



Excavation Safety Program

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Excavation Safety Program

I. OBJECTIVE

This Excavation Safety Program has been developed to protect employees from safety hazards that may be encountered during work in trenches and excavations. This program is intended to assure that:

- A. Employees who perform work in excavations are aware of their responsibilities and know how to perform the work safely.
- B. 20/20 Plumbing & Heating, Inc. has appointed one or more individuals within the company to assure compliance with the requirements of this program.
- C. The responsibilities of the Safety Director/Coordinators and workers are clearly detailed.
- D. All persons involved in excavation and trenching work have received appropriate training in the safe work practices that must be followed when performing this type of work.

II. ASSIGNMENT OF RESPONSIBILITY

A. Employer

In administering the Excavation Safety Program, the Safety Director/Coordinator will:

- 1. Monitor the overall effectiveness of the program.
- 2. Provide atmospheric testing and equipment selection as needed.
- 3. Provide personal protective equipment as needed.
- 4. Provide protective systems as needed.
- 5. Provide training to affected employees and supervisors.
- 6. Provide technical assistance as needed.
- 7. Review and update the program on at least an annual basis, or as needed.

B. Program Manager

The Safety Director/Coordinator acts as the competent person for 20/20 Plumbing & Heating, Inc. in reference to this program, and must assure that:

1. The procedures described in this program are followed.
2. Employees entering excavations or trenches are properly trained and equipped to perform their duties safely.
3. All required inspections, tests, and recordkeeping functions have been performed.

C. Employees

All employees, including contractor personnel, who work in or around excavations must comply with the requirements of this program. Employees are responsible for reporting hazardous practices or situations to 20/20 Plumbing & Heating, Inc.'s management, as well as reporting incidents that cause injury to themselves or other employees to the Safety Director/Coordinators.

III. TRAINING

A. Training Schedule

1. All personnel involved in trenching or excavation work shall be trained in the requirements of this program by the Safety Director/Coordinator with assistance from the appropriate supervisors.
2. Training shall be performed before employees are assigned duties in excavations.
3. Retraining will be performed when work site inspections indicate that an employee does not have the necessary knowledge or skills to safely work in or around excavations, or when changes to this program are made.
4. Training records will be maintained by the Safety Director/Coordinators, and shall include:
 - a. date of the training program;
 - b. name(s) of the instructor(s) who conducted the training;
 - c. a copy of the written material presented; and
 - d. name(s) of the employee(s) who received the training.

B. Training Components

The training provided to all personnel who perform work in excavations shall include:

1. The work practices that must be followed during excavating or working in excavations.
2. The use of personal protective equipment that will typically be required during work in excavations, including but not limited to safety shoes, hardhats, and fall protection devices.
3. Procedures to be followed if a hazardous atmosphere exists or could reasonably be expected to develop during work in an excavation.
4. The OSHA Excavation Standard, 29 CFR 1926, Subpart P.
5. Emergency and non-entry rescue methods, and the procedure for calling rescue services.
6. 20/20 Plumbing & Heating, Inc.'s policy on reporting incidents that cause injury to employees.

C. Training and Duties of the Safety Director and Coordinators

The Safety Director and Coordinators, shall receive the training detailed in this program as well as training on the requirements detailed in the OSHA Excavation Standard. The Program Safety Director and Coordinators shall:

1. Coordinate, actively participate in, and document the training of all employees affected by this program.
2. Ensure on a daily basis, or more often as detailed in this program, that worksite conditions are safe for employees to work in excavations.
3. Determine the means of protection that will be used for each excavation project.
4. Ensure, if required, that the design of a protective system has been completed and approved by a registered professional engineer before work begins in an excavation.
5. Make available a copy of this program and the OSHA Excavation Standard to any employee who requests it.

IV. EXCAVATION REQUIREMENTS

A. Utilities and Pre-Work Site Inspection

Prior to excavation, the site shall be thoroughly inspected by the Safety Director/Coordinator to determine if special safety measures must be taken.

B. Surface Encumbrances

All equipment, materials, supplies, permanent installations (i.e., buildings or roadways), trees, brush, boulders, and other objects at the surface that could present a hazard to employees working in the excavation shall be removed or supported as necessary to protect employees.

C. Underground Installations

1. The location of sewer, telephone, fuel, electric, water, or any other underground installations or wires that may be encountered during excavation work shall be determined and marked prior to opening an excavation.

Arrangements shall be made as necessary by Superintendent or Safety Director/Coordinator with the appropriate utility entity for the protection, removal, shutdown, or relocation of underground installations.

