depth, suitable permanent or temporary stairways shall be installed.

(d) Stairways, ramps or ladders shall be provided at all points where a break in elevation of eighteen inches or more occurs in a frequently traveled passageway, entry or exit.

(e) A minimum of one stairway shall be provided for access and exit for buildings and structures to three stories or thirty-six feet; if more than three stories or thirty-six feet, two or more stairways shall be provided. Where two stairways are provided and work is being performed in the stairways, one shall be maintained clear for access between levels at all times.

(f) Wood frame buildings.

(i) The stairway to a second or higher floor shall be completed before studs are raised to support the next higher floor.

(ii) Roof and attic work areas of all buildings shall be provided with a safe means of access and egress, such as stairways, ramps or ladders.

(iii) Cleats shall not be nailed to studs to provide access to and egress from roof or other work areas.

(g) Steel frame buildings. Stairways shall extend to the uppermost floor that has been planked or decked. Ladders may be used above that point.

(h) Reinforced concrete or composite steel--Concrete buildings. Stairways shall extend to the lowermost floor upon which a complete vertical shoring system is in place. A minimum of two ladders at different locations for each floor may be used above

this floor but not to exceed three floors.

(i) Riser height and tread depth shall be uniform within each flight of stairs, including any foundation structure used as one or more treads of the stairs. Variations in riser height or tread depth shall not be over 1/4-inch (0.6 cm) in any stairway system.

(j) Where doors or gates open directly on a stairway, a platform shall be provided, and the swing of the door shall not reduce the effective width of the platform to less than twenty inches (51 cm).

(k) Metal pan landings and metal pan treads, when used, shall be secured in place before filling with concrete or other material.

(l) All parts of stairways shall be free of hazardous projections, such as protruding nails.

(m) Slippery conditions on stairways shall be eliminated before the stairways are used to reach other levels.

(n) Employers are permitted to use alternating tread type stairs as long as they install, use, and maintain the stairs in accordance with manufacturer's recommendations and the following:

(i) The stair must be installed at an angle of seventy degrees or less.

(ii) The stair must be capable of withstanding a minimum uniform load of one hundred pounds per square foot with a design factor of 1.7, and the treads must be capable of carrying a minimum concentrated load of three hundred pounds at the center of any treadspan or exterior arc with a design factor of 1.7. If the stair is intended for greater loading, construction must allow for that loading.

(iii) The stair must be equipped with a handrail on each side to assist the user in climbing or descending.

(o) Due to space limitations, when a permanent stairway must be installed at an angle above fifty degrees, such an installation (commonly called an inclined or ship's ladder) shall have treads, open risers and handrails on both sides.

(p) Where ladders are permitted for access under subsection (1) of this section, means shall be provided for employee hoisting of tools and material, such as a well wheel and hoisting line or the equivalent, so employees will have both hands free for ascending and descending ladders.

(2) Temporary service. The following requirements apply to all stairways as indicated:

(a) Except during stairway construction, foot traffic is prohibited on stairways with pan stairs where the treads and/or landings are to be filled in with concrete or other material at a later date, unless the stairs are temporarily fitted with wood or other solid material at least to the top edge of each pan. Such temporary treads and landings shall be replaced when worn below the level of the top edge of the pan.

(b) Except during stairway construction, foot traffic is prohibited on skeleton metal stairs where permanent treads and/or landings are to be installed at a later date, unless the stairs are fitted with secured temporary treads and landings long enough to cover the entire tread and/or landing area.

(c) Treads for temporary service shall be made of wood or

other solid material, and shall be installed the full width and depth of the stair.

(3) Stairrails and handrails. The following requirements apply to all stairways as indicated:

(a) Stairways having four or more risers or rising more than thirty inches (76 cm), whichever is less, shall be equipped with:

(i) At least one handrail; and

(ii) One stairrail system along each unprotected side or edge.

Note: When the top edge of a stairrail system also serves as a handrail, subdivision (g) of this subsection applies.

(b) Winding and spiral stairways shall be equipped with a handrail offset sufficiently to prevent walking on those portions of the stairways where the tread width is less than six inches (15 cm).

(c) The height of stairrails shall be as follows:

(i) Stairrails installed after the effective date of this standard, shall be not less than thirty-six inches (91.5 cm) from the upper surface of the stairrail system to the surface of the tread, in line with the face of the riser at the forward edge of the tread.

(ii) Stairrails installed before the effective date of this standard, shall be not less than thirty inches (76 cm) nor more than thirty-four inches (86 cm) from the upper surface of the stairrail system to the surface of the tread, in line with the face of the riser at the forward edge of the tread.

(d) Midrails, screens, mesh, intermediate vertical members, or equivalent intermediate structural members, shall be provided between the top rail of the stairrail system and the stairway steps.

(i) Midrails, when used, shall be located at a height midway between the top edge of the stairrail system and the stairway steps.

(ii) Screens or mesh, when used, shall extend from the top rail to the stairway step, and along the entire opening between top rail supports.

(iii) When intermediate vertical members, such as balusters, are used between posts, they shall be not more than ((~~ninetten~~)) <u>nineteen</u> inches (48 cm) apart.

(iv) Other structural members, when used, shall be installed such that there are no openings in the stairrail system that are more than nineteen inches (48 cm) wide.

(e) Handrails and the top rails of stairrail systems shall be capable of withstanding, without failure, a force of at least 200 pounds (890 n) applied within two inches (5 cm) of the top edge, in any downward or outward direction, at any point along the top edge.

(f) The height of handrails shall be not more than thirty-seven inches (94 cm) nor less than thirty inches (76 cm) from the upper surface of the handrail to the surface of the tread, in line with the face of the riser at the forward edge of the tread.

(g) When the top edge of a stairrail system also serves as a handrail, the height of the top edge shall be not more than thirty-seven inches (94 cm) nor less than thirty-six inches (91.5 cm) from the upper surface of the stairrail system to the surface of the

tread, in line with the face of the riser at the forward edge of the tread.

(h) Stairrail systems and handrails shall be so surfaced as to prevent injury to employees from punctures or lacerations, and to prevent snagging of clothing.

(i) Handrails shall provide an adequate handhold for employees grasping them to avoid falling.

(j) The ends of stairrail systems and handrails shall be constructed so as not to constitute a projection hazard.

(k) Handrails that will not be a permanent part of the structure being built shall have a minimum clearance of three inches (8 cm) between the handrail and walls, stairrail systems, and other objects.

(l) Unprotected sides and edges of stairway landings shall be provided with guardrail systems. Guardrail system criteria are contained in chapter 296-155 WAC, Part ((~~K~~)) C-1, Fall protection requirements for construction.

AMENDATORY SECTION (Amending WSR 05-20-055, filed 10/3/05, effective 12/1/05)

WAC 296-155-655 General protection requirements. (1) Surface encumbrances. All surface encumbrances that are located so as to create a hazard to employees shall be removed or supported, as necessary, to safeguard employees.

(2) Underground installations.

(a) The location of utility installations, such as sewer, telephone, fuel, electric, water lines, or any other underground installations that reasonably may be expected to be encountered during excavation work, shall be located prior to opening an excavation.

(b) Utility companies or owners shall be contacted within established or customary local response times, advised of the proposed work, and asked to locate the underground utility installation prior to the start of actual excavation.

(c) When excavation operations approach the location of underground installations, the exact location of the installations shall be determined by safe and acceptable means.

(d) While the excavation is open, underground installations shall be protected, supported, or removed as necessary to safeguard employees.

(3) Access and egress.

(a) Structural ramps.

(i) Structural ramps that are used solely by employees as a means of access or egress from excavations shall be designed by a competent person. Structural ramps used for access or egress of equipment shall be designed by a competent person qualified in structural design, and shall be constructed in accordance with the design.

(ii) Ramps and runways constructed of two or more structural members shall have the structural members connected together to prevent displacement.

(iii) Structural members used for ramps and runways shall be of uniform thickness.

(iv) Cleats or other appropriate means used to connect runway structural members shall be attached to the bottom of the runway or shall be attached in a manner to prevent tripping.

(v) Structural ramps used in lieu of steps shall be provided with cleats or other surface treatments on the top surface to prevent slipping.

(b) Means of egress from trench excavations. A stairway, ladder, ramp or other safe means of egress shall be located in trench excavations that are 4 feet (1.22 m) or more in depth so as to require no more than 25 feet (7.62 m) of lateral travel for employees.

