DEPARTMENT OF THE NAVY
FALL-PROTECTION GUIDE

FOR

ASHORE FACILITIES

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DEPARTMENT OF THE NAVY

FALL PROTECTION GUIDE FOR ASHORE FACILITES

1.0 INTRODUCTION

1.1 PURPOSE:

This Guide establishes criteria for developing fall protection programs to protect all Navy personnel (military and Department of Navy civilians) on Navy Ashore Facilities.

1.2 BACKGROUND:

Falls are the leading cause of work-related injuries and fatalities. They are the number one cause in construction and are ranked as the second cause in general industry. According to Bureau of Labor Statistics (BLS), most work- related injuries and fatalities are on the decline In contrast, the number of injuries and fatalities from falls continues to rise, accounting for more than 13% of total fatal work injuries. Fatalities from falls increased from 684 in 1996 to 808 in 2001. In the United States, approximately three fatalities from falls occur each working day. Furthermore, thousands of workers suffer injuries due to falls with lost time from work. Half of the fatalities occurred in the construction industry. BLS data shows that fall fatalities from roofs are the most common, followed by falls from scaffolds, ladders, and other surfaces. Aside from tragic loss of life and suffering to victims and their families, workers are very expensive to train and to perform work efficiently. On the average, a single fall fatality costs approximately $800,000 to $2,400,000. The average cost of a single injury due to a fall is over $30,000. Additionally, falls are the most cited violation according to the Occupational Safety and Health Act (OSHA). The intent of this guide is to establish criteria for fall protection programs in order to heighten awareness and protect all Navy personnel exposed to fall hazards in the workplace.

1.3 APPLICATION:

This guide applies to all Navy Ashore Activities where there is a need for a fall protection program to ensure the safety of all personnel (military and Dept. of Navy civilians). It provides information on standards, regulations, and formal criteria for the protection of personnel and workers exposed to fall hazards.

1.4 SCOPE:

The scope of this guide is to develop a managed fall protection program and to provide the requirements and criteria for fall protection for potentially affected workers exposed to fall hazards on US Navy Ashore Activities.

This guide provides:

a. Definitions applicable to fall protection.
b. Criteria for a managed fall protection program, the use of the fall hazard assessment and survey process, and fall-hazard analysis.
c. The training requirements, duties, and responsibilities for fall protection workers.
d. The fall protection guidelines for specific common working conditions (roof work, communication towers, scaffold work, etc).
e. Criteria for the inspection, maintenance, storage, and care of fall protection equipment and assemblies.
f. The requirements for a fall protection and prevention plan.
g. The criteria for the design, identification, use, certification, and inspection of anchorages and tie off considerations.
h. Considerations and responsibilities during design, construction, operations and maintenance activities.
i. A discussion with examples and solutions for common fall protection conditions.
j. Use of fall protection work-plan matrix to identify fall hazards in workplaces.
k. A sample fall protection program instruction.
l. Discussion on the inspection, design, and installation of horizontal lifelines.

1.5 BASIC REQUIREMENT FOR FALL PROTECTION:

The threshold limit for providing fall protection is mandated by the US Code of Federal Regulations (CFR). Depending on the standard used, this height can be from four to six feet high.

The standard fall protection height for federal employees (military and civil service) on US Navy Ashore Facilities is 4 feet as per 29 CFR 1910, Subpart D.

Federal employees on public shipyards shall adhere to 5 feet as per 29 CFR 1915.

Construction site workers shall adhere to the threshold height of 6 feet, as per US Army Corps of Engineers (USACE), Safety and Health Requirements Manual EM 385-1-1, and 29 CFR 1926.500, Subpart ‘M”, Construction Industry Standards.

The following is a table indicating the threshold limit for various industries, at what height fall protection is required:

Industry	Feet	Standard Regulations Source
Contractor Construction	6	EM 385-1-1 29 CFR 1926.500
General Industry	4	29 CFR 1910
Shipyard	5	29 CFR 1915.159
Marine Terminals/ Longshoring	8	29 CFR 1918

Ashore activities may prescribe more stringent threshold requirements for federal employees as required, due to the site-specific facility needs.

1.6 COMPLIANCE:

The 29 CFR 1960 and Section 19 of the Occupational Safety and Health Act (OSHA) of 1970 prescribes requirements for federal employment occupational safety and health programs and contains provisions to assure safe and healthful working conditions for federal employees. Under Section 19 of OSHA and 29 CFR 1960.16, federal agencies' Occupational Safety and Health (OSH) programs shall be consistent and in compliance with the standards promulgated under Section 6 of the Act of 1970. Section 6 of OSHA has been directed by rule by the Secretary of Labor to promulgate the 29 CFR 1910.

Federal employees should comply with the 29 CFR 1910 requirements of four feet as stated under Subpart D, Walking-Working Surfaces, unless there are other alternate promulgated standards that are more specific to an Activity, Command, or industry, such as the five feet requirement for Shipyards and six feet requirement for Construction.

Therefore, fall protection must be provided each employee on any elevated surface ABOVE 4 FEET including working from ladders – where there is a possibility of a fall to a lower level, onto dangerous equipment, or environment or onto impalement hazards.

Exceptions: (1) When climbing OSHA compliant ladders, or (2) when erecting or dismantling supported scaffolds when it is determined by a competent person that providing fall protection is not feasible and creates a greater hazard (for example: when it is necessary to erect scaffolding before a structure that the scaffold accesses is erected or put in place).

All regulations and standards for fall protection and health and safety contain minimum requirements, DoD Instructions 6055.1 do not preclude DoD authorities from prescribing supplementary requirements for special conditions over which the DoD itself, or in coordination with other federal agencies, exercises statuary authority for safety and health matters. Generally, DoD Instruction 6055.1 does not apply to DoD contractors, except for provisions covering inspection requirements.

1.7 REGULATIONS/STANDARDS:

1.7.1 US Army Corps of Engineers (USACE), Safety and Health Requirements Manual, EM 385-1-1, current edition; shall be included and enforced on all DoD contracts involving construction, dismantling, demolition or removal work. Contractors performing such work shall comply with all pertinent provisions of the latest version of the manual (FAR 52.236-13);

1.7.2 29 CFR, PART 1926.500, Subpart M, Fall Protection Requirements in the Construction Industry;

1.7.3 29 CFR, PART 1910, Occupational Safety and Health Standards;

1.7.4 29 CFR PART 1915, Occupational Safety and Health Standards for Shipyard Employment;

1.7.5 29 CFR PART 1918, Safety and Health Regulations for Longshoring;

1.7.6 29 CFR PART 1960, Basic Program Elements for Federal Employee Occupational Safety and Health Programs;

1.7.7 Department of Defense Directive 6055.1, Occupational Safety and Health Program;

1.7.8 American National Standard Institute (ANSI) Z359.1 (R 1999), Safety Requirements for Personal Fall Arrest Systems, Subsystems and Components;

1.7.9 Navy Federal Guide Specification (NFGS)-01525, Safety Requirements;

1.7.10 OPNAVINST. 5100.23 (series), Navy Occupational Safety and Health (NAVOSH) Program Manual;

1.7.11 NAVFACINST 5100.11J.

End of Section

2.0 DEFINITIONS

Activation Distance: Distance required to lock-off or to activate a self-retracting lifeline/fall arrester.

Anchorage: A secured structure that can safely withstand forces exerted by fall arrest and rescue equipment. The structure can be in the form of a beam, girder, column, or floor. Anchorage is either engineered or improvised. The anchorage must be capable of withstanding a minimum force of 5,000 pounds per person, or engineered by a qualified person for twice the maximum arresting force.

Anchorage Connector: The means by which a fall arrest system is secured to the anchorage. This can include a steel cable sling, anchor strap, load-rated eyebolt, tripod, davit arm, or any other device designed to suspend human loads and capable of withstanding forces generated by a fall. **(See Figures 1 and 2.)**

Arresting Distance: The total vertical distance required to arrest a fall. Includes activation and deceleration distance. Does not include free-fall distance.

Arresting Force: Force exerted on a worker or test weight when a fall protection system stops a fall. The amount usually expresses the peak force experienced during a fall.

Authorized Person (End User: A person approved by the employer to perform a specific type of work at heights and at a specific location; a person who is trained on the use of fall arrest equipment.

Body Belt: A strap with means both for securing it about the waist and attaching it to a lanyard, lifeline, or deceleration device. **(Use in fall arrest is system prohibited after January 1998).**

Body Harness: Means of configuration of connected straps secured about the employee in a manner that will distribute the fall arresting forces over at least the upper thighs, waist, shoulders, chest and pelvis, with means for attaching a lanyard to other components of the personnel fall arrest system. Full-body harness is the only body support device allowed by OSHA when a free fall distance exceeds two feet. **(See Figure 3.)**

Body Restraint System: An application of the fall protection equipment, in which horizontal travel is restricted, preventing exposure to fall hazards. The system consists of a strap device, such as chest harness or full-body harness that can be secured around a worker and attached to a load-bearing anchorage in order to restrict travel and limit fall hazards. The strap can be single or multiple. **(See Figure 4.)**

Buckle: A connector used for attaching the strap or webbing segments together or to themselves. **(See Figures 5 and 6.)**

Cable Grab: A fall arrest device that locks by either a cam lock (locking arm) or inertia when a free fall is sensed. It is attached to a worker directly or by a lanyard that slides up or down a fixed or vertical cable or rope lifeline. **(See Figure 7.)**

Carabiner: A connector component generally consisting of an oval or trapezoidal shaped body with a closed gate or similar arrangement. **Only self-locking carabiners are acceptable for use.** **(See Figure 8.)**

Competent Person (CP) for Fall Protection: A person who is capable of identifying hazardous or dangerous conditions in the personal fall arrest system or any component thereof, as well as in their application and use with related equipment and have the authority to take prompt corrective measures to eliminate the hazards of falling. **(See qualified person for design knowledge.)**

Connector: A device that is used to couple (connect) parts of the personal fall arrest system 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 body belt or body harness, or a snap hook spliced or sewn to a lanyard or self-retracting lanyard).

Connecting Means: The method to connect a body support to an anchorage, such as a lanyard or a carabiner for the purpose of providing protected mobility for an elevated work task.

Controlled Access Zone (CAZ): A zone to restrict access to leading edge work. The CAZ is bound by a control line and should run the full length of the leading edge and connect on each side to a guardrail or wall. The control line can be made of rope, wire, tape, or equivalent material and shall be supported by posts and marked with a highly visible material. **CAZ is used when a guardrail system, fall arrest systems, or safety nets cannot be used or installed.**

Critical Sag: Is the deflection of a HLL where the arresting force exactly equals the weight of the worker. The worker's speed of fall does not decrease until the sag of the line is greater than the critical sag. Critical sag is a very important consideration for long-span HLL with in-line energy absorber.

Deceleration Device: Any mechanism, such as a rope grab, rip-stitch lanyard, specially-woven lanyard, tearing or deforming lanyards, automatic self-retracting lifelines/lanyards, etc., that serve 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: 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 locations of an employee's body belt or 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.

D-ring: A connector used in a harness or a positioning belt as an attachment element or fall arrest attachment. It is also used in lanyards, energy absorbers, lifelines, and anchorage connectors as an integral connector. D-rings can be used for work positioning and restraint.

Energy (Shock) Absorber: A component whose primary function is to dissipate energy and limit deceleration forces that the system imposes on the body and the anchorage system during fall arrest. **(See Figure 9.)**

Engineered Anchor: An anchorage designed and approved by a qualified person.

Failure: Load refusal, breakage, or separation of component parts. Load refusal is the Point where the ultimate strength is exceeded.

Fall Arrest System: A combination of equipment and components connected together, designed to stop a person from striking a lower level or an obstruction during a fall.

Fall Prevention: The elimination and minimization of potential fall hazards, lessening the chance of employee exposure to falls. Any same-level means used to reasonably prevent exposure to a fall hazard; examples of fall prevention are guardrails, walls, floors, and area isolation.

Fall Protection: Action and procedures to effectively protect a worker from fall hazards.

Fall-Restraint System: A system designed to restrain a worker from reaching an exposed fall hazard. System includes personal fall protection equipment, acceptable anchorage systems, and trained worker and administrative procedures. **(See Figure 4.)**

Force Factor: The ratio of peak arresting force using rigid weight compared to a human body having the same weight, both falling under identical conditions. For comparison between rigid weight and human body weight, multiply the rigid weight by 1.4 to allow for body comparison.

Free Fall: The act of falling before a personal-fall-arrest system begins to apply force to arrest a fall.

Free-Fall Distance: The vertical distance from the onset of a fall to a point where a fall-arrest system is activated or engaged. (This is 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, 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: See the definition of Body Harness.

Horizontal Lifeline (HLL): A fall arrest system that uses a line made from rope, wire rope or metal railing that spans horizontally between two end anchorages. The assembly includes the necessary connectors, turnbuckles, in-line energy absorbers, shackles, etc. and may include intermediate anchorages. This is a component of a fall protection system, which consists of a trained worker wearing appropriate fall protection equipment that enables them to safely traverse/work in the horizontal plane. The HLL shall be designed, installed, and used under the supervision of a qualified person. **(See Figures 10 and 11.)**

Ladder Climbing (Safety) Device: A device or climbing sleeve **connected to the front D-ring on the climber's full-body harness** that slides up or down a rigid rail or cable. Should a fall occur, the device is designed to lock by inertia or cam action to arrest the fall. **(See Figure 12.)**

Lanyard: A flexible line of rope, wire rope, or strap that generally has a connector at each end for connecting the body harness or body belt to a deceleration device, lifeline, or anchorage. **(See Figure 9.)**

Leading Edge: The unprotected side and edge that exposes a worker to a fall hazard. It means the edge of a floor, roof, or formwork for a floor or other walking/working surfaces.

Lifeline (LL): A component consisting of a flexible line for connection to an anchorage at one end, to hang vertically (vertical LL), or for connection to anchorage at both ends to stretch horizontally (HLL), and which serves as a means for connecting other components of a personal-fall-arrest system to the anchorage.

Maximum Arresting Force (MAF): The peak force exerted on the body or test weight when a fall protection system stops a fall.

Personal-Fall-Arrest System: A system used to arrest an employee in a fall from a working level. It consists of an anchorage system, connecting means, and body harness or body belt, and may include a lanyard, deceleration device, lifeline, or suitable

combination of these. **As of January 1, 1998, the use of body belt for fall arrest is prohibited.**

Positioning Belt: A single or multiple straps that can be secured around a worker's body to hold the user in a work position. A positioning belt shall not be used for fall arrest.

Positioning Device System: A combination of equipment that permits the user to have both hands free while being supported on an elevated vertical surface. **(See Figure 13.)**

Qualified Person (QP) for Fall Protection: A person with a recognized degree or professional certificate and extensive knowledge and experience in the subject field of fall protection who is **capable of performing design, analysis, evaluation, and specifications in fall protection system and equipment.** Note: for additional qualifications see section 6.1.

Restraint System: See fall restraint system definition.

Retracting Lifeline: Same as the Self-Retracting Lanyard.

Rollout: An action by which a snap hook or carabiner unintentionally disengages from the component to which it is attached.

Rope Access: A rope access suspended system consisting of two lifelines independently anchored at the top to protect the authorized person from falling. The ropes directly suspend the person. The technique is used on buildings, bridges, and other structures for conducting inspection, cleaning, and painting.

Rope Grab: A deceleration device that travels on a lifeline and automatically, by friction, engages the lifeline and locks to arrest the fall of a worker. A rope grab usually employs the principal of inertial locking, cam/level locking, or both. **(See Figure 7.)**

Sag: The distance the wire rope deviates from the horizontal plane established by the end anchor points. This is defined by the line between two anchor points and measuring downward at the mid-point of the wire rope.

Self-Retracting Lanyard (SRL): A deceleration device containing a drum-wound line which can be slowly extracted from, or retracted onto, the drum under slight tension during normal employee movement, and which, after onset of a fall, automatically locks the drum and arrests the fall. **(See Figure14.)**

Shock Absorber: A component of a fall protection system that dissipates energy by deformation, or extending the deceleration distance. **(See Figure 9.)**

Snap Hooks: A connector comprised of a hook-shaped body with a normally closed gate or similar arrangement, which may be opened to permit the hook to receive an object and when it is automatically released, closes to retain the object**. Only self-locking (single or double locking) snap hooks are acceptable for use. (See Figure 15.)**

Swing fall: A pendulum-like motion that can result from moving horizontally away from, or toward, a fixed anchorage and falling. Swing falls generate the same amount of force when falling the same distance vertically. Swing fall has the hazards in both the horizontal direction (swinging into obstruction0 and vertical (falling onto obstructions or ground).

Toe-Board: A deck level protective barrier that will prevent the fall of materials and equipment to lower levels.

Total Fall Distance: The vertical distance between the anchorage location and connecting point on the body (generally, the harness D-ring) after the fall is arrested, which includes the free fall and deceleration distances.

Vertical lifeline (VLL): A vertically suspended flexible line connected at the upper end to an overhead anchorage and along which a fall arrester travels.

Warning Line System: A barrier erected on a roof to warn workers that they are approaching an unprotected roof, side, or edge and which designates an area which roofing work may take place without the use of guardrail, body harness, or safety net systems to protect workers in the area. Work performed outside barriers will require fall protection systems. **The difference between the CAZ and the Warning Line system is that when using CAZ, approved anchorages cannot be provided to tie off the worker.** A safety person is required whose only job is observation and ensuring a safe working environment. **(See Figure 16.)**

Walking/Working Surface: Any surface, whether horizontal or vertical on which an employee walks or works, including, but not limited to, floors, roofs, ramps, bridges, runways, form work, and concrete reinforcing steel (but not including ladders, vehicles, or trailers), on which employees must be located in order to perform their job duties.

End of Section

3.0 FALL PROTECTION PROGRAM

Each Navy Ashore Activity which has personnel exposed to falls from height is required to establish a fall protection program. The program includes identification and elimination of fall hazards--whenever practical--through engineering controls, training of personnel, proper installation and use of fall protection systems, and required rescue equipment and procedures.

3.1 A Managed Fall Protection Program Should Include the Following:

a. Command Policy;
b. Duties and Responsibilities;
c. Workplace Assessment and Surveys of Fall Hazards;
d. Fall-hazard Prevention and Control, Including the Preparation of Fall Protection and Prevention Plans;
e. Education and Training Requirements;
f. Inspection, Storage, Care, and Maintenance of the Equipment;
g. Rescue and Evacuation Procedures;
h. Audits and Evaluation.

Appendix C of this Guide includes Sample Fall Protection Instructions to help various Navy Ashore Activities establish site-specific fall protection programs.

3.2 Fall-Hazard Assessment and Surveys:

Workplace assessment and survey will help identify potential fall hazards at the workplace. The gathered information will provide documentation to assist in the development of viable solutions to protect personnel exposed to fall hazards. Understanding work procedures and how a person conducts the required task is very important in the selection and development of the most appropriate fall protection method. Fall-hazard assessment and surveys will help identify options for fall-hazard elimination and/or selecting other control measures. The survey information, required to identify fall hazards at a building or facility, may include:

a. Interview of Authorized Person(s) and their supervisors.
b. Work-paths and Movement of the Authorized Person.
c. Range of Mobility in Each Fall-Hazard Zone.
d. Location and Distances to Obstructions.
e. Potential Anchorage Location, if a Fall Hazard Cannot Be Eliminated.
f. Total Fall Clearance.

g. Number of Personnel Exposed to Fall Hazards.
h. Frequency and Duration of Exposure.
i. Lock-Out/Tag-Out Hazards.
j. Potential severity of the fall.
k. Access to Fall-hazard Area.
l. Floor and Other Surfaces.
m. Review of Any Mishap Reports at the Facility.
n. Identify the Presence of Any:
    (1) Hot objects, sparks, flames, and heat-producing objects
    (2) Electrical and chemical hazards
    (3) Sharp objects
    (4) Abrasive surfaces
    (5) Moving equipment and materials
    (6) Impact of weather factors
    (7) Any other maintenance, work environment issues or conditions

3.3 Fall-Hazard Analysis:

After conducting the survey, a fall-hazard analysis can be performed to determine the risk assessment, hazard severity, and fall mishap probability in accordance with the requirements in OPNAVINST.5100.23 series. This will help in the prioritizing of hazard ranking and the selection of the most viable fall protection solutions.