2. If it is not possible to establish the exact location of these installations, the work may proceed with caution if detection equipment or other safe and acceptable means are used to locate the utility.

3. Excavation shall be done in a manner that does not endanger the underground installations or the employees engaged in the work. Utilities left in place shall be protected by barricades, shoring, suspension, or other means as necessary to protect employees.

D. Protection of the Public

Barricades, walkways, lighting, and posting shall be provided as necessary for the protection of the public prior to the start of excavation operations.

1. Guardrails, fences, or barricades shall be provided on excavations adjacent to walkways, driveways, and other pedestrian or vehicle thoroughfares.

Warning lights or other illumination shall be maintained as necessary for the safety of the public and employees from sunset to sunrise.

2. Wells, holes, pits, shafts, and all similar hazardous excavations shall be effectively barricaded or covered and posted as necessary to prevent unauthorized access. All temporary excavations of this type shall be backfilled as soon as possible.

3. Walkways or bridges protected by standard guardrails shall be provided where employees and the general public are permitted to cross over excavations. Where workers in the excavation may pass under these walkways or bridges, a standard guardrail and toeboard shall be used to prevent the hazard of falling objects. Information on the requirements for guardrails and toe-boards may be obtained by contacting Safety Director/Coordinator.

E. Protection of Employees

Stairs, ladders, or ramps shall be provided at excavation sites where employees are required to enter trench excavations over four (4) feet deep. The maximum distance of lateral travel (along the length of the trench) necessary to reach the means of egress shall not exceed 25 feet.

1. Structural Ramps

- a. Structural ramps 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 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 movement or displacement.
- c. Structural members used for ramps and runways shall be of uniform thickness.
- d. Cleats or other appropriate means used to connect runway structural members shall be attached to the bottom of the runway or shall be attached in a manner to prevent tripping.
- e. Structural ramps used in place of steps shall be provided with cleats or other surface treatments on the top surface to prevent slipping.

2. Ladders

- a. When portable ladders are used, the ladder side rails shall extend a minimum of three (3) feet above the upper surface of the excavation.
- b. Ladders shall have nonconductive side rails if work will be performed near exposed energized equipment or systems.

- c. Two or more ladders, or a double-cleated ladder, will be provided where 25 or more employees will be conducting work in an excavation where ladders serve as the primary means of egress, or where ladders serve two-way traffic.
- d. Ladders will be inspected prior to use for signs of damage or defects. Damaged ladders will be removed from service and marked with “Do Not Use” until repaired.
- e. Ladders shall be used only on stable and level surfaces unless secured. Ladders placed in any location where they can be displaced by workplace activities or traffic shall be secured, or barricades shall be used to keep these activities away from the ladders.
- f. Non self-supporting ladders shall be positioned so that the foot of the ladder is one-quarter of the working length away from the support.
- g. Employees are not permitted to carry any object or load while on a ladder that could cause them to lose their balance and fall.

F. Exposure to Vehicular Traffic

Employees exposed to vehicular traffic shall be provided with, and shall wear warning vests (Class II) or other suitable garments marked with or made of reflectorized or high-visibility material. Warning vests worn by flagmen shall be red or orange, and shall be Class III if worn during night work. Emergency lighting, such as spotlights or portable lights, shall be provided as needed to perform work safely.

G. Exposure to Falling Loads

No employee is permitted underneath loads being handled by lifting or digging equipment. Employees are required to stand away from any vehicle being loaded or unloaded to avoid being struck by any spillage or falling materials. Operators may remain in the cabs of vehicles being loaded or unloaded when the vehicles provide adequate protection for the operator during loading and unloading operations.

H. Warning System for Mobile Equipment

A warning system shall be used when mobile equipment is operated adjacent to the edge of an excavation if the operator does not have a clear and direct view of the edge of the excavation. The warning system shall consist of barricades, hand or mechanical signals, or stop logs. If possible, the grade should be away from the excavation.

I. Hazardous Atmospheres

Safety Director/Coordinators, Superintendents or Competent Person will test the atmosphere in excavations over four (4) feet deep if a hazardous atmosphere exists or could reasonably be expected to exist. A hazardous atmosphere could be expected, for example, in excavations in landfill areas, areas where hazardous substances are stored nearby, or near areas containing gas pipelines.