(4) Exposure to vehicular traffic. Employees exposed to vehicular traffic shall be provided with and shall wear high-visibility garments meeting the requirements of WAC 296-155-200, General requirements for personal protective equipment (PPE).

(5) Exposure to falling loads. No employee shall be permitted underneath loads handled by lifting or digging equipment. Employees shall be required to stand away from any vehicle being loaded or unloaded to avoid being struck by any spillage or falling materials. Operators may remain in the cabs of vehicles being loaded or unloaded when the vehicles are equipped, in accordance with WAC 296-155-610 (2)(g), to provide adequate protection for the operator during loading and unloading operations.

(6) Warning system for mobile equipment. When mobile equipment is operated adjacent to an excavation, or when such equipment is required to approach the edge of an excavation, and the operator does not have a clear and direct view of the edge of the excavation, a warning system shall be utilized such as barricades, hand or mechanical signals, or stop logs. If possible, the grade should be away from the excavation.

(7) Hazardous atmospheres.

(a) Testing and controls. In addition to the requirements set forth in parts B-1, C, and C-1 of this chapter (296-155 WAC) to prevent exposure to harmful levels of atmospheric contaminants and to assure acceptable atmospheric conditions, the following requirements shall apply:

(i) Where oxygen deficiency (atmospheres containing less than 19.5 percent oxygen) or a hazardous atmosphere exists or could reasonably be expected to exist, such as in excavations in landfill areas or excavations in areas where hazardous substances are stored nearby, the atmospheres in the excavation shall be tested before employees enter excavations greater than 4 feet (1.22 m) in depth.

(ii) Adequate precautions shall be taken to prevent employee exposure to atmospheres containing less than 19.5 percent oxygen and other hazardous atmospheres. These precautions include providing proper respiratory protection or ventilation in accordance with chapter 296-842 WAC.

(iii) Adequate precaution shall be taken such as providing

ventilation, to prevent employee exposure to an atmosphere containing a concentration of a flammable gas in excess of 10 percent of the lower flammable limit of the gas.

(iv) When controls are used that are intended to reduce the level of atmospheric contaminants to acceptable levels, testing shall be conducted as often as necessary to ensure that the atmosphere remains safe.

(b) Emergency rescue equipment.

(i) Emergency rescue equipment, such as breathing apparatus, a safety harness and line, or a basket stretcher, shall be readily available where hazardous atmospheric conditions exist or may reasonably be expected to develop during work in an excavation. This equipment shall be attended when in use.

(ii) Employees entering bell-bottom pier holes, or other similar deep and confined footing excavations, shall wear a harness with a lifeline securely attached to it. The lifeline shall be separate from any line used to handle materials, and shall be individually attended at all times while the employee wearing the lifeline is in the excavation.

Note: See chapter 296-62 WAC, Part M for additional requirements applicable to confined space operations.

(8) Protection from hazards associated with water accumulation.

(a) Employees shall not work in excavations in which there is accumulated water, or in excavations in which water is accumulating, unless adequate precautions have been taken to protect employees against the hazards posed by water accumulation. The precautions necessary to protect employees adequately vary with each situation, but could include special support or shield systems to protect from cave-ins, water removal to control the level of accumulating water, or use of a safety harness and lifeline.

(b) If water is controlled or prevented from accumulating by the use of water removal equipment, the water removal equipment and operations shall be monitored by a competent person to ensure proper operation.

(c) If excavation work interrupts the natural drainage of surface water (such as streams), diversion ditches, dikes, or other suitable means shall be used to prevent surface water from entering the excavation and to provide adequate drainage of the area adjacent to the excavation. Excavations subject to runoff from heavy rains will require an inspection by a competent person and compliance with subdivisions (a) and (b) of this subsection.

(9) Stability of adjacent structures.

(a) Where the stability of adjoining buildings, walls, or other structures is endangered by excavation operations, support systems such as shoring, bracing, or underpinning shall be provided to ensure the stability of such structures for the protection of employees.

(b) Excavation below the level of the base or footing of any foundation or retaining wall that could be reasonably expected to pose a hazard to employees shall not be permitted except when:

(i) A support system, such as underpinning, is provided to ensure the safety of employees and the stability of the structure;

or

(ii) The excavation is in stable rock; or

(iii) A registered professional engineer has approved the determination that the structure is sufficiently removed from the excavation so as to be unaffected by the excavation activity; or

(iv) A registered professional engineer has approved the determination that such excavation work will not pose a hazard to employees.

(c) Sidewalks, pavements, and appurtenant structure shall not be undermined unless a support system or another method of protection is provided to protect employees from the possible collapse of such structures.

(10) Protection of employees from loose rock or soil.

(a) Adequate protection shall be provided to protect employees from loose rock or soil that could pose a hazard by falling or rolling from an excavation face. Such protection shall consist of scaling to remove loose material; installation of protective barricades at intervals as necessary on the face to stop and contain falling material; or other means that provide equivalent protection.

(b) Employees shall be protected from excavated or other materials or equipment that could pose a hazard by falling or rolling into excavations. Protection shall be provided by placing and keeping such materials or equipment at least 2 feet (.61 m) from the edge of excavations, or by the use of retaining devices that are sufficient to prevent materials or equipment from falling or rolling into excavations, or by a combination of both if necessary.

(11) Inspections.

(a) Daily inspections of excavations, the adjacent areas, and protective systems shall be made by a competent person for evidence of a situation that could result in possible cave-ins, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions. An inspection shall be conducted by the competent person prior to the start of work and as needed throughout the shift. Inspections shall also be made after every rainstorm or other hazard increasing occurrence. These inspections are only required when employee exposure can be reasonably anticipated.

(b) Where the competent person finds evidence of a situation that could result in a possible cave-in, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions, exposed employees shall be removed from the hazardous area until the necessary precautions have been taken to ensure their safety.

(12) Fall protection.

(a) Walkways shall be provided where employees or equipment are required or permitted to cross over excavations. Guardrails which comply with chapter 296-155 WAC, Part ((~~K~~)) C-1 shall be provided where walkways are 4 feet or more above lower levels.

(b) Adequate barrier physical protection shall be provided at all remotely located excavations. All wells, pits, shafts, etc., shall be barricaded or covered. Upon completion of exploration and

similar operations, temporary wells, pits, shafts, etc., shall be backfilled.

AMENDATORY SECTION (Amending WSR 04-14-028, filed 6/29/04, effective 1/1/05)

WAC 296-155-682 Requirements for equipment and tools. (1) Bulk cement storage. Bulk storage bins, containers, and silos shall be equipped with the following:

(a) Conical or tapered bottoms; and

(b) Mechanical or pneumatic means of starting the flow of material.

(2) No employee shall be permitted to enter storage facilities unless the ejection system has been shut down and locked out in accordance with WAC 296-155-429.

(3) ((~~Safety belts,~~)) Harnesses, lanyards, lifelines or droplines, independently attached or attended, shall be used as prescribed in chapter 296-155 WAC, Part C-1, Fall protection requirements for construction.

(4) Concrete mixers. Concrete mixers with one cubic yard (.8 m3) or larger loading skips shall be equipped with the following:

(a) A mechanical device to clear the skip of materials; and

(b) Guardrails installed on each side of the skip.

(5) Power concrete trowels. Powered and rotating type concrete troweling machines that are manually guided shall be equipped with a control switch that will automatically shut off the power whenever the hands of the operator are removed from the equipment handles.

(6) Concrete buggies. Concrete buggy handles shall not extend beyond the wheels on either side of the buggy.

Note: Installation of knuckle guards on buggy handles is recommended.

(7) Runways.

(a) Runways shall be constructed to carry the maximum contemplated load with a safety factor of four, have a smooth running surface, and be of sufficient width for two buggies to pass. Single runs to have a minimum width of forty-two inches with turnouts. Runways to have standard railings. Where motor driven concrete buggies are used, a minimum four-inches by four-inches wheel guard shall be securely fastened to outside edge of runways.

(b) All concrete buggy runways which are 12 inches or more above a work surface or floor, or ramps with more than 4 percent incline shall be considered "elevated" runways.

Exception: Small jobs utilizing only one concrete buggy, or larger jobs utilizing a "one-way traffic pattern" may be exempt from the requirements for "turnouts" or for "sufficient width for two buggies to pass."

