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Safe Practice Guidelines and Risk Assessment for Lattice Tower Assembly

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Abstract: ***Mechanical industry forms an important part of the economies of all countries, employing a substantial workforce. It is also one of the most perilous industries in the world. Some mechanical site jobs include tower assembly, tower erection, building houses, roads, tree forts, workplaces and repair and maintain infrastructures. Major safety perils for mechanical workers include working at height locations, in lattice tower assembly. The leading safety perils include falls, being crashed between objects, being struck by objects, injuries and deaths on sites throughout the world. Failures in hazard identification are often due to bounded or improper training and overseeing of workers. Areas where there is limited training include tasks in design for safety, safety inspection, and monitoring safety. Most incidents can be avoided by taking appropriate measures or following proper working procedures. Employees should collaborate with their employers and other persons in complying with the safety legislation and guidelines, and should not do anything to endanger themselves and other persons.***
Keywords: Risk assessment, health, safety, Training

I. INTRODUCTION

Towers are the fundamental support structures for wind turbines which gives the suitable height to capture wind. Lattice towers are freestanding framework towers which have been implemented in transmission towers, cellular towers, radio towers, observation towers and wind turbine towers. Wind Energy workers are exposed to hazards that can result in fatalities and serious injuries. Many incidents involving fall from height, severe burns from electrical shocks and arc flashes/fires, and crushing injuries. Lattice tower assembly injuries will always have broad and worse impact, which includes the personal suffering of the injured workers, Lattice tower assembly delays and productivity losses incurred by the Lattice tower assembly contractor, higher insurance premiums that result from costly injuries and possible liability suits for all parties involved in the project. Their avoidance and even marginal reduction in their cost will have significant human and financial impact. The number of injuries and fatalities can be dropped by encouraging and reinforcing behavioural change. Prevention of Lattice tower assembly accidents requires foreseeing future accidents and their nature in given circumstances. Making such predictions must be based on information about past accidents and can be assessed using about various decision support tools. In Lattice tower assembly projects, the management needs to theorize the management of safety in order to nurture a strong culture. The aim is to examine what constitutes project management personal's conceptual skill and how this skill can be developed and applied in the context of Lattice tower assembly safety. Lattice tower assembly organization identifies the importance of project management personal's conceptual skill for managing Lattice tower assembly safety and provides relevant training opportunities for them to improve the skill and develop the system for accurate implementation to reduce incidents.

II. METHODOLOGY

Risk is the potential for realization of unwanted, adversarial concerns to human life, health, property, or the environment. Estimation of risk (for an event) is usually based on the expected value conditional possibility of the event occurring times the moment of the event, given that it has occurred. The risk is a measurable part of uncertainty, for which we are able to estimate the occurrence possibility and the magnitude of damage. The risk is assumed as a deviance from the desired level. It can be positive or, which most often happens, it can be negative. Therefore, the risks analysis is very important for project selection and coordination of Lattice tower assembly work. The risk analysis is regarded as the analysis of contrary events even at the stage of preparation and programming of a Lattice tower assembly project. This analysis improves the decision-making process and provides additional arguments, which help to select the optimal variant of a Lattice tower assembly project using the Multi-Aspects approach.

Workplace hazards (chemical, physical, etc.) can be controlled by a variety of methods. The goal of controlling perils is to prevent workers from being exposed to occupational perils. Some methods of hazard control are more efficient than others, but a combination of many methods usually provides a safer workplace than depending on only one method. Some methods of control are of less cost than others but may not be the best way to reduce exposures. Three different methods of the risk analysis as well as highlighting their disadvantages, advantages and primary areas of application are mentioned below:

A. Identify the Hazard

Workplace hazards (chemical, physical, etc.) can be controlled by different methods. The goal of controlling hazards is to avoid workers from being exposed to occupational hazards. Some methods of hazard control are more efficient than others, but a mixture of methods usually provides a safer workplace than relying on one single method.