1. Adequate precautions 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 forced ventilation of the workspace.
2. Forced ventilation or other effective means shall be used to prevent employee exposure to an atmosphere containing a flammable gas in excess of ten (10) percent of the lower flammability limit of the gas.
3. When controls are used that are intended to reduce the level of atmospheric contaminants to acceptable levels, continuous air monitoring will be performed by the Safety Director/Coordinators, Superintendents or Competent Person. The device used for atmospheric monitoring shall be equipped with an audible and visual alarm.
4. Atmospheric testing will be performed using a properly calibrated direct reading gas monitor. Direct reading gas detector tubes or other acceptable means may also be used to test potentially toxic atmospheres.
5. Each atmospheric testing instrument shall be calibrated by a trained Safety Director/Coordinator, Superintendent or Competent Person on a schedule and in the manner recommended by the manufacturer. In addition:
 - a) Any atmospheric testing instrument that has not been used within 30 days shall be recalibrated prior to use.
 - b) Each atmospheric testing instrument shall be calibrated at least every six (6) months.
6. Each atmospheric testing instrument will be field checked immediately prior to use to ensure that it is operating properly.

J. Personal Protective Equipment

1. All employees working in trenches or excavations shall wear approved hardhats and steel-toed shoes or boots.
2. Employees exposed to flying fragments, dust or other materials produced by drilling, sawing, sanding, grinding, and similar operations shall wear approved safety glasses with side shields.

3. Employees performing welding, cutting, or brazing operations, or are exposed to the hazards produced by these tasks, shall wear approved spectacles or a welding face-shield or helmet, as determined by the Competent Person.
4. Employees entering bell-bottom pier holes 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.
5. Employees shall wear, as determined by Competent Person, approved gloves or other suitable hand protection.
6. Employees using or working in the immediate vicinity of hammer drills, masonry saws, jackhammers, or similar high-noise producing equipment shall wear suitable hearing protection, as determined by Competent Person.
7. Each employee working at the edge of an excavation six (6) feet or more deep shall be protected from falling. Fall protection shall include guardrail systems, fences, barricades, covers, or a tie-back system meeting OSHA requirements, as determined by the on-site Competent Person.
8. Emergency rescue equipment, such as breathing apparatus, a safety harness and line, and a basket stretcher, shall be readily available where hazardous atmospheric conditions exist or may develop during work in an excavation. This equipment shall be attended when in use. Only personnel who have received approved training and have appropriate equipment shall attempt retrieval that would require entry into a hazardous atmosphere. If entry into a known hazardous atmosphere must be performed, then the Safety Director/Coordinators shall be given advance notice so that the hazards can be evaluated and rescue personnel placed on standby if necessary.

K. Walkways and Guardrails

Walkways shall be provided where employees or equipment are permitted to cross over excavations. Guardrails shall be provided where walkways, accessible only to on-site project personnel, are six (6) feet or more above lower levels.

L. Protection from Water Accumulation Hazards

1. Employees are not permitted to work in excavations that contain or are accumulating water unless precautions have been taken to protect them from the hazards posed by water accumulation. Precautions may include special support or shield systems to protect from cave-ins, water removal to control the level of accumulating water, or use of safety harnesses and lifelines.

2. If water is controlled or prevented from accumulating by the use of water removal equipment, the water removal equipment and operation shall be monitored by a person trained in the use of that equipment.
3. If excavation work interrupts the natural drainage of surface water (such as streams), diversion ditches, dikes, or other suitable means shall be used to prevent surface water from entering the excavation. Precautions shall also be taken to provide adequate drainage of the area adjacent to the excavation. Excavations subject to runoff from heavy rains shall be re-inspected by on-site Competent Person after each rain incident to determine if additional precautions, such as special support or shield systems to protect from cave-ins, water removal to control the level of accumulating water, or use of safety harnesses and lifelines, should be used.
4. The Competent Person shall inform affected workers of the precautions or procedures that are to be followed if water accumulates or is accumulating in an excavation.

M. Stability of Adjacent Structures

The Competent Person will determine if the excavation work could affect the stability of adjoining buildings, walls, sidewalks, or other structures.

1. Support systems (such as shoring, bracing, or underpinning) shall be used to assure the stability of structures and the protection of employees where excavation operations could affect the stability of adjoining buildings, walls, or other structures.
2. Excavation below the level of the base or footing of any foundation or retaining wall that could be reasonably expected to pose a hazard to employees shall not be permitted, except when:
 - a. a support system, such as underpinning, is provided to ensure the safety of employees and the stability of the structure;
 - b. the excavation is in stable rock;
 - c. 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
 - d. 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 other method of protection is provided to protect employees from the possible collapse of such structures.
4. Where review or approval of a support system by a registered professional engineer is required, The Safety Director/Coordinator shall secure this review and approval in writing before the work begins.

