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# Managed Fall Protection Programs: A Case Study

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## Introduction

With the recent publishing of the new ANSI/ASSE Z359 family of standards, many forward-thinking companies are adopting elements of the standard to create a safer work environment. Specifically, the ANSI/ASSE Z359.2 standard titled "Minimum Requirements for a Comprehensive Managed Fall Protection Program" provides valuable guidance to companies regarding the key elements of a successful program.

The program elements outlined in the ANSI/ASSE Z359.2 include:

- Policies, duties and training
- Fall protection procedures
- Eliminating and controlling fall hazards
- Rescue procedures
- Incident investigations
- Evaluating program effectiveness.

These elements are foundational for creating a program that reduces risk and enhances employee safety. When one or more of these elements is missing, a program can become stalled or be deemed ineffective.

After a review of key points form the ANSI Z359 standard, a case study is included in this paper to demonstrate some of these fundamental program elements in a real world setting. In 2002, Marathon Pipe Line LLC's (MPL) network of facilities launched a multi-year fall protection program that included fall hazard identification at 42 unique locations. Work continues with this program as fall hazards are being evaluated and abated over a planned timeframe.

## Policies, Duties and Training

While overall workplace fatalities decreased 12 percent from 1995 to 2007, fatalities due to falls increased approximately 30 percent. In that same time period, the sale of personal protective equipment for fall protection has doubled. Why is this happening?

Unfortunately, the answer to this question is typically grounded in flaws or inadequacies in most employers' policies, duties and training programs. For example:

- The company policy on fall protection is not clearly stated nor adhered to
- The roles and responsibilities within the program are not properly defined
- Workers and supervisors are expected to do their jobs safely without proper training

While the OSHA regulations are legal requirements to be followed, an effective policy statement provides overall program guidance and "…emphasizes management's commitment to providing a safe workplace for employees exposed to fall hazards," (ANSI/ASSE Z359.2, Section 3.11).

The Z359.2 standard explicitly outlines the specific duties of employers. These duties, as referenced in Exhibit 1, include providing sufficient resources to support the program and naming a program administrator to lead the initiative. Additionally, the standard states that employers are responsible for identifying and abating hazards in the workplace, developing and maintaining fall protection and rescue procedures, and properly training authorized and competent persons.

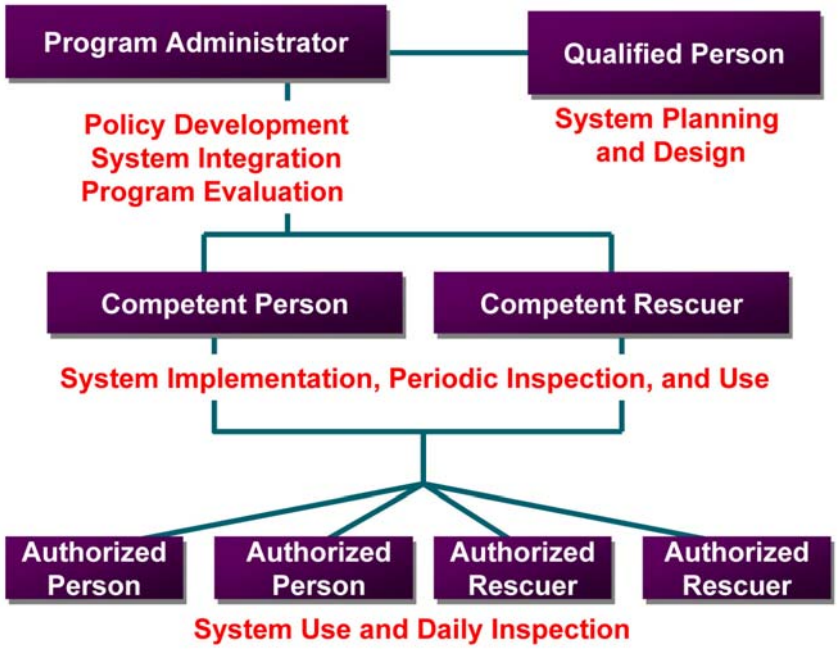


**Exhibit 1. This chart illustrates the roles and responsibilities associated with a comprehensive, managed fall protection program.**

The standard contains a great deal of content regarding the training needed for each role in the program. Some highlights of the training requirements include:

Program Administrator Training

- Knowledge of the fall protection regulations, standards and abatement systems
- Selection of competent persons and qualified persons
- Development of policies and standards
- Performance of incident investigations
- Minimum of 0.8 CEUs annually for re-training