B. Elimination/Substitution

The ideal solution to all fall hazards is elimination. The reason for exposure to the fall hazard is tested and gauged to determine if a change in the procedure, practice, location or equipment will eradicate exposure to the fall hazard. Specifying HVAC (Heating, Venting and Air Conditioning) equipment be located on the ground, or in an equipment room rather than by the edge of the roof, is an example of hazard elimination. The hierarchy should be applied to any hazard before buying unsuitable equipment or systems. By examining a fall hazard using the hierarchy, the best solution is often very evident.

C. Engineering Controls

Engineering controls is designed to protect person from falling or in the event they do fall, to stop them without causing extreme injury. Typically, fall protection has to be implemented when working at height, but may be relevant when working near any edge, such as near a pit or hole, or performing work on a steep surface. Fall protection is a very important safeguard for wind energy workers. Per the Occupational Safety and Health Administration (OSHA) construction industry, wind farm construction workers must be protected from the risk of falling when they work at heights of six feet or more. Meanwhile, general industry standards require workers to be protected from falls when they are at heights of four feet or more. Working above these heights is common in the wind industry, and following the below guidelines will help workers avoid accidents.

Fall arrest systems are created in such a way that a fall can occur but the fall is arrested within acceptable force and consent margins. Fall arrest systems have a higher risk associated with them, since we have to stop the falling worker within an acceptable level of force and prevent him/her from contacting the surrounding structure or the ground. Training for both fall restraint and fall arrest systems is key. ANSI Z359.2-2007 includes a noteworthy amount of information about fall protection training for authorized persons, competent persons, qualified persons, rescuers and trainers. Any work at a height more than 2 meter requires height protection like safety belt, safety net, mobile accessing equipment. This method describes the height safety requirements and safe work procedure for all assembly and height works. It summarizes suggested method of executing works safely within any restrictions. This method offers advice and guidance to the personnel involved in this activity to:

1) Carry works in a way that's safe at all times;
2) Know the hazards in the activity;
3) Ensure controls to steer clear of hazard exposure are in place.
4) Always execute the work safely complying with the required standard.

D. Administrative Controls

Administrative controls are work practices or procedures that increase a worker's awareness of a fall hazard. It must be distinguished that administrative controls are the least preferred method of protection because they do not provide a physical or positive means of protection. Administrative controls are preventive measures taken to lessen the likelihood of a fall. These methods include safety monitors, warning lines, warning horns, designated areas, or control lines. It must also be noted that OSHA regulates the use of many administrative controls and it is incumbent on the fall protection program administrator to understand the jurisdictions and regulations that apply. Administrative controls restraining the amount of time workers spend at a hazardous job can be used together with other methods of control to reduce exposure to hazards. Some examples of administrative controls include: Changing work schedules, Giving workers longer rest periods or shorter work shifts to reduce exposure time; Moving a hazardous work process to an area where less people will be exposed; Changing a work process to a shift when not many people are working. Administrative controls only reduce the amount of time the workers are exposed to a hazard – they do not eradicate exposures.

E. Personnel Protective Equipment

As a additional protection against exposure to hazardous conditions in lattice tower assembly. Where the safety of workers cannot be ensured by other means, such as elimination the hazard, controlling the risk at source or minimizing the risk. Suitable and sufficient PPE, having regards to the type of work and risks, and in consultation with workers and their representatives, should be used by the worker and provided and maintained.

III.HAZARD IDENTIFICATION

Hazard is defined as any real or potential condition that can cause injury, illness, or death to person, damage to or loss of a system, equipment or property or damage to the environment. Hazards have the potential to cause human injury or ill health. Hazards therefore need to be identified before the risks related with these hazards can be gaged and, if no controls exist or existing controls are insufficient, effective controls should be implemented according to the hierarchy of controls. The organization will document and keep the results of identification of hazards, risk assessment and determined control up to date.

The organization shall establish, implement and maintain a procedure for the ongoing hazard identification, risk assessment, and determination of necessary controls. The procedures for hazard identification and risk assessment shall take into account:

A. Routine and non-routine.
B. People having proper access to workplace including contractors and visitors
C. Human behavior, capabilities and other human factors.
D. Identified hazards originating outside the workplace and to put under the control of the organization within the workplace.
E. Hazards created in the vicinity of the workplace by work-related activities under the Control of the organization.
F. Infrastructure, equipment and materials at the workplace, whether provided by the Organization or others.
G. Modifications to the OH and S management system and activities.
H. Legal obligations relating to risk assessment and implementation of necessary controls.
I. Design of work area processes like installations, machinery or equipment, operating processes and work organization, including their adaptation to human capabilities.