N. Protection from Falling Objects and Loose Rocks 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:
 - a. scaling to remove loose material;
 - b. installation of protective barricades, such as wire mesh or timber, at appropriate intervals on the face of the slope to stop and contain falling material; or
 - c. benching sufficient to contain falling material.
2. Excavation personnel shall not be permitted to work above one another where the danger of falling rock or earth exists.
3. Employees shall be protected from excavated materials, equipment, or other materials that could pose a hazard by falling or rolling into excavations.
4. Protection shall be provided by keeping such materials or equipment at least two (2) feet from the edge of excavations, by use of restraining devices that are sufficient to prevent materials or equipment from falling or rolling into excavations, or by a combination of both if necessary.
5. Materials and equipment may, as determined by the Competent Person, need to be stored further than two (2) feet from the edge of the excavation if a hazardous loading condition is created on the face of the excavation.
6. Materials piled, grouped, or stacked near the edge of an excavation must be stable and self-supporting.

O. Inspection by Program Manager

1. The Competent Person, shall conduct daily inspections of excavations, adjacent areas, and protective systems for evidence of a situation that could result in possible cave-ins, 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 the trench will be or is occupied by employees.
2. Where the Competent Person finds evidence of a situation that could result in a possible cave-in, failure of protective systems, hazardous atmosphere, or other hazardous conditions, exposed employees shall be removed from the hazardous area until precautions have been taken to assure their safety.

3. The Competent Person shall maintain a written log of all inspections conducted. This log shall include the date, work site location, results of the inspection, and a summary of any action taken to correct existing hazards.

V. PROTECTIVE SYSTEM REQUIREMENTS

A. Protection of Employees

1. Employees in an excavation shall be protected from cave-ins by using either an adequate sloping and benching system or an adequate support or protective system. The only exceptions are:
 - a) excavations made entirely in stable rock; or
 - b) excavations less than five (5) feet in depth where examination of the ground by the Competent Person, provides no indication of a potential cave-in.
2. Protective systems shall be capable of resisting all loads that could reasonably be expected to be applied to the system.

B. Design of Sloping and Benching Systems

The slope and configuration of sloping and benching systems shall be selected and constructed by the Competent Person in accordance with the following options:

1. Allowable configurations and slopes for Type C soil
 - a) Excavations shall be sloped at an angle no steeper than one and one-half (1 ½) horizontal to one (1) vertical (34 degrees measured from the horizontal), unless one of the options listed below is used.
 - b) Slopes shall be properly excavated depending on soil type as shown in 29 CFR 1926, Subpart P, Appendix B.

Determination of slopes and configurations using 29 CFR 1926, Subpart P, Appendices A and B.

The maximum allowable slopes and allowable configurations for sloping and benching systems shall meet the requirements set forth in these appendices.

2. Designs using other tabulated data

The design of sloping or benching systems may be selected from, and shall be constructed in accordance with, other tabulated data, such as tables and charts. The tabulated data used must be in written form and include the following:

- a) Identification of the factors that affect the selection of a sloping or benching system.
- b) Identification of the limits of the use of the data, including the maximum height and angle of the slopes determined to be safe.
- c) Other information needed by the user to make correct selection of a protective system.
- d) At least one copy of the tabulated data that identifies the registered professional engineer who approved the data shall be maintained at the jobsite during construction of the protective system. After that time, the data may be stored off the jobsite, and shall be maintained by Safety Director/Coordinators.

3. Design by a registered professional engineer

- a) Sloping or benching systems designed in a manner other than those described in the preceding three options shall be approved by a registered professional engineer.
- b) Designs shall be in written form and shall include at least the following information:
 - i. the maximum height and angle of the slopes that were determined to be safe for a particular project; and
 - ii. the identity of the registered professional engineers who approved the design.
- c) At least one copy of the design shall be maintained at the jobsite while the slope is being constructed. After that time, the design may be stored off the jobsite, and shall be maintained by Safety Director/Coordinators.