Competent Person Training

- Identification of fall hazards including conducting fall hazard surveys
- Knowledge of the fall protection regulations and standards
- Identification of anchorages and understanding of the hierarchy of control
- Calculation of fall clearance distances
- Understanding of use and rescue procedures
- Hands-on training for inspecting and using the personal protective equipment
- Retraining at least every two years

Qualified Person Training

- See list for the competent person training plus the following items
- Selection of fall protection systems
- Designing anchorages or systems including horizontal lifelines
- Determining swing fall or other impact forces
- Minimum of 0.8 CEUs annually for retraining

Authorized Person Training

- Prior to being exposed to a fall hazard or when the workplace/work practices change
- Recognition of fall hazards and basic understanding of abatement methods
- Knowledge of the fall protection regulations
- Understanding of use and rescue procedures
- Hands-on training for inspecting and using personal protective equipment
- Retraining at least every two years

## Fall Protection Procedures

Fall protection procedures are an important element of any comprehensive, managed fall protection program. They should be developed by the employer's competent or qualified persons and should be specific to each workplace and task. The procedures should provide continuous protection throughout the work activities and should include the qualifications and training that is required of the worker (authorized person).

Other specific requirements for procedures are outlined in the standard for the following types of systems or activities:

- Fall arrest systems
- Work positioning and travel restraint systems
- Installing and dismantling of fall protection equipment
- Inspection

As one of the first steps in any program, hazards must be identified prior to developing solutions for addressing them. The ANSI Z359.2 standard describes a fall hazard survey report that should be a written document identifying the location of existing fall hazards. The report also documents the severity and probability associated with each identified fall hazard. The severity of a fall hazard is typically quantified by the fall distance and the likelihood of striking an object during the path of the fall. The probability is measured by factors such as frequency and length of exposure, number of workers exposed during the work activity, and other environmental conditions. The fall hazard survey report is described in the Procedures section of the Z359.2 document.

## Eliminating and Controlling Fall Hazards

Once fall hazards are identified, the evaluation phase focuses on determining the appropriate priorities and measures for abating the hazards. The Hierarchy of Controls (HOC), referenced in Exhibit 2, can play a significant role in evaluating the appropriate abatement methods. Clearly, the goal is to select the most effective solution that is the least likely to be defeated within the physical environment.

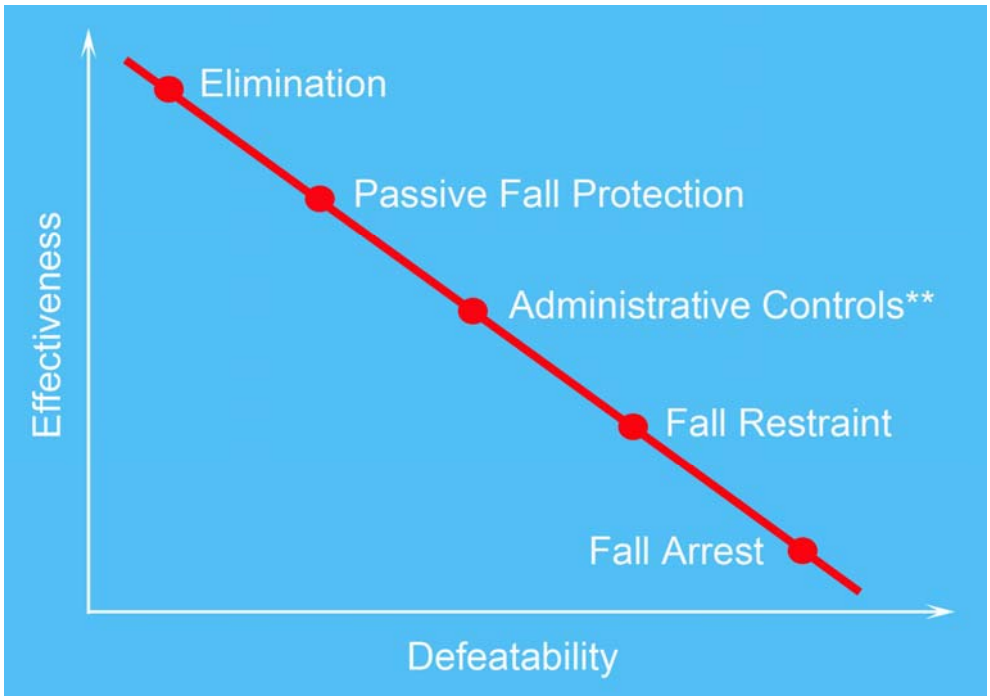


**Exhibit 2. The Hierarchy of Controls relates hazard abatement options in terms of effectiveness and ability to be defeated.**

After fall hazards have been identified and evaluated, the next step is to control the fall hazards. When considering an active fall protective system, the type of system and corresponding anchorage must be evaluated. Because of the variety of types and uses, designing and using anchorages can be complex. However, it is critical to understand different anchorages. The ANSI Z359 standard provides helpful information on anchorages, some of which is described below.