Exemption: Runways less than 12 inches above the floor or ground which are utilized by hard-powered buggies only, may be exempt from the requirements for guardrails and wheelguards.

(8) Concrete pumps and placing booms.

(a) Definitions.

"Concrete delivery hose" means a flexible concrete delivery hose which has two end couplings.

"Concrete pump" means a construction machine that pumps concrete.

"Controls" means the devices used to operate a machine.

"Delivery systems" means the pipe, hoses and components, through which the concrete is pumped.

"Grooved end" means a pipe clamp pipe connection where a groove is machined or rolled directly into the outside of the pipe wall (for example: Victualic).

"Material pressure" means the pressure exerted on the concrete inside the delivery system.

"Placing boom and placing unit" means a manual or power driven, slewable working device which:

- Consists of one or more extendable or folding parts for supporting the concrete delivery system, and directs the discharge into the desired location; and
- May be mounted on trucks, trailers, or special vehicles.

"Qualified person" means someone who:

- Possesses a recognized degree or certificate of professional standing; or
- Has extensive knowledge, training, and experience; or
- Successfully demonstrated the ability to resolve problems relating to the work.

"Restraining devices" means a sling, cable, or equivalent device used to minimize excess movement of a delivery system in case of separation.

"Whip hoses" means a suspended hose that has only one coupling and is used to direct the delivery of concrete.

(b) Equipment requirements.

(i) Equipment identification tag.

The employer must ensure the following identification is furnished if originally identified by the manufacturer and on all pumps manufactured after January 1, 1998:

- The manufacturer's name;
- The year of manufacture;
- The model and serial number;
- The maximum material pressure;
- The maximum allowable pressure in the hydraulic system; and
- The maximum weight per foot of delivery system including concrete.

(ii) Manufacturer's manual.

The employer must have the manufacturer's operation/safety manual or equivalent available for each concrete pump or placing boom.

(iii) Unsafe condition of equipment.

If during an equipment inspection a condition is revealed that might endanger workers, the equipment must not be returned to service until the condition is corrected.

(iv) Controls.

Controls must have their function clearly marked.

(v) Hydraulic systems.

(A) Concrete pumps and placing booms hydraulic systems must have pressure relief valves to prevent cylinder and boom damage.

(B) Hydraulic systems must have hydraulic holding valves if hose or coupling failure could result in uncontrolled vertical movement.

(vi) Certification.

In the event of failure of a structural member, overloading, or contact with energized electric power lines and before return to service, the equipment must be certified safe by:

- The manufacturer; or
- An agent of the manufacturer; or
- A professional engineer.

(vii) Marking weight. A permanent, legible notice stating the total weight of the unit must be marked on:

- Trailer or skid mounted concrete pumps;
- Placing booms; and
- All major detachable components over five hundred pounds.

(viii) Lifting a pump.

A concrete pump must be lifted using the lift points specified by the manufacturer or a professional engineer.

(ix) Emergency shutoff.

A concrete pump must have a clearly labeled emergency stop switch that stops the pumping action.

(x) Inlet and outlet guarding.

(A) The waterbox must have a fixed guard to prevent unintentional access to the moving parts.

(B) The agitator must be guarded with a point of operation guard in accordance with chapter 296-806 WAC, Machine safety, and the guard must be:

- Hinged or bolted in place;
- At least three inches distance from the agitator;
- Be capable of supporting a load of two hundred fifty pounds.

(C) A person must not stand on the guard when the pump or agitator is running.

(xi) Outriggers.

(A) Outriggers must be used in accordance with the manufacturer's specifications.

(B) Concrete pump trucks manufactured after January 1, 1998, must have outriggers or jacks permanently marked to indicate the maximum loading they transmit to the ground.

(xii) Load on a placing boom.

(A) The manufacturer's or a licensed, registered, structural engineer's specifications for the placing boom must not be exceeded by:

- The weight of the load;
- The length and diameter of suspended hose;
- The diameter and weight of mounted pipe.

(B) A concrete placing boom must not be used to drag hoses or lift other loads.

(C) All engineering calculations regarding modifications must be:

- Documented;
- Recorded; and

- Available upon request.

(xiii) Pipe diameter thickness. The pipe wall thickness must be measured in accordance with the manufacturer's instruction, and:

- Be sufficient to maintain a burst pressure greater than the maximum pressure the pump can produce;
- The pipe sections must be replaced when measurements indicate wall thickness has been reduced to the limits specified by the manufacturer.

(xiv) Pipe clamps.

(A) Concrete must not be pumped through a delivery system with grooved ends, such as those for Victualic-type couplers.

(B) Pipe clamps must have a pressure rating at least equal to the pump pressure rating.

(C) Pipe clamps contact surfaces must be free of concrete and other foreign matter.

(D) If quick connect clamps are used, they must be pinned or secured to keep them from opening when used in a vertical application.

(xv) Delivery pipe.

(A) Delivery pipe between the concrete pump and the placing system must be supported and anchored to prevent movement and excessive loading on clamps.

(B) Double ended hoses must not be used as whip hoses.

(C) Attachments must not be placed on whip hoses (i.e., "S" hooks, valves, etc.).

Table 1, Nonmandatory
Recommended maximum yards per hour through hose

Hose Diameter	Hose Length (12' and less) Max. yards per hour	Hose Length (12' and longer) Max. yards per hour
2"	30	30
3"	90	50
4"	160	110
5"	See manufacturer specs	See manufacturer specs

- The above figures are based on a minimum of a 4" slump and a 5 sack mix.
- Variables in mix design can have an effect on these ratings.
- Aggregate should not exceed 1/3 the diameter of the delivery system.

(xvi) Restraining. A restraining device must:

- Be used on attachments suspended from the boom tips; and
- Have a load rating not less than one-fifth of its ultimate breaking strength.

(xvii) Equipment inspection.

(A) An inspection must be conducted annually for the first five years and semiannually thereafter and must include the following:

- Nondestructive testing of all sections of the boom by a method capable of ensuring the structural integrity of the boom;

- Be conducted by a qualified person or by a private agency.

(B) The inspection report must be documented and a copy maintained by the employer and in each unit inspected. It must contain the following:

- The identification, including the serial numbers and manufacturer's name, of the components and parts inspected and tested;
- A description of the test methods and results;
- The names and qualifications of the people performing the inspection;
- A listing of necessary repairs; and
- The signature of the manufacturer, an agent of the manufacturer, or a qualified person.

Note: See WAC 296-155-628 (8)(d) for the inspection worksheet criteria.

(xviii) Equipment repair.

(A) Replacement parts must meet or exceed the original manufacturer's specifications or be certified by a registered professional structural engineer.

(B) A properly certified welder must perform any welding on the boom, outrigger, or structural component.

(xix) Compressed air cleaning of the piping system. To clean the piping system:

(A) The pipe system must be securely anchored before it is cleaned out.

(B) The flexible discharge hose must be removed.

(C) Workers not essential to the cleaning process must leave the vicinity.

(D) The compressed air system must have a shutoff valve.

(E) Blow out caps must have a bleeder valve to relieve air pressure.

(F) A trap basket or containment device (i.e., concrete truck, concrete bucket) must be available and secured to receive the clean out device.

(G) Delivery pipes must be depressurized before clamps and fittings are released.

(c) Qualification and training requirements.

(i) Operator trainee--Qualification requirements. To be qualified to become a concrete pump operator, the trainee must meet the following requirements unless it can be shown that failure to meet the requirements will not affect the operation of the concrete pump boom.

(A) Vision requirements:

- At least 20/30 Snellen in one eye and 20/50 in the other. Corrective lenses may be used to fulfill this requirement;
- Ability to distinguish colors, regardless of position, if color differentiation is required;
- Normal depth perception and field of vision.

(B) Hearing requirements: Hearing adequate to meet operational demands. Corrective devices may be used to fulfill this requirement.

(ii) Operator trainee--Training requirements. Operator trainee training requirements include, but are not limited to, the

following:

(A) Demonstrated their ability to read and comprehend the pump manufacturer's operation and safety manual.

(B) Be of legal age to perform the duties required.

(C) Received documented classroom training and testing (as applicable) on these recommended subjects:

- Driving, operating, cleaning and maintaining concrete pumps, placing booms, and related equipment;
- Jib/boom extensions;
- Boom length/angle;
- Manufacturer's variances;
- Radii;
- Range diagram, stability, tipping axis; and
- Structural/tipping determinations.

