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1.0 Purpose

Excavation projects present a significant threat to the health and safety of the Branscome Companies employees. The Branscome Companies is committed to conducting its Trenching and Excavation operations in the safest manner possible, with concern for the individual and in accordance with applicable Federal and State statutes. The Branscome Companies' Trenching and Excavation Safety Program has been prepared to comply with regulations promulgated by the Federal Occupational Safety and Health Administration (OSHA) and the Virginia Department of Labor and Industry.

2.0 Scope

This program establishes requirements for the Branscome Companies in order to work in, or around, any excavation operations. This program describes the training and certification requirements, rules of operation, accident reporting and other related information.

The primary goal of the Trenching and Excavation Safety Program is to protect human life and property. The following program has been created as a guideline for conducting trenching and excavation projects. These projects will encompass all activities which involve the removal of earth to a depth of five (5) feet or greater with non-hazardous atmospheres.

3.0 Roles & Responsibilities

- 3.1 Safety Department
 - Developing and Maintaining the written Trenching and Excavation Safety Program (Excavation Program);
 - Periodically review and update the program as new regulations are promulgated;
 - Periodically review and assess the implementation and management of the written excavation program;
 - Conducting periodic site evaluations of on-going excavation projects for health and safety considerations; and,
 - Developing and implementing an excavation safety training program
- 3.2 Construction Manager
 - Reviewing all work orders, requiring or potentially requiring excavation activities;



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- Assigning a project manager (PM) for planning and coordinating the work activities and impacted shops or remote sites;
- Assigning a trained, competent person (CP) for overseeing the daily activities at the excavation site;
- Notifying utility companies of proposed trenching or excavation activities;
- Arranging the use of monitoring equipment to be used by the excavation crew;
- Documenting and maintaining records related to Excavation Safety Training;
- Maintaining all training documentation for a period not less than three (3) years;
- Maintaining all project related documentation for a period not less than one (1) year;
- Reviewing all site-specific work plans prepared by the Project Manager (PM); and
- Ensuring that all the necessary equipment and materials are available for the use in the excavation prior to the commencement of excavation activities.

3.3 Project Manager

- Review the proposed excavation work and prepare the site-specific excavation work plan;
- Submit the site-specific work plan to the Construction Manager for review and approval prior to the commencement of excavation activities (allowances will be made for emergency situations);
- Request assistance from the Safety Specialist for work place evaluations as needed;
- Ensure appropriate engineering controls, personal protective equipment and monitoring equipment are available and properly used;
- Ensure Competent Person (CP) and other personnel working in and around the excavation have been properly trained in potential safety hazards and safe excavation work practices;
- Monitor safety performance of personnel assigned to the project;
- Correct any work practice or condition that may result in injury;
- Stop site operations in the event of an emergency or to correct unsafe work practices;
- Report any unsafe work practices to supervisor;
- Remove any person from the work area who endangers other personnel or that may be causing a safety hazard to the persons in the work area; and
- Make changes to the site-specific work plan, based upon changing site conditions.



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3.4 Competent Person

- Maintain a thorough understanding and knowledge of the OSHA excavation standard;
- Classify soils based on the OSHA excavation standard (for simplicity, classify all soils as "Type C Soils");
- Install appropriate protective systems necessary to provide adequate engineered personnel protection;
- Develop a site-specific Emergency Response Plan (ERP);
- Notify appropriate emergency response agencies. The location, work schedule and scope of work should be provided if the space is determined to be a confined space;
- Conduct inspections necessary to identify potentially hazardous conditions;
- Conduct site safety meetings to review site-specific health and safety issues related to the excavation project and emergency response plan;
- Ensure monitoring equipment is properly calibrated and used and that results are properly recorded and filed;
- Ensure appropriate engineering controls, personal protective equipment and monitoring equipment are available and properly used;
- Inspect equipment and materials that are used for protective systems for condition and suitability of use;
- Monitor safety performance of personnel assigned to the project;
- Correct any work practice or condition that may result in injury;
- Identify existing and predictable hazards in the surroundings or working conditions which are hazardous, unsanitary, or dangerous to employees;
- Be authorized to stop site operations in the event of an emergency or to correct unsafe work practices;
- Report any unsafe work practices to the appropriate Project Manager; and
- Make changes to the site-specific work plan based upon changing site conditions.
- 3.5 Employees

All employees who work in or around excavations, must comply with the requirements of this program. Employees are responsible for reporting hazardous practices or situations to the Branscome Companies' management, as well as reporting incidents that cause injury to themselves or other employees to their supervisor.