It is still the primary consideration to eliminate/remove potential fall hazards.

End of Section

4.0 TRAINING REQUIREMENTS

4.1 All Navy personnel at Ashore Facilities who are exposed to fall hazards shall be trained to recognize the hazards of falling in the workplace and how to minimize such hazards.

4.2 Before using the fall protection equipment, the employee must be trained in its safe use. It is recommended that all employee exposed to fall hazards receive a minimum of 16 hours, or as appropriate.

4.3 Retraining shall be provided as necessary for employees to maintain an understanding of these subjects.

4.4 A written certification of training is required and shall be maintained at the job site for the duration of the work. The certificate shall identify the employee trained, date of training, and the signature of the trainer. Additionally, a determination shall be made as to whether has resulted in personnel acquiring the required skills and knowledge.

4.5 It is highly recommended that a daily "Tool Box" meeting be conducted before work is begun to discuss fall hazards for that day and to remind workers to comply with the established fall protection procedures. Workers who receive adequate training in fall protection will be tracked in the Tool Box meetings.

4.6 For Navy personnel who may be in a situation that requires climbing involving the use of fall arrest systems, the Authorized Person Training shall also include practical climbing in a controlled situation in the presence of a competent person. Additionally, authorized personnel shall be trained in rescue and self rescue procedures.

4.7 Hands-on training is also required for investigation and inspection work.

4.8 All Navy architects, engineers, and in-house designers involved in planning and designing buildings, facilities, and structures should be trained to incorporate fall protection and prevention control measures into their design work to help contractors during the construction phase and to provide protection to Navy personnel performing their work during the maintenance phase.

4.9 The training should emphasize that fall hazards should be eliminated, and if they cannot, there should be a mechanism in place for preventing or protecting workers from such hazards.

4.10 The following training matrix requirements and methods identify the degree of training for various Navy personnel:

Fall Protection Training Requirements and Methods

Trainee GROUP	Desired Training Objectives	Training Mechanism And Type
End User/Authorized Person	- Selection and safe use of equipment - Application limits - Proper anchoring and tie-off techniques - Estimation of fall distances - Determination of deceleration distance - Total fall distance - Methods of inspection - Storage, care, and maintenance of equipment - Applicable regulations - Limitations of equipment - Specific lifelines - Rescue and self rescue techniques - Recognize fall-hazard deficiencies - Recognize fall risks at worksite	Formal/hands-on training using local equipment or on-site training as applicable to the activity (16 hours or as appropriate)
Safety Professional/ROICC Personnel	- Recognize fall-hazard deficiencies - Recognize fall risks at worksite - Basic fall protection systems inspection - Methods of use - Proper anchoring and tie-off techniques - Methods of inspection and record keeping - Storage of the equipment - Applicable regulations	Interactive CD-Rom or Formal Classroom
COTR/COR/CA Personnel	- Recognize fall-hazard deficiencies - Recognize fall risks at a worksite - Basic systems identification and proper use of equipment.	Formal Classroom (Awareness Training)
Competent Person (As Designated by the Activity) or	- In addition to the authorized person training, the competent person training shall also include:	- Formal Classroom with Hands-on practical applications

(Designated in Writing as the Competent Person)	-Various fall protection systems - Donning of the equipment - Proper inspection and record keeping - Recognize and identify fall hazards at work-site - Equipment installation techniques - Proper anchoring and tie off techniques - Risk assessment and hazard ranking - Review and approval of fall protection and prevention plans, and rescue and evacuation plans - Applicable fall protection regulations - Plan and specification review and approval	(40 hours or as appropriate)
Qualified Person	- Design, select, analyze, and certify fall protection systems and equipment - Preparation, update, review, and approve of fall protection and prevention plans, and rescue and evacuation plans - Fall protection regulations and standards - Plan and specification review and approval	- Formal Classroom (40 hours or as appropriate)
Architects and Engineers	- Understand various FP planning and design considerations during construction and maintenance phases - Recognize fall-hazard deficiencies - Recognize fall risks assessment and control measures at worksites - Basic systems identification and proper use	- Formal Classroom - Interactive CD-Rom (Awareness Training)
Fall Protection Program Managers/ Administrators	- Recognize and identify fall hazards at workplaces - Risk assessment and hazard ranking - Selection, safe use and limitation of fall protection systems and equipment - Storage, care and maintenance of the equipment - Applicable fall protection regulations	- Interactive CD-Rom - Train the Trainer - Formal classroom (40 hours or as appropriate)
Supervisors of End Users	- Fall protection awareness training - Familiarization with SOPs	Local Training plan/briefing, and/or

	- Local program requirements - Proper Inspection and record keeping - Proper anchoring and tie-off techniques	instruction or SOP (Awareness Training)

End of Section

5.0 FALL PROTECTION SYSTEMS and GUIDELINES

(For design requirements of fall protection systems see Chapter 10.0)

It is very important for a qualified person in fall protection to plan, evaluate, design, and select the most appropriate, safe, and efficient fall protection systems. There are many fall protection systems that are available or can be used and it is of the utmost importance to select the right system for a specific work application. Complete understanding of work procedures will enable the qualified person to select the most appropriate fall protection system.

In every fall-hazard situation, it is always advisable to have two protective systems: primary and secondary systems. If the primary system fails, the secondary system will be activated to protect the employee from falling. For example, when approaching a leading edge work, the employee's primary protective system is their feet. Therefore, a secondary protective system is required as a backup, such as a fall arrest/restraint system or guardrails. When climbing a ladder or a pole, the employee's primary fall protective system is their hands and feet. A ladder-climbing device is required as a secondary backup system.

5.1 Fall Protection Systems

Every employee exposed to fall hazard shall be protected from falling to a lower level by the use of fall protection systems. The main fall protection systems are:

- **Guardrail Systems**
- **Safety Nets**
- **Fall Arrest System**

5.1.1 Guardrail System is a conventional method for the prevention of falls from heights. The guardrail should have a top rail, mid rail, posts, and toe board.

Note: A continuous screen mesh can replace the mid rail if it is installed with 200 pounds strength it leaved no vertical opening greater than 19 inches.

5.1.2 Safety Nets are installed below the leading edge for employee protection or when working over water.

5.1.3 **Fall Arrest System** consists of the following subsystems and components:

- **Anchorage System -** includes anchorage point and anchorage connection.
- **Connecting Means -** includes lanyard (may include shock absorber, snap hooks, and carabiners, self retracting lanyards, or fall arrestors.
- **Body Support**
- **Rescue and Escape -** self-rescue or assisted rescue.

(For Fall Arrest System Checklist see Appendix G)

5.1.4 Other Fall Protection Systems Include:

- **Horizontal Lifelines**
- **Vertical Lifelines**
- **Ladder Climbing Devices**
- **Positioning Device Systems**
- **Restraint Systems**
- **Controlled Access Zone**
- **Warning Line System**
- **Arial Lifting Equipment, Working Platforms, and Catwalks**
- **Falling Object Protection**
- **Rope Access**
- **Covers**

Note: The fall arrest system is a passive system. The system will become activated when a fall is arrested. Fall arrest system is also considered a secondary system.

5.2 Fall Protection Guidelines

5.2.1 Communication Towers

Maintenance Work:

- The preferred method for accessing exiting towers to perform maintenance work is by the use of fixed ladders with attached climbing devices because it provides conventional fall protection during ascent and descent of the structure.

- To secure permanent anchorage on the tower, the first worker up requires a portable anchor, full-body harness, use of a self retracting lanyard (SRL), ladder climbing device or rope grab;
- After permanent anchorage is secured in place, workers that follow the first person up will require full-body harness, a SRL, vertical lifeline, ladder climbing device and/or rope grab;
- When working on towers, workers are required to wear fall protection equipment at all times.

Towers Erection:

(OSHA CPL 2-1.36 Interim Inspection Procedures During Communication Tower Construction Activities):

- For accessing the tower during construction activities, workers must be protected from falls using a fall arrest system or ladder climbing devices.
- For tower access, workers can be hoisted using a gin pole or other hoisting mechanism;
- When employees are at their workstations fall protection shall be provided.
- Hoist line may be used to hoist workers for access to tower work. The rigging line or hoist shall have a factor of safety of 10 against failure during personnel lift.
- A trial lift and proof testing shall be conducted on the hoisting equipment prior to lifting of employees.
- When working on towers, 100% fall protection is required at all times;

5.2.2 Roof Work:

- On slopped roofs: Use a full-body harness, SRL, roof brackets/anchors for anchorage points (single or multiple connections designed for 5000 pounds per person). Also use slide guards;
- On flat roofs with no parapet or guardrails: When working 6 feet from the edge, use a full-body harness, restraining system, and or lanyard/SRL. Establish a warning line system six to ten feet away from the leading edge or temporary guardrails for workers without fall arrest system. Personnel working within the warning line system do not require fall protection.

5.2.3 Leading Edge Work:

- Use horizontal lifelines, full-body harness, lanyard/SRL, roof anchors, guardrail system, and a restraining system.

5.2.4 Scaffold Work:

- Use guardrails, cross bracing or full-body harness, and lifelines. During erection and dismantling operations it is highly recommended to have a fall protection system.
- On supported scaffolds over 20 feet high, use staircases instead of ladders to access the scaffold.

5.2.5 Suspended Scaffolds (single and two point suspended scaffolds):

- The scaffold shall have guardrail and the use of an independent vertical lifeline for every worker connected to a full-body harness. **(See Figure 17.)**

5.2.6 Aerial Lifting Equipment:

- Use a full-body harness, lanyards connected to approved anchorage;
- Workers will require fall arrest system if the lifting equipment is positioned outside the wheel-base, even if the equipment is has guardrail system;
- **The manufacturer of Aerial Lift can modify the old equipment by installing approved anchorage connections to tie off for the use of a fall arrest system. Usually guardrails in the aerial lifting equipment are not designed to withstand the force generated by a fall and cannot be used and anchorages.**

5.2.7 Confined Space Entry:

- When entering a confined area, and if there is a hazard of exposure to vertical fall, the person entering such space shall be tied to lifeline or SRL and rescue and retrieval equipment. A co-worker should be able to retrieve the victim utilizing the retrieval mechanism from outside the confined space without any difficulty. **(See figure 18.)**

5.2.8 Excavated Trenches or Holes More Than Six Feet Deep:

- Provide temporary guardrail systems on both sides of the trench, or around holes, or establish a warning line system. Any person crossing this line or guardrails is required to have fall protection.

5.2.9 Covers

- Covers shall be capable of supporting, without failure, at least twice the weight of the employee, their equipment, and their material combined.
- Covers should be secured when installed, color-coded, and clearly marked with the word ”HOLE, or COVER."

5.2.10 Scissors Lift/Mobile Scaffolds

- Use guardrails

- **When using scissors lift, it is highly recommended to tie off to a manufacturer approved anchorage connection using full body harness at all times in addition to the guardrail.**

5.2.11 Safe Work Practices on Ladders and Stairs

5.2.11.1 Fixed ladders

- An employee shall not perform work from a fixed ladder unless he/she is wearing fall protection; such as a full body harness attached to a ladder climbing device or self-retracting lanyard which in turn is attached to a properly designed and installed anchorage.
- If the worker cannot perform the work with both feet and one hand on the ladder, the employee will have to be protected by more than a harness and lanyard connected to a ladder safety device. The tie-off type support shall meet the requirements of a boatswain's chair or other single point adjustable scaffold.
- Fixed ladders shall be provided with cages, wells, ladder safety devices, or self-retracting lifelines whenever the length of climb equals or exceeds 24 feet. Also, one or more of these safety devices must be provided on a ladder where the length of climb is less than 24 feet if the fall from that ladder can exceed 24 feet to the lower level (for example: 6 foot section of a fixed ladder located 25 feet above the lower level).
- If the total length of the climb on a fixed ladder equals or exceeds 24 feet, the following requirements must be met: fixed ladders must be equipped with either (a) ladder safety devices; (b) self-retracting lifelines and rest platforms at intervals not to exceed 150 feet; or (c) a cage or well, and multiple ladder sections, each ladder section not to exceed 50 feet in length. These ladder sections must be offset from adjacent sections, and landing platforms must be provided at maximum intervals of 50 feet." Also, "fixed ladders must be provided with cages, well, ladder safety devices, or self-retracting lifelines where the length of climb is less than 24 feet but the top of the ladder is at a distance greater that 24 feet above lower levels" (in-other-words if the fall from that ladder can exceed 24 feet to the lower level, for example: 6 foot section of a fixed ladder located 25 feet above a lower level). [OSHA 3124 (1997 Revised) Stairways and Ladders].
- The step-across distance between the center of the steps and rungs of fixed ladders and the nearest edge of a landing area must be no less than 2-1/2 inches and no more than 12 inches.

- All ladder climbing safety devices must permit the worker to ascend or descend without continually having to hold, push, or pull any part of the device, leaving both hands free for climbing. These safety devices must be activated within 2 feet after a fall occurs. Ladder climbing safety devices shall be attached to a frontal centered D-ring or other specifically designed centered frontal attachment point on a full body harness.
- The side rails of through or side-step ladder extensions must extend 42 inches above the top level or landing platform served by the ladder.

Note: Although allowed by OSHA, Ladder cages are not a safe fall protection method. They cannot stop a fall.

5.2.11.2 Portable and Extension Ladders (Non-Self- Supporting)

- Ladder shall be so placed as to prevent slipping, or it shall be lashed, or held in position;
- An employee may perform work from a non-self-supporting portable ladder placed at the correct angle and properly secured (e.g. lashing top and bottom), if the employee is facing the ladder and his/her body is between the side rails, and he/she uses one hand to grasp the ladder and both feet are on the ladder rungs.
- Non-self-supporting ladders must be used at an angle where the horizontal distance from the top support to the foot of the ladder is approximately one-quarter of the working length of the ladder.
- An employee must use at least one hand to grasp the ladder when climbing, and when ascending or descending the climber must face the ladder.
- An employee shall not stand or work from the top three rungs of a non-self-supporting portable ladder.
- The spacing of rungs or steps of a portable ladder shall be on 12-inch centers and the minimum width between side rails of a straight ladder or any section of an extension ladder shall be 11.5 inches.
- The length of single ladders or individual sections of ladders shall not exceed 30 feet. Two section ladders shall not exceed 48 feet in length, and over two-section ladders shall not exceed 60 feet in length.
- When portable ladders are used for access to an upper landing surface, the side rails must extend at least 3 feet above the upper landing surface. When such an extension is not possible, the ladders must be secured, and a grasping device such as a grab rail must be provided to assist workers in mounting and dismounting the ladder. In no case shall the extension be such that ladder deflection under load would, by itself, cause the ladder to slip off its support.

- The top of a non-self-supporting ladder must be placed with two rails supported equally unless it is equipped with a single support attachment.
- Do not paint wooden ladders – paint hides defects and can create a slippery climbing surface.
- Single-rail ladders shall not be used.
- An employee shall not carry any object or load that could cause the employee to lose balance and fall.

5.2.11.3 Portable Ladders- Self-Supporting (Stepladders)

- Neither the top of a stepladder nor the step below the top of the ladder (top step) shall be used as a step, nor used to stand on while performing work.
- Do not use a closed stepladder as a straight ladder - it may slip out.
- Stepladders shall not exceed 20 feet in length.
- The steps of a stepladder must be corrugated, knurled, dimpled, coated with skid-resistant material, or treated to minimize slipping.

5.2.14 Stairways

- Stairways having four or more risers, or rising more than 30 inches in height must have at least one handrail. A stairrail also must be installed along each unprotected side or edge. When the top edge of a stairrail system also serves as a handrail, the height of the top edge must be no more than 37 inches nor less than 36 inches from the upper surface of the stairrail to the surface of the tread.
- Midrails, screens, mesh, or intermediate vertical members must be provided between the top rail and stairway steps to the stairrail system. Intermediate vertical members when used must not be more than 19 inches apart.
- Unprotected sides and edges of stairway landings must be provided with standard 42-inch (+ or - 3 inches) guardrail systems.
- If the unprotected side or edge is protected by a 42 inch (+ or - 3 inches) standard railing or protected by a wall there also must be installed a handrail of not more that 37 inches nor less than 36 inches from the upper surface of the stairrail system to the surface of the tread on at least one side of the stairway.

End of Section

6.0 DUTIES and REPONSIBILITIES of QUALIFIED, COMPETENT PERSONS and FP PROGRAM MANAGERS

6.1 Qualified Person (QP):

The duties and responsibilities of the qualified person include the following:

- Prepare, review, approve, and modify:
  - Fall Protection and Prevention (FP&P) Plans;
  - Rescue and Evacuation Plans (REP);
- Design, select, certify, evaluate, and analyze Fall Protection Systems and Equipment;
- Review, prepare, and approve Fall Protection (FP) Specifications;
- Prepare contract documents for FP systems.

6.2 Competent Person (CP):

The duties and responsibilities of the competent person include the following:

- Implementation of:
  - FP&P Plans;
  - Rescue and Evacuation Plans (REP);
- Identify Hazardous and Dangerous Conditions in the workplace;
- Inspection and installation of approved fall-protection systems;
- Compliance with FP&P plans and REP plans;
- Training of all workers exposed to fall hazards;
- Understanding and knowledge of fall protection systems and equipment;
- Conduct inspection and accident investigations;
- Have full responsibility and authority to implement the FP&P Plans and REP at the workplace;
- Have only one task, which is to monitor employee compliance with FP&P Plans and REP requirements.

6.3 FP Program Manager/Administrator

- Managing the fall protection program at the activity
- Writing FP procedures
- Develop FP training programs
- Develop and approve equipment purchase list

End of Section

7.0 INSPECTION, MAINTENANCE, STORAGE, and CARE PROCEDURES for FALL PROTECTION EQUIPMENT

As stated in 29 CFR 1910.66 Appendix C, Section I, Paragraph (f), personal arrest systems must be regularly inspected. **Any component of the system with significant defects such as: cuts, tears, abrasions, mold, undue stretching, alterations or additions, which will affect its efficiency, and damage due to deterioration, contact with fire, acids, or corrosives, distorted hooks or faulty springs, tongues unfitted to the shoulder buckles, loose or damaged mountings, nonfunctional parts and any wearing or internal deterioration of the ropes must be taken out of service immediately and should be tagged or marked as unusable or destroyed.** All FP equipment shall be inspected before each use by the user and by a competent person at intervals of no more than one year (ANSI Z359.1 [6.1.1]). Inspection of the equipment by the competent person should be documented. All components and sub-components of the selected fall arrest, positioning, and restraint systems shall be compatible.

As a general rule, always consult equipment manufacturers' recommendations for use, inspection, care and maintenance.

Note: For Fall Protection Equipment Inspection Checklist see Appendix F.

7.1 Anchorage Systems:

a. Inspect all components of the anchorage systems.
b. Observe any abrasions, wear points, damaged threads, or swags in the sling material before use.
c. For synthetic slings and anchor straps inspect all sewing and loops for wear, chemical damage, burn damage, and/or ultraviolet deterioration.
d. Refer to the anchorage-attached tags to determine when the sling should be retired.
e. Inspect cable slings for excessive damage to the steel fibers.
f. Certify the anchorage system exposed to weather or corrosive conditions.

