

Week of October 4, 2010 – Excavation and Trenching

Ethyl Mercaptan, Senior Safety and Health Rep for the City, stood at the edge of what was once a fifteen foot trench. It was only last week that the pipe replacement project was moving along as planned. The new pump house was constructed without incident. The ten-foot structure required employees to use scaffolds and a life-line for the scheduled roof work. The last step was to tie in an underground 12-inch pipe into the existing line. Lockout/tagout procedures were conducted according to the contractor's program, thus controlling any chance of effluent being poured into the trench, resulting in a potential disastrous event. Yet two employees that had families and friends had their lives cut short when the trench walls collapsed. They were buried, only to be brought to the surface as part of a recovery act: too late for any chance of rescue.

The Investigation team, lead by Ethyl Mercaptan, concluded that the trench walls were improperly sloped for the soil type identified in the excavation permit. The men entered the 15-foot trench that had near vertical walls, when, in fact, the soils were categorized as a Type "C" soil - a very loose soil configuration that required an approximate 33.7° angle from the horizontal; that is, a horizontal run of 1 ½ feet for every vertical foot drop. Therefore the trench edges needed to be extended an addition 22 ½ feet. During the investigation, a number of people that were at the site were interviewed. It turns out that the additional clearance space (necessary for the appropriate slope) for the trench edges would have encroached upon the temporary access road used for the work area of another project. After a few minutes of discussion, the two project teams agreed that the pipe tie-in could be accomplished without sloping the trench sides. That way, both projects could finish on time and no one would have to perform a "tap dance" in front of their respective boss and explain the delay. Neither team relented, so closing the access road nor waiting for one project to finish before the other could continue were not options; both projects believed that their work was the priority, thus a stalemate. While time and maintaining schedule was foremost on everyone's mind, they allowed a safety requirement to be compromised. Now both projects were placed in a "Stop Work" mode with no commencement date projected any time soon.

The following is from a class taught at Purdue University, School of engineering

Trenching fatalities and injuries continue to plague the construction industry. While complete and accurate records of the actual number of fatalities occurring in trenching incidents are not maintained, "the estimate of 100 fatalities per year due to cave-ins and other excavation accidents", and 7000 injuries, is perhaps a reasonable approximation of the magnitude of the problem. In addition to the possibility of trench cave-ins, workers in trenches can "be harmed or killed by engulfment in water or sewage, exposure to hazardous gases or reduced oxygen, falls, falling equipment or materials, contact with severed electrical cables or improper rescue."

- Nearly 41% of all respondents said they experienced a trench collapse on one of their jobs. Out of this group, 29.4% said that someone was injured or killed in the collapse.
- Of the nearly 41% who had experienced a trench collapse on a job, 76.5% said that the trench collapse was due to unstable soil, 29.4% said it was due to human error, and 11.8% said it was due to insufficient shoring/shielding.

OSHA regulations for excavations can be found in 29 CFR 1926; Subpart P (sections 650 - 652, including appendices A, B, C and D). While the requirements for safe excavations are numerous, here are a few major points:

Competent person: One who is capable of identifying hazards associated with an excavation and who has the authority to take prompt action to correct or eliminate them.

Benching: A method of protecting employees from cave-ins by forming one or a series of horizontal levels or steps (usually with vertical or near-vertical surfaces between levels).

Sloping: A method of protecting employees from cave-ins by inclining the sides of an excavation using an angle of incline based on such factors as soil type, environmental conditions and application of surcharge loads.

Shoring: A structure to prevent excavation cave-ins, usually a metal hydraulic, mechanical or timber system that supports the sides of an excavation.

Note: While it is generally required to have a registered professional engineer classify soils to determine the appropriate sloping and to ensure shoring and benching techniques are appropriate for the specific work to be performed, the competent person is tasked to inspect these systems (as well as other hazards associated with the excavation) on a daily basis.

Means of Egress: When a trench is four feet or deeper, a ladder, stairway or other safe means of egress shall be located in the trench, as to ensure that no more than 25-feet of travel for employees is present in the excavation.

Equipment and materials must be stored at least two feet from the excavation edge or have a retaining structure to prevent such items from falling or rolling into the excavation.

Safety Challenge: What defines a trench as opposed to an excavation?

"Many of life's failures are people who did not realize how close they were to success when they gave up." **Thomas Edison**

Courtesy of Robert Brounstein, Corporate Director Safety and Health with TerranearPMC