(D) Maintain and have available upon request a copy of all training materials and a record of training.

(E) Satisfactorily completed a written examination for the concrete pump boom for which they are becoming qualified. It will cover:

- Safety;
- Operational characteristics and limitations; and
- Controls.

(iii) Operator--Qualification requirements. Operators will be considered qualified when they have:

(A) Completed the operator trainee requirements listed in (c)(i) and (ii) of this subsection.

(B) Completed a program of training conducted by a qualified person, including practical experience under the direct supervision of a qualified person.

(C) Passed a practical operating examination of their ability to operate a specific model and type of equipment. Possess the knowledge and the ability to implement emergency procedures.

(D) Possess the knowledge regarding the restart procedure after emergency stop has been activated.

(E) Possess the proper class of driver's license to drive the concrete pump truck.

(F) Demonstrate the ability to comprehend and interpret all labels, safety decals, operator's manuals, and other information required to safely operate the concrete pump.

(G) Be familiar with the applicable safety requirements.

(H) Understand the responsibility for equipment maintenance.

(d) Concrete pump inspection worksheet criteria. Concrete pump trucks will be inspected using the following criteria: The manufacturer's required inspection criteria will be followed in all instances.

Note: DOT requirements for inspections - Ref. 49.C.F.R.396.11, Driver Vehicle Inspections and 396.13, Driver Pre-Trip Inspections; and WAC 296-155-610.

(i) Hydraulic systems.

(A) Oil level;

(B) Hoses;

(C) Fittings;

(D) Holding valves;

(E) Pressure settings;

(F) Hydraulic cylinders;

(G) Ensure that the emergency stop system is functioning properly;

(H) All controls clearly marked.

(ii) Electrical.

(A) All systems functioning properly.

(B) All remote control functions are operating properly. Ensure that the emergency stop system is functioning properly.

(C) All controls clearly marked.

(iii) Structural.

(A) Visual inspection for cracks, corrosion, and deformations of the concrete pump with placing boom structure, and all load carrying components such as outriggers, cross frames, torsion box beams, and delivery line support structures that may lead to nondestructive testing.

(B) Visual examination of all links, pivots, pins, and bolts.

(C) Vertical and horizontal movement at the turret, turntable, rotation gear lash, bearing tolerances, not to exceed manufacturer's specifications.

(iv) Piping systems.

(A) Wall thickness must not exceed original manufacturer's specifications.

(B) Mounting hardware for attaching delivery system.

(C) Correct clamps and safety pins.

(v) Safety decals.

All safety decals shall be in place as required by the manufacturer.

(9) Concrete buckets.

(a) Concrete buckets equipped with hydraulic or pneumatic gates shall have positive safety latches or similar safety devices installed to prevent premature or accidental dumping.

(b) Concrete buckets shall be designed to prevent concrete from hanging up on top and the sides.

(c) Riding of concrete buckets for any purpose shall be prohibited, and vibrator crews shall be kept out from under concrete buckets suspended from cranes or cableways.

(d) When discharging on a slope, the wheels of ready-mix trucks shall be blocked and the brakes set to prevent movement.

(10) Tremies. Sections of tremies and similar concrete conveyances shall be secured with wire rope (or equivalent materials in addition to the regular couplings or connections).

(11) Bull floats. Bull float handles, used where they might contact energized electrical conductors, shall be constructed of nonconductive material or insulated with a nonconductive sheath whose electrical and mechanical characteristics provide the equivalent protection of a handle constructed of nonconductive material.

(12) Masonry saws shall be constructed, guarded, and operated in accordance with WAC 296-155-367 (1) through (4).

(13) Lockout/tagout procedures. No employee shall be permitted to perform maintenance or repair activity on equipment (such as compressors, mixers, screens, or pumps used for concrete

and masonry construction activities) where the inadvertent operation of the equipment could occur and cause injury, unless all potentially hazardous energy sources have been locked out and tagged in accordance with chapter 296-155 WAC, Part I.

AMENDATORY SECTION (Amending WSR 10-22-105, filed 11/2/10, effective 1/1/11)

WAC 296-155-706 Structural steel assembly. (1) Structural stability must be maintained at all times during the erection process.

Note: Federal Highway Administration (FHWA) regulations incorporate by reference a number of standards, policies, and standard specifications published by the American Association of State Highway and Transportation Officials (AASHTO) and other organizations. (See 23 C.F.R. 625.4.) Many of these incorporated provisions may be relevant to maintaining structural stability during the erection process. For instance, as of May 17, 2010, in many cases FHWA requires a registered engineer to prepare and seal working drawings for falsework used in highway bridge construction. (See *AASHTO Specifications for Highway Bridges, Div. II, Sec. 3.2.1, 15th edition, 1992,* which FHWA incorporates by reference in 23 C.F.R. 625.4.) FHWA also encourages compliance with AASHTO Specifications that the FHWA regulations do not currently incorporate by reference. (See http://www.fhwa.dot.gov/bridge/lrfd/index.htm.)

- Make sure that multistory structures have the following:

- Permanent floors installed as the erection of structural members progress;

- No more than eight stories between the erection floor and the upper-most permanent floor; and

- No more than four floors or forty-eight feet (14.6 m), whichever is less, of unfinished bolting or welding above the foundation or uppermost permanent secured floor.

Exception: The above applies except where the structural integrity is maintained as a result of design.

(2) **Walking/working surfaces.**

(a) Shear connectors and other similar devices.

(i) Shear connectors, reinforcing bars, deformed anchors or threaded studs must not be attached to the top flanges of beams, joists or beam attachments so they project vertically from or horizontally across the top flange of the member until after the metal decking, or other walking/working surface has been installed. This becomes a tripping hazard. Examples of shear connectors are headed steel studs, steel bars or steel lugs.

(ii) Installation of shear connectors on composite floors. When shear connectors are used in construction of composite floors, roofs and bridge decks, employees must lay out and install the shear connectors after the metal decking has been installed, using the metal decking as a working platform.

(b) Slip resistance of metal decking.

(c) Safe access must be provided to the working level. Employees must not slide down ropes, columns, or ladders.

(3) **Plumbing-up.**

(a) When deemed necessary by a competent person, plumbing-up equipment must be installed in conjunction with the steel erection process to ensure the stability of the structure.

(b) When used, plumbing-up equipment must be in place and properly installed before the structure is loaded with construction material such as loads of joists, bundles of decking or bundles of bridging.

(c) Plumbing-up equipment must be removed only with the approval of a competent person.

(4) **Metal decking.**

(a) Hoisting, landing and placing of metal decking bundles.

(i) Bundle packaging and strapping must not be used for hoisting unless specifically designed for that purpose.

(ii) If loose items such as dunnage, flashing, or other materials are placed on the top of metal decking bundles to be hoisted, such items must be secured to the bundles.

(iii) Bundles of metal decking on joists must be landed in accordance with WAC 296-155-709 (5)(d).

(iv) Metal decking bundles must be landed on framing members so that enough support is provided to allow the bundles to be unbanded without dislodging the bundles from the supports.

(v) At the end of the shift or when environmental or job site conditions require, metal decking must be secured against displacement.

(b) Roof and floor holes and openings. Metal decking at roof and floor holes and openings must be installed as follows:

(i) Framed metal deck openings must have structural members turned down to allow continuous deck installation except where not allowed by structural design constraints or constructibility.

(ii) Roof and floor holes and openings must be decked over. Where large size, configuration or other structural design does not allow openings to be decked over (such as elevator shafts, stair wells, etc.) employees must be protected in accordance with chapter 296-155 WAC, Part C-1 ((~~or Part K~~)), Fall protection requirements for construction.

(iii) Metal decking holes and openings must not be cut until immediately prior to being permanently filled with the equipment or structure needed or intended to fulfill its specific use and which meets the strength requirements of (c) of this subsection, or must be immediately covered.

(c) **Covering roof and floor openings.** Smoke dome or skylight fixtures that have been installed are not considered covers for the purpose of this section unless they meet the strength requirements of ((~~WAC 296-155-505 (4)(g) (Part K)~~)) chapter 296-155 WAC, Part C-1, Fall protection requirements for construction.

(d) **Decking gaps around columns.** Wire mesh, exterior plywood, or equivalent, must be installed around columns where planks or metal decking do not fit tightly. The materials used must be of sufficient strength to provide fall protection for personnel and prevent objects from falling through.