7.2 Snap Hooks and Carabiners:

a. Inspect on regular basis and before each use.
b. Retire snap hooks, carabiners, and all integral components if any discoloration, deformation, cracks, or abrasions are detected.
c. Retire immediately if it has sustained any fall, or if the spring brake and gate are bent, or if the gatekeeper no longer engages the slot cleanly.

e. Damaged snap hook and carabiners shall be tagged and removed from service and the inventory list.
f. Dirty snap hooks and carabiners shall be cleaned with kerosene, WD-40, or similar solvent and immersed in boiling water for 30 seconds to remove cleaning agent; dry with a soft cloth to ensure that the gate and gatekeeper operate properly.
g. Carabiners shall not be loaded along the gate side.
h. Snap hooks shall not be side-loaded.
I. Ensure that only double-locking-type gates are used.

7.3 Lanyards and Energy Absorbers:

a. Inspect lanyards put under a slight tension on a regular basis.
b. Check all components for abrasion, discoloration, cracks, and torn stitching.
c. Wash lanyards and energy absorbers on a regular basis to remove dirt and grit, which can abrade the fibers.
d. Lanyards and energy absorbers shall have a permanently attached label indicating the manufacture's name, serial number/lot number, manufacturer date, maximum elongation, maximum arresting force, maximum free fall, and capacity. The lanyards and energy absorbers must also have permanently attached labels that indicate they meet OSHA & ANSI Z359.1 requirements. **Lanyards baring the markings of ANSI A10.14 only are not acceptable and they should be taken out of service.**
e. Use and review manufacturer's logbook provided with the equipment to determine the age of the lanyard and energy absorber.
f. Lanyards and energy absorbers shall be inspected by the user prior to each use and by a competent person other than the user at least once a year.
g. Maximum usage of a lanyard shall not be more than 5 years, once put in service (assuming the new unused lanyard is stored in a climate-controlled location, [i.e., in a plastic bag not exposed to fumes, and in a cool location out of direct sunlight]). Retire the lanyard**:**
    (1) After a hard fall
    (2) When the shock absorber has been even slightly impacted
    (3) If the lanyard has been used for any other purpose other than fall protection
    (4) If the equipment show excessive wear, chemical damage, burn damage, and/or ultraviolet deterioration

7.4 Fall Arrester (Rope Grab)

a. Inspect regularly.
b. Check for signs of wear, corrosion, rust, and other anomalies.
c. If any sign of wear or malfunction, remove devise from service immediately.

7.5 Self-Retracting Lifelines (SRL):

a. Inspect before each use.
b. Inspect by a competent person once every six months and by the manufacturer annually.
c. SRL shall be returned to the manufacturer for servicing and re-certification once a year.
d. If SRL housing becomes yellow, gathers condensation, or the indicator has been engaged, remove from service immediately, and return it to the manufacturer for repair and re-certification.

7.6 Body Support (Harness):

a. Inspect on a daily basis or before each use for frayed threads, cuts, tears, or loose connections.
b. Inspect the stitched areas thoroughly.
c. Look for burn holes from welding or other heat sources.
d. Ensure harnesses are not painted or marked.
e. Store harnesses in a cool, dry, and safe environment; ideally in a locked storage area.
f. A competent person other than the user shall inspect the harness periodically, or at least once a year.
g. Wash the harness in a mild soap and rinse multiple times to remove any soap residue and hang to dry out of direct sunlight in a cool, dry environment.
h. Maintain a logbook indicating the date of entry into service, the nature of the work performed, washing the harness, or other relevant details.
i. Retire harnesses from service after five years from the date put in service (assuming the new unused harness is stored in a climate-controlled environment [i.e., in a plastic bag not exposed to fumes, and in a cool location out of direct sunlight]).
j. The body support harness shall have a permanently attached label indicating manufacturer's name, serial number/ lot number, manufacture date, capacity, and that it meets OSHA & ANSI Z359.1 requirements.

7.7 Ropes (Natural or Synthetic Fibers):

a. Inspect rope periodically for broken fibers, severely worn areas, or change in the consistency of the core; inspect under slight tension and check for soft areas, bulges, or excessive stiffness.
b. Avoid exposing rope to hazardous chemicals, moisture, acids, or oils.
c. Do not use the rope after it is impacted or damaged.
d. Wash the rope on regular basis to remove dirt or grit with lukewarm water and mild detergent; rinse several times to remove soap residue and hang in a dry, cool, dark area.

e. Store rope in a strong weatherproof bag. Rope should always be dry before placing in storage.
f. Rope shall have a permanently attached label indicating manufacture's name, serial number/ lot number, manufacture date, capacity, and that it meets OSHA & ANSI Z359.1 requirements.
g. Retire rope after five years of service. If it is damaged, impacted, or exposed to chemicals, remove from service immediately.
h. If possible, avoid the use of Kern mantle-type ropes.

7.8 Vertical Lifelines (Flexible): Refer to section 7.7 above and manufacturer's recommendations regarding inspection, care, and maintenance.

7.9 Ladder Climbing Systems:

a. Inspect on a regular basis and as per equipment manufacturer's requirements.
b. The sleeve should run freely without hand operations or guidance.
c. Check cable and rails for abrasions, wear, looseness, and cracks.
d. Before climbing, check integrity of cable, systems, and ground level.

7.10 Raising/Lowering Devices (Rescue):

a. Inspect before each use.
b. Check for wear and corrosion.
c. Refer to the rope section for additional information.

End of Section

8.0 TIE-OFF CONSIDERATIONS

One of the most important aspects of personal fall arrest is fully planning the system before it is put in use. Probably the most overlooked component of the fall-arrest system is planning for suitable anchorages. Such planning should ideally be done during the design stage and before a structure or a building is constructed so that anchorages can be incorporated and identified during construction for maximum use later for maintenance work. And, if properly planned and designed, these anchorages may be used during construction, as well as afterward during the maintenance phase.

8.1 The strength of a personal fall arrest system depends on its subsystems and components, as well as the anchorages and how strongly such a system is attached to the anchorage. Such attachment shall not significantly reduce the strength of the system, including the structural members (e.g., the beams or columns to which it is attached). If a means of attachment is used that will reduce the strength of the system, such component (i.e., beam, column) should be replaced with a stronger one in order to maintain the appropriate maximum characteristics.

8.2 Lanyards shall not be connected to themselves or to another lanyard.

8.3 Knots shall not be tied in lanyards, lifelines, or anchorage connectors (i.e., anchor straps). Tie-off using a knot in a lanyard, lifelines, or anchorage connectors can reduce the strength by 50% or more.

8.4 Tie-off of a rope lanyard or lifeline around an “H” or “I” beam or similar support can reduce the strength drastically due to cutting action of a sharp edges of the beam. Tie-off should not be used around a beam, unless it is specifically designed for that tie-off application.

8.5 Tie-off around rough or sharp surfaces reduces the strength of the line and drastically affects the design reaction of the system in a fall. Such tie-off should be avoided or alternate tie-off rigging should be used, such as snap hook/D-ring connection, wire rope tie-off, an effective padding of the surfaces, or an abrasion-resistance strap around or over the sharp or rough surfaces.

8.6 The anchorage location should be as high as possible to minimize the free fall distance and prevent any contact with an obstruction or the ground below if a worker falls. Free-fall distance shall not exceed six feet. The anchor point height shall reflect this restriction.

8.7 Tie-off point(s) shall be located in such a way to minimize the swinging of the worker (pendulum-like motion) that can occur during a fall. The farther away in a

horizontal direction a worker moves from a fixed tie-off point, the greater the swinging angle if a fall occurs. If any obstruction exists in the path of the swing fall, the force generated by such a fall can be significant. The maximum angle of swing away from the tie-off point should not be more than 30 degrees.

8.8 The strength of an eyebolt is rated along the axis of the bolt and its strength is greatly reduced if the force is applied at an angle to this axis. Also, the diameter of the eyebolt should be compatible to snap hook or carabiner attachment. Non-rotating rings should be avoided, since falls rarely occur directly along the axis of the eyebolt. Where possible, rotating rings with full motion in the three axes should be used. The ring will then be able to automatically align along the direction of force. The eyebolt used in the fall protection system shall be forged. Effort shall be made to minimize the angle between the axis of the eyebolt and the direction of the pull.

8.9 Horizontal lifelines, depending on their geometry and angle of sag, may be subjected to greater loads than the impact load imposed by an attached component. When the angle of sag for the horizontal lifeline is less than 30 degrees, the impact force generated is greatly amplified. For example, with a sag angle of 15 degrees, the force amplification is about 2:1 and at 5 degrees sag, it is about 6:1. Depending on the angle of sag, and the line's elasticity, the strength of the horizontal lifeline and the anchorages to which it is attached should be increased a number of times over that of the lanyard. Extreme care should be taken in considering a horizontal lifeline for multiple tie-off. The reason for this is that in a multiple tie-off to a horizontal lifeline, if one employee falls, the movement of the falling worker may cause other employees to also fall. Horizontal lifeline and anchorage strength should be calculated for each additional employee to be tied-off. For these and other reasons, horizontal lifelines shall only be designed, selected, and certified by qualified persons. Testing of installed horizontal lifelines and anchors before use is recommended. **(See Figures 10 and 11 for HLL and 19 thru 22 for anchorage connection.)**

End of Section

9.0 FALL PROTECTION and PREVENTION (FP&P) PLANS/RESCUE and EVACUATION PLANS (REP)

The FP&P Plans/REP are documents prepared by Navy commands for the purpose of planning, designing, installing, monitoring, and rescuing workers exposed to fall hazards and to prevent fall accidents from occurring in the workplace. The FP&P Plan/REP is a dynamic document that will require modification due to changes during different phases of work, procedures, or methods of construction or maintenance work. A qualified person shall be responsible for preparing FP&P Plans/REP, as well as making any required changes, designs, updates, or approvals relating to various methods and requirements pertaining to fall protection systems. It is of utmost importance that a FP&P Plan/REP be prepared and approved prior to start of work. The plans shall be kept at the work site at all times, with any changes noted.

9.1 FALL PROTECTION AND PREVENTION PLAN REQUIREMENTS:

The FP&P Plan is different from Fall Protection Plan stated in 29 CFR 1926.503(k). A Fall Protection Plan is available only to employees who can demonstrate that it is infeasible or it creates greater hazard to use conventional fall protection systems: (i.e., guardrail, safety nets, or personal fall arrest system). The FP&P Plan is a document that includes written procedures for performing a specific work, task, or project, indicating the proper way of using safe fall protection systems and equipment and any other relevant information.

The FP&P Plan should include the following:

a. Description of fall hazards that will be encountered at the workplace by users during performance of their work.
b. Type of fall protection/fall prevention methods or systems used for every phase of work.
c. Training requirements for every employee exposed to fall hazards.
d. Type of fall protection equipment and systems provided to the employees that might be exposed to fall hazards.
e. The names of qualified and competent persons shall be included in the plan.
f. Indicate fall protection equipment and instructions for assembly, disassembly, storage maintenance, and care.
g. Description of training requirements.

h. FP&P Plan must be concurred with by a qualified person. A competent person will implement the plan. All employees working at heights at a job site shall understand and agree to use the FP&P Plan and REP.

9.2 RESCUE AND EVACUATION PLAN REQUIREMENTS (REP)

(Refer to Form 1-1)

When personal fall arrest systems are used, the employer must assure that the employee they can be promptly rescued, or can rescue themselves should a fall occur. The REP shall include emergency procedures, methods of rescue, equipment used, and training requirements.

The REP Should Include the Following Information as Part of the FP&P Plan:

a. Detailed location of the work site with any information that will help find the location, building number, floor number; etc. Post written directions that can be read over the telephone to an ambulance driver/police/fire department or their dispatchers on how to get to the site from the main gate of a facility. Give complete, accurate information to the rescue responder. Post a map at the job site and highlight with yellow marker the route one should take from the site to the nearest hospital that someone can use to drive an employee with minor injuries.

b. Indicate location of the lift or other equipment that will be used in case of emergency and the location of the key.

c. Detailed location of the closest first aid kit. To assure that no time lost looking for first aid kits during an emergency, post a site map marking the location of the first aid kits.

d. Listing of emergency telephone numbers. If an emergency rescue is required, call the telephone numbers in the order that they are listed 1st, 2nd, and 3rd. Post written directions that can be read over the telephone to an ambulance driver/police/fire department or their dispatchers on how to get to the site from the main gate of a facility. Give complete, accurate information to the rescue responder.

e. Send an escort to meet the fire department upon arrival at the scene and help them or the rescuer find the location of the accident.

f. Indicate who is the person (the escort designated to meet the fire department upon arrival at the scene) and their back-up person (in case the designated person is injured), who is responsible to make the phone call in case of emergency.

g. Indicate names of personnel that may require rescue during the course of performing their jobs.

h. If self-rescue is used, indicate the type of self-rescue equipment that is available at the job site or will be utilized during rescue operations.

i. Indicate the training requirement the rescuer should receive in order to become a qualified rescuer.

End of Section

10.0 FALL-PROTECTION SYSTEM DESIGN REQUIREMENTS

10.1 General Discussion: In order to plan and design a safe fall protection program, Dept of Navy personnel, as well as contractors and subcontractors, shall be trained and have the knowledge, understanding, and commitment to implement comprehensive fall protection requirements for the safety of all employees exposed to fall hazards.

Planners and designers should be striving toward removing hazards to achieve 100% fall protection for all employees exposed to fall hazards during construction work, maintenance, and repair work (after construction is complete).

Planners and designers should consider, in order, the following list that prioritizes control measures and solutions when dealing with fall hazards (see section 12.6 for description):

a. Elimination of FH
b. Substitution and Replacement of FH
c. Isolation and Separation of FH
d. Engineering Controls
e. Administrative Controls

10.2 Design Requirements for Fall Protection Systems: (For specific design criteria not included, see other regulations, standards and references.) - For additional information, see the Navy Guide Specification Section 01525, Safety Requirements. **The following design information can be inserted into contracts or used by the in-house design group.**

10.3 General Fall Protection System Requirements: The requirement for fall protection at an established maximum height is mandated by the US Code of Federal Regulations (CFR). Depending on the standard used, this height can be from four to six feet.

a. The standard fall protection height for federal employees (military and civilian personnel) on US Navy Ashore Facilities is four feet, per 29 CFR 1910, Subpart D.

b. Federal employees on Public Shipyards shall adhere to five feet, per 29 CFR 1915.

c. Construction site workers shall adhere to the threshold height of six feet, per the US Army Corps of Engineers (USACE), Safety and Health Requirements Manual EM 385-1-1, and 29 CFR 1926.500, Subpart M, the Construction Industry Standards.

d. The standard for Long-shoring activities, per 29 CFR 1918 is eight feet.

e. Ashore Activities may prescribe more stringent threshold requirements for federal employees as required due to the site-specific needs of that facility.

10.4 Specific Fall Protection Requirements:

a. Guard Rails:

(1) 42 inches high, plus or minus 3 inches above walking/working level.

(2) Shall be made of posts (stanchions), top rail, mid-rails, and toe boards.

(3) Posts shall be made a minimum of 2X4 inches of lumber and a maximum spacing of 8 feet.

(4) Top rail shall withstand a force not less than 200 pounds if applied to the top rail in any outward or downward direction; mid-rails shall withstand a force of 150 pounds; and toe board shall withstand a force of 50 pounds.

(5) Top rail shall made of 2X4 inches of lumber, ¼ inch-diameter steel cable flagged every 6 feet, 1.5 inches nominal-diameter schedule 40 pipe, or 2 inches by 2 inches by 3/8 inch structural steel.

(6) Top rail shall not deflect lower than 39 inches.

(7) Mid rail shall be at least 1X6 inch lumber.

(8) Toe board shall be a minimum of 3½ inches high lumber.

b. Stairs Rails and Handrails:

(1) 36-37 inches high, (29 CFR 1926.500, Subpart M) for construction work.

(2) 30-34 inches high, (USACE EM 385-1-1 and 29 CFR 1910) for general industry.

c. Safety Nets:

(1) Minimum breaking strength of 5,000 pounds.

(2) Safety net mesh opening should not be larger than 36 square inches or longer than 6 inches on any side opening.

(3) In any case, the net shall not be installed lower than 30 feet from the working surface.

(4) Safety nets must extend out from the working surface as follows:

Distance from working level to the net	Distance the net should extend from working surface
Up to 5 feet	**8 feet**
Over 5 feet up to 10 feet	**10 feet**
Over 10 feet	**13 feet**

(5) Safety nets shall be tested in the field and certified by a qualified person once every six months using a drop test of 400 pounds, dropped from the same elevation that a worker might fall.

d. Ropes:

(1) Synthetic rope lifelines: minimum strength of 5,600 pounds.
(2) Wire rope lifeline: minimum strength of 6,000 pounds.
(3) Vertical lifelines: minimum strength of 5,000 pounds.

e. Warning Line:

(1) Installed six to ten feet away from a leading **edge,** and flagged every 6 feet; provide signage indicating "warning line."
(2) The height of the warning line should be between 34-39 inches.
(3) Shall consist of a rope, wire or chain and supporting stanchions.
(4) A safety person is required whose sole job is observation and ensuring a safe working environment.

10.5 Personal Fall Arrest Systems Requirements:

(For Fall Arrest System Checklist see Appendix G)

a. The system must prevent the worker from seeing 1800 lbs. force when wearing a full-body harness in pounds.

b. Maximum free-fall distance is 6 feet.

c. Anchorage System for Fall Arrest: Shall withstand a minimum force (breaking strength) of 5,000 pounds, or engineered for twice the maximum arresting force.

Note: Many manufacturers require 5,400 pounds minimum anchorage strength for their equipment.

d. Positioning Device System: A minimum strength of 3,000 pounds. The system consists of body belt or body harness and a short lanyard. **Although allowed by OSHA, it is recommended that body belts should not be used in a positioning device system.**

e. Travel Restraint System: A minimum strength of 3,000 pounds, unless engineered.

f. Snap hooks and Carabiners:

(1) Minimum strength of 5,000 pounds; must be self locking type.
(2) The gate must withstand a minimum side loading force of 350 pounds.

g. Lanyards:

(1) Strength of 5,000 pounds.
(2) Length: varies from 2 to 6 feet.
(3) Synthetic rope lanyard minimum diameter is 1/2 inch.
(4) Provide energy absorber with lanyards (integral in-line is preferred).
(5) Dynamic performance test, where the maximum arresting force on the body is 1,800 pounds.
(6) Depending on special or specific applications, dual shock-absorbing lanyards may be required.
(7) A lanyard strap shall not be wrapped around a tie-off point and then attached back to itself; unless it is a tieback lanyard where the lanyard straps have been designed accordingly.
(8) The snap hook shall only be secured to an attached D-ring (incorporated into the body harness by the manufacturer).
(9) Shall have a permanently attached label indicating manufacturer's name, serial number/lot number, manufacture date, capacity, and that it meets the applicable OSHA and ANSI Z359.1 Standards.

h. Energy Absorbers:

(1) Shall not elongate more than 42 inches
(2) Maximum arresting force of 1800 pounds, minimum operating or activation force of 450 pounds
(3) Shall have a permanently attached label indicating the manufacturer's name, serial number/lot number, manufacture date, maximum elongation force, maximum free fall distance, capacity, and that it meets OSHA and ANSI Z359.1 standards.

i. Self-Retracting Lanyards:

(1) Shall withstand a minimum tensile load of 5,000 pounds if free fall distance is more than 2 feet
(2) Shall withstand a minimum tensile load of 3,000 pounds if the free fall distance is 2 feet and less
(3) Maximum arresting force shall not exceed 1,800 pounds.

j. Full-Body Harness:

(1) Maximum arresting force of 1,800 pounds
(2) Dorsal D-ring should be incorporated into the full-body harness
(3) Shall have a permanently attached label indicating manufacture's name, serial number/lot number, manufacture date, capacity, and it meets OSHA & ANSI Z359.1 requirements.
(4) Manufacturers test the harness with a rigid weight of 220 pounds. The conversion factor of rigid weight to the human body is **1.4.** A 220 pounds rigid weight is equivalent to 310 pounds of human body weight.

k. Rope Access:

(1) Requires two independent anchorages.
(2) Two lifelines or ropes attached to the anchorages, a working line, and a back-up safety line. Each one is to be independently anchored.
(3) Ropes should be of low-stretch kern mantel and arranged so that any abrasion will be avoided.
(4) Use full-body harness.