Fig.1. Hazard Identification Methods

IV.RISK ASSESSMENT

A risk assessment is an important step in protecting workers and their business, as well as abides by the law. It helps to focus on the risks that really important in your workplace the ones with the potential to cause severe harm. In many occurrences, straightforward measures can readily control risks, for example ensuring people slip by cleaning, or cupboard drawers are kept closed to ensure people do not trip. This involves looking at the chance or likelihood of a hazard occurring and, if it does, the extent of any injury or harm that is the concerns. It is a way of deciding which hazards need to be addressed first, that is where there is the highest risk of injury or harm.

The risk assessment is mainly concerned with assessing the likelihood of a worker getting caught, entangled or nipped and determining the severity of injuries. This form may be adapted for other actions relevant to machines in the workplace, such as buying, fitting, repairs or work procedures. A risk assessment is simply a careful inspection of what, in your work, could cause damage to people, so that you can weigh up whether you have taken enough protections or should do more to avoid the damage. Workers and others have a right to be safe from harm caused by a failure to take sensible control measures.

Following the five steps is classified for Risk Assessment

Identify the hazards, Decide, Evaluate the risks and decide on safety measures.

Record the findings and implement them, Review the assessment.

When implementing controls, or considering changes to existing controls, consideration shall be given to reducing the risks according to the following hierarchy:

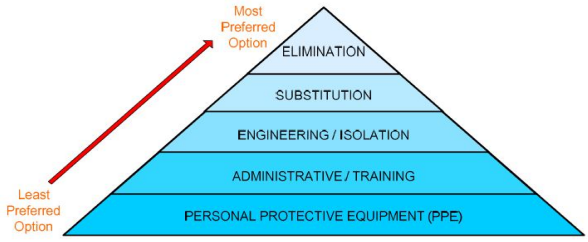

Fig.2.Hierarchy of Control Options

A. Elimination of hazards
B. Replacement of process or methods can be implemented to avoid hazards
C. Engineering controls such as safeguarding and isolation can be done
D. Training must be given to workers
E. Appropriate PPE's should be provided.

V. PROBLEM IDENTIFICATION

The wind turbine assembly sector involves more number of activities such as civil, mechanical, electrical and commissioning. Each activity involves more number of dangerous act and insecure condition which leads to hazards. Erection, assembly, material handling, are the main hazards associated with fall of person or material from height. The degree of injury depends upon the fall and height of the work respectively. It also includes injuries such as cut injury, fall of objects and health related issues during cleaning of shutters. During lattice tower assembly all section will be assembled individually and it will be erected one by one to complete the task so more number of man power, man lift, and crane, hydra, vehicle and equipment musts be used. And more number of lattice tower crossings will be takes place during assembly. Proper clearance must be obtained for all material and vehicle crossing each other. The next major problem is the improper route map of the equipment. Improper selection and improper usage of tools and safety devices also creates hazards.

VI. CONCLUSIONS

Proper operational control procedure and work instruction has to be framed to avoid hazards which in turn results in accidents. Awareness amongst workers must be created by conducting training programs and effective implementation of safe operating procedures. Incidents in workplaces are unplanned and unwanted occurrences involving movement or fall of persons, objects or materials which may result in injury, damage or loss to property or people. The majority of incidents happen when employees disrespect safety rules (Unsafe acts) and organization ignore the existence of risky conditions. Therefore unsafe acts and unsafe conditions are the immediate (direct) causes of incidents. Managers and supervisors can reduce risks at Lattice tower assembly workplaces. On the other hand, physical and mental condition of the person as well as environmental forces and supervisory safety performance are other (indirect) causes of incidents. Training and education of workers is required in order to develop competencies and safety awareness. However there is a fundamental dilemma which is the different understandings of risk, safety and the extent of risk which needs to be reduced to be acceptable. People are likely to believe that once an action is executed in response to a hazard, the situation is safe or safe enough. A number of incidents can be prevented if the safety management system reflects both natural degradation and these core threats. The initial step in developing such system is preparing a model which shows the interaction between the incident likelihood and organizational tasks and activities in the presence of these hazards.