(e) **Installation of metal decking.**

(i) Metal decking must be laid tightly and immediately secured upon placement to prevent accidental movement or displacement.

(ii) During initial placement, metal decking panels must be placed to ensure full support by structural members.

(f) **Derrick floors.**

(i) A derrick floor must be fully decked and or planked and the steel member connections completed to support the intended floor loading.

(ii) Temporary loads placed on a derrick floor must be distributed over the underlying support members so as to prevent local overloading of the deck material.

AMENDATORY SECTION (Amending WSR 02-13-115, filed 6/19/02, effective 9/1/02)

WAC 296-155-716 Fall protection. (1) **General requirements.**

(a) Fall protection will be in accordance with chapter 296-155 WAC, Part((~~s~~)) C-1 ((~~and K~~)), Fall protection requirements for construction.

(b) During steel erection activities, fall protection must be as required by chapter 296-155 WAC, Part((~~s~~)) C-1 ((~~and K~~)). Additionally, on multistory structures, perimeter safety cables must be installed at the final interior and exterior perimeters of the floors as soon as metal decking has been installed. See Appendix D.

(2) **Connectors.** Each connector must: Have completed connector training in accordance with WAC 296-155-717.

(3) **Custody of fall protection.** Fall protection provided by the steel erector must remain in the area where steel erection activity has been completed, to be used by other trades, only if the controlling contractor or its authorized representative:

(a) Has directed the steel erector to leave the fall protection in place; and

(b) Has inspected and accepted control and responsibility of the fall protection prior to authorizing persons other than steel erectors to work in the area.

AMENDATORY SECTION (Amending WSR 96-24-051, filed 11/27/96, effective 2/1/97)

WAC 296-155-740 Cofferdams. (1) If overtopping of the cofferdam by high waters is possible, means shall be provided for controlled flooding of the work area.

(2) Warning signals for evacuation of employees in case of emergency shall be developed and posted.

(3) Cofferdam walkways, bridges, or ramps with at least two means of rapid exit, shall be provided with guardrails as specified in Part ((~~K~~)) C-1 of this chapter.

(4) Manways and ladderways shall be installed separately from the hoistways and partitioned off to prevent hoisted materials from protruding into or falling into manways and/or ladderways.

(5) Pumping equipment shall be located on substantially constructed platforms and where installed in such a position that persons must work below, toe boards shall be installed on the platform.

(6) Cofferdams located close to navigable shipping channels shall be protected from vessels in transit, where possible.

AMENDATORY SECTION (Amending WSR 01-17-033, filed 8/8/01, effective 9/1/01)

WAC 296-155-745 Compressed air. (1) General provisions.

(a) There shall be present, at all times, at least one competent person designated by and representing the employer, who shall be familiar with this part in all respects and responsible for full compliance with these and other applicable parts.

(b) Every employee shall be instructed in the rules and regulations which concern their safety or the safety of others.

(2) Medical attendance, examination, and regulations.

(a) There shall be retained one or more licensed physicians familiar with and experienced in the physical requirements and the medical aspects of compressed air work and the treatment of decompression illness. They shall be available at all times while work is in progress in order to provide medical supervision of employees employed in compressed air work. They shall be physically qualified and be willing to enter a pressurized environment.

(b) No employee shall be permitted to enter a compressed air environment until they have been examined by the physician and reported to be physically qualified to engage in such work.

(c) In the event an employee is absent from work for 10 days, or is absent due to sickness or injury, they shall not resume work until they are reexamined by the physician, and their physical condition reported, as provided in this subsection, to be such as to permit them to work in compressed air.

(d) After an employee has been employed continuously in compressed air for a period designated by the physician, but not to exceed 1 year, the employee shall be reexamined by the physician to determine if they are still physically qualified to engage in compressed air work.

(e) Such physician shall at all times keep a complete and full record of examinations made by themselves. The physician shall also keep an accurate record of any decompression illness or other illness or injury incapacitating any employee for work, and of all loss of life that occurs in the operation of a tunnel, caisson, or other compartment in which compressed air is used.

(f) Records shall be available for the inspection by the

director or his/her representatives, and a copy thereof shall be forwarded to the department within 48 hours following the occurrence of the accident, death, injury, or decompression illness. It shall state as fully as possible the cause of said death or decompression illness, and the place where the injured or sick employee was taken, and such other relative information as may be required by the director.

(g) A fully equipped first-aid station shall be provided at each tunnel project regardless of the number of persons employed. An ambulance or transportation suitable for a litter case shall be at each project.

(h) Where tunnels are being excavated from portals more than 5 road miles apart, a first-aid station and transportation facilities shall be provided at each portal.

(i) A medical lock shall be established and maintained in immediate working order whenever air pressure in the working chamber is increased above the normal atmosphere.

(j) The medical lock shall:

(i) Have at least 6 feet of clear headroom at the center, and be subdivided into not less than two compartments;

(ii) Be readily accessible to employees working under compressed air;

(iii) Be kept ready for immediate use for at least 5 hours subsequent to the emergence of any employee from the working chamber;

(iv) Be properly heated, lighted and ventilated;

(v) Be maintained in a sanitary condition;

(vi) Have a nonshatterable port through which the occupant(s) may be kept under constant observation;

(vii) Be designed for a working pressure of 75 p.s.i.g.;

(viii) Be equipped with internal controls which may be overridden by external controls;

(ix) Be provided with air pressure gauges to show the air pressure within each compartment to observers inside and outside the medical lock;

(x) Be equipped with a manual type sprinkler system that can be activated inside the lock or by the outside lock tender;

(xi) Be provided with oxygen lines and fittings leading into external tanks. The lines shall be fitted with check valves to prevent reverse flow. The oxygen system inside the chamber shall be of a closed circuit design and be so designed as to automatically shut off the oxygen supply whenever the fire system is activated.

(xii) Be in constant charge of an attendant under the direct control of the retained physician. The attendant shall be trained in the use of the lock and suitably instructed regarding steps to be taken in the treatment of employee exhibiting symptoms compatible with a diagnosis of decompression illness;

(xiii) Be adjacent to an adequate emergency medical facility;

(xiv) The medical facility shall be equipped with demand-type oxygen inhalation equipment approved by the U.S. Bureau of Mines or Mine Safety and Health Administration (MSHA) and the National Institute for Occupational Safety and Health (NIOSH);

(xv) Be capable of being maintained at a temperature, in use, not to exceed 90°F. nor be less than 70°F.; and

(xvi) Be provided with sources of air, free of oil and carbon monoxide, for normal and emergency use, which are capable of raising the air pressure in the lock from 0 to 75 p.s.i.g. in 5 minutes.

(k) Identification badges shall be furnished to all employees, indicating that the wearer is a compressed air worker. A permanent record shall be kept of all identification badges issued. The badge shall give the employee's name, address of the medical lock, the telephone number of the licensed physician for the compressed air project, and contain instructions that in case of emergency of unknown or doubtful cause or illness, the wearer shall be rushed to the medical lock. The badge shall be worn at all times--off the job, as well as on the job.

(3) Telephone and signal communication. Effective and reliable means of communication, such as bells, whistles, or telephones, shall be maintained at all times between all the following locations;

(a) The working chamber face;

(b) The working chamber side of the man lock near the door;

(c) The interior of the man lock;

(d) Lock attendant's station;

(e) The compressor plant;

(f) The first-aid station;

(g) The emergency lock (if one is required); and

(h) The special decompression chamber (if one is required).

(4) Signs and records.

(a) The time of decompression shall be posted in each man lock as follows:

TIME OF DECOMPRESSION FOR THIS LOCK

..... pounds to ..... pounds in ..... minutes.

..... pounds to ..... pounds in ..... minutes.

(Signed by) .....

(Superintendent)

This form shall be posted in the man lock at all times.

(b) Any code of signals used shall be conspicuously posted near workplace entrances and such other locations as may be necessary to bring them to the attention of all employees concerned.

(c) For each 8-hour shift, a record of employees employed under air pressure shall be kept by an employee who shall remain outside the lock near the entrance. This record shall show the period each employee spends in the air chamber and the time taken from decompression. A copy shall be submitted to the appointed physician after each shift.

(5) Compression.

(a) Every employee going under air pressure for the first time shall be instructed on how to avoid excessive discomfort.

