ADVATEK SYSTEMS INC.

Fall Protection

SECTION 4

Updated November 26 2015

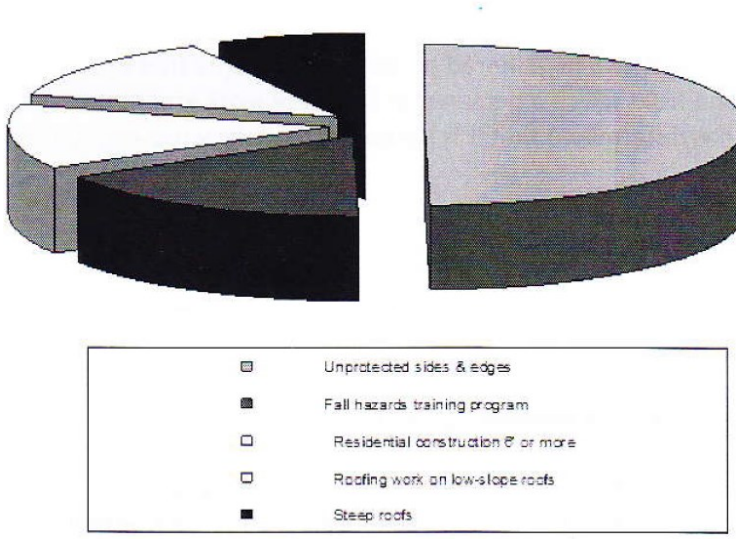
Leave blank for two sided printing

1.01 Fall Protection introduction

Fatal Facts... Falls Kill

- Falls are the leading cause of fatalities in the construction industry.
- 939 workplace fatalities occurred 2009 in Canada according to Statscan.

Most Frequent Citation To Cause Death



1.02 Prevention

- Select fall protection systems appropriate for given situations.
- Use proper construction and installation of safety systems.
- Use safe work procedures- . Train workers in the proper selection, use, and maintenance of fall
- Supervise employees properly.

1.03 What .does the law say? Sec, ,19(1)

The employer shall provide and the employee shall continually use of Fall-protection system when a employee works from an unguarded work area that is 3 m or more above water or the nearest permanent safe level, above any surface or object that could cause injury to the employee upon contact, or above any open top tank, bin, hopper or vat, a work area that is 3 m or more above a permanent safe level and from which a person may full if the work area tips, or falls, or a work area where an officer has determined that it is necessary for safety reasons to use a fall-protection system.

1.04 Fall Protection is Needed When... Sec.49 General Protection

The employer shall provide and the employee shall continually use a fall-protection system when an employee works from an unguarded work area that is:

- 3 feet or more above water or the nearest permanent safe level,
- Above any surface or object that could cause injury to the employee upon contact, (i.e. unusual possibility of injury)
- Above any open top tank, bin, hopper or vat

A fall-protection system must also be adhered to when a work area that is 3 m or more above a permanent safe level and from which a person may fall if the work area tips or fails, or a work area where an officer has determined that it is necessary for safety reasons to use a fall-Protection system.

****What is an Unusual Possibility of injury?****

An unusual possibility of injury is when there is a chance the injury may be worse than an injury from landing on a solid, flat surface.

1.05 Responsibility of Employer and implementing Fall Protection

1. An employer must install an engineering control such as a guardrail.
2. If the use of a guardrail is not reasonably practicable, an employer must ensure that a worker uses a travel restraint system that meets the requirements.
3. If the use of a travel restraint system is not reasonably practicable, an employer must ensure that a worker uses a personal fall arrest system that meets the requirements.
4. If the use of a personal fall arrest system is not reasonably practicable, an employer must ensure that a worker uses an equally effective fall protection system that meets the requirements of this part.

1.06 Workers Must Obey Company Policy

A worker must use or wear the fall protection system the employer requires the worker to use or wear in compliance with this Code. All equipment must be inspected before use.

1.07 Limiting an Employee's Free Fall Sec.29.2

An employer and a contractor must ensure that a fall-arresting system limits free falls to the shortest distance possible, which distance cannot exceed 1.8 m (8 kN/ 1800 lbs-f), and the total fall distance must be less than the distance from the work area to the next lower level. water or obstruction below.

1.08 What if an energy absorber/shock absorber cannot be used? se.. 49.2(3)

If using an energy absorber is hazardous or impracticable, the fall arresting system shall not include an energy absorber, not use lanyards made of wire rope or other inelastic material, and must limit free falls to 1.2 m.