10.6 Design Considerations for Horizontal Lifelines: HLL shall be designed, installed, certified, and used under the supervision of a qualified person, as part of a complete fall arrest system, which maintains a safety factor of 2. HLL can be either permanent or temporary systems, and either flexible or rigid (such as the trolley system).

a. Certain parameters should be taken into consideration when designing horizontal lifelines, such as:
(1) Initial and maximum deflection or sag of the line.
(2) Clear span between supports or anchorages.
(3) Design of anchor points and anchorage connectors.
(4) Number of workers attached to the system.
(5) Free-fall distance and total fall distance.
(6) Minimum clearance below HLL system.
(7) Unit weight of the cable and the line.
(8) Total weight of all workers attached to HLL.

b. The components of typical HLL sub-system may include the following:
(1) Anchorages, anchorage connectors.
(2) Lifeline tensioner.
(3) Cable or rope.
(4) May include shock or energy absorber.

c. Presently, there are no U.S. standards that identify HLL verification and testing requirements. However, verification testing requirements may include the following tests:

(1) Line fittings static test
(2) Corrosion Inspection

Unfortunately, with a factor of safety of two, many tests have the potential to activate the lifeline system. Careful consideration is required in determining testing requirements.

End of Section

11.0 IDENTIFICATION, USE, SELECTION, CERTIFICATION, and RE-CERTIFICATION of ANCHORAGES

Anchorages can either be engineered or improvised. An anchorage system is a combination of anchorage point and anchorage connector(s). Improvised fall-arrest anchorages and anchorage connectors shall withstand a force of 5,000 pounds for every person attached to the system. Positioning and restraint anchorage shall withstand a force of 3,000 pounds. Anchorage connectors are usually designed and prefabricated by a manufacturer under the supervision of a qualified person and meets OSHA and ANSI standards. The certification and re-certification of anchorage connectors can be done by the manufacturer or qualified person.

11.1 Responsibility of Anchorage Identification, Design, and Certification:

a. Anchorages should be designed and installed before use by a registered professional engineer with experience in designing fall-protection systems; or another qualified person with appropriate education and experience should design the anchor point to be installed. If there is a need to devise an anchor point from existing structures such as beams, or eyebolts, a qualified person should be used to evaluate these anchorages.

b. Fall-arrest system anchorages shall be capable of supporting 5,000 pounds per employee attached; or the anchorages shall be designed, installed, and used under the supervision of a qualified person as part of a complete fall-arrest system.

c. A qualified person should be able to calculate the forces generated by arresting a fall; total loading; impact on the structural members the line is attached to; and determine the optimal and safe location where and how to tie-off. The qualified person should have the knowledge and be capable of designing, certifying, supervising, approving, and rating the anchor points and tie-off points.

11.2 Inspection, Certification and Re-Certification of Anchorages:

a. Inspection: Fall arrest, positioning, and restraint equipment shall be inspected by the user before each use, and by a competent person annually, and in accordance with the manufacturer's instructions. Workers are not qualified to inspect anchor points; however, they could be trained to pay special attention to any cracks developing around the anchor points or if the anchor points are unstable or loose. End users shall not tie-off to unsafe anchorages and they should bring it to the attention of the competent person if such a situation exists.

b. Certification and Re-Certification of Anchorages: Anchorages should be field-verified by a qualified person. ANSI Z359.1 addresses certification of anchorage connections. It does not address certification of anchor points. A registered professional engineer or a qualified person can certify the structural integrity of the anchor points. Depending on the design, type, location, and the size of the structural member the anchorage is connected to, the environment and weather conditions dictate how often such anchorages shall be inspected and re-certified by a qualified person.

11.3 Guide for Selecting Safe Anchorages

a. The strength of a personal fall-arrest system depends on its subsystems and components, as well as the points of anchorage and how strongly such a system is attached to the anchorage point. Such attachment shall not significantly reduce the strength of the system, including the structural members such as beams, columns, or any rigid structure.

b. All components and sub-components of the selected fall-arrest system shall be compatible with each other.

c. When tying off to a beam or column, do not attach the anchorage connection to a hole in the beam unless evaluated by a qualified person, because the forces generated by a fall will weaken the beam structure. Do not drill a hole for tying off. This attachment will weaken the beam. The most favorable way to tie off is to use an anchorage connection to wrap around the beam or column, such as an anchor strap, or use a designed beam clamp.

d. Do not tie a knot in the anchorage connection.

e. The most favorable location to tie off to a beam is in the center of the span. This action will distribute the forces evenly at the supports. The closer the tie off point is to the beam support the force of a fall will increase accordingly.

f. Select the point of anchor as high as possible. This will minimize the free-fall distance and total fall distance and will prevent any contact with an obstruction or the ground below.

g. Take into consideration the impact of shear forces and the bending moment at the supports and also the distribution of forces beyond the supports onto other structural members.

h. When selecting the point of anchor in a column, take into consideration the impact of fall forces due to axial loading and bending stresses.

i. The point of anchorage shall be located in such a way to minimize swinging the worker (pendulum-like motion) that can occur during a fall. The farther away in a horizontal direction a worker moves from a fixed tie off point, the greater is the swinging angle if a fall should occur. If any obstruction exists in the path of the swing fall, the force generated by such a fall is the same as the force in a vertical fall. The maximum angle of swing away from the point of anchor should not be more than 30 degrees.

j. Refrain from using welding to weld the anchorage connection to the anchorage. Welding certification is required annually.

k. When using nails to install roof anchors, the number of nails used to attach the component to a wood roof shall be in accordance with the building code requirements.

l. Always specify the number of authorized users that are allowed to attach to a specific point of anchor.

m. When planning and selecting a point of anchor location, take into consideration the accessibility and ease of securing to it.

n. If an eyebolt is selected as a point of anchor, it should be rated along its axis. Eyebolt strength is greatly reduced if the force is applied at an angle to the eyebolt axis. In addition, the diameter of the eyebolt shall be compatible to the snap hook or carabiner attachment. Non-rotating rings should be avoided, since falls rarely occur directly along the axis of the eyebolt. Where possible, rotating rings with full motion in all three axes should be used. The ring will then be able to automatically align along the direction of force.

End of Section

12.0 FALL PREVENTION CONSIDERATIONS DURING the PLANNING and DESIGN PHASE

12.1 INTRODUCTION: When planning and designing new buildings or facilities, Navy planners and designers, including owners/managers of such facilities, are responsible for providing safe design for the protection of all workers and users exposed to the hazards of fall from heights during performance of their work. Navy architects and engineers or any other entity planning or designing a building, structure, or facility, including integral assemblies such as weight-handling equipment (cranes, hoists, etc), have the general duty and responsibility to have a safe design for preventing falls throughout the facility. This duty extends to any person who may be involved in the construction, demolition, modification, renovation, maintenance, or normal work operation of the building, structure, or facility.

a. Navy architects and engineers need to be aware that **any part of a building, facility, structure, equipment,** and integral assemblies such as weight-handling equipment (cranes, hoists, etc) **etc, will require maintenance work**. If such work is required, prevention and control measures should be incorporated into the design to eliminate and prevent the need to work at height with its subsequent exposure to fall hazards.

b. Architects, engineers, designers, construction managers, superintendents, contractors/subcontractors, and owners of buildings and facilities have a major role and are responsible for creating a safe work environment and being aware of fall hazards. They shall have the proper knowledge and awareness of all the fall hazards that will be encountered at the workplaces they are designing, constructing, occupying, and operating.

12.2 PLANNING AND DESIGINING CONSIDERATIONS: It is very important at the design and planning phase to give consideration to the prevention of falls, not only during construction, but subsequent use, or maintenance of the building, structure, or facility. Consideration during various phases include the following:

a. Construction Phase:

(1) Reducing the risk when working at heights (e.g., installation of guardrails to the perimeter structural members prior to erection).
(2) Reducing the need to work at heights as much as possible by prefabricating modules on the ground before lifting them into position.
(3) The placement and condition of the access road leading to the building or facility during construction, for example, which would enable a crane to place building material in the most appropriate and accessible location.

(4) Preparation and/or clearing debris on the ground or floor below the work area. The ground should be compacted and leveled in order to prevent tilting, unstable equipment (e.g., cranes or scissors lifts)
(5) Provision of temporary safety mesh as much as possible to prevent objects from falling down to lower levels

b. Maintenance and Occupancy Phase:

(1) Safe access to or egress from any work area.
(2) Provision of permanent guardrails or edge protection such as parapets.
(3) Selection of material that can withstand a harsh environment (e.g., special wood planks such as particle boards can weaken due to moisture absorption, thereby not supporting the weight of a worker during a future roofing inspection or maintenance work).
(4) Use of temporary work platforms whenever possible, such as scaffold, and elevating work platforms.
(5) Identification and location of services (e.g., location of power lines, water).
(6) Location and operations of type of equipment selected and devices used (e.g., using adjustable light fixtures that can be lowered to the ground for replacement).
(7) Use of fall-arrest systems and devices, including the provision of suitably located temporary or permanent anchor points and field identification of all required anchorage points.
(8) Provision of safety nets, when required.
(9) Location of and access to equipment for maintenance purposes.
(10) Location of amenities, such as plants.
(11) First aid facilities and trained personnel.

12.3 <u>FALL-HAZARD IDENTIFICATION:</u> Navy planners and designers and **system safety engineers** should identify any hazards that involve an employee falling while at the workplace or using means of access to or egress from a building or facility. In order to assist in identifying fall hazards, special considerations should be given to:

a. Consultation, communication, and coordination with safety and health professionals.

b. Knowledge of injuries arising from falls that have occurred at a workplace or at similar workplaces.

c. Communication with various A/Es and contractors to find out if “at risk” workers are having or are likely to have problems while performing their jobs.

d. Accidents or near-miss incidents related to falls at the workplace or similar workplaces; review safety web pages for various accidents that occurred at similar workplaces.

e. Review of relevant fall-protection standards, regulations, and guidance documents.

f. Communications with employees of similar facilities to determine what type of risks an employee would face during the performance of their duties.

g. Conducting a walk through inspection of the facility or similar facilities to become familiar with various risk situations.

h. Compiling statistical records indicating potentially unsafe work practices.

12.4 <u>RISK ASSESSMENT:</u> It is the responsibility of the planner or the designer to assess risk of injury to employees—while the employees are at the workplace during performance of their work— resulting from each hazard that involves falling.

a. Risk in relation to any injury or harm means the probability of that injury or harm occurring is increased. If a hazard is identified, the risks associated with such hazard can be assessed. Assessment of risks will help planners, designers, and system safety engineers determine the potential injury and thus help identify methods to reduce risks. The necessary steps in a risk assessment process may include the following:

(1) Identify the specific hazardous/situation that might occur in a workplace.

(2) Identify the nature of the decisions to be made about hazards and who is responsible for making these decisions.

(3) Define and decide how such information needs to be presented to the decision makers.

b. The required information may include the determination and assessment of the following:

(1) Size, height, and layout of a workplace.

(2) Material handling methods or accessing all material or equipment at different locations of the facility.

(3) Location and condition of all equipment and/or material used in a workplace.

(4) The number, type of work, and movement of all employees in a workplace, planned facility, or building.

12.5 <u>RISK CONTROL</u>: Planners and designers should consider the means by which risk may be eliminated or reduced. Once risks have been assessed, measures should

be taken to control the hazards of falling. There is a hierarchy or a preferred order of control measures. These range from eliminating the worst hazards to the other methods that reduce risks. Specific control measures may include the following:

a. Plans or designs of new or modifications to existing buildings, structures, or facilities should take fall prevention into consideration.
b. Evaluate methods or the way jobs can be performed safely to eliminate or reduce the likelihood of a fall.

c. Organize and schedule work so that employees do not interfere in safety measures taken or increase the risk of a fall for themselves or others

d. Identify the information and knowledge required by contractors to enable them to work safely.

e. Collect, assemble, and present the information required to eliminate or reduce hazards.

f. Identify the training or knowledge requirement to work safely if there is a fall risk.

12.6 <u>HIERARCHY OF CONTROL MEASURES</u>: The hierarchy or preferred order of control is:

a. Elimination - Removing the hazard or hazardous work practices from a workplace. This is the most effective control measure (e.g., lower various devices or instruments such as meters or valves to the height level of the individual instead of servicing such devices or instruments at heights.)

b. Substitution - Substituting or replacing the hazard or hazardous work practice with a less hazardous one (e.g., prefabricate structures on the ground instead of building them at heights).

c. Isolation - Isolating or separating the hazard or hazardous work practice from employees or others from the general work area (e.g., install guardrail at an opening or leading edge).

d. Engineering Controls - If the hazard cannot be eliminated, “substitute or isolate” is the next-preferred measure to control the risk (e.g., use pre-drilled holes for fall-arrest systems and devices to attach anchorage connections).

e. Administrative Controls - This includes introducing new work practices that reduce the risk of a person falling (e.g., erecting warning signs or restricting access to certain areas).

f. Personnel Protective Equipment - This should be considered only when other control measures are not practical; for example, when it is necessary to increase protection by employing a backup system, or when a secondary system is needed.

Note: Control measures are not mutually exclusive. There may be situations when more than one control measure should be used to reduce the risk of a fall.

End of Section

13.0 AMERICAN NATIONAL STANDARD INSTITUTE (ANSI) FALL PROTECTION STANDARDS UPDATE

13.1 ANSI Z359.1-1992 (R1999):

a. Safety Requirements for Personal Fall-Arrest Systems, Subsystems, and Components:

The ANSI Z359.1 includes safety requirements for personal fall-arrest systems, subsystems, and components. The standard establishes requirements for performance, design, marking, qualification, testing, instruction, inspection, use, maintenance, and removal from service of connectors, full-body harnesses, lanyards, energy absorbers, anchorage connectors, fall arresters, vertical lifelines, self-retracting lanyards and other fall-arrest equipment. The standards comprise personal fall-arrest systems for users within the range of 130 to 310 pounds of capacity. Combined weights include the user's body weight, clothing, tools, and other objects born or carried by the user. For weights above 310 or below 130 pounds (combined weight of the user and equipment), consult full-body harness manufacturers.

b. The Standard Requirement Does Not Address the Construction Industry, Window Cleaning Belts, and Sports-Related Activities. ANSI Z359.1 addresses Personal Fall-Arrest systems incorporating full-body harnesses only. Body belts are not addressed as part of ANSI Z359.1.

Note: ANSI Z359 Standard Committee is drafting three new standards. The titles of the new standards are:

(1) ANSI Z359.0: American National Standards on the Fall Protection Program

(2) ANSI Z359.2: Requirements for Positioning and Restraining Systems

(3) ANSI Z359.3: Requirements for Assisted Rescue and Self-Rescue Systems, Subsystems, and Components

End of Section

14.0 FALL PROTECTION TRAINING ROSTER

(Refer to Form 1-2)

14.1 Before starting a job, all workers exposed to fall hazards shall read, understand, and sign the FP&P Plan, which acknowledges that the employee has been trained in job hazard recognition and shall be trained in the proper use of fall protection equipment. Procedures may be developed at the local level to ensure compliance.

14.2 All contractor and subcontractor workers exposed to fall hazards shall be trained accordingly.

14.3 All employees (workers) newly assigned to a job must review the FP&P Plan and sign the roster. If the fall hazards, fall protection equipment, or methods change during the course of the job, the FP&P plan must be reviewed and signed again by all employees working at the job site.

14.4 The written FP&P Plan and REP shall be part of written Accident Prevention Plan that is maintained at the job site.

14.4 If additional requirements arise or change at the job site as work progresses, the FP&P Plan and REP shall be reviewed and updated by a qualified person and signed by all workers exposed to fall hazards.

End of Section

15.0 REFERENCES

15.1 29 CFR 1926.500, Subpart M, Fall Protection in the Construction Industry.

15.2 29 CFR 1910, Occupational Safety and Health Standards.

15.3 29 CFR 1915.159, Personal Fall Arrest Systems.

15.4 US Department of Labor, OSHA 3124 1993 (Revised), Stairways and Ladders.

15.5 US Department of Labor, OSHA Instruction Standards, 3.1, December 1995, Interim Fall Protection Compliance Guidelines for Residential Construction.

15.6 American National Standard Institute, ANSI Z359.1-1992 (R1999), Safety Requirements for Personal Fall Arrest Systems, Subsystems, and Components.

15.7 Introduction to Fall Protection, J. Nigel Ellis, PHD, CSP, PE, (Third Edition: American Society of Safety Engineers).

15.8 US Army Corps of Engineers (USACE), Safety and Health Requirements Manual, EM 385-1-1, current edition.

How to Obtain information

1. OSHA Regulations/Standards from OSHA Web Page: http://www.osha.gov/
2. DoD employees can acquire at no cost the Construction Criteria Base (CCB) from the National Institute of Building Sciences. CCB is an electronic collection of over 10,000 documents used in building design and construction, including guide specifications, manuals, handbooks, regulations, reference standards and other essential design and construction criteria documents. CCB comprises multiple CDs covering Codes Of Federal Regulations, OSHA Standards, Specifications, DOD Manuals and Design Criteria and other relevant information. These CDs are updated quarterly. The P.O.C for Navy employees to order the CCB CDs is:

Pat Broughton, Phone: (202) 289-7800. The CCB website can be accessed at: http://www.ccb.org/html/home.html. Specifications can also be downloaded from the SpecsIntact website (with helpful links, including the CCB website) at: http://si.ksc.nasa.gov/specsintact/software/software.htm

3. To acquire "Introduction to Fall Protection" by Dr. Nigel Ellis, Ph.D., the handbook can be purchased for $85 plus shipping and handling from:
American Society of Safety Engineers (ASSE)
1800 East Oakton Street
Des Plains, IL 60018-2187
Phone: (847) 699-2929

4. ANSI Standards can be purchased from ASSE at the above address.

5. This Guide can be found at the NAVFAC Safety Web site under guidance at:
http://www.navfac.navy.mil/safety/site/Fall/policy.htm - Policy

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APPENDIX A

PART I.

INSTRUCTIONS FOR USING FALL PROTECTION WORK PLAN MATRIX

(See page 96)

The following instructions are included to help Navy personnel identify fall hazards at the workplace using a work-plan matrix and to identify the recommended fall-protection systems to minimize the dangers of falls:

A.1 Identification of Fall Hazards in the Workplace:

A.1.1 Fall Hazards above four feet.
A.1.2 Fall Hazards - Above a hazard at any height (e.g., above debris, machinery, structures, reinforcing bars, or liquids).
A.1.3 Open Sided - [ ] Floors [ ] Platforms [ ] Stairs [ ] Catwalks
[ ] Scaffolds [ ] Machinery [ ] Other

A.2 How to Identify Fall Hazards in the Workplace

Read the first two items, (1 & 2) and check the boxes that apply. If either statement is applicable, you should fill out the Fall Protection Work-plan Matrix.