C. Design of Support, Shield, and Other Protective Systems

The design of support systems, shield systems, and other protective systems shall be selected and constructed by the Competent Person in accordance with the following requirements:

1. Designs using 29 CFR 1926, Subpart P, Appendices A, C and D
 - a) Timber shoring in trenches shall be designed in accordance with the requirements of the OSHA guidelines.
 - b) Aluminum hydraulic shoring shall be designed in accordance with the manufacturer's tabulated data or the requirements of the OSHA guidelines.
2. Designs using manufacturer's tabulated data
 - a) Support systems, shield systems, and other protective systems designed from manufacturer's tabulated data shall be constructed and used in accordance with all specifications, recommendations, and limitations issued or made by the manufacturer.
 - b) Deviation from the specifications, recommendations, and limitations issued or made by the manufacturer shall be allowed only after the manufacturer issues specific written approval.
 - c) Manufacturer's specifications, recommendations, and limitations, as well as the manufacturer's written approval to deviate from the specifications, recommendations, and limitations, shall be kept in written form at the jobsite during construction of the protective system(s). After that time, the information may be stored off the jobsite, and shall be maintained by the Safety Director/Coordinators.
3. Designs using other tabulated data

Designs of support systems, shield systems, and other protective systems shall be selected from and constructed in accordance with tabulated data, such as tables and charts.

a. The tabulated data shall be in written form and shall include all of the following:

- i. identification of the factors that affect the selection of a protective system drawn from such data;
- ii. identification of the limits of the use of such data; and
- iii. information needed by the user to make a correct selection of a protective system from the data.

b. At least one written copy of the tabulated data, which identifies the registered professional engineer who approved the data, shall be maintained at the jobsite during construction of the protective system. After that time, the data may be stored off the jobsite, and shall be maintained by the Safety Director/Coordinators.

4. Design by a registered professional engineer

Support systems, shield systems, and other protective systems designed in a manner other than the preceding three options shall be approved by a registered professional engineer.

a. Designs shall be in written form and shall include:

- i. a plan indicating the sizes, types, and configurations of the materials to be used in the protective system; and
- ii. the identity of the registered professional engineer who approved the design.

b. At least one copy of the design shall be maintained at the jobsite during construction of the protective system. After that time, the design may be stored off the jobsite, and shall be maintained by Safety Director/Coordinators.

D. Materials and Equipment

1. Materials and equipment used for protective systems shall be free from damage or defects that might affect their proper function.

2. Manufactured materials and equipment used for protective systems shall be used and maintained in accordance with the recommendations of the manufacturer, and in a manner that will prevent employee exposure to hazards.

3. When materials or equipment used for protective systems are damaged, The Safety Director/Coordinators shall ensure that these systems are examined by a competent person to evaluate suitability for continued use. If the competent person cannot assure that the material or equipment is able to support the intended loads or is otherwise suitable for safe use, then such material or equipment shall be removed from service. The material or equipment shall then be evaluated and approved by a registered professional engineer before being returned to service.

E. Installation and Removal of Supports

1. General

- a) Members of support systems shall be securely connected together to prevent sliding, falling, kickouts, or other potential hazards.
- b) 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 systems.
- c) Individual members of the support systems shall not be subjected to loads exceeding those that they were designed to support.
- d) Before temporary removal of individual support members begins, additional precautions shall be taken as directed by the Competent Person to ensure the safety of employees (i.e., the installation of other structural members to carry the loads imposed on the support system).
- e) Removal of support systems shall begin at, and progress from, the bottom of the excavation. Members shall be released slowly. If there is any indication of possible failure of the remaining members of the structure or possible cave-in of the sides of the excavation, the work shall be halted until it can be examined by the Safety Director/Coordinators.

Backfilling shall progress in conjunction with the removal of support systems from excavations.

2. Additional Requirements

- a) Excavation of material to a level no greater than two (2) feet below the bottom of the members of a support system is allowed, but only if the system is designed to resist the forces calculated for the full depth of the trench. There shall be no indications of a possible loss of soil from behind or below the bottom of the support system while the trench is open.
- b) Installation of a support system shall be closely coordinated with the excavation of trenches.

F. Sloping and Benching Systems

Employees are not permitted to work above other employees in the faces of sloped or benched systems, except when employees at lower levels are protected from the hazards of falling, rolling, or sliding material or equipment.

G. Shield Systems

1. General

- a) Shield systems shall not be subjected to loads that are greater than those they are designed to withstand.
- b) Shields shall be installed in a manner that will restrict lateral or other hazardous movement of the shield and could occur during cave-in or unexpected soil movement.
- c) Employees shall be protected from the hazard of cave-ins when entering or exiting the areas protected by shields.
- d) Employees are not permitted in trenches when shields are being installed, removed, or moved vertically.

2. Additional Requirements

- a) Excavation of material to a level no greater than two (2) feet below the bottom of the shield system is allowed, but only if the system is designed to resist the forces calculated for the full depth of the trench.
- b) There shall be no indications of a possible loss of soil from behind or below the bottom of the shield system while the trench is open.