(b) During the compression of employees, the pressure shall

not be increased to more than 3 p.s.i.g. within the first minute. The pressure shall be held at 3 p.s.i.g. and again at 7 p.s.i.g. sufficiently long to determine if any employees are experiencing discomfort.

(c) After the first minute the pressure shall be raised uniformly and at a rate not to exceed 10 p.s.i. per minute.

(d) If any employee complains of discomfort, the pressure shall be held to determine if the symptoms are relieved. If, after 5 minutes the discomfort does not disappear, the lock attendant shall gradually reduce the pressure until the employee signals that the discomfort has ceased. If the employee does not indicate that the discomfort has disappeared, the lock attendant shall reduce the pressure to atmospheric and the employee shall be released from the lock.

(e) No employee shall be subjected to pressure exceeding 50 pounds per square inch except in an emergency.

(6) Decompression.

(a) Decompression to normal condition shall be in accordance with the decompression tables in Appendix A of this part.

(b) In the event it is necessary for an employee to be in compressed air more than once in a 24-hour period, the appointed physician shall be responsible for the establishment of methods and procedures of decompression applicable to repetitive exposures.

(c) If decanting is necessary, the appointed physician shall establish procedures before any employee is permitted to be decompressed by decanting methods. The period of time that the employees spend at atmospheric pressure between the decompression following the shift and recompression shall not exceed 5 minutes.

(7) Man locks and special decompression chambers.

(a) Man locks.

(i) Except in emergency, no employees employed in compressed air shall be permitted to pass from the working chamber to atmospheric pressure until after decompression, in accordance with the procedures in this part.

(ii) The lock attendant in charge of a man lock shall be under the direct supervision of the appointed physician. The lock attendant shall be stationed at the lock controls on the free air side during the period of compression and decompression and shall remain at the lock control station whenever there are persons in the working chamber or in the man lock.

(iii) Except where air pressure in the working chamber is below 12 p.s.i.g., each man lock shall be equipped with automatic controls which, through taped programs, cams, or similar apparatus, shall automatically regulate decompressions. It shall also be equipped with manual controls to permit the lock attendant to override the automatic mechanism in the event of an emergency, as provided in item (viii) of this subdivision.

(iv) A manual control, which can be used in the event of an emergency, shall be placed inside the man lock.

(v) A clock, thermometer, and continuous recording pressure gauge with a 4-hour graph shall be installed outside of each man lock and shall be changed prior to each shift's decompression. The chart shall be of sufficient size to register a legible record of

variations in pressure within the man lock and shall be visible to the lock attendant. A copy of each graph shall be submitted to the appointed physician after each shift. In addition, a pressure gauge, clock, and thermometer shall also be installed in each man lock. Additional fittings shall be provided so that the test gauges may be attached whenever necessary

(vi) Except where air pressure is below 12 p.s.i.g. and there is no danger of rapid flooding, all caissons having a working area greater than 150 square feet, and each bulkhead in tunnels of 14 feet or more in diameter, or equivalent area, shall have at least two locks in perfect working condition, one of which shall be used exclusively as a man lock, the other, as a materials lock.

(vii) Where only a combination man-and-materials lock is required, this single lock shall be of sufficient capacity to hold the employees constituting two successive shifts.

(viii) Emergency locks shall be large enough to hold an entire heading shift and a limit maintained of 12 p.s.i.g. There shall be a chamber available for oxygen decompression therapy to 28 p.s.i.g.

(ix) The man lock shall be large enough so that those using it are not compelled to be in a cramped position and shall not have less than 5 feet clear head room at the center and a minimum of 30 cubic feet of air space per occupant.

(x) Locks on caissons shall be so located that the bottom door shall be not less than 3 feet above the water level surrounding the caisson on the outside. (The water level, where it is affected by tides, is construed to mean high tide.)

(xi) In addition to the pressure gauge in the locks, an accurate pressure gauge shall be maintained on the outer and inner side of each bulkhead. These gauges shall be accessible at all times and shall be kept in accurate working order.

(xii) Man locks shall have an observation port at least 4 inches in diameter located in such a position that all occupants of the man lock may be observed from the working chamber and from the free air side of the lock.

(xiii) Adequate ventilation in the lock shall be provided.

(xiv) Man locks shall be maintained at a minimum temperature of 70°F.

(xv) When locks are not in use and employees are in the working chamber, lock doors shall be kept open to the working chamber, where practicable.

(xvi) Provision shall be made to allow for rescue parties to enter the tunnel if the working force is disabled.

(xvii) A special decompression chamber of sufficient size to accommodate the entire force of employees being decompressed at the end of a shift shall be provided whenever the regularly established working period requires total time of decompression exceeding 75 minutes.

(b) Special decompression chamber.

(i) The headroom in the special decompression chamber shall be not less than a minimum 7 feet and the cubical content shall provide at least 50 cubic feet of airspace for each employee. For each occupant, there shall be provided 4 square feet of free walking area and 3 square feet of seating space, exclusive of area

required for lavatory and toilet facilities. The rated capacity shall be based on the stated minimum space per employee and shall be posted at the chamber entrance. The posted capacity shall not be exceeded, except in case of emergency.

(ii) Each special decompression chamber shall be equipped with the following:

(A) A clock or clocks suitably placed so that the attendant and the chamber occupants can readily ascertain the time;

(B) Pressure gauges which will indicate to the attendants and to the chamber occupants the pressure in the chamber;

(C) Valves to enable the attendant to control the supply and discharge of compressed air into and from the chamber.

(D) Valves and pipes, in connection with the air supply and exhaust, arranged so that the chamber pressure can be controlled from within and without;

(E) Effective means of oral intercommunication between the attendant, occupants of the chamber, and the air compressor plant; and

(F) An observation port at the entrance to permit observation of the chamber occupants.

(iii) Seating facilities in special decompression chambers shall be so arranged as to permit a normal sitting posture without cramping. Seating space, not less than 18 inches by 24 inches wide, shall be provided per occupant.

(iv) Adequate toilet and washing facilities, in a screened or enclosed recess, shall be provided. Toilet bowls shall have a built-in protector on the rim so that an air space is created when the seat lid is closed.

(v) Fresh and pure drinking water shall be available. This may be accomplished by either piping water into the special decompression chamber and providing drinking fountains, or by providing individual canteens, or by some other sanitary means. Community drinking vessels are prohibited.

(vi) No refuse or discarded material of any kind shall be permitted to accumulate, and the chamber shall be kept clean.

(vii) Unless the special decompression chamber is serving as the man lock to atmospheric pressure, the special decompression chamber shall be situated, where practicable, adjacent to the man lock on the atmospheric pressure side of the bulkhead. A passageway shall be provided, connecting the special chamber with the man lock, to permit employees in the process of decompression to move from the man lock to the special chamber without a reduction in the ambient pressure from that designated for the next stage of decompression. The passageway shall be so arranged as to not interfere with the normal operation of the man lock, nor with the release of the occupants of the special chamber to atmospheric pressure upon the completion of the decompression procedure.

(8) Compressor plant and air supply.

(a) At all times there shall be a thoroughly experienced, competent, and reliable person on duty at the air control valves as a gauge tender who shall regulate the pressure in the working areas. During tunneling operations, one gauge tender may regulate the pressure in not more than two headings: Provided; That the

gauges and controls are all in one location. In caisson work, there shall be a gauge tender for each caisson.

(b) The low air compressor plant shall be of sufficient capacity to not only permit the work to be done safely, but shall also provide a margin to meet emergencies and repairs.

(c) Low air compressor units shall have at least two independent and separate sources of power supply and each shall be capable of operating the entire low air plant and its accessory systems.

(d) The capacity, arrangement, and number of compressors shall be sufficient to maintain the necessary pressure without overloading the equipment and to assure maintenance of such pressure in the working chamber during periods of breakdown, repair, or emergency.

(e) Switching from one independent source of power supply to the other shall be done periodically to ensure that workability of the apparatus in an emergency.

(f) Duplicate low-pressure air feedlines and regulating valves shall be provided between the source of air supply and a point beyond the locks with one of the lines extending to within 100 feet of the working face.

(g) All high-pressure and low-pressure air supply lines shall be equipped with check valves.

(h) Low-pressure air shall be regulated automatically. In addition, manually operated valves shall be provided for emergency conditions.

(i) The air intakes for all air compressors shall be located at a place where fumes, exhaust gases, and other air contaminants will be at a minimum.