There Are Five Fall Protection Systems

1st	2nd	3rd	4th	5th
Guardrails System	Travel Restraint System	Fall Restricting System	Fall Arrest System or (PFAS)	Safety Net System

1.09 Guardrails System Sec. 97(2)

A guardrail system consists of a top rail, mid rail, and intermediate vertical member. Guardrail systems can also be combined with toe boards that prevent materials from rolling off the walking/working surface. Guardrail systems must be free of anything that might cut a worker or snag a worker's clothing.

1.10 Other Requirements for Guardrails and Toe Boards

- Install along open sides and ends . Top rails 0.9 1.07 meters tall (Midrails halfway between top rail and platform
- Toe boards must be 127 millimeters high has a space of not more than 6 mm between the bottom of the toe board and the floor
- Posts, distance between, of the guardrail system may not be greater than 2.4 meters (scaffold 3 M)

1.11 Temporary Guardrails

Temporary guardrails do not require a horizontal intermediate member if it has a substantial barrier positioned within the space bounded by the horizontal top member, toe board and vertical members that prevents a worker's falling through the space.

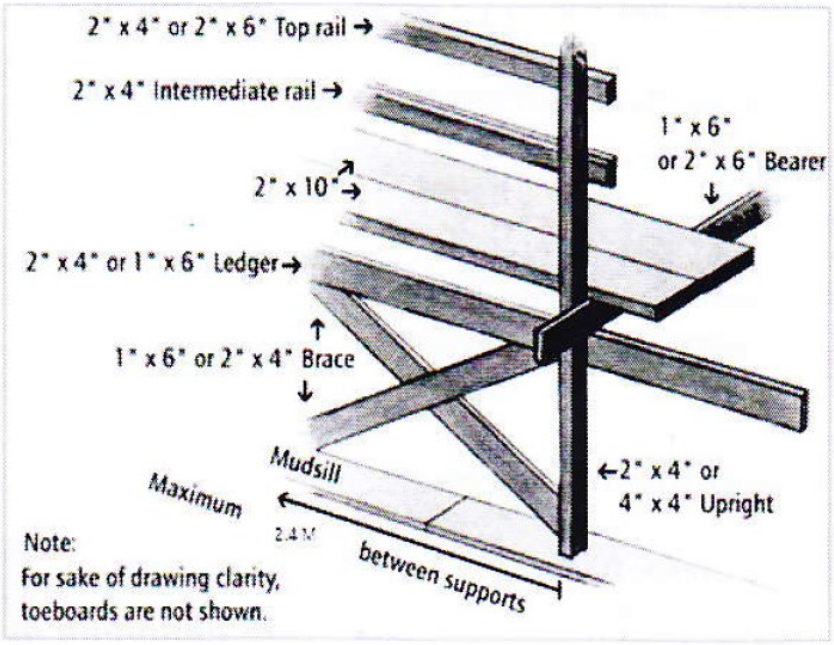
1.12 Guardrail Strength

An employer must ensure that a guardrail is secured so that it cannot move in any direction if it is struck or any point on it comes into contact with a worker, materials or equipment.

1.13 Wood Guardrails Sec. 97(2)

The following additional requirements apply to a guardrail system that is made of wood I f

1. The wood shall be spruce, pine or fir No.2 (S-P-F) timber of construction grade quality or better and shall not have any visible defect affecting its load-carrying capacity.
2. The wood shall be free of sharp objects such as splinters and protruding nails.
3. The system shall have posts that are at least 50 millimeters by 100 millimeters No.2 grade or better SPF, are securely fastened to the surface and are spaced at intervals of not more than 3 meters.



4. The top rail and the intermediate rail shall each be at least 50 millimeters by 100 millimeters.

1.14 Wire Rope Guardrails Sec. 97(1)iv

The following additional requirements apply to a guardrail system that is made of wire rope:

- The vertical supporting posts shall be made of steel of at least 40 mm in diameter or of a material of equivalent strength, and
- The top rail and intermediate rail shall be at least 10 mm in diameter, be attached to a welded fastening on the vertical supporting posts with metal clips to prevent unnecessary sagging and be easily distinguishable from the background.

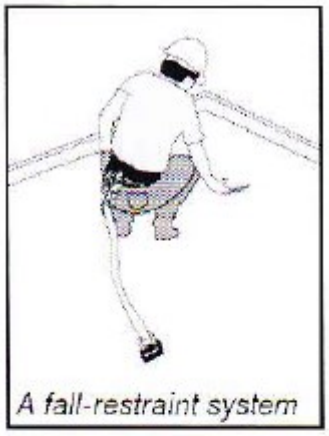
1.15 Can wire mesh be utilized as a safety, precaution?