A.2.1 Continue to read the information describing fall hazards and indicate the items that apply by placing a check mark in the appropriate box to the left of the reference number.
A.2.2 Use the reference number to find additional information in Part II.
A.2.3 If a hazard exists that is not listed, write it in the “Other” box.

A.3 Description of Fall Arrest/Restraint Methods

A.3.1 Select the method(s) to be used from those indicated by any open circle in the intersection between section (1) and (2) (Marked “A’ at the corner). Fill in the circle to indicate the method(s) that will be used and place a check mark in the appropriate box to the left of the reference number.
A.3.2 An existing **X** in the boxes indicates a required item to be used.
A.3.3 Use the reference number to find additional information in Part II.
A.3.4 If the method chosen is not listed, write it in the “Other” box.

A.4 Inspection and Instructions for Assembly, Disassembly, and Storage

A.4.1 Fill in the open circle to indicate the item to be used from those recommended in the intersection between section (2) and (3), (Marked "**B"** at the corner). Place a check mark in the appropriate box to the left of the reference number.
A.4.2 An existing **"X"** in the boxes indicates a required item to be used.
A.4.3 Use the reference number to find additional information.
A.4.4 If the method chosen is not listed, write it in the "Other" box.

A.5 Warning Systems/Falling Objects Protection

A.5.1 Fill in the open circle to indicate the items to be used from those recommended in the intersection between sections: (**4**) and (**1**) (marked "C" at the corner), then place a check mark in the appropriate box to the left of the reference number.
A.5.2 Hard hats/Hard caps **and** one other method to protect workers from falling objects should be select from items: 35, 36, 39, 41, 42, 47, or an appropriate "Other" method.
A.5.3 An existing **"X"** indicates a required item to be used.
A.5.4 Use the reference numbers in Part II to find additional information.
A.5.5 If the method chosen is not listed, write it in the "Other" box.

PART II.

HOW TO IDENTIFY FALL HAZARDS IN THE WORKPLACE UTILIZING the WORKPLAN MATRIX
(Step-by-step procedure)

SECTION 1

Fall Protection Planning

To determine the requirement for fall protection, address the following questions:

Ref. # 1 Do Fall Hazards of more than six feet exist? (For general industry the height is four feet and shipyard is five feet.)

Ref. # 2 Will work be performed above a hazardous location?

a. If fall protection is required, a fall protection work-plan matrix should be completed.

b. After identifying fall hazards in the workplace, check all boxes that apply.

Ref # 3 [ ] **Open sided** [ ] **Floors** [ ] **Platforms** [ ] **Stairs**
[ ] **Roof** [ ] **Catwalks** [ ] **Scaffolds** [ ] **Machinery**
[ ] **Other**
Open sides and edges mean any side or edge (except at entrances to points of access to floors, roofs, working platforms, stairs, catwalks, scaffolds, and ramps or runways) where there is no wall or guardrail system 42 inches high.

Ref. # 4 Holes mean a gap or void one inch (per 29 CFR 1910.23) or more in its least [smallest, shortest?] dimension in a floor, roof, or walking/working surface:

Opening of two inches or more in its least dimension.
[ ] Manholes [ ] Pits [ ] Tanks [ ] Skylights [ ] Open Shafts
[ ] Chutes [ ] Other

Examples: A gap or opening in flooring, stairways, ramps, or roofing two inches or greater through which material can fall through; or, in the case of larger holes, a person can step or fall through. In either case, FP in the form of a secured and marked covering, FP, or barricading is required.

Consideration should also be given to guarding holes, which may be a trip or entrapment hazard.
If there is a danger of falling through a skylight opening, a standard guardrail system should be installed on all sides of the skylight.

Ref. # 5 **Wall opening: the minimum of at least 30 inches high by 18 inches wide, lest a person may fall to a lower level.**

This should be considered at any time work is performed near a wall or window opening with a fall hazard to a lower level present.

Ref. # 6 **Working in a boom-supported articulating lift:**

Before each elevation of the work platform, the operator will check to see that all occupants' full-body harnesses are on and properly attached.

Ref. # 7 **Leaving the floor surface of a:**
[ ] Lift [ ] Catwalk [ ] Platform
[ ] Scaffold [ ] Elevating Work Platform [ ] Stairway
[ ] Other

Whenever an employee leaves the floor of any of the above, thereby reducing the height of the top rail to less than 42 inches (plus or minus 3 inches) in relation to the employee, FP should be utilized.

Ref. # 8 **Working above suspended ceilings:**

Fall arrest, restrain systems, or working stands/platforms should be used.

Ref. # 9 **Leading-edge work above six feet on a less than 4/12 pitch (low-pitched roof):**

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. Leading edges not actively under construction are considered to be "unprotected sides and edges. Positive methods of fall arrest or fall restraint shall be required to protect workers exposed to fall hazards. Positive methods of fall arrest or fall restrained should be required for persons conducting inspection or surveying existing or old roofs."

Ref. # 10 **Working within six feet of an unguarded roof edge with less than 4/12 pitch:**

During the performance of work on low-pitched roofs with a potential fall hazard greater than 6 feet, ensure that employees engaged in such work are protected from falling from all unprotected and edges of the roof as follows:

a. Use fall-restraint or fall-arrest systems
b. Use of a warning-line system
c. Mechanical equipment shall be used or stored only in areas where employees are protected by a warning-line system, fall restraint, or fall-arrest systems.

Ref. # 11 Steep roof (greater than a 4/12 pitch):

A fall protection or restraint system shall be used when working on steep roof. Warning line and safety monitor system are prohibited on surfaces exceeding 4 to12 pitch, and on any surface whose dimensions are less than 45 inches in all directions.

Ref. # 12 Elevating work platforms (e.g., scissors lifts):

When working from elevated work-platforms six feet or higher, elevating work platforms must be equipped with standard guardrail and toe boards. If the worker's feet leave the floor of the elevating work platform or the worker is required to exit the lift—at height—FP&P Plan must be completed and continuous fall protection must be provided. Workers shall be provided with fall-arrest systems if the lifting equipment is positioned outside the wheelbase, even if the equipment has guardrail. <u>It is highly recommended to tie off in scissors lift, even if the platform does not move away from the base.</u>

Ref. # 13 Boatswain chair:

The term "boatswain chair" shall mean a seat to support a worker in a sitting position supported by rope slings attached to a suspension rope.

Ref. # 14 Working on roofs when the possibility of adverse weather conditions may be present, such as wind, ice, or rain:

When the possibility of adverse weather conditions exists, extra caution must be exercised. The Safety manager or a competent person must be consulted where the work is occurring, the duration of work, the number of employees, and who to contact in case of adverse weather.

Ref. # 15 Other:

Write in any fall hazard identified during site inspection that is not listed above. Be specific as possible. Describe fall arrest/fall restraint method. Fill in the open circles that apply, and check the appropriate boxes to the left of reference box under Section 2.

SECTION 2

Description of Fall-Protection Methods

Ref. # 16 Guardrails (temporary or permanent):

Standard Guardrail, temporary or permanent, shall consist of top rail, intermediate rail, toe-board, and posts; the guardrail shall have a vertical height of 42 inches, plus or minus 3 inches from the upper surface of the top rail to the floor, platform runway, or ramp level. The posts and framing members for railings of all types shall be capable of withstanding a load of 200 pounds applied in any outward or downward direction at any point along the top edge with minimum deflection (29 CFR, 1926.502). In any case, the top edge of the guardrail shall not deflect to a height less than 39 inches above the walking working surfaces with minimum deflection.

Ref. # 17 Warning-line system:

A warning-line system is a barrier erected on a walking and working surface or a low-pitch roof having a slope less than or equal to 4 in 12 (vertical to horizontal), to warn workers that they are approaching (an) unprotected fall hazard(s).

A warning line system must be erected around all sides of the work area. Where mechanical equipment are being used, the warning line shall be erected not less than six (6) feet from the edge of the roof. When mechanical equipment are not being used, the warning line shall be erected no less than six feet from the roof edge, which is parallel to the direction of mechanical equipment operation. The warning line shall not be less than 10 feet from the roof edge, which is perpendicular to the direction of mechanical equipment operation.

Ref. # 18 Catch platform/safety nets:

A substantial catch platform shall be installed below the working area of roofs more than 20 feet from the ground to eaves with a slope greater than 4 in 12 (vertical to horizontal and without a parapet. In width, the platform shall extend 2 feet beyond the projection of the eaves, and shall be provided with a safety rail, mid rail, and toe-board. This provision shall not apply to workers engaged in work upon such roofs and are protected by a harness attached to a lifeline.

Where work is in progress above workers, a catch platform or other means shall be provided to protect those working below. All workers shall be notified. One completed floor shall be maintained between workers and steel or concrete work above.

Ref. # 19 Vertical lifeline/rope grab:

- A vertical lifeline is a vertical line from a fixed anchorage independent of the walking/working surface to which a lanyard or device is attached.
- A rope grab is a fall arrester designed to move up or down a lifeline, to which the harness is attached. For additional requirements, refer to the Definition Section.

- Only one person shall be attached to a vertical lifeline. Two workers will require two independent vertical lifelines.

Ref. # 20 Horizontal lifeline:

A horizontal lifeline (also called a catenary line or static line) is a rail, rope, wire, or synthetic cable that is installed on a horizontal plane between two anchorages and used for attachments of a worker's lanyard or lifeline device while moving horizontally. A horizontal lifeline is used to control dangerous pendulum-like swing falls**. A qualified person** must design the system. The competent person will review and approve only the installation.

Ref. # 21 Fall-arrest system:

Fall-arrest equipment consists of:

(a) Full-body harness, approved lanyard, and an approved anchor point:

- **The full-body harness** shall meet ANSI Z359.1 requirements.
- **The lanyard** shall be a shock-absorbing type lanyard (2, 4, or 6 feet long, depending on the application).
- **The anchor point** shall be capable of supporting 5,000 pounds per employee, or 3000 pounds per employee if a self-retracting lifeline is used. The anchor point shall be designed and approved by **a qualified person**". (See Definition Section).

Note: Use only a full-body harness. Body belts are not allowed in a fall-arrest system.

(b) Safety nets

Safety nets shall be installed as close as practical under the walking/working surface on which employees are working; in no case more than 30 feet away. Safety nets shall extend outward from the outermost projection of the work surface as follows:

Distance from working level to the net	Distance the net should extend from working surface
Up to 5 feet	**8 feet**
Over 5 feet, up to 10 feet	**10 feet**
Over 10 feet	**13 feet**

(c) Catch platforms

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

(2) The width of the catch platforms shall equal the distance of the fall, but shall be a minimum of 45 inches wide. The catch platforms shall be equipped with standard guardrail on all open sides.

Ref. # 22 Positioning and restraint system:

Positioning device system consists of:

(a) A safety harness (full-body harness) or body belt incorporated in a FBH with two side "D" rings.
(a) The system shall be rigged to allow a maximum fall-free fall of two feet.
(a) Anchorages used for positioning system that shall withstand a minimum force of 3,000 pounds.

Note: Although allowed by OSHA, body belts should not be used in a positioning device system.

Restraint protection consists of:

(a) Harness attached to securely rigged restraint lines.
(b) Safety harness (full-body harness)
(c) 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's recommendations and instructions.
(d) Anchorages used for fall restraint shall withstand a minimum force of 3,000 pounds.
(e) Restraint protection shall be rigged to allow the movement of employees only as far as the sides and edges of the walking/working surfaces.

Ref. # 23 Egress fall protection:

Whenever employees are required to move from one elevated area to another that presents a fall hazard of 4 feet (6 feet in construction) or greater, fall protection shall be provided. For example, utilizing a scissors lift to gain access to a roof or intermediate platform. The employee must be protected when exiting the scissors lift. This can be accomplished by using a double lanyard or a "Y" lanyard. One hundred percent fall protection is required at all times.

Ref. # 24 Safety monitor system (competent person):

A safety monitor system (SMS) may be used in conjunction with other fall arrest systems. **"NAVFAC NFGS 01525 Safety Requirements" prohibits the use of the safety monitor as the only fall protection method employed. The safety monitoring system may be used with the warning line system as a method of guarding against falls during work on low-pitched roofs and leading edge work only**. The safety monitor system is used only after evaluation if it is demonstrated that the use of other systems is not feasible or creates a greater hazard. The SMS shall not be used when weather conditions create additional hazards.

A person acting in the capacity of a SMS shall be trained in both the safety monitor duties and warning line systems, and shall:

(a) Have control authority over the work as it relates to fall protection.
(b) Be instantly distinguishable from members of the work crew by wearing distinguishable markings or a different-colored high-visibility vest.
(c) Engage in no other duties while acting as safety monitor.
(d) Be positioned with a clear, unobstructed view and be able to maintain normal voice communication with the workers under their protection.
(e) Not supervise more than eight exposed workers at one time. Control zone workers shall be distinguished from other members of the crew by wearing a high-visibility vest only while in the control zone.

Ref. # 25 Floor/hole covers (temporary):

Trenches, manhole covers, and other appurtenances—when located in a roadway and vehicular aisles—shall be designed to carry twice the maximum axle load of the largest vehicle expected to cross over.

All floor-opening covers shall be capable of supporting twice the maximum potential load, including worker and equipment but never less than two hundred pounds (with a safety factor of two). The cover shall be the same level of the rest of floor and it shall be securely fastened to the floor to prevent accidental removal. All covers shall be color-coded or they shall be

marked with the word “Hole” or “Cover” to provide warning of the hazard. If it becomes necessary to remove a cover, provide a conventional fall-protection system around the opening until the cover is replaced.

Ref. # 26 Other:

List any other specific fall-protection system that will be used on a project.

SECTION 3

Inspection and Instruction for Assembly, Disassembly, and Storage

Fill in the open box, circles that apply and check the appropriate ones to the left of the reference boxes.

Ref. #27 Inspect all fall protection/restraint equipment before each use:

All equipment must be inspected per the manufacturer's instructions. Operator's Manual shall be included with the equipment for employee's reference. Also, follow all instructions dictated by the qualified person before using the equipment.

Ref. # 28 Contact qualified person for anchorages loading, selection and approval:

Due to the variability in the structural strength of different materials before using an anchorage point, a qualified person must be contacted to ensure that the anchorage point meets/exceeds regulatory requirements.

Ref. # 29 Protect against cuts and abrasions:

All safety lines and lanyards shall be protected against cuts or abrasions. Padding must be used wherever sharp edges exist.

Ref. # 30 Stored in a approved location:

All fall protection/restraint equipment shall be stored in a weatherproof container or locker when not in use. Equipment should not be allowed to lie in water or direct sunlight, since this will affect equipment strength.

Ref. # 31 The fall-arrest system shall be engineered/compatible:

Contact the qualified person or manufacturer's representative for assistance. When using fall-arrest systems, all components shall be designed for use with each other, or approval must be obtained from the manufacturer or qualified person to use the configuration that uses different components. All system components shall be compatible.

Ref. # 32 Follow manufacturer's and the qualified person's instructions for installation, assembly/disassembly, and use:

All systems must be installed, assembled, disassembled per the manufacturer's direction. Failure to follow these instructions could lead to the possible failure of a system.

Ref. # 33 **In the event of a fall secure all equipment involved and contact Safety for disposition. Do not reuse safety equipment that has been used in a fall:**

In the event of a fall, the first response is to ensure the safety of the employees. After rescue and, if required, medical aid is provided, all equipment involved must be removed from service. Safety must be contacted.

Ref. # 34 **Other:**

[Use this space to list other special identified instructions.]

SECTION 4

Warning Systems and Falling Object Protection

Fill in the open circles that apply and check the appropriate boxes to the left of the reference numbers.

Ref. # 35 Barricade area:

All areas must be barricaded to safeguard employees. When working overhead, barricade the area below to prevent entry by unauthorized employees. A distance of six feet shall be barricaded around the worker.

Ref. # 36 Warning tapes/signs:

Construction warning tape and signs shall be posted so they are clearly visible from all possible access points. When a sign is used, it should clearly indicate the entry requirements, potential hazards, and personal protective equipment requirement.

Ref. # 37 Hard hat/hard cap requirements:

Hard hats/ Hard caps must comply with ANSI Z89.1, 1997 Type I, Class E & G and will be required when workers are exposed to falling/flying objects. Furthermore, select one additional measure:

[ ] Barricades [ ] Canopy Structure [ ] Toe Boards

Hard hats/Hard caps must be worn any time that employees are working below other employees and/or the potential exists for falling objects to strike the employees working below. In addition to hard hats, one additional preventive measure must be implemented.

For example, when using hard hats/hard caps, the employee must use additional form(s) of protection from falling objects, such as: barricading the area or employing protective canopy structures or platforms with toe boards.

Ref. # 38 Clothing and safety shoes:

Suitable clothing shall be worn. Sufficient and proper clothing shall be worn to assist in preventing scratches, abrasions, slivers, sunburn, or similar hazards. Loose or ragged clothing or ties shall

not be worn while working around moving machinery. At a minimum, employee must wear a short-sleeved shirt and long pants.

Employees shall wear substantial footwear made of leather or other equally firm material whenever there is a danger of injury to the feet from: falling or moving objects, or from burning, cutting, penetration, or similar hazards. The soles and heels of such footwear shall be of a material that will not create a slipping hazard. Footwear that has deteriorated to the point where it does not provide the required protection shall not be used.

Ref. # 39 Evacuate area below:

All non-essential personnel below a construction area must be cleared or protection provided.

Ref. # 40 Secure the stored material:

All construction materials and equipment stored on a roof or other exposed areas must be secured against inclement weather conditions. Before the end of the workday, all loose materials must be secured to prevent injury or property damage from falling objects. Caution must also be taken not to overload the roof. Materials shall not be stored within six feet of the edge of the roof unless guardrails are erected on the roof edge.

Ref. # 41 Traffic control:

When working over or adjacent to a roadway, traffic control measures must be implemented. Employees working adjacent to roadways must wear vests that are highly visible and have reflective markings. When working adjacent to transportation aisles, traffic control measures should be reviewed to ensure the safety of the personnel on the job site.

Ref. # 42 Control falling objects:

When employees are working over other employees, all tools and equipment will be secured so that they will not fall. Tethers should be used to tie off tools and equipment. Employees must wear hard hats whenever there is a potential for falling objects. (See reference #37). Toe boards and solid floor surfaces without any openings shall be provided to prevent objects from falling through the openings.

Ref. # 43 Debris control:

Measures shall be taken to control debris in the construction area. Debris shall not be allowed to accumulate on walking/working surfaces.

Ref. # 44 Safety monitoring on the floor or radio communication is recommended:

Whenever working on a roof, lift, or other area where potential for falls exists, a safety monitor or two-way radio communication is recommended.

Ref. # 45 Safety communications:

Establish/maintain contact/communication with your Activity Safety Manager or competent person whenever roof top work is being performed and the possibility of adverse weather conditions exists.

Ref. # 46 Perform fall- protection equipment inspection:

All fall-protection equipment shall be inspected each day before use. A competent person—other than the user—shall conduct a thorough annual inspection of the equipment.

Ref. # 47 Canopy:

A covering should be erected to provide protection from falling or flying objects. The canopy must be designed and constructed to withstand the force of all potential falling objects under the supervision of a qualified person before it is erected or put into use.

Ref. # 48 Lock-Out/Tag-Out/Try-Out

When working near energy sources, lock-tag/try-out must be used to eliminate any potential hazards.

