Underground Construction Safety

An Online Continuing Education Course for Engineers

Course Number: C-1022

Credit: 1 Hour / 1 PDH / 1 CPD

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Introduction

The construction of underground tunnels, shafts, chambers, and passageways are essential yet dangerous activities. Working under reduced light conditions, difficult or limited access and egress, with the potential for exposure to air contaminants and the hazards of fire and explosion, underground construction workers face many dangers. To help employers protect the safety and health of underground construction workers, the Occupational Safety and Health Administration (OSHA) has prepared a number of guidance documents, including the underground construction regulations, found in Part 1926, section 800 of Title 29 of the Code of Federal Regulations (29 CFR 1926.800).

This course is intended for engineers in the construction industry who 1) oversee construction work that occurs substantially below ground, and 2) desire a general understanding of OSHA's guidance on underground construction safety. The course should be used as a guide but not as a substitute for the complete text of 29 CFR 1926.800.

Construction Operations Covered by the OSHA Standard

The OSHA underground construction regulation (29 CFR 1926.800) applies to the construction of underground tunnels, shafts, chambers, and passageways. It also applies to cut-and-cover excavations connected to ongoing underground construction as well as those that create conditions characteristic of underground construction. These hazards include reduced natural ventilation and light, difficult and limited access and egress, exposure to air contaminants, fire, flooding, and explosion. The regulation does not apply to excavation and trenching operations for above ground structures that are not physically connected to an underground construction operation or to underground electrical transmission and distribution lines.

OSHA has developed the following definitions for construction activities that fall within the underground construction field:

A tunnel is "an excavation beneath the surface of the ground, the longer axis of which makes an angle not greater than 20 degrees to the horizontal."

A shaft is "(1) a passage made from the surface of the ground to a point underground, the longer axis of which makes an angle greater than 20 degrees to the horizontal; or (2) a pit in which there are employees, and it is foreseeable that they may enter (or do enter) the horizontal excavation; or (3) a pit that has typical underground construction hazards and is connected to a horizontal excavation."

Employers and Employees Covered by the OSHA Standard

In general, OSHA authority extends to all private sector employers with one or more employees, as well as to civilian employees in federal agencies. As such, OSHA coverage applies to employers and employees in the construction industry. Workers not covered by OSHA include the self-employed; public employees of state and local governments; employees whose working conditions are regulated by other federal agencies, such as mine workers and atomic energy workers; and immediate family members of farming operations that do not employ outside workers.

States can administer their own occupational safety and health programs through plans approved by the Department of Labor under section 18(b) of the Occupational Safety and Health (OSH) Act of 1970, but they must enforce standards that are at least as effective as federal requirements.

Requirements of the OSHA Standard

The underground construction standard covers many topics of concern to those who work in the challenging environment of underground construction. A sampling of items covered by the standard includes requirements for safe access and egress routes, employee training in hazard recognition, a "check-in/check-out" procedure, and emergency procedures. This course summarizes all requirements of the standard.

The standard provides some flexibility in methods to control workplace hazards in underground construction as long as appropriate precautions are taken to protect workers in a variety of situations. OSHA requires that a "competent person" be responsible for carrying out several

requirements of the underground construction regulations. Situations that require intervention by a "competent person" are identified in the following sections.

The Need for a "Competent Person"

The definition of a "competent person" in 29 CFR 1926.32 (f) is as follows:

One who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.

Under Subpart S, Underground Construction, caissons, cofferdams, and compressed air, a competent person is responsible for inspecting and evaluating workplace conditions, including air monitoring and the presence of air contaminants, ground stability, and the drilling, hauling and hoisting of equipment, to identify and correct any deficiencies.

Training Requirements

All employees involved in underground construction must be trained to recognize and respond to hazards associated with this type of work. Training should be tailored to the specific requirements of the jobsite and include any unique issues or requirements.

The following topics should be part of an underground construction employee training program:

- Air monitoring and ventilation
- Illumination
- Communications
- Flood control
- Personal protective equipment
- Emergency procedures, including evacuation plans
- Check-in/check-out procedures
- Explosives
- Fire prevention and protection
- Mechanical equipment

Notification and Communication Requirements

Any time an employer receives a notification of a hazardous condition, all oncoming shifts must be notified of occurrences or conditions that either have affected or might affect their safety. Examples of this type of situation include equipment failures, earth or rockslides, cave-ins, flooding, fires, explosions, or release of gas.

The employer must also maintain open lines of communication with other employers at the worksite to ensure a rapid and complete exchange of information concerning events or situations that may impact worker safety.

Employers must maintain lines of communication with employees during underground construction activities. To ensure effective communications are always available, communication systems must be tested upon initial entry of each shift to the underground and as often as necessary at a later time to ensure they are in working order. Powered communication systems must operate on an independent power supply and be installed so that the use of or disruption of any single communication device or signal location will not disrupt the operation of the system in any other location.

If natural unassisted voice communication is ineffective at any time, a power-assisted means must be used to ensure communication between the work face, the bottom of the shaft, and the surface. In the case of an individual employee working alone underground in a hazardous location who is out of range of natural unassisted voice communication and not able to be observed by other employees, the employer must provide an effective means of obtaining assistance in the event of an emergency.

All shafts being developed or used for personnel access or hoisting require two effective means of communication. In addition, hoist operators must have a closed-circuit voice communication system connected to each landing station, with speaker-microphones located so that the operator can communicate with individual stations while the hoist is in use. (See the section on cranes and hoists later in this course for more specific information.)

Site Control Procedures

Check-in/Check-out Procedures

The employer must maintain a check-in/check-out procedure to ensure that above ground personnel maintain an accurate accounting of the number of persons underground and to prevent

unauthorized persons from gaining access to the site. This is especially important in the event of an emergency but is a common sense requirement at all times.

The only time this procedure is not required is when an underground construction project designed for human occupancy is completed to the point that permanent environmental controls are effective and any remaining construction activity does not have the potential to create an environmental hazard or structural failure in the construction area.

Any time an employee is working underground, at least [illegible] must be on duty above ground. This person is respon[illegible]nd keeping an accurate count [illegible]ency.

Con[illegible]

In ad[illegible] sure safe access to and[illegible]rom potential hazard[illegible]quipment.

To help[illegible] be tightly covered[illegible] read, "Keep Out" or [illegible]

Ground[illegible]

Portal op[illegible]otcreting or equivaler[illegible]cess these areas. Sul[illegible]ricades and warni[illegible]t loose soil, rock,[illegible]

Ground S[illegible]

A compete[illegible]ning of each shift a[illegible]ed with such inspec[illegible], ground support, or e[illegible]dage ways and travel ways must also be[illegible]sary to ensure safe passage and loose ground considered to[illegible]s to employees must be scaled, supported, or taken down.