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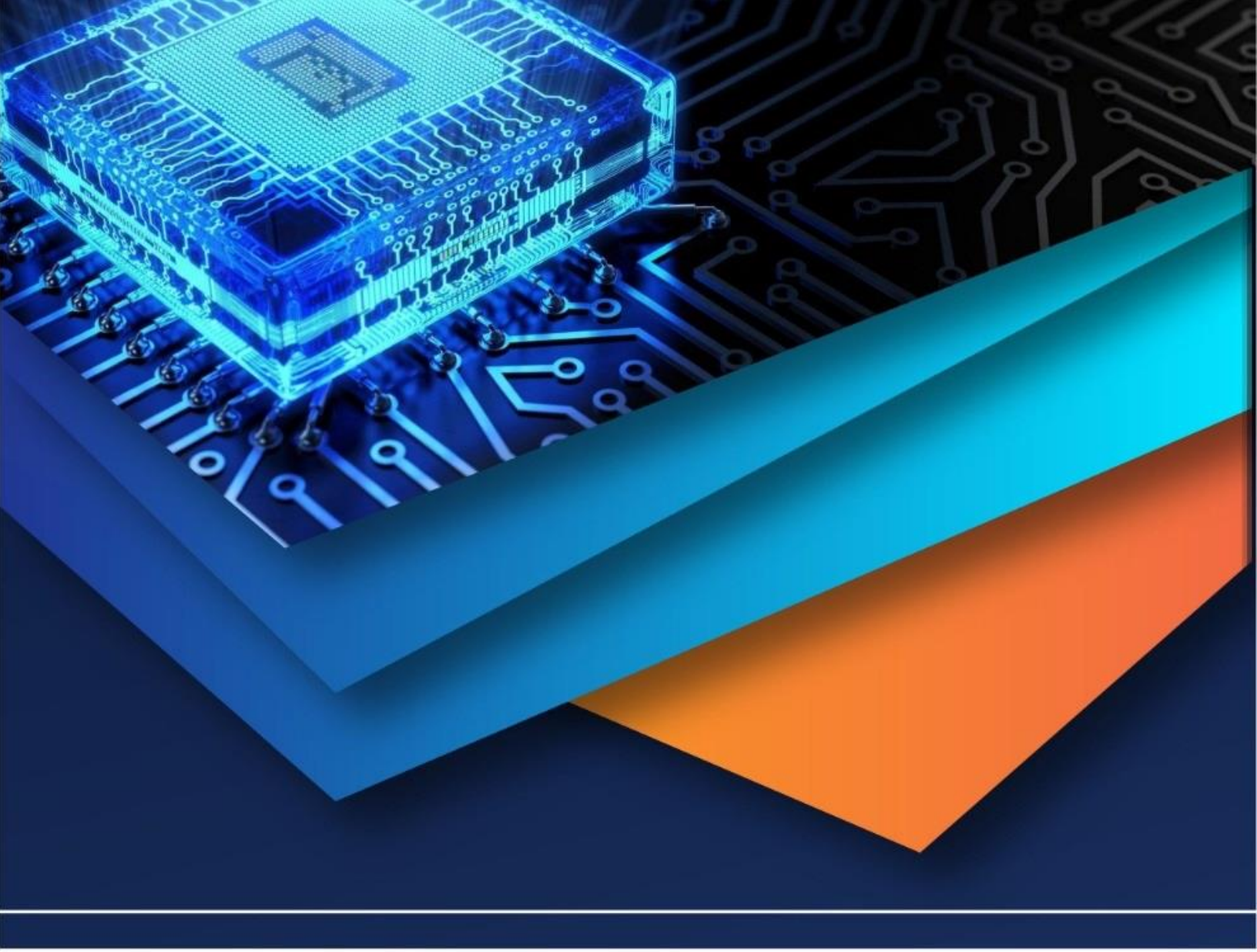

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