Ref. # 49 Crane rail stops:

Implement the crane rail stops as mandated by the Activity WHE-certifying official.

Ref. # 50 Other:

Note any other falling object protection measures or other protective measurers taken.

APPENDIX B

B.1 Total Fall Distance:

A worker is connected to a strong anchorage using a six-foot energy-absorbing lanyard (EAL). The anchorage is located three feet below the worker's dorsal D ring. The energy absorber meets ANSI Z359.1. (See figure 28.)

- **The maximum free-fall distance is:**
  3 + 6 = 9 feet free fall distance.

- **If the anchor is stronger than 5,000 pounds, does this system meet OSHA requirements, as stated in 29 CFR 1926.502(d)(16)?**

  No, the system does not meet OSHA requirements, because the free-fall distance is more than six feet.

- **To determine what is the clearance requirement, measured from the anchorage to the ground below. Assume the worker's "D" ring location is five feet from his toe at the instant of the worker's fall until he comes to a complete stop. A three-foot safety buffer is required between the bottom of the worker's shoe and the ground below.**

  6' + 5' + 3.5' + 3' = 17.5 feet total distance required from the anchorage to the ground below.

- **The minimum clearance requirement, measured from the work platform to the ground below is equal to:**

  17.5’ -- 3' = 14.5 feet

Appendix C

C.1 SAMPLE FALL-PROTECTION PROGRAM INSTRUCTION

Date:

INST 5100.XX

From: **Commanding Officer, Navy Command, Anywhere USA**

Subj: **FALL-PROTECTION PROGRAM**

Ref:
- **(a) Fall Protection Guide for Ashore Facilities, dated 4 March 2003**
- **(b) NAVFACENGCOM 5100.11J Safety and Health Program, dated 17 January 2000**
- **(c) COMNAVREGXXXINST 5100.X**
- **(d) OPNAVINST 5100.23F**
- **(e) NAVFAC P-307**
- **(f) 29 CFR 1910**

Encl:
- **(a) Authorized Employee Equipment checklist (If required)**
- **(a) Fall-Protection Equipment Inventory/Use Log (If required)**
- **(c) Fall-Protection Authorized Employee Training Certificate (if required)**

1. <u>Purpose.</u> Provide policy and guidance for the implementation of (Command name) Fall-Protection Program.

2. <u>Background.</u> Falls from elevation are the leading cause of injuries and fatalities in the workplace. Thousands of workers suffer injuries due to falls, resulting in lost work time. Reference (d) directed all Navy activities to establish fall-protection programs that include identification and elimination of fall hazards, whenever practical, through engineering controls, training for personnel, proper installation and use of fall-protection systems, and required rescue equipment and procedures.

3. <u>Command Policy.</u> All (Command) personnel must implement the fall-protection program in accordance with the requirements of the applicable standards and regulations, and utilize this instruction as the primary guide for the protection

of workers exposed to fall hazards. Whenever performance of any task would allow a worker to fall a distance of four feet or more to a lower level, the hazard shall be identified, evaluated, and controlled. The worker shall receive adequate training if required and shall be protected from falling. The controlling regulations would be 29 CFR 1910, the General Industry Standards.

4. <u>Responsibilities.</u>

a. <u>The Fall-Protection Program Manager/Supervisor of End User Shall:</u>

(1) ensure that the designated competent persons and qualified persons receive adequate training commensurate with their duties within the fall protection program;
(2) ensure that all workers—including contractors and subcontractors—performing work for the command shall be protected from falling to a lower level at all times;
(3) set the guidelines for the Safety Office to implement and maintain the command policies and the fall protection program;
(4) establish that all personnel, contractors, and subcontractors shall abide by the requirements of the fall protection program;
(5) ensure that all personnel exposed to fall hazards and those who are involved in the implementation of the fall-protection program shall be adequately trained;
(6) ensure that the investigation and reporting of a fall mishap comply with the requirements set forth in ref. d;
(7) ensure that fall hazard assessments and surveys are complete;
(8) ensure that fall-protection and prevention plans, rescue, and escape plans are adequately prepared and used.

b. <u>FALL PROTECTION MANAGER</u> Shall:

(1) "Indicate duties and responsibility as required"

c. <u>QUALIFIED PERSON (QP)</u> Shall:

See the QP duties and responsibilities addressed under reference (a), Section 6, page 30.
Include additional duties and responsibilities as required.

d. <u>COMPETENT PERSON (CP)</u> Shall:

See the CP duties and responsibilities addressed under reference (a), Section 6, page 30. Include additional duties and responsibilities as required.

e. <u>AUTHORIZED PERSON</u> (End User) Shall:

(1) not work in any fall-hazard area without being adequately trained and after the competent person has authorized him to proceed with the type of work, or activity;
(2) be adequately trained in the fall-protection equipment selection, use rescue, and storage and maintenance;
(3) not work in any fall-hazard area without first reviewing and fully understanding the FP &P Plan and Rescue and Evacuation Plan;
(4) shall not proceed with work assignments without having the proper fall-protection equipment and/or systems.
(5) Include any additional duties as required.

5. <u>Workplace Assessment/Surveys.</u>

a. Surveys of the work areas shall identify all fall hazards that exist at a specific location within buildings and facilities. This information will be used by the fall-protection program manager or the qualified person (QP) for fall-hazard elimination and/or protection of authorized persons from falling while performing various work tasks. The survey will provide pertinent information as to the type of fall hazard that will be encountered. All hazards shall be evaluated in accordance with reference d. This evaluation will enable the program manager/QP to develop solutions to those hazards that present the greatest risk of exposure and potential for injury.

b. A team made up of individuals, including authorized users and the CP, shall conduct assessment of workplace hazards.

***c.* See Reference a, Fall Protection Guide, paragraph 3.2 and Appendix A.**

6. <u>Fall-Hazard Prevention and Control</u> (Site Specific)

a. Regarding the proper order of control measures and solutions to fall hazards and project hierarchy and desirability, the QP should consider the order of control measure specified in Reference d.

b. System Design Requirements- See Reference (a).

c. Fall-Protection and Prevention Plan (FP&PP) - For preparation of the plan, See Reference (a). The plan should be site specific.

7. <u>Education and Training Requirements.</u>

a. Fall-Protection Training Requirements for:

(1) AUTHORIZED PERSON (END USER):

Training will include the following: hands-on training on the safe use and limitations of the equipment, nature of fall hazards, application limits, and proper anchoring and tie-off techniques. It will also include estimation of free-fall distance, deceleration distance and total fall distance; methods of inspection, storage, and care of the equipment and systems, familiarity with the applicable fall-protection regulations and standards, and rescue/self rescue techniques. The authorized person will receive a minimum of 16 hours of training, or as appropriate.

(2) COMPETENT PERSON:

In addition to the above-authorized person (end user), the competent person (CP) will require more stringent, detailed training requirements. Training will include the following: different types of fall-protection systems, hazard ranking systems and risk assessment, and various fall arrest/restraint and positioning systems; inspection and record keeping of fall-arrest equipment, inspection and identification of fall hazards, and installation and inspection of proper anchoring and tie-off points. CP will receive 40 hours of training or as appropriate.

(3) QUALIFIED PERSON:

In addition to the above CP training, the qualified person (QP) will be trained on how to design, select, certify, evaluate, and analyze fall-protection systems. The duration of the training is 40 hours, or as appropriate.

(4) COTR/COR/CA PERSONNEL:

These personnel will receive awareness training.

(5) ARCHITECTS and ENGINEERS:

These personnel will receive awareness training.

Note: For additional personnel training, see Reference (a), Section 4.10.

10. Audits and Program Evaluation

a. The FP program shall be evaluated periodically to determine the success of the program. The program manager shall collect and compare fall mishap data and near misses in order to compare this data to establish metrics.
b. Include any other required metrics.

10. Inspection, Storage, Care, and Maintenance of Equipment
a. See reference (a) Section 7.0

10. Rescue Systems/Plans
a. See reference (a)

Name

Appendix D

DISCUSSION EXAMPLES/PROBLEMS AND SOLUTIONS TO FALL HAZARDS

The following examples/problems, questions, and solutions to fall hazards are included to help safety personnel, Resident Officers in Charge of Construction (ROICCs), design engineers, contractors, and subcontractors to address fall hazard issues and concerns in the workplace, especially during the performance of work.

D.1 Product or Material Delivery to a Construction Site:

Question: Are vendors delivering products or materials to a construction site covered under 29 CFR 1926.500, Subpart M, if the products and material are delivered to a location on the construction site that is six feet or more above lower level?

Answer: Yes, they are required to comply with Subpart M. Vendors and others are considered engaged in construction activities when they deliver products or materials to a construction site that are used during construction work or when they are engaged in an activity that completes the construction work, such as final cleanup of buildings and structures. If the construction contractors picked up the products or materials at the vendor's outlet (store, warehouse, etc.) the vendor, depending upon the type of facility, may not be regulated by 29 CFR 1926.500, Subpart M.

D.2. Delivery and Placement of Roofing Materials:

Question: What are the obligations of suppliers of roofing materials when they deliver roofing materials to a construction site and place the material on the roof?

Answer: Because the products will be used during construction activities, the suppliers will be required under Subpart M to protect their employees from falls of six feet or more to lower levels when possible. Therefore, employees shall be provided with personal fall-arrest equipment to attach to an anchor point if available. In case of delivering roofing materials, the following is required

Gaining Access to a Roof: When gaining access to a roof, a handhold (rope, chain, or other railing) shall be attached to the conveyor belt in order for the vendor or supplier's employee to have something to steady himself/herself with; or a ladder shall be used to gain access to the roof.

Discussion: Distribution of Roofing Materials: Once on the roof, the vendor's employee will receive roofing products from a conveyor belt (lift truck or similar equipment) and then distribute the products onto the roof at various locations.

During this distribution, OSHA will not require the vendor's employees to install anchorage point for fall-protection equipment regardless of the slope of the roof or the fall distance. The construction contractor shall establish/identify properly designed anchorages to be used by vendor's employee.

Additional Discussion: It is recommended that the employee be tied to an anchorage point to be established at the ridge or the highest point on the roof. The anchorage point can have a post four to five feet high attached to it, so that a self-retracting lanyard or lifeline attachment to the "D" ring will be high enough and won't become a tripping hazard.

D.3 Performing Work from an Elevated Scissors Lift:

Question: When working above six feet high and performing work from an elevated scissors lift, does a worker require fall-protection equipment, even if the scissors lift is equipped with 42" guardrails?

Answer: Yes, to conform to standard established safety practices. However, there is some confusion surrounding this issue. According to OSHA, if the scissors lift is equipped with standard guardrail on all sides, this would be in compliance with ANSI A92.2 "Self Propelled Elevating Work Platforms." However, most of the time, workers performing work while in an elevated scissors lift may lean over the guardrails and perform work outreaching beyond the limits of the guardrails. Furthermore, if the scissors lift, while in motion, collides with other equipment or stops abruptly, the worker might be ejected or thrown out. Therefore, additional fall protection equipment (fall arresting/restraining equipment) will be required for workers in a scissors lift.

Additional Discussion:
All other self-propelled elevating work platforms will require the worker to be tied-off to a properly designed anchorage point in the lift at all times, as per 29 CFR 1926.453. According to OSHA standard interpretation and compliance letters dated 7 July 1998 for aerial lifting equipment and fall-protection for scissors lifts, OSHA recognizes that there is confusion regarding safety measures pertaining to scissors lifts and appropriate standards governing such equipment. Furthermore, the interpretation letters state that while working from an elevated scissors lift (ANSI A92.6) a worker need only be protected from falling by a properly designed and maintained guardrail system.

D.4. Fall Protection Requirements for Scaffolds:

Question: What type of fall protection equipment will be required while working on scaffolds?

Answer: A fall-arrest system, vertical lifeline, and guardrail system will be required on movable or suspended scaffolds. If the scaffold is attached to a building or structure (is stationary), workers will require guardrail systems. However, it is recommended to use fall-arrest system, horizontal, or vertical lifelines on stationary scaffolds. Warning-line system is required at the lower level.

D.5 Roofing Work:

Question: If a roofing contractor performs new work as well as re-roofing or recovering roofing equipment, what type of fall-protection system is required?

Answer: When working on sloped roofs, use a horizontal lifeline with a lanyard and full-body harness, or use roofing anchor brackets with a rope grab. If working on flat roofs, use a fall-restraining system with full-body harness and lanyard, or construct temporary guardrails. On flat roofs, utilize a warning-line system to prevent workers from approaching the leading edge of the roof.

D.6 How to Calculate Total Fall Distance/Clearance:

Question: How to calculate total fall distance/clearance from the anchorage location to the ground below to determine if a worker exposed to fall hazard would not come in contact with the ground below?

Answer: To calculate total fall distance for a worker exposed to a potential fall, determine the location where the tie off point is, including lanyard length, deceleration distance (which is not more than 42 inches), height of the worker, and clearance distance from the foot of the worker to the ground below. If the tie off point location is below the D-ring of the harness, this will increase total fall distance.

D.7 Third-Party Certification:

Question: Is third-party certification required for fall-arrest systems?

Answer: Existing regulations and standards do not address third-party certification. Major fall-protection equipment manufacturers felt that there is a need to certify their equipment or products by a third-party entity, independent from the manufacturers themselves. The need for the third party certification is highly recommended, because although there are regulations and standards governing fall protection equipment manufacturers, the industry itself is not regulated. The market is being flooded with new fall-protection equipment manufacturers and products, and some of these products are not safe or are

manufactured for the mountaineering industry, but are being inappropriately used for fall arrest.

Note: Anchor points do not require third party certification as long as the qualified person has designed/verified/approved and certified the system, and it was installed under his or her authority.

D.8 Requirements for Inspection and Certification Process for Horizontal Lifeline System:

Question: What is the difference between the inspection and certification process?

Answer:

Inspection: The act of verifying conditions of a system, assembly, or component. Inspection should be per established standards and criteria with a means in place to correct deficient conditions. The inspector shall be trained for the inspection task.

At Navy Ashore facilities, the horizontal lifelines shall be considered fall protection equipment requiring annual inspection. Inspection of HLL components should include anchorage connectors, lifeline tensioner, thimble, cable, fittings, snap hooks, self-retracting lanyard shock absorber, lanyards, and full-body harness. Inspection should follow ANSI Z359.1 standards inspection process or OEM instructions, or if produced locally by the qualified engineer.

Certification: Is the process resulting in documentation that the criteria established for the design of the system and inspection requirements is met. Each activity that installs HLL shall develop a certification process that evaluates the design of the assembly and provides inspection criteria.

Standards and requirements: Certifying HLL Systems is carried out by testing or applying proven analytical methods under the supervision of a qualified person. However, according to ANSI Z359.1, Paragraph 3.1.4, Personal Fall- Arrest System (PFAS) incorporating a HLL is outside the scope of the standard.

D.9 Personal Fall-Arrest Equipment Consideration as Personal Protective Equipment (PPE)

Question: Is Personal Fall Arrest Equipment considered personal protective equipment (PPE)?

Answer: PPE is supposed to protect a person using the equipment. A full-body harness by itself will not protect the user from falling. Other components of the system are required, such as lanyard, a means of connection, and an anchorage system. In other words, a fall-arrest system will protect the person from falling only if the system is complete and connected. A fall-arrest system—as a whole—not the components, will protect the user from falling. The most logical designation of PFAS should be personal protective systems (PPS).

Additional Discussion:
Under 29 CFR 1910.132(a) Application, states that protective equipment include PPE for eyes, face, head, extremities, protective clothing, respiratory devices, and protective shields and barriers. Body protection is not mentioned.
Under ANSI Z359.1, throughout the standards, reference is always made to personal fall-arrest equipment and systems, not PPE. Only in one location under the explanatory column on page 9, Section E.1.1, which is not part of the standard states the following: “equipment used in personal fall-arrest system is commonly referred to as personal protective equipment (PPE) in the literature of the safety field."

Under 29 CFR 1910 .66, Appendix C, Personal Fall-Arrest System, throughout this part there is no mention of PPE in the regulations; only fall arrest systems and components are used.

Under 29 CFR 1926.500, Subpart M, the wording PPE is not used.

Most manufacturers do not use the wording PPE to define or describe fall-arrest equipment or systems. Under 1910 Subpart I, PPE, the requirements include eye, face, respiratory, head, foot protection, electrical protective equipment, and hand protection. Body protection is not mentioned.

Under 29 CFR 1926, Subpart E, 1926.95, the criteria for PPE does not include any reference to fall-arrest equipment. The title of this section is Personal Protective Equipment and Life Saving Equipment.

Only under 29 CFR 1915, such equipment is referenced as PPE. Furthermore, OSHA, under Proposed Rulemaking on Personal Protective Equipment dated 31 March1999, included fall protection equipment as PPE.

D.10 Aircraft Maintenance

Question: What are the different types of fall protection methods used for aircraft maintenance?

Answer: The most widely used method is horizontal lifeline, and self-retracting lifeline. Other methods include work-stands and platforms. The usage of HLL depends on many factors, including special design requirements to limit the total fall distance, so that the user will not come in contact with the ground below during a fall. Other factors include: amount of sag in the line, training requirements for the users and annual testing, and certification requirements. Furthermore, there are some limitations with HLL, such as the number of users connected to the system. Another factor is that the aircraft may not be situated in the same hanger location, and this may cause limitations regarding the HLL; the aircraft should be situated always at the same location inside the hangar.
On the other hand, work-stands and platforms are also widely used in aircraft maintenance. It is safer to use work-stands and platforms, and they can be built and assembled in sections to allow such assembly at different locations inside or outside the hangars. For smaller aircraft, or if the worker is performing low elevation maintenance (below 10 feet) using work-stands and platforms is the most desirable alternative because there is no need for user training, maintenance, annual testing, certification and inspection of HLL or fall arrest equipment. Usually work-stands are built in sections and can be assembled around an aircraft and at different locations within a hangar.

Other fall-protection systems include in addition to work-stands and the use of HLL, a restraining system utilizing air suction equipment attached to the wing of the aircraft. This system is new and not widely used. Some of the disadvantages of this system are limits on user movement on the aircraft wing, and the reliability of the suction power of the system used as the anchorage requires constant monitoring.

D.11 Applicability of Standards to Preflight Inspection Work

Question: How do regulations and standards apply to the preflight inspection work?

Answer:
Let us examine the applicability of the standards and instructions to the preflight inspection work and assume that personnel will only be walking the wings or climbing a pylon. If they are performing any other maintenance work, they should be protected from falling by the use of fall-protection systems. Although under Scope, Application, and Definitions of 29 CFR 1926, Subpart M states the following exception: “The provision of this subpart does not apply when performing inspection and investigation work. However, these standards are for the construction industry and do not apply to preflight employees are making an inspection, investigation, or assessment of workplace conditions prior to the start of actual work or after construction is completed.” As indicated before, these standards do not apply to preflight inspection work; they only apply to construction

work.

According to OPNAV 5100.23, Appendix 3-A, enclosure (1), Classify the Job Hazard Category working on aircraft as "E" and the hazard level as "LOW". When OPNAVINST .23 was drafted, fall hazards were not taken into consideration. There is no reference to any fall hazards in the instructions. Workers are fatally injured when they fall from lower heights (as low as the wing of an aircraft).

29 CFR 1910 are the applicable standards to the preflight inspection work. According to subpart D of the standards, the title of this subpart is "Walking-Working Surfaces;" the regulation means that every person who is walking or working on a surface will require some form of fall protection. The standards do not mention specifically mention inspection, but by stating the word “walking,” one can imply that “inspection” is certainly the intent. Paragraph 1910.23(c)(1), states that every open-sided floor or platform consisting of four feet or more will require some form of fall protection.

