

Marshall Municipal Utilities
EXCAVATIONS AND TRENCHING
Effective August 1, 2011
Revised August 17, 2017

POLICY

This policy applies to all open excavations and trenches; including those excavations and trenches made by contractors and/or sub-contractors.

Any work activity that results in exposure of employees to cave-ins from material that could fall or roll from an excavation face or into an excavation, from collapse of adjacent structures, or from atmospheres Immediately Dangerous to Life and Health (IDLH) which could threaten the safety and health of any worker will be properly identified and controlled.

SCOPE

All excavations and trenches will be assessed by a competent person to ensure that employees and sub-contractors will not be exposed to danger that results from excavation or trench cave-in or other physical hazards associated with these activities. All employees working in or around these excavation or trenching areas shall be trained in the requirements of this section before the start of work.

TRAINING AND COMPETENT PERSON REQUIREMENTS

All employees shall have knowledge about the hazards of cave-ins, how to recognize signs of cave-ins, water hazards, access requirements, confined space issues, surface encumbrances, underground installation marking requirements, fall protection requirements, traffic control measures, and mobile equipment hazards.

When employees enter excavation or trench work areas, a competent person shall be available on-site and complete a safety inspection of the immediate work area before the start of work. If the competent person must leave the job site, another competent person shall be present or all employees shall immediately exit the work area. A competent person is not required to be present if any man-made cut, cavity, trench, or depression in an earth surface formed by earth removal is so small as to prevent a person from being exposed to the hazards identified in this policy.

The Competent Person has additional training and experience of the requirements and regulations listed in this policy, and has authorization to stop work to abate any safety or health hazards at any time.

DEFINITIONS

1. **Benching** – (Benching System) a method of protecting employees from cave-ins by excavating the side(s) of the excavation to form one or a series of horizontal levels or steps, usually with vertical or near-vertical surfaces between levels.
2. **Competent Person** – 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.

3. **Excavation** – Any man-made cut, cavity, trench, or depression in an earth surface formed by earth removal.
4. **Hazardous Atmosphere** – An atmosphere which by reason of being explosive, flammable, poisonous, corrosive, oxidizing, irritating, oxygen deficient, toxic, or otherwise harmful, may cause death, illness, or injury.
5. **Protective System** – A method of protecting employees from cave-ins, from material that could fall or roll from an excavation face or into an excavation, or from the collapse of adjacent structures. Protective systems include support systems, sloping and benching systems, shield systems, and other systems that provide the necessary protection.
6. **Shield** – (Shield System) a structure that is able to withstand the forces imposed on it by a cave-in and thereby protects employees within the structure. Shields can be permanent structures or can be designed to be portable and moved along as work progresses.
7. **Shoring** – (Shoring System) a structure such as metal hydraulic, mechanical or timber shoring system that supports the sides of an excavation and which is designed to prevent cave-ins.
8. **Sloping** – (Sloping System) a method of protecting employees from cave-ins by excavating to form sides of an excavation that are inclined away from the excavation so as to prevent cave-ins. The angle of incline required to prevent a cave-in varies with differences in soil type(s), environmental conditions, and application of surcharge loads.
9. **Support System** – A structure such as underpinning, bracing or shoring, which provides support to an adjacent structure, underground installation, or the sides of an excavation.

SPECIFIC EXCAVATION REQUIREMENTS

1. All surface encumbrances that are located as to create a hazard to employees shall be removed or supported, as necessary, to safeguard employees.
2. All federal, state, and local regulations shall be complied with; in addition to, special attention and compliance with OSHA Excavation Safety Requirements – Subpart P - 29 CFR 1926.650, 651, and 652. Supervisors and Competent Persons should review the non-mandatory appendixes of the standard for additional help to achieve compliance while working in excavations or trenches.
3. The sides of excavations or trenches 5 feet (1.52m) or more in depth, or less than 5 feet (1.52m) in unstable soil, shall be shored, braced, sloped, or otherwise supported by means of sufficient strength to protect the employees within them. *Benching cannot be done in Type C Soil.*
4. A registered professional engineer shall design the sloping, shoring, benching, or shielding method, as well as, the manufacturer's tabulated data for shoring equipment must be strictly followed for excavations exceeding 20 feet in depth.