(j) Gauges indicating the pressure in the working chamber shall be installed in the compressor building, the lock attendant's station, and at the employer's field office.

(9) Ventilation and air quality.

(a) Exhaust valves and exhaust pipes shall be provided and operated so that the working chamber shall be well ventilated, and there shall be no pockets of dead air. Outlets may be required at intermediate points along the main low-pressure air supply line to the heading to eliminate such pockets of dead air. The quantity of ventilation air shall be not less than 30 cubic feet per minute.

(b) The air in the workplace shall be analyzed by the employer not less than once each shift, and records of such tests shall be kept on file at the place where the work is in progress. The test results shall be within the threshold limit values specified in part B of this chapter, for hazardous gases, and within 10 percent of the lower explosive limit of flammable gases. If these limits are not met, immediate action to correct the situation shall be taken by the employer.

(c) The temperature of all working chambers which are subjected to air pressure shall, by means of after-coolers or other suitable devices, be maintained at a temperature not to exceed 85°F.

(d) Forced ventilation shall be provided during decompression. During the entire decompression period, forced ventilation through

chemical or mechanical air purifying devices that will ensure a source of fresh air shall be provided.

(e) Whenever heat-producing machines (moles, shields) are used in compressed air tunnel operations, a positive means of removing the heat build-up at the heading shall be provided.

(10) Electricity.

(a) All lighting in compressed-air chambers shall be by electricity exclusively, and two independent electric-lighting systems with independent sources of supply shall be used. The emergency source shall be arranged to become automatically operative in the event of failure of the regularly used source.

(b) The minimum intensity of light on any walkway, ladder, stairway, or working level shall be not less than 10 foot-candles, and in all workplaces the lighting shall at all times be such as to enable employees to see clearly.

(c) All electrical equipment, and wiring for light and power circuits, shall comply with requirements of Part I, of this standard, for use in damp, hazardous, high temperature, and compressed air environments.

(d) External parts of lighting fixtures and all other electrical equipment, when within 8 feet of the floor, shall be constructed of noncombustible, nonabsorptive, insulating materials, except that metal may be used if it is effectively grounded.

(e) Portable lamps shall be equipped with noncombustible, nonabsorptive, insulating sockets, approved handles, basket guards, and approved cords.

(f) The use of worn or defective portable and pendant conductors is prohibited.

(11) Sanitation.

(a) Sanitary, heated, lighted, and ventilated dressing rooms and drying rooms shall be provided for all employees engaged in compressed air work. Such rooms shall contain suitable benches and lockers. Bathing accommodations (showers at the ratio of one to 10 employees per shift), equipped with running hot and cold water, and suitable and adequate toilet accommodations, shall be provided. One toilet for each 15 employees, or fractional part thereof, shall be provided.

(b) When the toilet bowl is shut by a cover, there should be an air space so that the bowl or bucket does not implode when pressure is increased.

(c) All parts of caissons and other working compartments shall be kept in a sanitary condition.

(12) Fire prevention and protection.

(a) Firefighting equipment shall be available at all times and shall be maintained in working condition.

(b) While welding or flame-cutting is being done in compressed air, a firewatch with a fire hose or approved extinguisher shall stand by until such operation is completed.

(c) Shafts and caissons containing flammable material of any kind, either above or below ground, shall be provided with a waterline and a fire hose connected thereto, so arranged that all points of the shaft or caisson are within reach of the hose stream.

(d) Fire hose shall be at least 1 1/2 inches in nominal

diameter; the water pressure shall at all times be adequate for efficient operation of the type of nozzle used; and the water supply shall be such as to ensure an uninterrupted flow. Fire hose, when not in use, shall be located or guarded to prevent injury thereto.

(e) The power house, compressor house, and all buildings housing ventilating equipment, shall be provided with at least one hose connection in the waterline, with a fire hose connected thereto. A fire hose shall be maintained within reach of structures of wood over or near shafts.

(f) Tunnels shall be provided with a 2-inch minimum diameter waterline extending into the working chamber and to within 100 feet of the working face. Such line shall have hose outlets with 100 feet of fire hose attached and maintained as follows: One at the working face; one immediately inside of the bulkhead of the working chamber; and one immediately outside such bulkhead. In addition, hose outlets shall be provided at 200-foot intervals throughout the length of the tunnel, and 100 feet of fire hose shall be attached to the outlet nearest to any location where flammable material is being kept or stored or where any flame is being used.

(g) In addition to fire hose protection required by this part, on every floor of every building not under compressed air, but used in connection with the compressed air work, there shall be provided at least one approved fire extinguisher of the proper type for the hazards involved. At least two approved fire extinguishers shall be provided in the working chamber as follows: One at the working face and one immediately inside the bulkhead (pressure side). Extinguishers in the working chamber shall use water as the primary extinguishing agent and shall not use any extinguishing agent which could be harmful to the employees in the working chamber. The fire extinguisher shall be protected from damage.

(h) Highly combustible materials shall not be used or stored in the working chamber. Wood, paper, and similar combustible material shall not be used in the working chamber in quantities which could cause a fire hazard. The compressor building shall be constructed of noncombustible material.

(i) Man locks shall be equipped with a manual type fire extinguisher system that can be activated inside the man lock and also by the outside lock attendant. In addition, a fire hose and portable fire extinguisher shall be provided inside and outside the man lock. The portable fire extinguisher shall be the dry chemical type.

Note: For additional requirements relating to portable fire extinguishers see WAC 296-800-300.

(j) Equipment, fixtures, and furniture in man locks and special decompression chambers shall be constructed of noncombustible materials. Bedding, etc., shall be chemically treated so as to be fire resistant.

(k) Head frames shall be constructed of structural steel or open frame-work fireproofed timber. Head houses and other temporary surface buildings or structures within 100 feet of the shaft, caisson, or tunnel opening shall be built of fire-resistant materials.

(l) No oil, gasoline, or other combustible materials shall be stored within 100 feet of any shaft, caisson, or tunnel opening, except that oils may be stored in suitable tanks in isolated fireproof buildings, provided such buildings are not less than 50 feet from any shaft, caisson, or tunnel opening, or any building directly connected thereto.

(m) Positive means shall be taken to prevent leaking flammable liquids from flowing into the areas specifically mentioned in the preceding subdivision.

(n) All explosives used in connection with compressed air work shall be selected, stored, transported, and used as specified in part T of this chapter.

(13) Bulkheads and safety screens.

(a) Intermediate bulkheads with locks, or intermediate safety screens or both, are required where there is danger of rapid flooding.

(b) In tunnels 16 feet or more in diameter, hanging walkways shall be provided from the face to the man lock as high in the tunnel as practicable, with at least 6 feet of head room. Walkways shall be constructed of noncombustible material. Standard railings shall be securely installed throughout the length of all walkways on open sides in accordance with Part ((~~K~~)) C-1 of this chapter. Where walkways are ramped under safety screens, the walkway surface shall be skidproofed by cleats or by equivalent means.

(c) Bulkheads used to contain compressed air shall be tested, where practicable, to prove their ability to resist the highest air pressure which may be expected to be used.

REPEALER

The following sections of the Washington Administrative Code are repealed:

WAC 296-155-245	Reserve.
WAC 296-155-24501	Scope and application.
WAC 296-155-24503	Definitions.
WAC 296-155-24505	Fall protection work plan.
WAC 296-155-24507	Reserve.
WAC 296-155-24510	Fall restraint, fall arrest systems.
WAC 296-155-24515	Guarding of low pitched roof perimeters.
WAC 296-155-24519	Reserve.
WAC 296-155-24520	Leading edge control zone.
WAC 296-155-24521	Safety monitor system.
WAC 296-155-24522	Reserve.
WAC 296-155-24523	Appendix A to Part C-1--Determining roof widths nonmandatory guidelines for complying with WAC 296-155-

	24515 (2)(b).
WAC 296-155-24524	Reserve.
WAC 296-155-24525	Appendix B to Part C-1--Fall restraint and fall arrest (employer information only).
WAC 296-155-500	Definitions applicable to this part.
WAC 296-155-505	Guardrails, handrails and covers.
WAC 296-155-50503	Roofing brackets.
WAC 296-155-50505	Reserved.
WAC 296-155-510	Reserved.
WAC 296-155-515	Ramps, runways, and inclined walkways.

