PERSONAL FALL ARRESTOR SYSTEM (PFAS)

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Abstract: Personal Fall arrestor system Wind industry where there is hazard of fall from height. There are various PPE (Personal Protection Equipment) among which PFAS (Personal Fall arrestor system) plays a key role. The right PFAS has to be chosen based upon the circumstances in which the person works and based on the hazardous substances he is exposed to. The health issues of the person also are important while selecting the right PFAS.

My document focuses on the selection, maintenance and limitations of PFAS.

If PFAS is used incorrectly, or is badly maintained, the wearer is unlikely to receive adequate protection. PFAS is comfortable to wear and is an intrusion into normal activities. PFAS may interfere with work.

At certain times poor selection of PFAS can arise with adverse effects on the person wearing it.

Index Terms: Accidents at construction site, Types of fall arrestor system, Awareness.

Introduction

1.1 What is PFAS?

A Personal Fall Arrest System (PFAS) is safety equipment used by personnel working at heights to protect them from accidental falls.

A PFAS is mostly used by workers who perform their duties at a certain height during the construction phase, as well as maintenance workers on towers or poles. The use of a PFAS is inevitable and essential, according to safety laws.

There are three basic requirements for the PFAS, which include an anchorage point, bodily support, and a means of connection. Typical examples are shown in Figure 1.

PFAS can only protect the wearer. Control measures at source protect all those in the area.

A properly used protective system prevents workers from falling. An anchorage point is crucial and refers to any solid column, floor, or beam through which the main bodily support can be connected easily. For example, if a worker is performing a task on the outer side of a building, there must be a column or even a hook anchor to which the body harness can be connected through an

anchorage connector. If one person is linked to that point through a body harness, then the anchorage point must be able to bear at least 5,000 lbs of force per person, as per OSHA requirements. If two people are attached to one anchorage point, that point must be able to bear at least 10,000 lbs of force.

Bodily support mainly consists of two parts: a full-body harness and body belts. A full-body harness must be made of high-quality material and covers a person's entire upper body, thighs, and pelvis to evenly distribute forces in the case of a fall. A full-body harness also has a main centre-back fall-arrest attachment that appears on the backside of the person wearing it, and it attaches to the fall arrest connecting device.

D-rings are used for the connection between these two components. A means of connection is used to link the bodywear to the anchorage point. This connection must be very strong and durable to bear a person's weight in case of an accidental fall. The means of connection also features an element that absorbs some portion of energy to reduce the amount of energy transmitted to the worker's body in case of an accidental fall. As per OSHA requirements, a person working at a height of six feet or more must use a PFAS as a protective measure against accidental falls.

Types of PFAS:

- Horizon Horizontal Fall Arrestor System
- Vertical fall arrestor system

When can PFAS be used?

PFAS should only be selected and used after a justification has been made in

The risk assessment required by law. It can be used in the following situations:

- where an inhalation exposure risk remains after you have put in place other reasonable controls (residual risk);
- short-term or infrequent exposures where you decide that other controls at source are not reasonably practicable;
- while you are putting in place other control measures (interim measures);
- emergency escape – you need to provide PFAS for safe exit from an area where hazardous substances may be released suddenly in the event of control systems failures;
- emergency work or temporary failure of controls where other means of controls are not reasonably practicable;
- Emergency rescue by trained personnel is necessary.

However, there may be circumstances where you may consider it prudent to issue PPE including PFAS, not because other control measures are inadequate on their own, but to provide additional protection if any of the control measures fail to operate. In this type of situation, it is prudent to seek specialist support.

Hazardous substances

Basic understanding of hazards, their forms, and the way people can be exposed to them, is essential for the selection of adequate and suitable PFAS

Considerations for fall-arrest anchor points:

All fall-arrest equipment must meet some sort of standard and pass some tests so equipment manufacturers can ensure end users and employers that the equipment will perform to specifications. These standards (ANSI Z359 Fall Protection Code) are the first defense in place to save lives while working at height. With all this thought, testing, and design put into equipment (harnesses, snaphooks, carabiners, lanyards, self-retracting lifelines, and ladder climbing sleeves), why would anyone connect to an anchor that is not designed, tested, or even certified for use as fall protection? Yet every day in the wind industry, workers are connecting compliant fall protection equipment to anchors that are not compatible, or were never designed or intended for use as a fall-arrest anchor. The only advantage to these anchors is that they are already in place. Just because an anchor is convenient, doesn't mean you should depend on it to save your life.

Fall-arrest anchors are placed in three main areas in a wind turbine. There are anchorage points that support the ladder safety system for access to the nacelle. There are assorted fall arrest and rescue anchors used inside the nacelle, the hub and the blades and there

are fall arrest anchors and rescue anchors on top of the nacelle. Each one of these areas creates different challenges for workers and it is unnerving to think that these anchors may not be sufficient, whether we are talking about strength, design, or a combination of both. In some instances, turbines are designed outside of the U.S. Hence, the safety systems are designed to the requirements of that country, which may not meet the requirements here. Some anchorages were originally designed for fall restraint but are being used for arrest, while others were not designed for fall protection at all.