UNDERGROUND INSTALLATIONS

1. The estimated location of underground utility installations, such as, electrical lines, fuel lines, communication lines, water lines, sewer lines, or any other underground installations that

reasonably may be expected to be encountered during excavation work shall be determined prior to beginning an excavation or trench.

2. Contact the Missouri One-Call System before the proposed work begins to establish the location of underground utility installations prior to the start of actual excavation. Upon contact with this service you will be provided a confirmation number that shall be documented, along with the time, date, and the name of the contact person. If there are utilities not represented by the one-call service, these utilities shall also be contacted. Request for locates shall be made in accordance with the Missouri One-Call System requirements; and may be requested online or by calling the appropriate telephone number listed below:

MISSOURI ONE-CALL: 1-800-DIG-RITE (1-800-344-7483)

3. When excavating operations approach the estimated location of the underground installations, the exact location shall be determined by safe and acceptable means (hand digging, hydro-excavating, etc).
4. While the excavation is open, underground installations shall be protected, supported, or removed as necessary to protect employees.

ACCESS AND EGRESS

1. A stairway, ladder, ramp or other safe means of egress shall be located in trench excavations that are 4 feet (1.22m) or more in depth so as to require no more than 25 feet (7.62 m) of lateral travel for employees.
 - a. Structural ramps that are used solely by employees as a means of access or egress from excavations shall be designed by a competent person. Structural ramps used for access or egress of equipment shall be designed by a competent person qualified in structural design, and shall be constructed in accordance with the design.
 - b. Ramps and runways constructed of two or more structural members shall have the structural members connected together to prevent displacement.
 - c. Structural ramps used in lieu of steps shall be provided with cleats or other surface treatments on the top surface to prevent slipping.

WARNING SYSTEM FOR - AND PROTECTION OF - MOBILE EQUIPMENT

1. When mobile equipment is operating adjacent to an excavation, or when such equipment is required to approach the edge of an excavation and the operator does not have a clear and direct view of the edge of the excavation, a warning system such as barricades, hand or mechanical signals, or stop logs shall be utilized.
 - a. Employees exposed to public vehicular traffic, and all other operating equipment, shall wear Type-II high-visibility reflective garments.
2. Mechanical excavating equipment that is parked or operating on streets, highways, or public traffic ways shall be protected by proper warning devices.

- a. When it is necessary to leave excavating equipment unattended, the blade, bucket, or scoop shall be lowered to the ground with the ignition key removed and the cab locked.

EXPOSURE TO FALLING LOADS

No employee shall be permitted underneath loads handled by lifting or digging equipment. Employees shall be required to stand away from any vehicle being loaded or unloaded to avoid being struck by any spillage or falling materials. Prior to exiting the cab of any vehicle(s) being loaded or unloaded, the operator(s) shall stop all loading or unloading operations to provide adequate protection.

HAZARDOUS ATMOSPHERES

To prevent exposure to harmful levels of atmospheric contaminants and to assure acceptable atmospheric conditions, the following requirements shall apply:

TESTING AND CONTROLS

1. Where oxygen deficiency (atmospheres containing less than 19.5 percent oxygen) or a hazardous atmosphere exists, or could reasonably be expected to exist, the atmospheres in the excavation shall be tested before employees enter excavations.
2. Adequate prevention shall be taken to prevent employee exposure to atmospheres containing less than 19.5 percent oxygen and other hazardous atmospheres. These precautions include providing proper respiratory protection or ventilation.
3. Adequate precautions shall be taken such as providing ventilation, to prevent employee exposure to an atmosphere containing a concentration of a flammable gas in excess of 10 percent of the Lower Explosive Limit (LEL).
4. When controls are used that are intended to reduce the level of atmospheric contaminants to acceptable levels, testing shall be conducted as often as necessary to ensure that the atmosphere remains safe.
5. Emergency rescue equipment, such as breathing apparatus, a safety harness and line, or a basket stretcher shall be readily available where hazardous atmospheres exist, or may reasonably be expected to develop during work in an excavation. This equipment shall be attended when in use.
6. Employees entering bell-bottom pier or other similar deep and confined footing excavations shall wear a harness with a lifeline securely attached to it. The lifeline shall be separate from any line used to handle materials, and shall be individually attended at all times while the employee wearing the lifeline is in the excavation.