An employer must ensure that wire mesh used in a safeguard required by this Code is:

a. fabricated of wire at least 1.6 millimeters in diameter, and

b. spaced lo reject a ball 40 millimeters in diameter

1.16 A Travel Restraint System


A fall-restraint system

A travel restraint system prevents a worker from reaching an unprotected edge; and thus, prevents a fall from occurring. The system consists of an anchorage, connectors, and a body harness or a body belt. The attachment point to the body belt or full body harness can be at the back, front, or side D-rings.

The anchorage for a fall-restraint system must support at least 789 pounds of falling force or be designed and installed with a safety factor of at least two in conjunction with Anchor Systems.

A Travel Restraint System must include and be:

- A full body harness with adequate attachment points or a safety belt, and
- Attached to an independent fixed support (Anchor Point).

Restraint System inspection:

- Restraint system shall be inspected by a competent worker before each use.
- If a component of the travel restraint system is found to be defective on inspection, the defective component shall immediately be taken out of service.


A positioning-device system with self-retracting lifeline

1.17 Positioning-Device Systems

Positioning device systems, is a form of fall travel restraint, making it easier to work with both hands free on a vertical surface such as a wall or concrete form. The components of a positioning-device system are as follows: anchorage, connectors, and body support. However, the systems serve different purposes. A positioning device system provides support and is not designed to stop a workers fall; but merely to hold a worker in position, restraining a fall hazard.

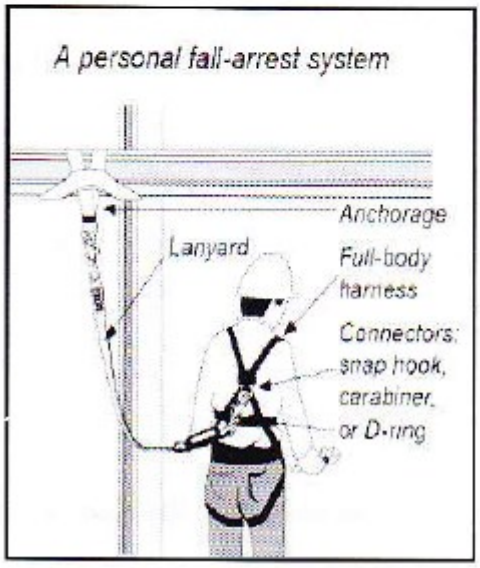
- **Anchorage**. Positioning-device systems must be secured to an anchorage that can support at least twice the potential impact of a worker's fall or 3,000 pounds, whichever is greater..
- **Connectors**. Connectors must have a minimum strength of 5,000 pounds. Snap hooks and D-rings must be proof-tested to a minimum load of 3,600 pounds without deforming or breaking.
- **Body support.** A body belt is acceptable as part of a positioning device system. However, it must limit the arresting force on a worker to 900 pounds, and it can only be used for body support. A full body harness is also acceptable and must limit the arresting force to 1,800 pounds. Belts or harnesses must have side D-rings or a single front D-ring for positioning

1.18 A Fall Restricting System (Retractable Devices)

A fall restraining device has been recently engineered to reduce a workers free fall lo safe and lower distances. By reducing one's free fall distance, the damaging arresting force upon the human body can lessen to acceptable levels.

A fall restricting system must be:

- Attached to an independent fixed support (Anchor Point).
- Must reduce a worker's free fall distance to 1.2 meters or less (0.6 M most common).
- inspected by a competent worker before each use.
- lf defective on inspection, the defective component must immediately be taken out of service.
- lf a worker who is using the fall restricting system falls or slips more than the distance determined, 0.6 meters, the system must be removed and certified by the manufacturer.



1.19 Personal Fall Arrest System {PFAS)

A personal fall arrest system includes an anchorage, connectors, and a full-body harness, lifeline, and a decelerating device, that work together to stop a sudden "STOP" after a fall and to minimize the arresting force of a fall. The personal fall-arrest system is effective only ifthe equipment is functioning properly, installed correctly, and the workers are knowledgeable about its uses. Only when allthese factors are working in harmony can PFAS be effective. PFAS is the less effective means of preventing a fall and fall injuries.