AMENDATORY SECTION (Amending WSR 05-01-054, filed 12/7/04, effective 3/1/05)

WAC 296-874-20008 Make sure platforms are properly planked or decked.

You must:

● Fully plank or deck each platform between the front uprights and the guardrail supports on all working levels of a scaffold so that there is no more than one inch (2.5 cm):

- Between adjacent units;

AND

- Between the platform and the uprights.

Exemption:

● There may be more than one inch between platform units if all of the following are met:
– You can demonstrate that a wider space is necessary, such as to fit around uprights when side brackets are used to extend the platform width;
– The platform is planked or decked as fully as possible;
– The open space between the platform and the guardrail supports is nine and one-half inches (24.1 cm) or less.
● Platforms used solely as walkways or only by employees erecting or dismantling scaffolds do not have to be fully decked or planked if:
– The planking provided makes for safe working conditions;
AND
– Employees on those platforms are protected from falling.

REFERENCE		
Fall protection requirements for employees:	Are located in the following chapters:	In the following sections:
On walkways within scaffolds	Chapter 296-874 WAC, Scaffolds	WAC 296-874-20056
Erecting or dismantling supported scaffolds	Chapter 296-874 WAC, Scaffolds	WAC 296-874-40010
Erecting or dismantling suspended scaffolds in general industry	Chapter 296-24 WAC, General safety and health standards	Part J-1 Working surfaces, guarding floors and wall openings, ladders AND Part J-3 Powered platforms
Erecting or dismantling suspended scaffolds in construction work	Chapter 296-155 WAC, Safety standards for construction work	Part C-1 Fall ((~~restraint and fall arrest~~ ~~AND~~ ~~Part K~~ ~~Floor openings, wall openings, and stairways~~)) protection requirements for construction

You must:

● Make sure wood platforms are not covered with an opaque finish.

Exemption: Platform edges may be covered or marked for identification.

Note: Platforms may be coated periodically with wood preservatives, fire-retardant finishes, or slip-resistant finishes if the coating does not obscure the top or bottom wood surfaces.

AMENDATORY SECTION (Amending WSR 07-17-026, filed 8/7/07, effective 10/6/07)

WAC 296-874-20030 Make sure ramps and walkways used to access scaffolds meet these requirements.

You must:

- Make sure ramps and walkways are not inclined at a slope steeper than one vertical in three horizontal (1:3 or twenty degrees from the horizontal).
- Make sure ramps and walkways that are inclined at a slope steeper than one vertical in eight horizontal (1:8) have cleats to provide footing which are:
  - Securely fastened to the planks;

  AND
  - Spaced not more than fourteen inches (35 cm) apart.

Reference: Ramps and walkways that are four feet (1.2 m) or more above a lower level need to have a guardrail system. Those requirements are found in other chapters.
– For general industry activities, go to:
■ Working surfaces, guarding floors and wall openings, Part J-1, in the general safety and health standards, chapter 296-24 WAC;
– For construction activities, go to:
■ Floor openings, wall openings, and stairways, Parts ((~~K~~)) C-1 and J, in the safety standards for construction work, chapter 296-155 WAC.

AMENDATORY SECTION (Amending WSR 07-17-026, filed 8/7/07, effective 10/6/07)

WAC 296-874-20052 Provide fall protection for employees on scaffolds.

You must:

- Protect each employee on a scaffold more than ten feet (3.1 m) above a lower level, from falling to the lower level, by providing either:
  - A personal fall arrest system;

  OR
  - Guardrails.

REFERENCE		
Fall protection requirements for employees:	Are located in the following chapters:	In the following sections:
On walkways within scaffolds	Chapter 296-874 WAC, Scaffolds	WAC 296-874-20056

REFERENCE		
Fall protection requirements for employees:	Are located in the following chapters:	In the following sections:
Erecting or dismantling supported scaffolds	Chapter 296-874 WAC, Scaffolds	WAC 296-874-40010
Erecting or dismantling suspended scaffolds in general industry	Chapter 296-24 WAC, General safety and health standards	Part J-1 Working surfaces, guarding floors and wall openings, ladders AND Part J-3 Powered platforms
Erecting or dismantling suspended scaffolds in construction work	Chapter 296-155 WAC, Safety standards for construction work	Part C-1 Fall ((~~restraint and fall arrest~~ ~~AND~~ ~~Part K~~ ~~Floor openings, wall openings, and stairways~~)) protection requirements for construction

You must:

- Make sure employees erecting the scaffold install the guardrail system, if required, before the scaffold is used by any other employees.

AMENDATORY SECTION (Amending WSR 05-01-054, filed 12/7/04, effective 3/1/05)

WAC 296-874-20058 Make sure personal fall arrest systems meet these requirements.

You must:

- Make sure personal fall arrest systems used on scaffolds for general industry activities, meet the requirements of personal fall arrest system, Appendix C, Part 1, WAC 296-24-88050, in powered platforms, Part J-3, found in the general safety and health standards, chapter 296-24 WAC.
- Make sure personal fall arrest systems are attached by a lanyard to one of the following:
  - Vertical lifeline;
  - Horizontal lifeline;
  - Appropriate structural member of the scaffold.

Reference: Requirements for personal fall arrest systems used on scaffolds for construction activities are in ((~~fall restraint and fall arrest,~~)) Part C-1, found in the safety standards for construction work, chapter 296-155 WAC.

AMENDATORY SECTION (Amending WSR 05-01-054, filed 12/7/04, effective 3/1/05)

WAC 296-874-40020 Meet these requirements when using integral prefabricated scaffold access frames.

You must:

● Make sure integral prefabricated scaffold access frames meet all of the following:

- Have been specifically designed and constructed to be used as ladder rungs;
- Have a rung length of at least eight inches (20 cm);
- Have a maximum spacing between rungs of sixteen and three quarters inches (43 cm);
- Are uniformly spaced within each frame section;
- Have rest platforms at least every twenty feet (6.1 m) on all supported scaffolds more than twenty-four feet (7.3 m) high.

Note: Nonuniform rung spacing caused by joining end frames together is allowed, provided the resulting spacing does not exceed sixteen and three quarters inches (43 cm).

You must:

● Make sure, when panels with rungs that are less than eleven and one-half inches long are used as work platforms, that employees use either:

- A positioning device;

OR

- A personal fall arrest system.

Reference:
● For personal fall arrest system requirements in this chapter, go to WAC 296-874-20058.
● For construction activities, go to ((~~fall restraint and fall arrest,~~)) Part C-1, in safety standards for construction work, chapter 296-155 WAC.

AMENDATORY SECTION (Amending WSR 05-01-054, filed 12/7/04, effective 3/1/05)

WAC 296-874-40034 Meet these requirements when using repair bracket scaffolds.

You must:

● Make sure brackets are all of the following:

- Secured in place by at least one wire rope that's at least one-half inch (1.27 cm) in diameter;
- Attached to the securing wire rope by a positive locking device, or equivalent, that will prevent the bracket from being unintentionally detached from the rope;
- Provided with a shoe, heel block, foot, or a combination that:

■ Is located at the contact point between the supporting structure and the bottom of the bracket;

AND

■ Will prevent lateral movement of the bracket.

● Secure the platforms to the brackets in a way that prevents:

- The platforms from separating from the brackets;

AND

- The platforms or brackets from moving on a completed scaffold.

● Make sure wire rope placed around the structure to provide a safe anchorage for personal fall arrest systems used by employees erecting or dismantling scaffolds:

- Is at least five-sixteenths inch (0.8 cm) in diameter;

- Provides an anchorage that meets the requirements of WAC 296-874-20058.

■ For construction activities, go to ((~~fall restraint and fall arrest,~~)) Part C-1, in the safety standards for construction work, chapter 296-155 WAC.

● Make sure each wire rope used for securing brackets in place or as an anchorage for personal fall arrest systems is all of the following:

- Protected from damage due to contact with edges, corners, protrusions, or other parts of the supporting structure or scaffold components;

- Tensioned by a turnbuckle or equivalent means. Turnbuckles must be:

■ At least one inch (2.54 cm) in diameter;

AND

■ Connected to the other end of its rope by an eye splice thimble that's sized appropriate to the turnbuckle.

- **Not** used with U-bolt wire rope clips.

● Make sure materials are not dropped to the outside of the supporting structure.

● Erect the scaffold by progressing around the structure in only one direction.