## Types of Anchorages

When considering how to protect an employee from a fall, it is important to understand the differences in the types of anchorages. Five unique types of anchorages include:

- Fall arrest
- Work positioning
- Travel restraint
- Horizontal lifeline
- Rescue

The ANSI Z359 standard defines all these anchorage types and provides distinct loading requirements for each. Each anchorage type serves a different purpose, but some anchorages can be designed to fulfill multiple needs.

While it is crucial to understand the distinctions among the different types of anchorages, it is also important to evaluate where the solution falls within the Hierarchy of Control. It should be noted that the frequency of the task should also be considered when evaluating the best solution. OSHA regulations provide guidelines as to which abatement solutions are appropriate, depending on the frequency of tasks.

## Certified vs. Non-certified anchorages

The ANSI standard describes two methods of anchorage evaluation and the associated design loading requirements. A certified anchorage is one where there is documentation that the system meets the requirements of the standard and where an OSHA qualified person identifies the anchorage and designs the system.

In contrast, a non-certified anchorage is one that a competent person can judge to be capable of supporting the predetermined anchorage forces and incorporates an energy absorbing device.

But, who is a competent person? According to the ANSI standard, a competent person is one who identifies existing, foreseeable and predictable hazards and has the authority to take prompt corrective measures to eliminate such hazards. Typical responsibilities of a competent person also include supervision of work at heights, inspection of equipment, and training of authorized persons.

With this definition of non-certified anchorages, competent persons are now asked to take on the additional responsibility of "judging" what is capable of supporting specific loading criteria. This is an exception to the requirement that anchorages are designed, installed and used under the supervision of a qualified person.

The ANSI standard refers to competent persons selecting anchorages consisting of "unquestionably" strong elements of a structure. But, it seems that this situation fits the 80/20 rule in life. That is, there may be 10 percent that are truly unquestionably strong, in the case of a large bridge girder or other major structure. Another 10 percent certainly will not hold any additional loading, such as conduit, sprinkler line or other smaller elements. But, that leaves 80 percent that will likely require more investigation than a visual judgment to determine if it can safely support the loading criteria. It should also be noted that in many cases, the addition or modification of the structure as part of the fall protection system loading will invoke the involvement of the building code for a local or state jurisdiction regarding the need to involve a professional engineer in the change-in-use to the structure.

As this discussion illustrates, there is no definitive answer as to when and why someone would use a non-certified anchorage. Many factors are involved in determining appropriate anchorages, so it is important to evaluate the best anchorage type and methodology for each given situation when eliminating and controlling fall hazards.

## Rescue Procedures, Incident Investigations and Evaluating Program Effectiveness

Both OSHA and ANSI indicate the importance of prompt rescue, but rescue procedures are one of the most overlooked areas of fall protection. Even if a worker has been "rescued" by an active fall protection system after a fall, there must also be a plan in place for summoning a professional rescue agency or an in-house rescue service. Unfortunately, many fall protection system designers think their work has been accomplished with the initial rescue. But, the likelihood of additional injuries or even a fatality can still be high if they are not truly rescued. The recommended timeframe for contact (verbal communication or physical contact) with the fallen victim is within six minutes. This can only be accomplished if the proper rescue procedures are in place.

When an incident occurs, the typical response is that the program has failed. Once the immediate needs of the worker are attended to, a true comprehensive managed fall protection program response is to launch a thorough incident investigation. This investigation provides an opportunity to evaluate the work practices occurring at heights and all aspects of the overall program to determine what is and is not working properly. Elements of a thorough incident investigation include but are not limited to a review of duties, policies, procedures and training. Additionally, there should be an evaluation of the fall protection systems, anchorages and equipment in use at the time of the incident, including inspection logs and communication during the incident.

