OH&S
OCCUPATIONAL HEALTH & SAFETY

Safe Excavation Work Essentials

Workers frequently aren't aware of the hazard potential and are not properly trained to identify safety issues.

By Stephen V. Magyar, Jr., MBA, CSP | Mar 01, 2006

CONSTRUCTION workers make up only 6 percent of the total workforce, but they are involved in more than 20 percent of all work-related fatalities. Trenching accidents that are directly related to excavation work account for almost 200 deaths annually. Construction workers are buried, and they die from suffocation. It is almost impossible to escape once a cave-in occurs because soil weighs about 100 pounds per cubic foot.

Investigations indicate that improper planning, failure to recognize potential safety problems, and/or the lack of a formal excavation plan are the primary accident causes. Unsafe placement of spoil pile, operating equipment too close to the edge of a trench, improper shoring, failure to provide safe access and egress to the work area, and lack of adequate emergency rescue equipment are major contributing factors. In many cases, workers are not aware of the hazard potential or are not properly trained to identify safety issues.

Before Excavation Begins

All workers must understand the nature of the work to be performed, the procedures to be followed, and the potential hazards to be encountered before any work begins. Electrical, water, and sewer easements must be investigated and their locations properly identified.

Precautions to prevent accidental contact must be taken. All objects outside the excavation area that could cause a cave-in must be supported or moved a safe distance away. Barrier guards, signs, or flashing lights also must be provided to protect the excavation site. Access to the area must be restricted to workers.

When workers are required to enter an excavated area that is more than 4 feet deep, confined space safety rules must be followed. These rules require preliminary monitoring in the work area if breathable air contamination or a hazardous atmosphere is suspected.

When contamination exists, monitoring results must be posted at the work site, and an entry supervisor must issue a work permit. The permit must outline the work to be performed, potential hazards, and approved work procedures.

All confined space work team members must be identified. Team members include an attendant who enforces the work permit, entrants who do the work inside the work space, a rescue team that is on stand-by status in the event of an emergency, and an atmosphere evaluator who monitors contamination in the work space.

The permit must be posted at the work site. Stand-alone rescue equipment also must be immediately available, and rescue team members must be trained in emergency rescue techniques. The attendant cannot perform rescue operations; all rescuers must be respirator-certified. At least one person must be trained in cardiopulmonary resuscitation techniques.

Special Safety Issues

* *Equipment* should be operated only by trained workers.

* *No work* should be performed on the faces of sloped or benched excavations above workers without protecting workers at the lower levels.

* *Drainage* must be provided whenever work is performed in excavations where water is accumulating or can accumulate.

* *Stairways*, ladders, and/or ramps must be provided in all trenches that are 4 feet deep or deeper. Means of access/egress must be positioned so they are no more than 25 feet from any worker inside the work area. Earthen ramps are acceptable for egress only if a worker can use them while walking in an upright position.

* *Guardrails* must be provided on walkways or bridges that cross excavations that are more than 6 feet deep.

* *Reflectorized* or warning vests must be worn by all workers when vehicular traffic is present or in close proximity to the excavation site. It also may be necessary to provide traffic control in busy work areas.

Excavated Materials

All excavated materials must be set back at least 2 feet from the excavation area to prevent possible cave-ins. When the proper setback cannot be provided, materials should be hauled away. Excavation equipment should not be operated or stored where it can create a potential cave-in problem.

Safe egress or rescue operations should not be blocked by materials or equipment stored outside the work area. A clear path of egress from the work area must always be maintained.

Work Site Inspections

Work site inspections must be conducted by a competent person on a daily basis before work begins. Inspections also are required throughout the work shift, as needed, to ensure proper safety conditions are maintained. Other inspections must be conducted after each rainstorm or hazardous occurrence.

The competent person must have training in soil analysis, the use of protective systems, and rescue procedures. He/she must understand OSHA safety requirements and have the authority to stop work immediately when a hazard develops. Use an inspection checklist such as this one to ensure standardization of all inspections:

Excavation Work (Daily Inspection Checklist)

Excavation Work Site

Has work site been inspected by a competent person?
Does he/she have the authority to stop work?
Are all workers wearing hard hats?
Are spoils, materials, equipment set back 2 feet?
Are barriers provided? Are walkways equipped with guardrails?
Are workers protected from suspended loads?
Are all warning devices/systems operational?

Utilities

Have utility companies been contacted? Utilities located and marked?
Were workers advised of potential hazards? Are procedures being followed?
Have underground installations been protected?

Wet Conditions

Is water buildup controlled? Is removal equipment monitored?
Are access/egress routes protected? All inspections completed?

Hazardous Atmosphere

Has the atmosphere been tested for contamination?
Is the oxygen content 19.5 percent to 21 percent?
Is forced air ventilation provided to prevent buildup of flammable gas?
Has monitoring been conducted to ensure the work area remains safe?
Is emergency rescue equipment available? Rescuers trained?
Are rescue drills conducted? Rescue team on stand-by status?
Are safety harnesses/life lines individually attended?
Have all safety issues been addressed?

Soil Classifications

* *Stable rock:* natural solid matter that can be excavated with vertical sides and remain intact while exposed.
* *Type "A" soil:* cohesive soil with an unconfined compressive strength of 1.5 tons/sq. ft. (TSF) . . . clay, sandy clay, hardpan

* *Type "B" soil:* cohesive soil with an unconfined compressive strength greater than 0.5 but less than 1.5 TSF . . . silt, sandy loam
* *Type "C" soil:* cohesive soil with an unconfined compressive strength of 0.5 TSF or less . . . granular soils, sand, loamy sand

Maximum Allowable Slopes

Maximum allowable slopes for excavations that are less than 20 feet deep:

* *Stable rock:* 90 degrees (vertical)
* *Type "A" soil:* 53 degrees
* *Type "B" soil:* 45 degrees
* *Type "C" soil:* 34 degrees

Protective Support Systems

No protective support system is necessary if the excavation is made entirely in stable rock, is less than 5 feet deep, and a competent person has found no indication of a potential cave-in. All other excavations must meet established safety standards or be approved as follows:

* Must conform to data provided by the manufacturer/supplier of the support system.

* Must meet tabulated data approved by a registered professional engineer.

* Must be designed by a registered professional engineer. All support systems for excavations deeper than 20 feet must be designed by a registered professional engineer.

Conclusion

Work inside open trenches is seldom regarded as work in a confined space until emergency escape is necessary. Potential safety hazards must be more readily recognized before work begins, and all workers must know the precautions needed to prevent accidents.

Additional awareness training is necessary. Workers who enter confined spaces are at extreme risk. They should always "look before they leap." Serious accidents are the consequence of poor planning and a lack of hazard recognition.

This article appeared in the March 2006 issue of *Occupational Health & Safety*.

About the Author

Stephen V. Magyar, Jr., MBA, CSP, is a Certified Safety Professional with more than 30 years of professional safety experience. He has managed accident prevention, occupational health, and worker's compensation programs at the corporate, division, and plant levels. Currently he is a professional safety consultant providing training and consulting services to private- and public-sector

employers in the Dallas area.