PROTECTION FROM HAZARDS ASSOCIATED WITH WATER ACCUMULATION

1. Employees shall not work in excavations in which there is accumulated water, or in excavations in which water is accumulating, unless adequate precautions have been taken to protect employees against all hazards posed by water accumulation. Special precautions necessary to protect employees adequately vary with each situation, but could include

special support or shield systems to protect from cave-ins, water removal to control the level of accumulating water, or use of safety harness or lifeline.

2. If water is controlled or prevented from accumulating by the use of water removal equipment, the water removal equipment and operations shall be monitored by a competent person to ensure proper operation.
3. If excavation work interrupts the natural drainage of surface water, diversion ditches, dikes, or other suitable means shall be used to prevent surface water from entering the excavation; and provide adequate drainage of the area adjacent to the excavation. Excavations subject to runoff from heavy rains will require an inspection by a competent person and compliance with paragraphs (1) and (2) of this section.

STABILITY OF ADJACENT STRUCTURES

1. Where the stability of adjoining buildings, walls, or other structures is endangered by excavation operations, support systems such as shoring, bracing or underpinning shall be provided to ensure the stability of such structures for the protection of employees.
2. Excavation below the level of the base or footing of any foundation, retaining wall, sidewalk, pavement, or appurtenant structure that could be reasonably expected to pose a hazard to employees shall not be permitted; except when:
 - a. A support system, such underpinning, is provided to ensure the safety of employees and the stability of the structure; or
 - b. A registered professional engineer has approved the determination that the structure is sufficiently removed from the excavation so as to be unaffected by the excavation activity; or
 - c. A registered professional engineer has approved the determination that such excavation work will not pose a hazard to employees.
3. Sidewalks, pavements and appurtenant structures shall not be undermined unless a support system or another method of protection is provided to protect employees from the possible collapse of such structures.

PROTECTION OF EMPLOYEES FROM LOOSE ROCK OR SOIL

1. Adequate protection shall be provided to protect employees from loose rock or soil that could pose a hazard by falling or rolling from an excavation face. Such protection shall consist of scaling to remove loose material, installation of protective barricades at intervals as necessary on the face to stop and contain falling material, or other means that provide equivalent protection.
2. Employees shall be protected from excavated or other materials or equipment that could pose a hazard by falling or rolling into excavations. Protection shall be provided by placing and keeping such materials or equipment at least 2 feet (.61m) from the edge of excavations, or by the use of retaining devices that are sufficient to prevent materials or equipment from falling or rolling into excavations; or by a combination of both if necessary.

FALL PROTECTION

1. Walkways with standard guardrails shall be provided where employees or equipment are required or permitted to cross over excavations that are 4 feet in depth or more, and wider than 30 inches at the top.
2. Adequate barrier protection and/or warning devices, barricades, or guardrails shall be provided at excavations that present hazards to persons, or traffic. All wells, pits, shafts, etc., shall be barricaded or securely covered.

INSPECTIONS

1. Daily inspections of excavations, the adjacent areas, and protective systems shall be made by a competent person for evidence of a situation that could result in possible cave-ins, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions. An inspection shall be conducted by the competent person prior to the start of work, and as needed throughout the shift. Inspections shall also be made after every rainstorm or other hazard increasing occurrence. These inspections are only required when employee exposure can be reasonably anticipated.
2. Where the competent person finds evidence of a situation that could result in a possible cave-in, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions, exposed employees shall be removed from the hazardous area until the necessary precautions have been taken to ensure their safety.

