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Excavation & Trenching work Safety: A review

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Abstract: *Excavation & Trenching is beginning stage of any civil construction Project. Excavation carried out initially to proceed next step of project activity. Large numbers of accident occurs in construction industries during different phase of construction work in which one is excavation & Trenching phase. Excavation & Trenching related accidents occur at workplace due to failure or collapse of soil edge of excavation or trenching or personnel contact with heavy equipment during operation. There are many potential sources such as loose soil, underground utilities, equipment operation, unsafe behaviour of workman may lead to cause of injury, death or harm during Excavation and trenching activity. Objective to publish this paper is to know safe procedure of excavation and trenching work and Control excavation & Trenching related accident.*

Keywords:

Excavation & Trenching, Risk control during excavation & Trenching activity, Incident prevention, Safe method of excavation and trenching activity.

Objectives

- To Identify Potential sources of harm during excavation & trenching activity.
- Protect to person from potential source of Accident.
- Increase employees morale.
- To Ensure Compliance as per respective state &country law and regulation
- To control or minimise cost of accident and avoid from project delay.
- To achieve world class recognition and reputation among top industries.

1. Introduction:

Accident directly effect to construction industries business such as poor reputation, increase project cost and cause of project delay. Each and every year several people killed, several injured and caused of huge organisational losses due to not taking adequate safety control measure to minimise or control risk. Excavation and trenching related accident occur due to poor method of hazard identification and not taking adequate measure to control risk. Hazard identification is a Technique used to identify all potential sources of Harm that may lead to cause of accident and associated with excavation and trenching related activity.

Excavation means a process of removal of earth surface or digging manually or by mechanical means. If Excavation that is deeper than width is known as trench. As per OSHA, Trench means narrow underground excavation that is deeper than its wide, and no wider than 4.5 meter.As per OSHA excavation greater than 4 feet deep is consider as Confined space and need to take additional safety control measures for such deep excavation.

Excavation is done by two methods, manually and by mechanical means. In manually excavation, excavation is carried out manually. By Mechanical means, heavy equipments such as excavator, JCB used to excavate the ground. Loose soil, undercutting, Adjacent structure nearby excavation area, equipment operation, availability of underground utilities, Sudden release of toxic gas during excavation are few major Potential source of harm.

2. Hazard during excavation work

Few major hazards associated with excavation & Trenching activity are follow:

- Fall of person inside excavation or trenches
- Fall of materials such debris, loose soil on workers body, those who are working inside excavation or trenches
- Underground utilities such as cables, water lines
- Availability of Toxic, flammable and explosive gases
- Potential to damage or collapse of nearby adjacent Structures
- Uneven surface or poorly placed materials nearby excavation area
- Tripping over equipment or other sources that is associated with heavy equipment operation

In few area where excavation running, presence of water may lead to cause of drowning, presence of snake in grassy area may cause of bite, are also potential source of harm.

3. Principle to prevent Excavation & Trenching related incident

Excavation & Trenching related incident can be controlled by following ways:

Hazard identification & Risk Assessment (HIRA): Before Starting Excavation and trenching work, Hazard identification and Risk assessment must be carried out and on based on hazard identification and risk assessment document, all safety control measure should be taken to minimise risk As low as reasonable practicable (ALARP).

Slope, support & Barricading: Ensure adequate slope as per soil condition. Provide adequate shoring as per need. Excavation should be done by benching & sloping

method. Simple and multiple are basic two types of benching. Avoid undercutting of soil. Avoid to keep excavated soil or loose materials near edge of excavation. As per OHSA Temporary spoil must be keep away minimum 2 ft (0.61 m) from the surface edge of the excavation

Always take adequate control measure to prevent building or structure collapse that is present nearby of excavation or trenching work area.

Administrative control: Effective enforcement of Rules, Regulation& procedure help to control excavation and trenching related risk. Take work permits before starting excavation work and ensure all safety measure has been taken as per safety checklist of work permit. Conduct Training on regular basis and display adequate Numbers of Traffic and safety signage. Carry out regular supervision though skill & experience person to avoid unsafe practices to motivate workforce and preventing excavation and trenching related incident.

Personnel Protective equipments (PPE): Always use suitable Personnel Protective equipments (PPE's) to protect to workers from hazard exposure. PPE's not eliminate to hazard, it only minimise the severity of Harm. Safety Helmet, Shoes, Fluorescent jacket, Apron, Safety goggle, Safety gloves, Ear plug, Ear muss, Safety mask are few example of PPE's .

Earth moving equipment safety: Ensure all Safety devices such as Proximity Warning and Alert System (PWAS), rear side mirror, Horn, brakes good working condition or not. Before starting equipment, be certain that it has been inspected and serviced according to the regular schedule and manufacturer guidelines. Shut off engines during refuelling or when equipment not in use. Ensure all rotating parts of equipment guarded. Keep Fire extinguisher with equipment. Depute Flagman with heavy equipment during operation. Avoid to take rest or stand near equipment operation area. Ensure operator fitness and their competency before assigning on duty.

Apart from this ensure water sprinkling arrangements to control dust generation, ensure dewatering whenever required and ensure good housekeeping on daily basis. Avoid to take rest in excavation area. Carry out manual excavation in operational plant or utilities area.

4. Summary:

This paper will help to identify excavation & trenching activity related hazard and ensuring suitable control measure to minimize risk. To prevent accident during

excavation and trenching work, Carry out survey of site before starting work, check soil condition and on based on soil condition, ensure suitable slope of excavation, avoid undercutting, cutting must be done by slopping & benching method. Heavy equipment such as excavator should be good working and safe condition. Carry out regular supervision to motivate to operator and engage workers to prevent human error. Ensure good health of operator and impart training time to time to engage workmen. Effective implementation of Safety rules and procedure helps to prevent excavation and trenching related accident.

References

- Boom, J. (1999) Trenching is a Dangerous and Dirty Business, OSHA's Job Safety and Health Quarterly Magazine, 11(1) Fall 1999
- Safety Management system in construction industries, Shahnawaz Rampuri, IJSEI, International Journal of Institution of Safety Engineers (India) Volume 1, Issue 1,Jan-Mar 2018
- Hinze, J., and Bern, K. (1997). The Causes of Trenching Related Fatalities and Injuries, Proceedings of Construction Congress V: Managing Engineered Construction in Expanding Global Markets, Stuart D. Anderson ASCE pp 389-398
- Challenges to Control workplace Risk in Construction Industries, Mr. Sunil Bhalerao IJISEI, International Journal of Institution of Safety Engineers (India), Volume 1, Issue 4, Oct-Dec 2018
- Study & analysis of occupational health safety management system (OHSMS) in organisation: a review nair. J sindhu,2shahnawaz rampuri, International Journal of Exploring Emerging Trends in Engineering (IJEETE) vol. 04, issue 01, jan- feb, 2017 pg. 34 – 39 www.ijeete.com , ISSN – 2394-0573
- Stanevich, R. L., and Middleton, D. C. (1988). An Exploratory Analysis of Excavation Cave-In Fatalities. Professional Safety (Vol. 33) 1988: 24-28.
- OSHA—Occupational Safety and Health Administration, "Occupational Safety and Health Guidelines," 2009 & OSHA
- Thompson, L.J. and Tannenbaum, R.J., Responsibility for Trenching and Excavation Design. Journal of the Geotechnical Engineering Division, ASCE, Vol. 103 April 1977, p.p. 327-338.