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4.0 Definitions

- 4.1 **Accepted engineering practices:** Those requirements which are compatible with standards of practice required by a registered professional engineer.
- 4.2 Aluminum hydraulic shoring: A pre-engineered shoring system comprised of aluminum hydraulic cylinders (cross-braces) used in conjunction with vertical rails (uprights) or horizontal rails (walers). Such system is designed specifically to support the sidewalls of an excavation and prevent cave-ins.
- 4.3 **Benching** means a method of protecting employees from cave-ins by excavating the sides of an excavation to form one or a series of horizontal levels or steps, usually with vertical or near vertical surfaces between levels.
- 4.4 **Cave-in** means the separation of a mass of soil or rock material from the side of an excavation, or the loss of soil from under a trench shield or support system, and its sudden movement into the excavation, either by falling or sliding, in sufficient quantity so that it could entrap, bury, or otherwise injure and immobilize a person.
- 4.5 **Competent person (CP)** means one who is capable to identify existing and predictable hazards in the surroundings or working conditions that may affect employees and the general public, and who has authority to take prompt corrective measures to eliminate them

The Competent Person(s):

- Must be trained in and knowledgeable of excavation and trenching standard, and other programs that may apply (Hazard Communication, Confined Space, Respiratory Protection);
- Must be capable of recognizing hazardous conditions and must have authority to stop work and ensure that hazards are corrected;
- Performs and documents the 'Daily Excavation Inspection', and knows when inspections should be performed;
- Must assure that the location of underground installations or utilities have been properly located; and
- Must identify and ensure the use of adequate protective systems, work methods and personal protective equipment (PPE) on the excavation site.
- 4.6 **Crossbraces:** The horizontal members of a shoring system installed perpendicular to the sides of the excavation, the ends of which bear against either uprights or wales.



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- 4.7 **Excavation** means any man-made cut, cavity, trench, or depression in an earth surface, formed by earth removal.
- 4.8 **Faces or sides:** The vertical or inclined earth surfaces formed as a result of excavation work.
- 4.9 **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.
- 4.10 **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.
- 4.11 **Ramp:** An inclined walking or working surface that is used to gain access to one point from another, and is constructed from earth or from structural materials such as steel or wood.
- 4.12 **Registered professional engineer** (RPE) means a person who is registered as a professional engineer.
- 4.13 **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. For example, uprights placed so that individual members are closely spaced, in contact with or interconnected to each other.
- 4.14 **Shielding:** Protects workers by using trench boxes or other types of supports to prevent soil movement and cave-ins.
- 4.15 **Stable rock:** Natural solid mineral material that can be excavated with vertical sides and will remain intact while exposed. Unstable rock is considered to be stable when the rock material on the side or sides of the excavation is secured against caving-in or movement by rock bolts or by another protective system that has been designed by a registered professional engineer.
- 4.16 **Shield (shield system)** means a structure that is able to withstand the forces imposed on it by a cave-in and thereby protect employees with the structure. Shields can be a permanent structures or can be designed to be portable and moved along as work progresses. Also known as trench boxes or trench shields.



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- 4.17 **Shoring (shoring system)** means a structure such as a metal hydraulic, mechanical or timber shoring system that supports the sides of an excavation and which is designed to prevent cave-ins.
- 4.18 **Sloping (sloping system)** means 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 varies with differences in such factors as the soil type, environmental exposure conditions, and application of surcharge loads.
- 4.19 **Soil Type A** Most stable: clay, silty clay, and hardpan (resists penetration). No soil is Type A if it is fissured, is subject to vibration of any type, has previously been disturbed, or has seeping water. As most soils in areas where work will be conducted at UF have been disturbed, no UF soils will be considered Type A.
- 4.20 **Soil Type B** Medium stability: silt, sandy loam, medium clay and unstable dry rock; previously disturbed soils unless otherwise classified as Type C.
- 4.21 **Soil Type C** Least stable: gravel, loamy sand, soft clay, submerged soil or dense, heavy unstable rock, and soil from which any water is seeping.
- 4.22 **Soil Mixed Types** (Layered Geological Strata) The soil must be classified on the basis of the soil classification of the weakest soil layer. Each layer may be classified individually if a more stable layer lies below a less stable layer, i.e. where a Type C soil rests on top of stable rock.
- 4.23 **Tabulated data:** Tables and charts approved by a registered professional engineer and used to design and construct a protective system.
- 4.24 **Trench:** A narrow underground excavation (in relation to its length) made below the surface of the ground. The depth is greater than the width, but the width of a trench (measured at the bottom) is not greater than 15 feet (4.5 m). If forms or other structures are installed or constructed in an excavation so as to reduce the dimension measured from the forms or structure to the side of the excavation to 15 feet or less, (measured at the bottom of the excavation), the excavation is also considered to be a trench.
- 4.25 **Uprights:** The vertical members of a trench shoring system placed in contact with the earth and usually positioned so that 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."