A Fall Arrest System must include:

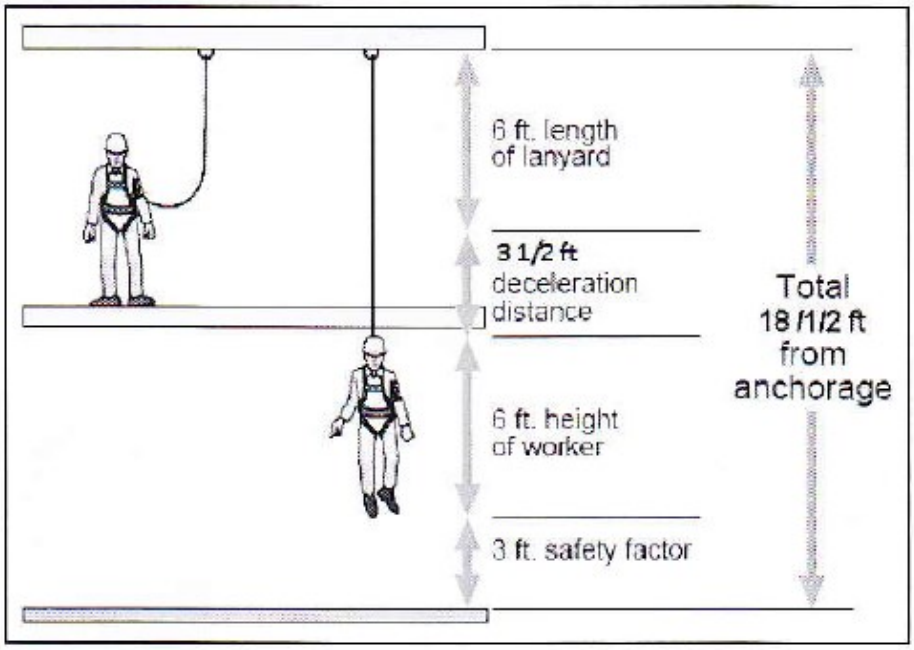
- Anchorage, connectors, and a full-body harness, lifeline, and a decelerating device.
- Fall arrest system must be arranged so that a worker does not hit the ground or an object or level below the work.
- The Fall arrest system shall be inspected by a competent worker before each use.
- lf a component(s) are defective on inspection, the defective component must immediately be taken out of service
- lf a worker who is using the fall removed from service and shall the system have been certified arrest system falls, the system shall be immediately not be used again by a worker unless all components of by the manufacturer as being safe for reuse.

1.20 Shock-Absorbing Lanyards increase a Worker's Total Fall Distance!

Shock absorbers reduce the impact on a worker during fall arrest by extending up to 1 meter {3.3 feet) to absorb the arrest force. A worker's arresting force must be limited to 1,800 pounds to minimize injury, but a shock-absorbing lanyard can further reduce arresting force to 900 pounds.

A shock-absorbing lanyard extends up to 1 meter (3.3 feet) typically; thus, it's critical that the lanyard stops the worker before the next lower level. Allow about 6 vertical meters (20 feet) between the workers anchorage point and the level below the working surface. Always estimate the total distance of a possible fall before using a shock-absorbing lanyard.

Worker's Total Fall Distance



1.21 Personal Fall Arrest Systems (PFAS)

"Free fall distance" means the vertical displacement of the fall arrest attachment point on the employee's body belt or 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, lifeline/lanyard elongation, but includes any deceleration device slide distance or self retracting lifeline/lanyard extension before they operate and fall arrest forces occur.

"The Attachment Point" of the body harness shall be located in the center oft he wearer's back near shoulder level, or above the wearer’s head.

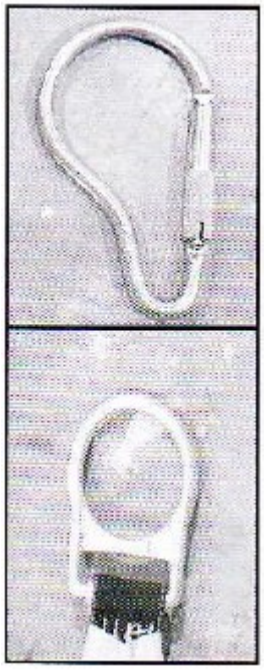
1.22 What if the fall protection system is activated or used?