See "Excavation Checklist" for required completion

PROTECTION OF EMPLOYEES IN EXCAVATIONS

1. Each employee in an excavation shall be protected from cave-ins by an adequate protective system designed in accordance with the requirements of OSHA 29 CFR 1926.652 Subpart P, including Appendices A, B, C, D, E and F, for Type B and Type C soil classifications only.
2. Protective systems shall have the capacity to resist without failure all loads that are intended or could reasonably be expected to be applied or transmitted to the system.
3. Excavations that are sloped and/or benched shall be at an angle not steeper than "maximum allowable slope" for the classified soil type:

Soil or Rock Type	Maximum Allowable Slopes (H:V) For Excavations Less Than 20 Feet Deep
TYPE B	1:1 (45 degrees)
TYPE C	1 ½ :1 (34 degrees)

Benching cannot be done in Type C soil.

4. Excavations greater than 20 feet deep shall be designed by a Registered Professional Engineer.
 - a. Designs shall be in written form and include at least the following:
 - i. The magnitude of the slopes that were determined to be safe for the particular project;

- ii. A plan indicating the sizes, types, and configurations of the materials to be used in the protective system for the particular project;
 - iii. The identity of the registered professional engineer approving the design.
- b. At least one copy of the design shall be maintained at the jobsite during construction of the approved protective system. After that time, the design may be stored off the jobsite, but a copy of the design shall be made available upon request.

INSTALLATION AND REMOVAL OF PROTECTIVE SUPPORT SYSTEMS

GENERAL

1. Members of support systems shall be securely connected together to prevent sliding, falling, kick-outs, or other predictable failure.
2. Support systems shall be installed and removed in a manner that protects employees from cave-ins, structural collapses, or from being struck by members of the support system.
3. Individual members of support systems shall not be subjected to loads exceeding what they were designed to withstand.
4. Before temporary removal of individual members begins, additional precautions shall be taken to ensure the safety of employees, such as installing other structural members to carry the loads imposed on the support system.
5. Removal shall begin at, and progress from, the bottom of the excavation. Members shall be released slowly so as to note any indication of possible failure of the remaining members of the structure or possible cave-in of the sides of the excavation.
6. Backfilling shall progress together with the removal of support systems from excavations.

ADDITIONAL REQUIREMENTS FOR PROTECTIVE SUPPORT SYSTEMS OF TRENCH EXCAVATIONS

1. Excavation of material to a level no greater than 2 feet (.61m) below the bottom of the members of a support system shall be permitted, but only if the system is designed to resist the forces calculated for the full depth of the trench, and there are no indications while the trench is open of a possible loss of soil from behind or below the bottom of the support system.
2. Members of protective systems shall extend at least 18 inches (0.45 meters) above the surrounding area.
3. Installation of a support system shall be closely coordinated with the excavation of trenches.
4. Sloping and benching systems. Employees shall not be permitted to work on the faces of sloped or benched excavations at levels above other employees except when employees at the lower levels are adequately protected from the hazards of falling, rolling, or sliding material or equipment.

SHIELD SYSTEMS

1. Shield systems shall not be subjected to loads exceeding those which the system was designed to withstand.
2. Shields shall be installed in a manner to restrict lateral or other hazardous movement of the shield in the event of the application of sudden lateral loads.
3. Employees shall be protected from the hazard of cave-ins when entering or exiting the areas protected by shields.
4. Employees shall not be allowed in shields when shields are being installed, removed, or moved vertically.
5. Excavations of earth material to a level not greater than 2 feet (.61m) below the bottom of a shield shall be permitted, but only if the shield is designed to resist the forces calculated for the full depth of the trench, and there are no indications while the trench is open of a possible loss of soil from behind or below the bottom of the shield.

For additional information contact the Safety Department or reference:

OSHA 29 CFR 1926.652 Subpart P; and Appendices A, B, C, D, E and F.