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4.26 **Wales:** Horizontal members of a shoring system placed parallel to the excavation face whose sides bear against the vertical members of the shoring system or earth.

5.0 References

5.1 OSHA 29 CFR 1926.650-652, Subpart P - Excavations

6.0 General Trenching and Excavation Requirements

6.1 Work that involves the removal of earth to a depth greater than five (5) feet shall be considered an excavation. Protective systems shall be designed and utilized specifically for all excavations greater than five (5) feet. These protective systems may include sloping or benching of the sides of the excavation or, supporting the sides of the excavation or by using a shield, such as a trench box, between the work area and the excavation side. Each protective system shall be designed specifically for the project-related excavation.

The installation and use of protective systems are not required when an excavation is made entirely in stable/competent rock or is less than five (5) feet deep and a competent person has examined the ground and found no indication of a potential cave-in.

6.2 Soil Classification

Any excavation activity shall be assumed to be Type C soil. For all excavations, soils shall be classified in accordance with 29 CFR 1926.650 (Subpart P Appendix A, OSHA Excavation Standard) prior to the commencement of excavation activities.

6.3 Depth of Cut

For all excavations greater than four (4) feet, but less than five (5) feet, the CP shall assess the cut (or excavation) for potential cave-in hazards. The CP will have the authority to install any protective systems necessary to protect the person(s) working in excavation from cave-ins. The CP shall also determine if a hazardous atmosphere exists before persons are allowed to work within the excavation.

Personnel shall not be permitted to work on the faces of sloped excavations at levels above other employees, except when employees at lower levels are adequately protected from the hazards of falling, rolling or sliding materials or equipment.



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For excavations five (5) feet in depth or greater, protective systems shall be used. The CP and individual department policies shall determine the actual use of a specific protective system described below. Protective systems that may be employed are sloping, benching, shoring and shielding.

6.4 Sloping

Sloping is a method of protecting employees from cave-ins by forming sides that are inclined away from the excavation. The angle of the incline required will vary with the soil type and environmental conditions. Since we are operating under the assumption that all soils on the property are to be considered Class Type C soils, the walls of the excavation will be sloped at an angle not steeper than $1\frac{1}{2}$ horizontal to 1 vertical (1.5 : 1) or thirty-four (34°) degrees measured from the horizontal plane.

This is the only non-structural protective method allowed in Class Type C soil. Maximum allowable slopes and sloping configurations will be determined according to soil type as described in Appendix A and B of the OSHA excavation standard.

6.5 Benching

Benching is 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. This method may only be used in Class Type A or Class B soils.

Maximum allowable number and configuration of benches will be determined according to soil type as described in Appendix A and B of the OSHA excavation standard.

6.6 Shoring and Shielding

The CP shall select and oversee the construction of support systems, shield systems and other protective devices designed for the protection of personnel working in excavations. Materials and equipment used in protective systems will not be damaged or defective. Manufactured materials and equipment used for protective systems will be used and maintained safely and according to manufacturer's recommendations. The CP is responsible for daily inspections of the protective systems. General structural integrity and the ability to adequately support the excavation walls will be observed by the CP.



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Excavation of the material shall not exceed two (2) feet below the bottom of the members of the support system. Excavation greater than two (2) feet below the bottom of the support system may be permitted only if reviewed and approved by a registered Professional Engineer (PE), and there are no indications of a possible loss of soil from behind or below the bottom of the support system.

6.7 Shielding

A shield is a structure that protects employees and is able to withstand forces imposed upon it created by a cave-in. Shields may be permanent or designed to be portable and moved as the work progresses. Shields may also be manufactured to meet the project-specific needs of the excavation site. A trench box is an example of a shielding system.

The manufacturer's tabulated data for the trench box or shield that is used in the excavation project will be kept on-site at all times. This must be readily accessible to an inspector reviewing the site.

For excavations other than those described in the 29 CFR 1926.652 Subpart P or this document (i.e., excavations greater than 20 feet in depth), protective systems shall be designed and approved by a registered PE and the written design shall include at a minimum a plan indicating the sizes, types and configurations of materials to be used in the protective system and the name of the registered PE approving the design.

At least one (1) copy of the design shall be maintained at the job site during the construction of the protective system. After that time, the design may be stored off-site but shall be available for review upon request.