If a worker who is using the fall protection system falls and is activated to stop the employees fall, the system shall be taken out of service immediately and shall not be used again by a worker unless all components of the system have been certified by the manufacturer as being safe for reuse

1.23 Personal Fall Arrest Systems must:

- Limit maximum arresting force on an employee to 1,800 pounds when used with a body harness;
- Be rigged such that an employee can neither free fall more than 6 feet (1.8 m), nor contact any lower level; and
- Bring an employee to a complete stop and limit maximum deceleration distance an employee travels to 3.5 feet.

1.24 Personal Fall Arrest Systems PFAS consist ol Four Components



"Anchorage" means a secure point of attachment for lifelines, lanyards or deceleration devices. Anchorages used for attachment of personal fa l arrest equipment shall be independent of any anchorage being used to support or suspend platforms and capable of supporting at least 5,000 pounds {22.2 kn.) per employee attached.

"Connector" means a device whjch is used to couple (connect) parts of the personal fall arrest system and positioning device systems together. may be an independent component of the system, such as a carabineer.

Connectors may be an integral component of part of the system (such as a buckle or D-ring sewn into a body belt or body harness, or a snap-hook spliced or sewn to a lanyard or self-retracting lanyard).

"Snaphooks" The non locking type with a self-closing keeper which remains closed until pressed open for connection or disconnection.

Unless the snaphook is a locking type and designed for the following connections, snaphooks sha ll not be engaged:

- Directly to webbing, rope, or wire rope,
- To each other, or .
- To a D-ring to which another snaphook or other connector is attached to a horizontal lifeline.

"lanyards"

- Cannot be made of natural fiber rope
- Must be protected against damage by cuts or abrasions
- Each employee must be provided a separate lanyard.
- Lanyards must have a minimum breaking strength of 5000 pounds.

"Deceleration distance" means the additionalvertical distahce a falling employee travels, excludjng lifeline elongatlon and free fall distance, before stopping, from the point at which the deceleration devjce begins to operate.

It is measured as the distance between the location of an employee's body belt or body harness attachmenl 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.

1.25 Additional Requirements PFAS

- If subject to impact loading, examined by CP (See Manufacturer details)
- PFAS equipment is for employee protection and not to hoist materials
- Prompt rescue of employees in the event of a fall
- Inspected prior to each use
- Not attached to guardrail systems

1.26 Removal of Fall Protection Equipment from Service

An employer must ensure that equipment used as part of a fall protection system is removed from service and either returned to the manufacturer or destroyed if:

- Equipment is defective,
- Equipment has come into contact with excessive heat, a chemical, or any other substance that may corrode or otherwise damage the fall protection system, or
- After a personal fall arrest system has stopped a fall, the system is removed from service.

An employer must ensure that a personal fall arrest system that is removed from service is not returned to service unless a professional engineer or the manufacturer certifies that the system is safe to use.

1.27 Horizontal Lifelines Sec. 49.5-7

- Horizontal lifelines shall be designed by a Professional Engineer (PE), installed, and used, under the supervision of a competent person, as part of a complete personal fall arrest system.
- Devices used to connect to a horizontal lifeline which could become vertical must be capable of locking in both directions on the lifeline.

1.28 Horizontal Lifelines Design Must include the Following

- Show the arrangement of the system including the anchorage or fixed support system,
- Indicate the components used,
- State the number of workers that can safely be attached to it,
- Set out instructions for installation or erection, and
- Show the design loads for the system.
- The system shall be installed or erected, and maintained, in accordance with the professional engineer's design.
- Before each use, the system shall be inspected by a PE or a competent worker designated by a supervisor.
- The constructor shall keep the design at the project while the system is in use.

1.29 Training Requirements

The following must be explained during instruction and training:

◊ Training must be instructed and evaluated by a competent person.

◊ The training is for each employee who might be exposed to falls.

1.30 Topics to be Covered in your Training Program

◊ A review of current Alberta Code pertaining to fall protection

◊ An understanding of what a fall protection plan is;

◊ Fall protection methods, system, a worker is required to use at a work site;

◊ identification of fall the hazards;

◊ Assessment and selection of specific anchors that the worker may usej

◊ instructions for the correct use of connecting hardware;

◊ information about the effect of a fall on the human body, including

◊ Maximum arresting force,

◊ The purpose of shock and energy absorbers,

swing fall,

Free fall,

Pre-use inspection,

◊ Emergency response procedures to be used at the work site, if necessary; and

◊ inspecting, fitting, adjusting and connecting fall protection systems and components, and

◊ Emergency response procedures

◊ The importance of inspections prior to use

◊ The limitations of the equipment

◊ The unique conditions at the worksite which may be important in determining the type of system to use

1.31 When any of the following occur, re-training is required:

- A fall occurs
- Other related items
- Serious incident occurs
- Near miss
- Changes to the fall protection
- New practices, procedures, or training.