Ladder safety systems: There are a number of ladder safety systems on the market. Rail or pipe units spread fall arrest loads over a number of rungs, while cable systems require a single anchor at the top of the ladder. Cable systems are the most prevalent in the wind industry. In many cases, these systems are connected to the rungs of the ladder or to a point at the top of the ladder. As a minimum, the anchor point at the top of the ladder must meet the requirements given by the manufacturer, a figure usually dependent on the number of workers climbing the ladder at any given time. For example, one manufacturer requires attaching its cable system to a structure that can withstand the following loads:

Therefore, for a one-person system with a top bracket connected to three ladder rungs (typical installation), each rung must support at least 1,125 lbs (5 kN). This can be of concern knowing that a 0.75-in. round steel bar with a 16-in. span (typical ladder rung) becomes fully stressed and enters into plastic deformation at about 1,000 lbs when applying that load to the centre of the span. It is of even greater concern if the ladder is aluminum because these rungs will fail at much lower loads

Anchors inside the nacelle: As a rule, fall arrest anchors must have a minimum strength of 5,000 lb, or be designed by a qualified person and have a factor of safety of at least two. In most turbines, finding this kind of strength is not an issue. The issue is that most anchors used for fall protection in a wind turbine, whether it be in the tube at the transition points, in the nacelle itself or in the hub, were not designed with fall protection in mind. Many were designed for equipment lifting or used during construction of the turbine. In many cases an incompatible connection is created when used with the large snap hooks that most wind turbine climbers use. An incompatible connection is one that allows the gate of the snap hook to contact the anchor point and apply a load on the gate in the event of a fall. New ANSI standards have increased the required design strength of snap hook and carabiner gates, however this increase in gate strength by no means eliminates the possibility of defeating the gate, especially when connected to a rigid anchor. The only way to limit the hazard exposure to the worker is with properly designed anchors intended for fall protection and designed for use with appropriate fall arrest equipment, along with education. Anchors on the top of the nacelle: These anchors have the same design requirements as anchors located inside the nacelle. Anchorages located at foot level have additional considerations because the free fall distance may be greater, increasing the potential energy created during the fall. Nacelle anchorages are commonly a pipe design, strategically placed on the roof or surrounding the perimeter of the nacelle. Other designs involve a number of single anchorages placed around the roof. The same issues of compatible connections come into play and there is a great concern regarding the strength of the pipe rail and performance as a system. Depending on the pipe's location, weight of the worker and lanyard used, forces on the anchorages could vary considerably because of the increased free-fall distance and potential to fully deploy an energy absorber. Many rails were never installed for fall arrest, yet they are being used with that intent on a regular basis. More and more we see accidents in which the worker has an ANSI compliant harness and lanyard, however not enough thought was put into what the lanyard is connected to, and then a system failure occurs. Workers are making decisions about which anchor points are acceptable but they are not given the tools to make an educated decision or they are not given a properly engineered anchor they deserve. We are putting lives at risk as long as we believe that strength is the only requirement of a fall arrest anchor and we can connect to anything readily available as long as it looks good. WPE

Examples lifeline attached in ladder in wind turbines.

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Anchoring points on top of the wind turbines market in yellow colour

Risk rating chart

Examples of hierarchy control

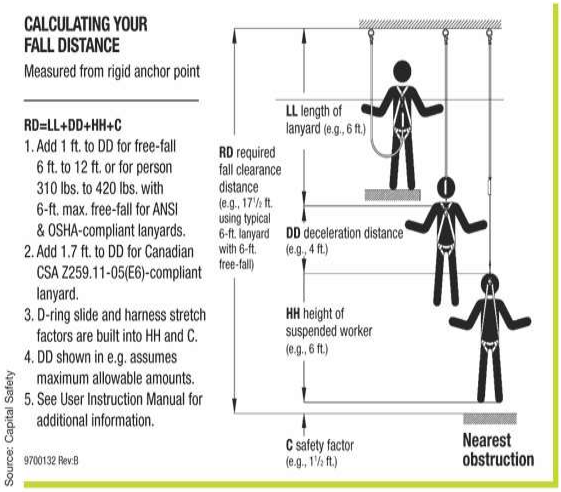
STEPS TO IMPLEMENT A FALL-PROTECTION PROGRAM

Whether working atop bridges or refuse vehicles, your employees are often subjected to serious risks while working at height. But between new Occupational Safety and Health Administration (OSHA) regulations, national consensus American National Standards Institute (ANSI) standards, and changing jobsite requirements, developing a fall-protection program can seem overwhelming. It doesn't have to be if you follow these steps

Designated areas

You may also want to designate areas where PFAS is needed as. This will make it clear where PFAS is required. You should note that designation of PFAS zones is mandatory if you have to comply with the CAW regulations.

PFAS use should fall within the general health and safety framework in your workplace. A good introduction to effective health and safety management is given in the HSE leaflet Managing health and safety, five steps to success.



Fall factor safe distance

Example of swing fall

CONCLUSION

PFAS does not necessarily protect the wearer in all the situations. Proper analysis of the work area, wearer health and the other factors as mentioned above should be considered while opting for PFAS. The process given is not the only process available. It depends on each company how selection is to be made.

Some hazards occur accidentally and these cannot be predicted earlier for the right selection of PFAS. Hence proper knowledge of the PFAS equipment is to be given for each worker also.

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