6.8 Installation and Removal of Support Systems

Support systems shall be installed and removed in a manner which protects employees from cave-ins, structural collapses or being struck by members of the support system. Members of support systems shall be securely connected together to prevent sliding, falling, kick-outs or other predictable failure. The individual members of support systems shall not be subjected to loads exceeding those for which they were designed to withstand.

Prior to installation of any support system, the system shall be inspected by the CP for structural integrity. The CP shall ensure that the selected support system is appropriate for the excavation activity (i.e., size, depth, height, work activity and



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configuration). The depth of the excavation shall not be greater than one (1) foot above the top of the installed support system.

Removal of support systems shall begin at the bottom of the excavation. Before removal begins, additional precautions shall be taken to ensure the safety of employees, such as installing other temporary structural members to carry the loads imposed on the support system. Members shall be removed slowly, noting any indication of possible failure of the remaining members or possible cave-ins. Backfilling shall progress with the removal of the support systems from the excavation.

The number of employees present in the excavation shall be limited to only those necessary for the installation or removal of the support system.

6.9 Materials and Equipment for Protective Systems

All materials and equipment used for protective systems shall be free from any damage or defects that impair their proper function. These materials and equipment shall be maintained in accordance with the manufacturer's recommendations. They shall also be used in a manner that will prevent employee exposure to hazards. If the materials or equipment becomes damaged, the CP shall evaluate the damaged and determine the suitability for continued use. If the CP cannot assure the material or equipment is suitable for safe use then the item(s) will be removed from service. The item(s) shall be evaluated and approved by a registered PE before being returned to service.

6.10 Hazardous Atmospheres

Hazardous Atmospheres such: as oxygen deficiency (atmospheres containing less than 19.5% or more than 23.5% oxygen by volume), the presence of flammable gases or vapors and the presence of toxic gases or vapors may be present, or may occur, in excavations. Situations where hazardous atmospheres may occur include, but are not limited to: steam tunnels, sewer-related work, manure pits, aquaculture fish tanks or excavations in high vehicle traffic areas.

In locations where hazardous atmospheres are possible and in excavations greater than or equal to four (4) feet in depth, the CP will test the air in the excavation before employees are permitted to enter. Engineering controls will be established as specified in the site-specific work plan to maintain acceptable atmospheric conditions. All test results shall be recorded and maintained in the competent persons' inspection log.



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When flammable gases or explosive atmospheres (at levels which are above fifty (50) percent of the LEL) are present, the space shall be treated as a confined space and the Confined Space Program shall be implemented.

6.11 Condition of Soil

The CP shall evaluate the soils in and around the excavation for conditions that may result in cave-ins. These hazardous conditions include frost, frozen soil and water content. Existing conditions such as frozen ground are subject to change when exposed to ambient air temperatures or sunlight. These conditions shall be considered when designing protective devices.

6.12 Weather Conditions

Weather conditions including changes in temperature, humidity and precipitation will impact the integrity of the excavation sides. As weather changes, protective devices and work practices may require alteration to accommodate for the changing site conditions. The CP shall include observations of changing weather conditions as part of the routine inspection process. An inspection of the excavation, the adjacent areas and protective systems shall be performed after every rainstorm or other weather-related, hazard-increasing occurrence.

6.13 Access and Egress

Safe access and egress to the excavation shall be maintained at all times. For excavations greater than or equal to four (4) feet in depth, adequate means of egress must be provided. An appropriate ladder, ramps or other safe means of access and egress must be provided every 25 feet along the length of the excavation. If structural ramps are used as a means of employee access or egress, they must be designed by a CP. If structural ramps are used as a means of equipment access or egress, they must be designed by a registered PE and shall be constructed in accordance with the design. Structural members used for ramps or runways must be uniform in thickness and joined in a manner to prevent slipping, tripping or displacement. Cleats or other appropriate means used to connect runway structural members shall be attached to the bottom surface of the runway to avoid tripping.

Steps, ramps or other safe means of access or egress will be provided with a handrail that meets OSHA requirements for walking and working surfaces (29 CFR 1926.651). Handrails must be between 39"–45" in height and contain both a mid-rail and toe-board. The top rail should be capable of supporting 200 pounds and the mid-rail should be capable of supporting 125 pounds.



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6.14 Other Operations in the Vicinity of the Excavation Site

Operations in the vicinity of the excavation site shall be evaluated by the CP for potential impact on the excavation. Any activities determined to have an impact on site safety or the integrity of the excavation shall be curtailed for the duration of the excavation project.