1.32 Permanent/ Temporary Anchor systems sec, 49.2(lxc)

An anchor is:

- Capable of safeiy withstanding the impact forces applied to it and
- Has a minimum breaking strength per attached worker of 22.2 kn (5000 lbs-f)

The employer must ensure that an anchor rated at two times the maximum arresting force designed, installed and used in accordance with the manufacturer's specifications, or specifications certified by a professional engineer.

1.33 Safety Nets Sec. 49.8(1)

Safety nets are used where it is difficult or impossible to arrange for guard railing, or to provide a proper anchoring and life line system for fall arrest. The most common applications for safety nets are bridge work or structural steel erection.

Safety nets may be installed as a form of fall protection, provided they meet the following requirements ANSI Standard 10.11-19891

- Safety hooks or shackles of drawn, rolled or forged steel with an ultimate tensile strength of not less than 22.2 kn (5000 lbs)
- The joints between net panels capable of developing the full strength of the web
- Extends not less than 2.4 meters and extends not more than 6 meters beyond the work area
- The maximum deflection under impact load does not allow any part of the net to touch another surface.

1.34 Professional Engineers must Certify Safety Nets

An employer must ensure that the supporting structure to which a personnel safety net is attached is certified by a professional engineer as being capable of withstanding any load the net is likely to impose on the structure.

1.35 Covers or Holes

Covers or holes must be:

- Able to withstand twice expected load,
- Secured,
- Covered/or guard rail when not in use, and .
- Marked with 'HOLE' or 'COVER.'

1.36 What does the law say about a written fall protection plan?

An employer must develop procedures that comply with this part in a fall protection plan for a work site if a worker at the worksite may fall 3 meters or more and the worker is not protected by guard-rails.

1.37 Who Needs a Fall Rescue Plan/Post-Fall Rescue Procedure Sec. 50.1

“Written Fall Protection Rescue Plan" is available only to employees/employers when the use of guard rails had been proven to be infeasible and a fall arrest system or safety net system have been selected as employee fall protection. The wr'1ten plan should also demonstrate that the pre-ferred fall protection, guard rails, is impossible or it creates a greater hazard.

1.38 What Does a Written Fall Protection Plan include?

A fall protection plan must specify:

◊ Fall hazards at the work site,

◊ Fall protection system to be used at the worksite,

◊ Anchors to be used du ring the work,

◊ Clearance distances below the work area, if applicable, have been confirmed as sufficient to prevent a worker from striking the ground or an object or level below the work area,

◊ Procedures used to assemble, maintain, inspect, use and disassemble the fall protection sys-tem, where applicable, and

◊ Rescue procedures to be used if a worker falls and is suspended by a personal fall arrest sys-tem or safety net and needs to be rescued.

The employer must ensure that the fall protection plan is available at the work site and is reviewed with workers before work with a risk of falling begins. The employer must ensure that the plan is up-dated when conditions affecting fall protection change.

1.38 Additional Plan Details

- Prepared by a qualifjed person
- Specific to site
- Changes made by a qualified person
- Plan kept at site
- lmplemented by competent person
- Documents why conventionalfall protection is infeasible
- Discuss measures used to protect workers and how to retrieve them in a timely manner

1.39 What are Controlled zones? sec. 49.6

"Controlled zone (CZ)" means an area in which certain work (e.g. overhand bricklaying) may take place ***without*** *the use of guardrail systems, personal all arrest systems, or safety net systems and* ***access to the zone is controlled****.*

Where leading edge and other operations are taking place, the controlled access zone shall be de-fined by a control line:

- At least 3 M (10 feet) from leading edge,
- Connected at ends to guardrail or wall,
- Flagged or marked at least every six feet,
- 39 to 45 inches high (recommended), and
- 200 pound breaking strength (recommended).
- Control line can be used instead of guardrail system along leading edge to protect along lead-ing edge workers.

1.40 What Needs to be Documented?

The fall protection plan shall document the reasons why the uses of conventional fall protection sys-tems (guardrail systems, personal fall arrest systems, or safety net systems) are infeasible or why their use would create a greater hazard.

- identifies all controlled access zones (CAZ) .
- Where no other measures are used, a safety monitor must be used .
- identify all CAZ employees .
- lf an employee falls, review plan to prevent reoccurrence.