According to OSHA Instructions STD 1-1.13 dated April 16, 1984: The purpose of this instruction was to clarify the applicability of 29 CFR 1910.23(c)(1) "protection of open-sided floors, platforms, and runways. Paragraph "F" of the OSHA Instructions provides the following interpretations: “Platforms are interpreted to be any elevated surface designed or used primarily as a walking or working surface, and any other elevated surfaces upon which employees are required or allowed to walk or work while performing assigned tasks on a predictable and regular basis. Predictable and regular basis means employee functions such as, but not limited to, inspection, service, repair, and maintenance which are performed: At least once every 2 weeks or for a total of 4 man-hours or more during any sequential 4-week period.” Paragraph G-2 of the same instructions states the following: “In situations where safeguarding requirements under 29 CFR 1910.32(c)(1) or (3) are not applicable because employees are exposed to falls from an elevated surface other than a predictable and regular basis, personal protective equipment as required by 29 CFR 1910.132(a) or other effective fall protection shall be provided.”

It should be determined if the intended preflight work is predictable, unpredictable, regular, or on a non-regular basis. Then a decision can be made if fall-protection is required. All regulations, standards, and instructions contain the minimum requirements.

29 CFR 1960, Federal Employees Basic Program Elements for Occupational Health and Safety Programs for Federal Employees: Under Subpart 1960.16 Compliance with OSHA Standards directs each agency head to comply with all occupational and health standards issued under section 6 of the Act (Occupational Safety and Health Act of 1970), or with alternate standards issued pursuant to this subpart. Under Part 1960.1, Purpose and Scope, Paragraph (e), states that the

Executive order 12196 and the basic program elements (under 29 CFR 1960) apply to all agencies of the Executive Branch. They apply to all Federal employees and all working conditions. They apply to all working conditions of federal employees except those involving uniquely military equipment, systems, and operations. The term "Uniquely Military" is defined under 1960.2(I) as follows: The term " uniquely military equipment, systems and operations" excludes from the scope of the order (Executive Order 12196) the design of Department of Defense equipment and systems that are unique to the national defense mission, such as military aircraft, ships, submarines, etc. and excludes operations that are uniquely military, such as field maneuvers, naval operations, military flight operation, associated research test and development activities, and action required under emergency conditions. However, the term includes within the scope of the Order, Department of Defense workplaces and operations comparable to those of industry in the private sector such as: vessel, aircraft and vehicle repair, overhaul and modification, construction, supply services, civil engineering, public works, etc.

Recommendations:

If preflight inspection is performed inside a hangar, fall protection should be provided. If a preflight inspection is performed at the tarmac, or at the flight line, it will be difficult to provide fall protection. In accordance with OSHA Instruction STD 1-1.13, if it is determined that fall protection is not required, it should not be used as an overall blanket policy or guide for not providing fall protection during preflight inspection work and at all times. If there is the possibility of using any form of fall protection, it should be used. The above standards do not preclude us from prescribing additional safer requirements beyond OSHA or other existing standards/instructions. In situations when fall protection is not or cannot be provided, such as "inspection work" performed at the tarmac/flight line, proper and applicable fall protection training should be provided to the person exposed to fall hazards from the wing of an aircraft or pylon. Additionally, it should be stressed during training that the person performing inspection work should keep away from the edge as much as possible. The edge of the wings may be inspected from a stepladder. In certain situations, the term “uniquely military” might be applicable; however, it should not hinder anyone from taking additional precautionary measures to protect personnel exposed to fall hazards.

D.12 Risk of Exposure to High Winds

Question: What is the maximum wind velocity an employee should be exposed to while performing a job?

Answer: All fall-protection standards do not address exposure to high winds. However, the 29 CFR 1910.269 titled “Electric Power Generation, Transmission,

and Distribution; Paragraph (x)(5)" defines: "High Winds as a wind of such velocity that the following hazards would be present:

[1] An employee would be exposed to being blown from an elevated location, or

[2] An employee or employee operating material-handling equipment could lose control of the materials being handled, or

[3] An employee would be exposed to other hazards not controlled by the standard involved."

Note: Winds exceeding 40 miles per hour (64.4 kilometers), or 30 miles per hour (48.3 kilometers) if material handling is involved, are normally considered as meeting this hazard-prevention criteria unless precautions are taken to protect employees from the hazardous effects of the wind.

D.13 Responsibility of HLL Certification

Question: Who is responsible for certifying horizontal lifeline systems?

Answer: The responsibility lies with the activity that owns or uses the system. Navy activities should take into consideration when selecting or designing HLL systems that these systems will require annual or periodic certification by a qualified person and activities should budget funds for this effort.

Appendix E

FORMS

(Note: Local commands should use the following form format, making sure they adhere to appropriate local regulations that may apply)

EMERGENCY RESCUE PLAN FORM

Site & Location Identification:

Detailed Location:

Primary Emergency Phone Number:

Type of Phone/Location:
Local Phone Line/Outside Line:
Secondary Emergency Phone Number:

Backup Rescue Lift is Available/Located at:

First Aid kit Location(s):

Fire Extinguishers locations(s):

Nearest Hospital Route and Location:

Describe Rescue Operation:

Type of equipment (PPE, Ladder, Hoist, etc.)

Training on Rescue:

Name of Personnel Requiring Rescue:

Self-Rescue Equipment used:

Additional Comments: _____
_____
_____

Form 1-1

FALL PROTECTION TRAINING ROSTER (FORM)

All employees signing this form indicate that they understand the fall hazards on the job site, and that they have been trained in the proper use of and will use the selected fall protection equipment and methods. Review and sign again if hazards or methods change.

NAME: _____
ORGANIZATION/CODE/SHOP: _____
SIGNATURE: _____
TRAINING DATE(s): _____
DURATION OF TRAINING (Hrs): _____
INSTRUCTOR'S NAME: _____
COURSE TITLE: _____
DESCRIPTION OF THE COURSE: _____

NAME: _____
ORGANIZATION/CODE/SHOP: _____
SIGNATURE: _____
TRAINING DATE(s): _____
DURATION OF TRAINING (Hrs): _____
INSTRUCTOR'S NAME: _____
COURSE TITLE: _____
DESCRIPTION OF THE COURSE: _____

NAME: _____
ORGANIZATION/CODE/SHOP: _____
SIGNATURE: _____
TRAINING DATE(s): _____
DURATION OF TRAINING (Hrs): _____
INSTRUCTOR'S NAME: _____
COURSE TITLE: _____
DESCRIPTION OF THE COURSE: _____

NAME: _____
ORGANIZATION/CODE/SHOP: _____
SIGNATURE: _____
TRAINING DATE(s): _____
DURATION OF TRAINING (Hrs): _____
INSTRUCTOR'S NAME: _____
COURSE TITLE: _____
DESCRIPTION OF THE COURSE: _____

Form 1-2

APPENDIX F

FALL PROTECTION EQUIPMENT INSPECTION CHECKLIST

Activity/Command:	**Page 1**
Inspected by: (Supervisor's Name)	**Date:**
Work Area:	**Department:**

Instructions:

1. **All parts of the fall protection system and components are to be checked for excessive wear and damage.**
2. **Use the symbol "Y" for yes or OK.**
3. **Use the symbol "N" for no or replace.**
4. **All equipment must be inspected visually before each use and documented on this form at least weekly under continued use or if the system has not been used for thirty days.**

Name or Equip #	Self Retracting Lifelines		Lanyards		Full Body Harnesses			Horizontal Lifeline System		
	Cable	Mechanism	Webbing	Energy Absorber	Webbing	"D" Rings and Connectors	Labeling	Anchorage Connection / Stanchions	Cable	Hardware

APPENDIX F (continued)

FALL PROTECTION EQUIPMENT INSPECTION CHECKLIST

Activity/Command:	**Page 2**
Inspected by: (Supervisor's Name)	**Date:**
Work Area:	**Department:**

Name or Equip. #	Vertical Lifelines		Anchorages/ Anchorage Connections		Ladder Climbing Systems			Snap Hooks/ Carabiners		
	Rope/cable	Rope Grabs	Structural Integrity	Anchor Strap, Beam Wall and Roof Anchors	Cable/ Rope	Rope Grab	Connections	Gate Locking Mechanism	Any Cracks	Deformation

APPENDIX G

FALL-ARREST SYSTEM CHECKLIST

(Must answer yes to all applicable questions)

ANCHORAGES

1. Do workers know appropriate anchorage points for each task that requires a fall-arrest/positioning or restraint system? _____

2. Are all anchorage points stable, substantial, and have sufficient strength to withstand twice the potential impact energy of the free-fall? _____

3. Is the "D" ring of the full body harnesses located at the back shoulder height? _____
   Are anchorage points for self-retracting lifeline systems located overhead? _____

4. Can the employee move from one station to another or climb up and down without exposure to a fall? _____

5. If the lifeline, lanyard, or self-retracting lifeline is not permanently attached to an anchorage point at the elevated work area, is the first worker up or the last worker down protected while climbing and traversing? _____

VERTICAL LIFELINES

1. Does the lifeline have a minimum breaking strength of 5,000 pounds? (2,268 kilograms) _____

2. Is the lifeline protected from abrasive or cutting edges? _____

3. Does the system provide fall protection as the worker connects to and releases from the lifeline? _____

4. Is the lifeline arranged so workers never have to hold it for balance? (A lifeline should never be used for balance) _____

5. Is the vertical segment integrated with the horizontal segment to provide continuous fall protection? _____

HORIZONTAL LIFELINES

1. Has the entire horizontal lifeline system been designed and approved by a qualified person? _____

2. Have the anchorages to which the lifeline is attached been designed and evaluated specifically for a horizontal lifeline? _____

3. Has the designer of the system approved the number of employees that will be using it? _____

4. Is the rope or cable free from signs of wear or abrasion? _____

5. Does the rope or cable have the required initial sag? _____

6. Have the workers been warned about potential falls? _____
Have the clearances been checked? _____

7. Is the hardware riding on the horizontal lifeline made of steel? (Aluminum is not permitted because it wears excessively) _____

FALL ARRESTERS

1. Is the fall arrester compatible with the lifeline on which it is to be installed or operated? _____

2. Is the fall arrester in operational condition? _____

3. Is the fall arrester equipped with a changeover lever that allows it to become a stationary anchor on the lifeline? _____

4. Is the fall arrester equipped with a locking mechanism that prevents unintentional opening of the device and subsequent disengagement from the lifeline? _____

5. Is the fall arrester's "up" direction marked properly so that the equipment can be attached to the line correctly? _____

6. Is the fall arrester included in a regular maintenance and inspection program? _____

LANYARDS

1. Is the lanyard length as short as necessary and in no case greater than 6 feet? (1.8 meters) _____

2. Are manually adjustable lanyards used when it is desirable to be able to take slack out of the lanyard? _____

3. Does the lanyard have a shock-absorbing feature to limit the arresting forces? _____

4. If the lanyard has a shock absorber, is it obvious to the user that the shock absorber has been deployed? (Is there a warning label, broken pouch, etc.) _____

5. Have you prohibited tying of knots from the lanyard to the lifeline? (Mechanical rope grabs or fall arresters must be used) _____

SELF-RETRACTING LE LIFELINE (SRL)

1. Are employees properly trained to use a SRL? _____

2. Is the SRL under a regular maintenance and inspection program? _____

3. Is the end of the cable properly spliced? _____ (Thimble eye, Flemish eye-spliced, and swaged fitting/ferrule)

SNAP HOOKS

1. Have double-locking snap hooks been used? _____

2. Is the snap hook attached to the D-ring, eyebolt, or other hardware in a manner approved by the manufacturer of the snap hook? _____

3. Are snap hooks inspected regularly for stress, wear, distortion, and spring failure? _____

4. Are snap hooks arranged so they are never connected to each other? _____ (They should NOT be connected to each other.)

FULL BODY HARNESSES

1. Are full-body harnesses selected for a particular job quipped with all necessary attachment points? (For fall arresting, work positioning, descent control, rescue, or ladder fall-protection systems) _____

2. Are body harnesses inspected regularly for wear, abrasion, broken stitching, and missing hardware? _____

3. Is the Velcro type of closure prohibited from all load-bearing connections? _____

4. Have workers been instructed in the use and care of body harnesses/body belts? _____

OTHER CONSIDERATIONS

1. Has the free-fall distance been considered, so that a worker will not strike a lower surface or object before the fall is arrested? _____

2. Have pendulum-swing fall hazards been eliminated? _____

3. Have safe methods to retrieve fallen workers been planned? _____

4. Is all fall-arrest equipment free of potential damage from welding, chemical corrosion, or sandblasts? _____

5. Are all components of the system compatible according to the manufacture's instruction? _____

6. Have employees been properly trained in the following issues?

   Manufacturer's recommendations, restrictions, instructions, and warnings _____

   Location of appropriate anchorage points and attachment techniques _____

   Are there any problems associated with elongation, deceleration distance, and method of use, inspection, and storage? _____

7. Are all regular inspections performed by trained inspectors? _____

8. Are written reports maintained? _____

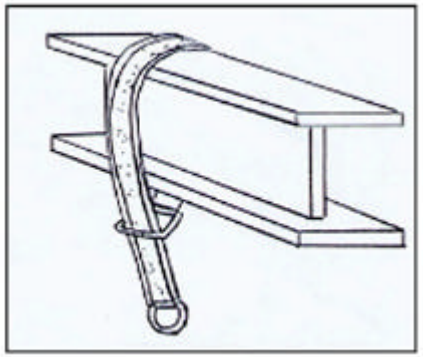
9. Has the total fall distance been considered? _____

10. Has rescue of the worker been considered? _____

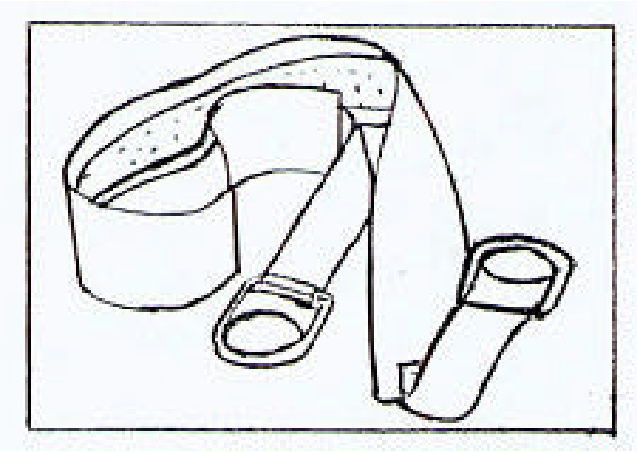
FALL PROTECTION WORK PLAN MATRIX

Ref		16 GAURD RAILS (TEMP)	17 WARNING LINE SYSTEM	18 CATCH PLATFORM/SAFETY NETS	19 VERTICAL LIFE LINE/ROPE GRAB	20 HORIZONTAL LIFE LINE	21 FALL ARREST SYSTEM W/5000 LB ANCHORAGE	22 POSITIONING/RESTRAINING SYSTEM	23 EGRESS FALL PROTECTION	24 SAFETY MONITORING SYSTEM	25 FLOOR/HOLE COVER	26 OTHER
C												A
1	FALL HAZARDS - GREATER THAN 6 FEET											
2	FALL HAZARD: ABOVE A HAZARDAT ANY HEIGHT (e.g. ABOVE DEBRIS, MACHINARY, REBAR, STRUCTURES ETC.)											
3	OPEN SIDED [ ]FLOORES [ ]PLATFORMS [ ]STAIRS [ ]CATWALKS [ ]SCAFFOLDS [ ]MACHINARY [ ]OTHER	O		O		O	O	O				
4	OPENING 2 INCHES OR MORE; [ ]MANHOLES [ ]PITS [ ]TANKS [ ]SKY LIGHTS [ ]FLOOR HOLES [ ]OTHERS	O			O	O	O	O			O	
5	WALL OPENING: 30 IN HIGH X18 IN WIDE & LESS THAN 3 FT ABOVE WORKING SURFACE W/FALL TO LOWER LEVEL	O		O		O	O	O				
6	WORKING IN BOOM SUPPORTED ARTICULATING LIFT (I.E. LIFT)						X		O			
7	LEAVING GAURDED FLOOR SURFACE OF: [ ]LIFT [ ]CATWALK [ ]PLATFORM [ ]SCAFFOLD [ ]OTHER				O				O			
8	WORKING ABOVE SUSPENDED CEILINGS				O	O	O	O				
9	LEADING EDGE WORK ABOVE 6 FT. ON A LESS THAN 4/12 (LOW) PITCH ROOF	O	O	O		O	O	O		O		
10	WOKING WITHIN 6 FT. OF ANY UNGAURDED ROOF EDGE LESS THAN 4/12 (LOW) PITCH ROOF	O		O		O	O	O		O		
11	STEEP ROOF (GREATER THAN 4/12 PITCH)	O		O		O	O	O				
12	ELEVATED WORK PLATFORMS: E.G. SCISSORS LIFT, LIFT-A-LOFT, GENIE LIFT								O			
13	BOATSWAIN CHAIR				X		X					
14	WORKING ON ROOFS WHEN ADVERSE WEATHER MAY BE ENCOUNTERED (WIND, SNOW, ICE, HAIL)				O		O	O	O	O		
15	OTHER											

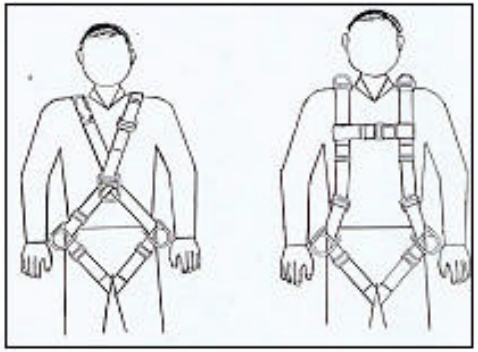
FIGURES



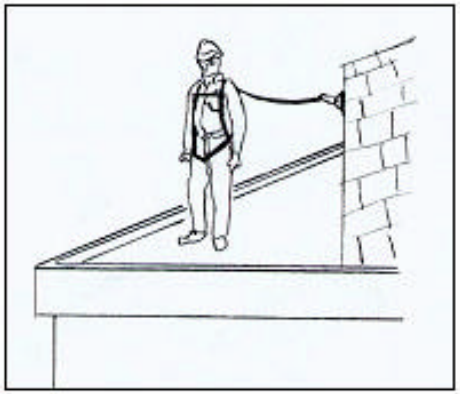
Anchor Strap Connected to a Beam
(Figure 1)



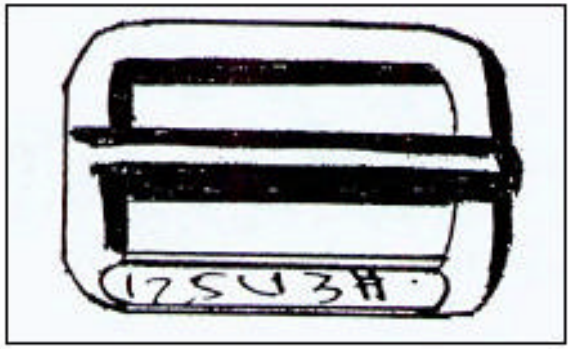
Anchor Strap
(Figure 2)



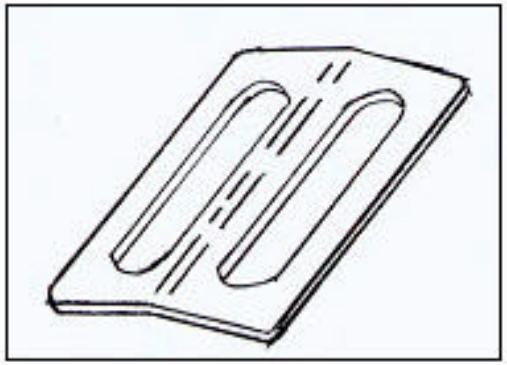
Full Body Harness
(Figure 3)