As an element of continuous improvement, an evaluation of the program's effectiveness should be conducted at least biannually. This is one of the responsibilities of the program administrator, but, a team approach involving employees and management is preferred. The team approach is specifically referenced when recommending action steps to be taken as a result of the program evaluation.

## Case Study: Identify – Evaluate – Control

After a safe access issue resulted in a lost time injury in 2002, Marathon Pipe Line initiated Phase I of a new fall hazard program. The company allocated resources to this program, which was initially focused on ensuring safe access throughout its facilities. Primary focuses of the program were identification, evaluation and control of fall hazards.

Identification: Phase I

Phase I, which took place from 2003 to 2005, consisted of conducting assessments and employing abatements. Safe access assessments were conducted at MPL's major facilities, primarily those facilities with personnel on site full time. Marathon's, Terminals, Transport and Marine (TT&M) organization, MPL's sibling, also was in the process of conducting fall hazard assessments throughout all their facilities at this time.

Identification: Phase II

Once TT&M's program was complete, MPL followed and moved from Phase I safe access assessments to Phase II fall hazard assessments. As a first step, three pilot assessments were performed in 2005. Working with a professional safety consultant, LJB Inc., MPL selected three representative facilities for the pilot study based on specific criteria:

- Facilities with a larger number and varying sizes of tanks
- Recently acquired facilities
- Facilities with varying tank roof types

The results of the pilot assessments were submitted to MPL in summary and graphic methods and provided the company with justification for continuing the program. Key findings from the pilot assessments included:

- Identified 284 different hazards
- Greatest hazard of falls from greater than 4 feet associated with above ground storage tanks (ASTs)
- ASTs accounted for 64 percent of total hazards

From 2006-2008, MPL moved into a three-year fall hazard assessment program for facilities with above ground storage tanks. Locations assessed during the three-year program were based on the following:

- Year 1
  - Facilities with highest concentration of ASTs completed first
  - Geographical proximity of sites was considered for maximizing efficiency
  - Conducted assessments at nine locations

- Year 2
  - Facilities with next highest concentration of AST's
  - Focused on Midwest
  - Conducted assessments at 15 locations

- Year 3
  - Finished remaining facilities in Midwest
  - Conducted assessment on facilities in Western U.S.
  - Conducted assessments at 15 locations

## Evaluation: Risk Data

Between 2005 and 2008, a total of 42 locations were evaluated for fall hazards by MPL personnel from Safety and Operations and their safety consultant. These evaluations provided valuable owner information regarding work activities so that the probability of the risk could be evaluated accurately.

MPL's professional safety consultant ranked from highest to lowest priority all fall hazards identified from the facilities and entered them into a master database. This database then could be viewed from a site-by-site perspective, or from a global, pipeline-wide perspective. MPL personnel used the database and assigned an Action Code, as described below.

- Action Codes:
  - Code A – Engineering solution required
  - Code B – Anchor point and fall arrest/restraint system required
  - Code C – Administrative procedure required
  - Code D – Include with future maintenance (In particular, Tank API 653 Inspections)
  - Code E – Infrequent exposure → Code C or Code D
  - Code H – Requires further evaluation

## Control: Abatement Approach

The original project plan was to abate the identified fall hazards in the specific order of highest risk to lowest risk. In 2006, abatements identified by the pilot assessments were executed. For added efficiency and synergies, the original risk-ranked plan was revised to conduct abatements on a location-by-location basis.

Since assessments have been completed and the fall hazards identified at selected locations, the abatement approach for 2009 to 2010 is being adjusted to focus on mitigation of the highest risk hazards while still achieving a synergistic efficiency on a location basis. Based on assessments begun in 2005, MPL has:

- Executed abatements at seven facilities
- Corrected 118 identified hazards
- 9.5 percent completion of all identified hazards, 30 percent completion of identified hazards excluding Code D hazards

## Moving forward

To continue the momentum and success of MPL's fall hazard program, the company is now in the process of identifying any remaining locations for Phase II fall hazard assessments. MPL also will resume the Phase I safe access assessment program to address issues at locations that were not evaluated in 2003 to 2005. The work on abating the identified fall hazards also continues throughout the MPL terminal network.

## Conclusion

As this case study demonstrates, significant time and effort was required to execute a successful managed fall protection program. In addition to the fall hazard identification, evaluation and control that was described in this case study, MPL has invested in Competent Person training for the Fall Hazard Program Subject Matter Expert lead. Like MPL, other companies can follow the guidelines provided in the ANSI Z359.2 document to execute an effective fall protection program and provide their employees with a safer work environment.