6.15 Personal Protective Equipment

Prior to the commencement of any excavation, an assessment will be made by the CP as to appropriate PPE required to safely work in and around the excavation. The CP will ensure, at a minimum, that the following PPE is worn at all times by workers and visitors at the site:

- Hard hats;
- Safety-toed shoes;
- Impact-resistant eye protection; and,
- Appropriate gloves or hand protection.

Other issues such as hearing protection and respiratory protection must also be considered when assessing the project for PPE requirements.

All employees and visitors shall wear the required PPE at all times while on the excavation site.

6.16 Site Safety

Prior to the commencement of the excavation project, site safety protocols shall be established in writing and discussed with all project personnel. Safety protocols may consist of established standard procedures; however, these established procedures shall be amended to incorporate any site-specific issues. These protocols shall become part of the site safety plan and will include the following elements:

- Restriction of site access to authorized personnel only;
- Installation of adequate engineering controls and barriers;
- Site authority and management responsibilities;
- Visitor's access protocols; and,
- General work practices and procedures.

These protocols shall be observed and maintained throughout the duration of the excavation project.



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6.17 Inspection Requirements

Daily inspections of excavations, the adjacent areas and protective systems shall be made by the CP for evidence of a situation that could result in possible caveins, indications of failure of protective systems, hazardous atmospheres or other hazardous conditions. An inspection shall be conducted by the CP 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 reasonably be anticipated.

Where the CP observes evidence of a situation that could result in a possible cavein, indications of failure of protective systems, hazardous atmosphere or other conditions, exposed employees shall be removed from the hazardous area until the necessary precautions have been taken to ensure their safety.

The CP is responsible for maintaining a daily inspection report of the excavation project. This report will become part of the permanent project documentation. The following items shall be included in the CP's daily report:

- List of personnel on-site;
- Evaluation of physical hazards;
- Evaluation of atmospheric hazards and all monitoring data;
- Changing site conditions (including a change in the project scope, weather or vehicular traffic);
- Visitors;
- Summary of project-related activities.

The CP shall complete and sign the daily inspection logs before attaching them to the project documentation. A copy of the signed log shall be kept on-site for the duration of the project.

6.18 Emergency Response

Prior to excavation activities and as part of the site-specific work plan development, procedures for emergency response shall be determined and implemented. Personnel involved with a specific project shall be made familiar with project specific emergency response procedures as outlined in the site safety plan. These emergency response procedures shall include at a minimum the following items:

- Protocol for notification of emergency response agencies;
- Responsibilities of individuals on the site;



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- Posting of local emergency response agencies;
- Notification of these agencies of the scheduled work prior to commencement; and
- Identification of the nearest telephone, radio or other telecommunication device.

The local fire department and ambulance needs to be listed in the emergency response plan and notified of the project commencement date and time.

For excavations where hazardous atmospheric conditions exist or may be reasonably expected to develop during the course of the work in the excavation, emergency rescue equipment such as safety harnesses, lifelines and basket stretchers shall be on-site and available to personnel working at the excavation site or responding to the site in the event of an emergency.

6.19 Accident and Injury Reports

Any serious injuries that require immediate medical attention requires contacting EMS at 911. All injuries shall be reported to the Project Manager. All injuries occurring during excavation projects shall be reported to Safety Management within 24 hours of the incident. Accidents involving property damage shall be reported to the Claims Manager within 24 hours of occurrence.

7.0 Training

All personnel working in or around excavations shall receive training to familiarize them with the OSHA excavation standard and other issues related to excavation projects. At a minimum, the following topics shall be discussed during the Annual Trenching Awareness training:

- Potential safety hazards of excavations;
- Safe excavation work practices;
- Hazardous atmosphere testing;
- Excavation inspection procedures;
- Requirements for protective systems; and
- Standard rescue procedures

In addition to the awareness training, the Competent Person will attend a Designated Competent Person training program. These courses are offered free of charge to the employee. This 8-hour training shall include soils evaluation; site inspection procedures; protective systems; and, a confined space overview. The CP will be required to attend annual Trenching Awareness Training.



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The CP shall conduct a Site Safety meeting prior to the start of any excavation work. During the meeting, the CP will review the potential safety hazards of the project, safe work practices, site-specific health and safety issues and emergency rescue procedures.

8.0 Documentation and Recordkeeping Requirements

The Project Manager shall maintain copies of training records for all personnel completing excavation safety or CP training. These records shall be maintained for a minimum period of three (3) years. Project related records such as inspection forms, project logs and atmospheric evaluations shall be maintained for a minimum of one (1) year.

9.0 9.0 Document History

Number	Effective Date	Author
Original	May, 2006	
Revision 1	January, 2012	Alvin Trotman