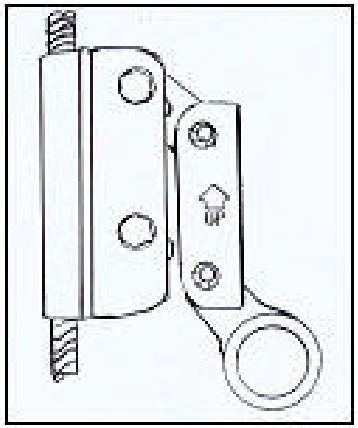
Body Restraint System
(Figure 4)



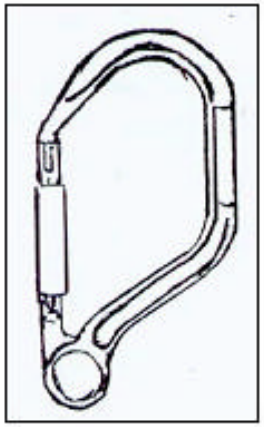
Adjustable buckle
(Figure 5)



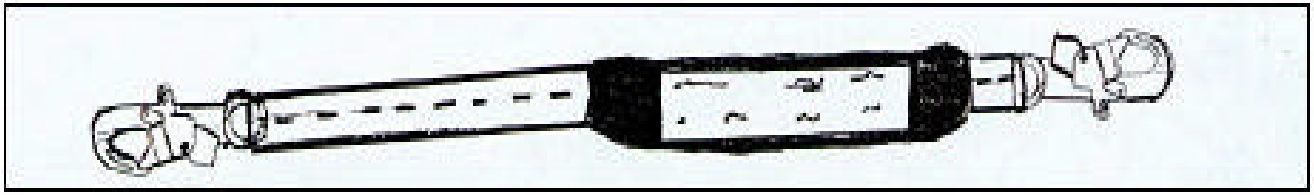
Friction Buckle
(Figure 6)



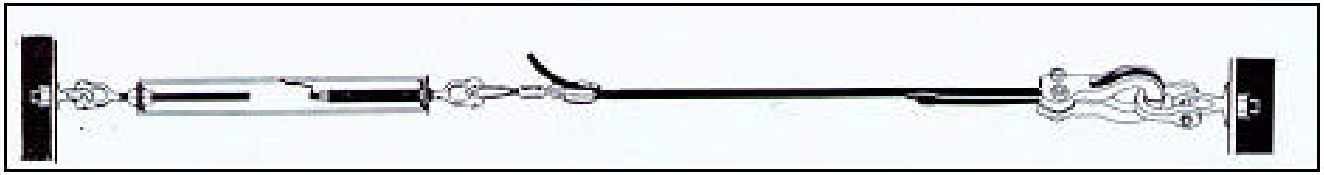
Rope/Cable Grab
(Figure 7)



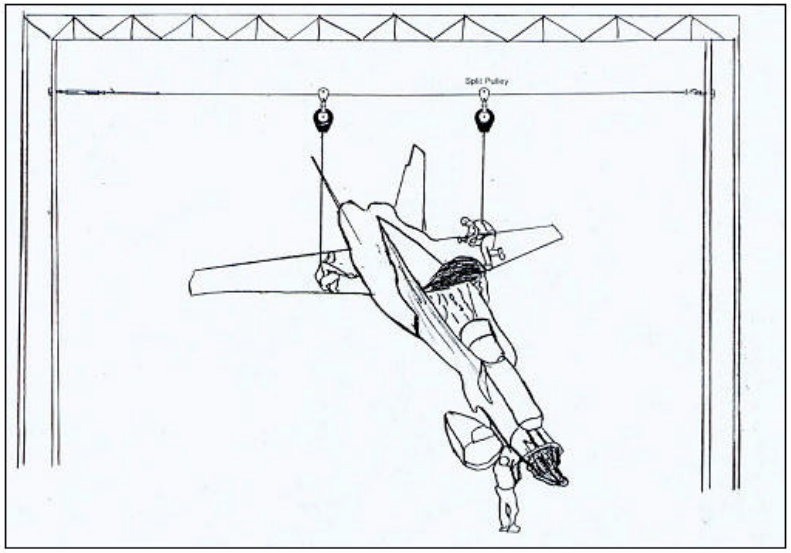
Carabiner
(Figure 8)



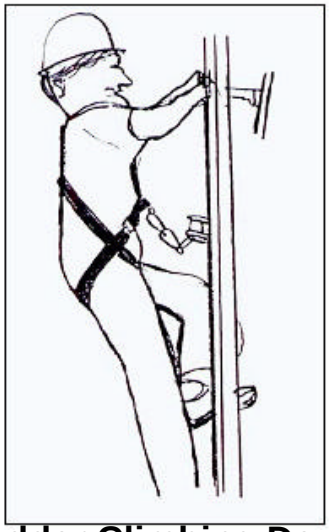
Lanyard with energy Absorber
(Figure 9)



Horizontal Lifeline System
(Figure 10)

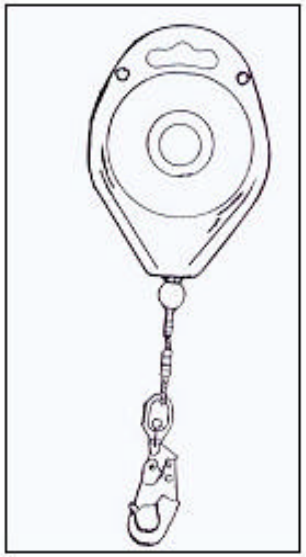


Horizontal Lifeline system
For Aircraft Maintenance
(Figure 11)



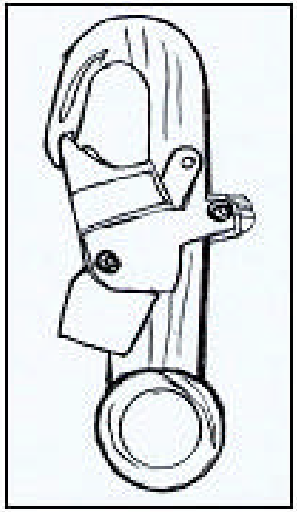
Ladder Climbing Device
(Figure 12)

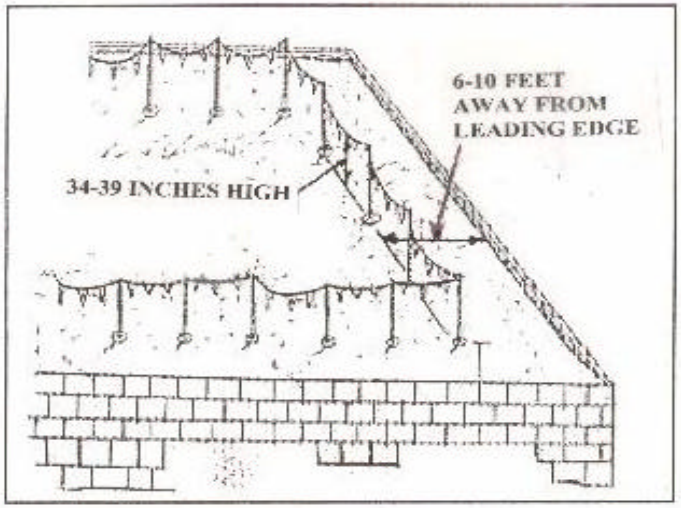
Positioning system with Vertical Lifeline
(Figure 13)



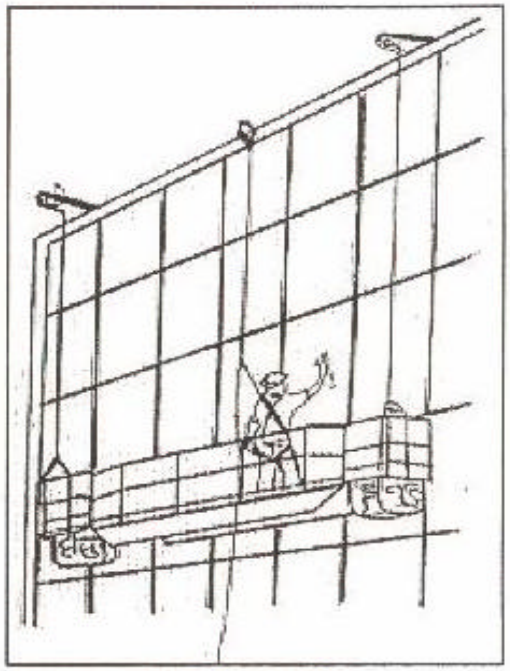
Self Retracting Lanyard
(Figure 14)

Locking Snap Hook
(Figure 15)



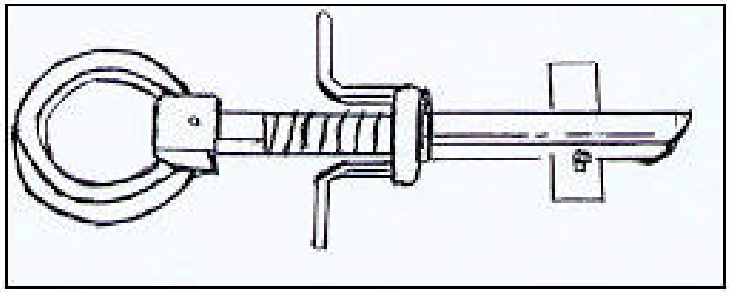


Warning Line System
(Figure 16)

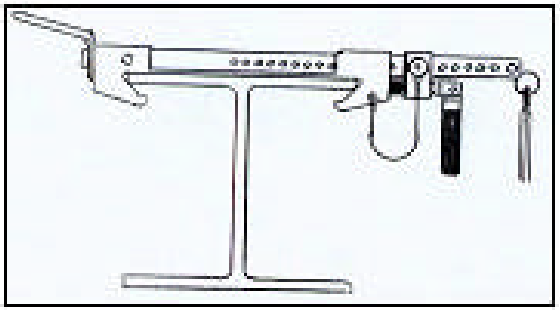


Suspended Scaffold with
Vertical Lifeline
(Figure 17)

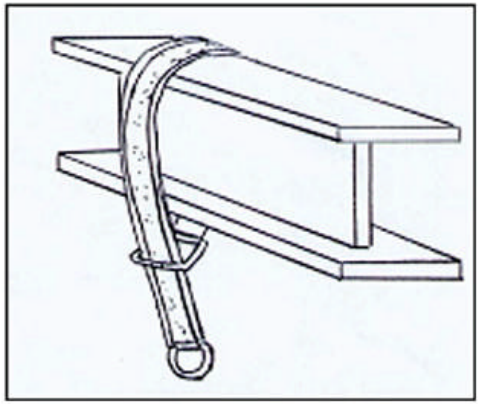
Confined Space Entry
(Figure 18)



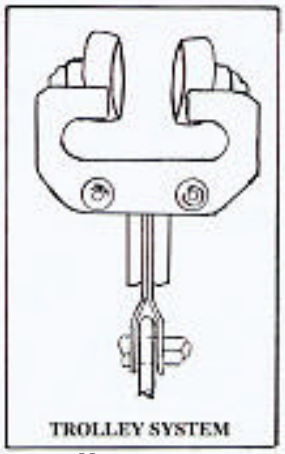
Bolt Hole Anchor connection
(Figure 19)



Beam Anchor Connection
(Figure 20)



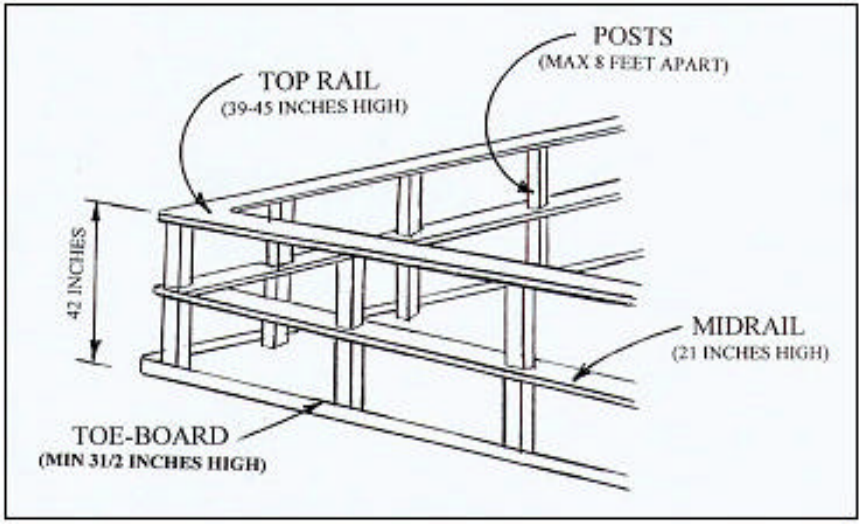
Anchor Strap rapped around a beam
((Figure 21)

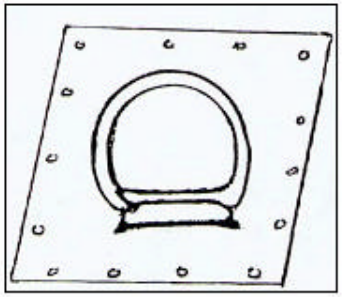


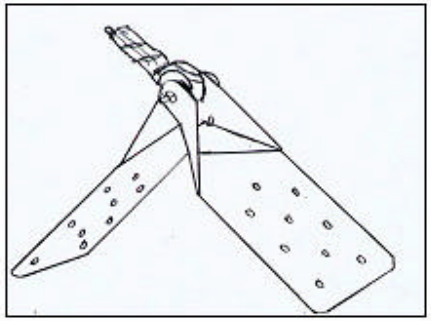
Trolley System
(Figure 22)

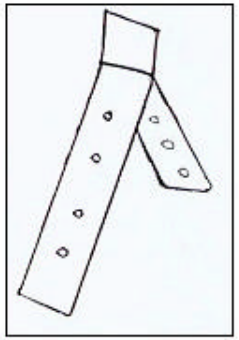
Miscellaneous Anchorage Connections

Guard Rail system
(Figure 23)

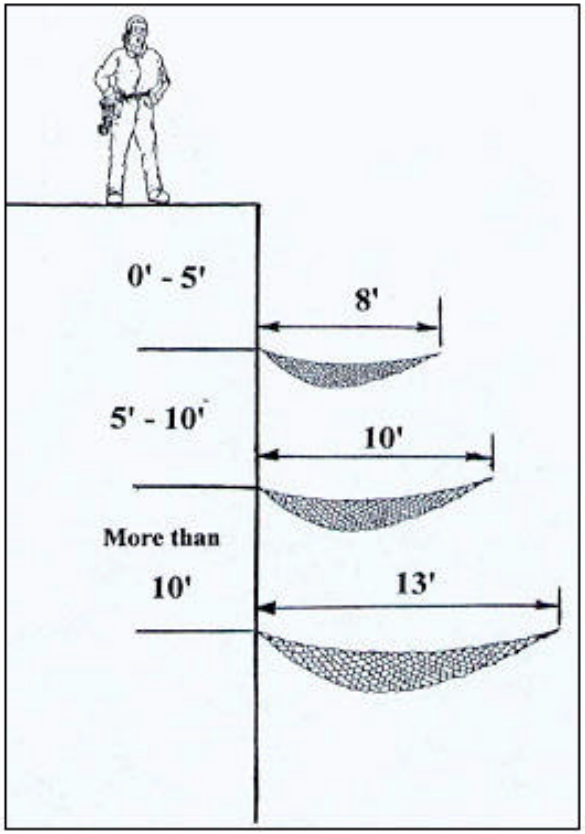




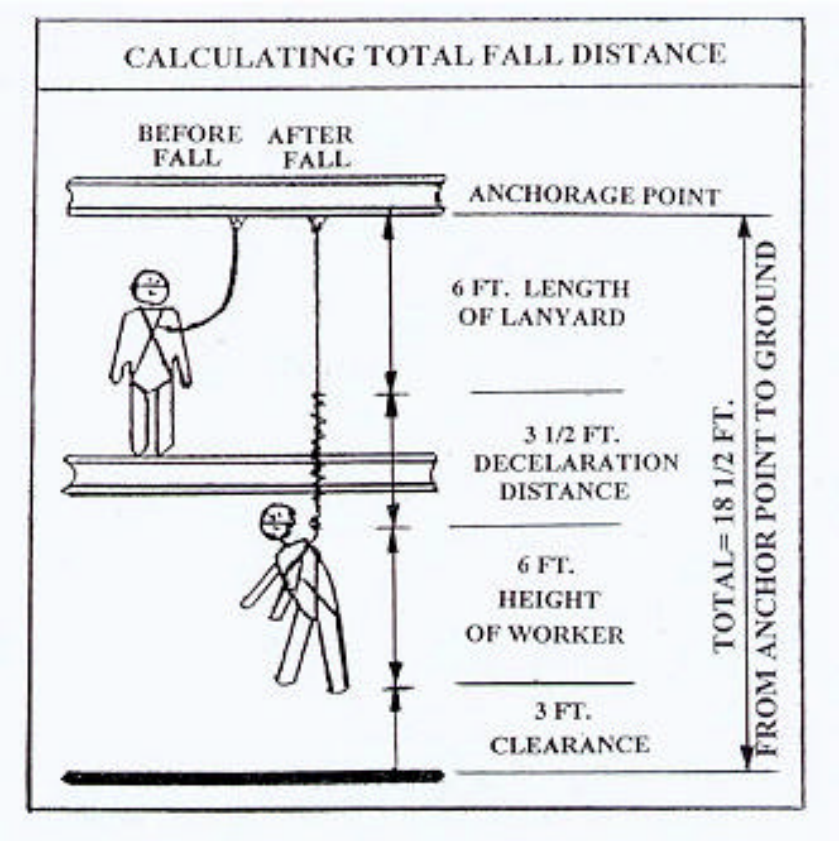




Miscellaneous Roof anchors
(Figure 24)



Safety Net Extension
(Figure 25)

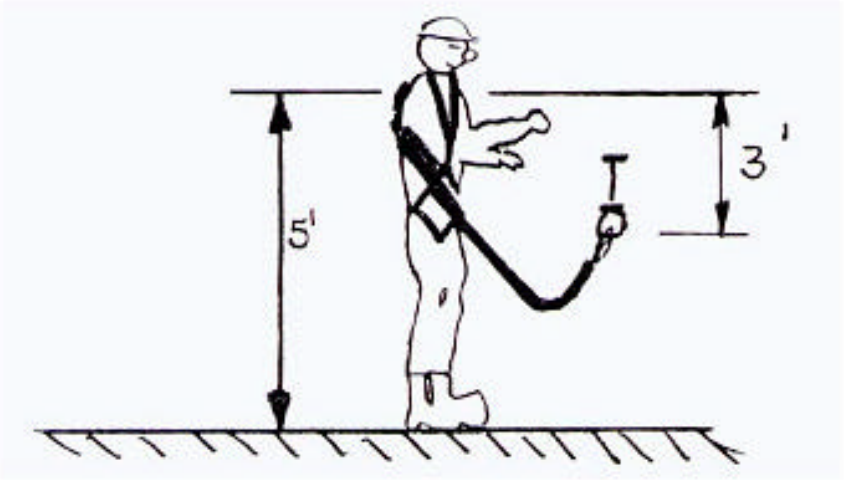


Total Fall Distance
(Figure 26)

Work Stand for Small Aircraft

Various Work Stands and Platforms for Aircraft Maintenance

(Figure 27)



Total Fall Distance
{Figure 28}