VI. ACCIDENT INVESTIGATIONS

All incidents that result in injury to workers, as well as near misses, regardless of their nature, shall be reported and investigated. Investigations shall be conducted by the Safety Director/Coordinators as soon after an incident as possible to identify the cause and means of prevention to eliminate the risk of reoccurrence.

In the event of such an incident, the Excavation Safety Program shall be reevaluated by the Safety Director/Coordinators to determine if additional practices, procedures, or training are necessary to prevent similar future incidents.

VII. CHANGES TO PROGRAM

Any changes to the Excavation Safety Program shall be approved by Safety Director and shall be reviewed by a qualified person as the job progresses to determine additional practices, procedures, or training needs necessary to prevent injuries. Affected employees shall be notified of procedure changes, and trained if necessary. A copy of this program shall be maintained in the RED BOOK at the jobsite.

VIII. GLOSSARY

Accepted engineering practices: the standards of practice required by a registered professional engineer.

Aluminum hydraulic shoring: a manufactured shoring system consisting of aluminum hydraulic cylinders (crossbraces) used with vertical rails (uprights) or horizontal rails (wales). This system is designed to support the sidewalls of an excavation and prevent cave-ins.

Bell-bottom pier hole: a type of shaft or footing excavation, the bottom of which is made larger than the cross section above to form a bell shape.

Benching system: a method of protecting employees from cave-ins by excavating the sides of an excavation to form one or more horizontal steps, usually with vertical or near-vertical surfaces between levels.

Cave-in: the movement of soil or rock into an excavation, or the loss of soil from under a trench shield or support system, in amounts large enough to trap, bury, or injure and immobilize a person.

Competent person: a person who has been trained to identify hazards in the workplace, or working conditions that are unsafe for employees, and who has the authority to have these hazards corrected.

Cross braces: the horizontal members of a shoring system installed from side to side of the excavation. The cross braces bear against either uprights or wales.

Excavation: any man-made cut, cavity, trench, or depression in an earth surface formed by earth removal.

Faces or sides: the vertical or inclined earth surfaces formed as a result of excavation work.

Failure: the movement or damage of a structural member or connection that makes it unable to support loads.

Hazardous atmosphere: an atmosphere that is explosive, flammable, poisonous, corrosive, oxidizing, irritating, oxygen deficient, toxic, or otherwise harmful, that may cause death, illness, or injury.

Kickout: the accidental movement or failure of a cross brace.

Program Manager: the individual within the company who oversees excavation work and is responsible for assuring compliance with this program.

Protective system: a method of protecting employees from cave-ins, from material that could fall or roll from an excavation face 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.

Ramp: an inclined walking or working surface that is used to gain access to one point from another. A ramp may be constructed from earth or from structural materials such as steel or wood.

Sheeting: the members of a shoring system that retain the earth in position and in turn are supported by other members of the shoring system.

Shield system: a structure used in an excavation to withstand cave-ins and which will protect employees working within the shield system. Shields can be permanent structures or portable units moved along as work progresses. Shields used in trenches are usually referred to as **trench boxes** or **trench shields**.

Shoring system: a structure that is built or put in place to support the sides of an excavation to prevent cave-ins.

Sides: see faces.

Sloping system: sloping the sides of an excavation away from the excavation to protect employees from cave-ins. The required slope will vary with soil type, weather, and surface or near surface loads that may affect the soil in the area of the trench (such as adjacent buildings, vehicles near the edge of the trench, etc.).

Stable rock: natural solid mineral material that can be excavated with vertical sides that will remain intact while exposed.

Structural ramp: a ramp built of steel or wood, usually used for vehicle access.
Ramps made of soil or rock are not considered structural ramps.

Support system: a structure used as underpinning, bracing or shoring, which provides support to an adjacent structure, underground installation, or the sides of an excavation.

Tabulated data: tables and charts approved by a registered professional engineer and used to design and construct a protective system.

Trench: a narrow excavation (in relation to its height) made below the surface of the ground.

Trench box or trench shield: see **shield**.

Uprights: the vertical members of a trench shoring system placed in contact with the earth and usually positioned so the individual members do not contact each other. Uprights placed so that individual members are closely spaced, in contact with or interconnected to each other, are often called **sheeting**.

Wales: horizontal members of a shoring system placed in the direction of the excavation face whose sides bear against the vertical members of the shoring system or earth (the uprights or sheeting).