



The INGAA Foundation, Inc.

## Construction Safety & Quality Consensus Guidelines

# Trenching and Excavation Safety

Document	Revision	Date
CS-S-12	1	June 2019

## 1.0 ACTIVITY DESCRIPTION

- 1.1 This document provides basic safety guidelines related to excavation and trenching in pipeline construction activities. These guidelines are applicable to the locating, marking and initial exposure of a buried pipeline in response to a state one-call notification and during excavation for various company maintenance and construction activities including but not limited to, pipeline repair or construction tie-in work. Excavation projects should be carefully planned and implemented to minimize potential damage to buried utilities and to mitigate hazard exposure to personnel.
- 1.2 All personnel have, and must use, "Stop Work" authority whenever non-compliance with the guidelines in this document or the site-specific excavation plan or potentially hazardous conditions are identified.
- 1.3 This document is not meant to supersede or replace regulatory requirements, nor is it intended to be all inclusive of the applicable regulatory requirements. It is intended to be supportive and complimentary to such requirements.

## 2.0 HAZARD ASSESSMENT

- 2.1 Hazard assessments are performed to identify and mitigate perceived and actual environmental and operational hazards.
- 2.2 Hazard assessments are performed at the beginning of each shift.
- 2.3 Review and update hazard assessments when:
  - Each new task is begun.
  - There is a change in how a task is performed.
  - Changes in soil conditions occur (e.g., after a rain event, alteration of approved excavation).
  - A specific need or concern is identified (i.e., as needed to ensure the safety of personnel or property).

## 3.0 ROLES AND RESPONSIBILITIES

### 3.1 Management Responsibilities *(includes all personnel with a supervisory role)*

- 3.1.1 Empower all personnel with the authority to "Stop Work" whenever hazardous conditions or potentially hazardous conditions are identified.
- 3.1.2 Protect the public from open excavations and accidental entry.
- 3.1.3 Verify compliance regarding OSHA Competent Person requirements and appropriate operator qualifications, as per the Owner/Operator task requirements.



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- 3.1.4 Facilitate excavation and Competent Person training programs.
- 3.1.5 Require and verify that the Competent Person is on site when personnel are working in or near the excavation.
- 3.1.6 Require and verify that existing utilities, structures and roadways are properly identified, located, protected, and supported.
- 3.1.7 Require that atmospheric monitoring is conducted when working in or near open excavations with a potential for hazardous atmospheres to be present.
- 3.1.8 Require and verify that a Competent Person(s) and a Professional Engineer(s) is designated to perform duties and have authorities as listed in OSHA 1926, Subpart P.

### 3.2 Health & Safety (H&S) Responsibilities

- 3.2.1 Provide technical support for interpretation of excavation and trenching H&S guidelines.
- 3.2.2 Evaluate the effectiveness of the excavation and trenching plan.
- 3.2.3 Immediately stop and correct any health and/or safety related non-compliant activities.
- 3.2.4 Verify that applicable personnel receive the appropriate excavation entry, atmospheric testing or monitoring, Operator Qualification and/or Competent Person training.
- 3.2.5 Verify that atmospheric monitoring is conducted when working in or near open excavations with a potential for hazardous atmospheres to be present.
- 3.2.6 Verify the protection of all entrants from excavated soil, other materials and/or equipment that could pose a hazard by falling or rolling into the excavation as per OSHA 1926, Subpart P.
  - Maintain a safe distance of at least two feet from the edge of the excavation or use a retaining device sufficient to stop the migration of materials or equipment into the excavation.
  - Verify that adequate protection is provided to protect from loose rocks or soil that could pose a hazard by falling or rolling from an excavation face.

### 3.3 Employee Responsibilities

- 3.3.1 No employee shall enter any excavation until it has been determined by a competent person, that the excavation complies with OSHA, and applicable State, and Local standards.
- 3.3.2 Enter excavations only when a Competent Person has determined that the excavation complies with applicable Federal, State, and Local standards.
- 3.3.3 Enter excavations only in the execution of work duties and authorized by your Supervisor. Exit the excavation as soon as the work is complete, do not linger.



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- 3.3.4 Employees shall not enter or occupy an excavation or trench when there is a potential for operating equipment or materials to come into contact with personnel in the excavation.
- 3.3.5 Do not work in excavations where water is accumulating unless the water is being controlled and maintained at a safe level.
- 3.3.6 Report any non-compliant excavation and trenching H&S activities to a Supervisor.

## 4.0 HAZARD MITIGATION

- 4.1 For purposes of this guidelines document, the remaining descriptions are divided into excavation planning and excavation work activities.

### 4.2 Excavation Planning Guidelines

#### Excavation Planning

- 4.2.1 Develop a work plan for each excavation.
- 4.2.2 Verify that no mechanical equipment digs are planned to be performed no less than 18 inches (or more stringent when stipulated by the Owner/Operator) of any utility. Soft dig methods must be used when less than 18 inches of a marked utility, i.e. the tolerance zone.
- 4.2.3 Ensure other utility owners agree with ground cover conditions prior to placement of excavation equipment over the affected utilities.
- 4.2.4 If stipulated by the Utility Owner, Contractor shall notify the Authorized Company Representative prior to excavation.
- 4.2.5 In areas where there may be pedestrian, vehicular or animal traffic, a protective barrier should be installed to prevent unauthorized entry.
- 4.2.6 Have a professional engineer design and/or approve alternative excavation safety designs, as required by OSHA 1926 Subpart P requirements.

#### Underground Crossings and Structures

- 4.2.7 Determine and verify the exact location of underground installations by safe and acceptable means. This may include hand excavation, potholing, use of hydro-excavator, and / or conducting an inductive sweep utilizing a line locator. The utility lines must be marked according to industry standards 50 ft upstream and downstream from the planned excavation. Also, below grade facilities within 25 ft of a mechanical excavation shall be located and identified by probing or other means.
- 4.2.8 No work will take place over existing pipelines unless approved by that Company.



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### One Call System

- 4.2.9 Verify that proper notifications ("One Call Systems", utility companies, etc.) are made prior to beginning any excavation and that documentation of the notification(s) is maintained. Such notifications may include:
- Description of the proposed work, including the scheduled start date.
  - Request for location of underground installations to be identified with temporary markings.
- 4.2.10 Verify that the one call has been made and that utilities are marked and depth verified before the commencement of digging activities.
- 4.2.11 In the event that temporary markings are moved, damaged or no longer visible, an excavator shall contact the State one-call center to have the facilities remarked before any excavation continues.

### Protective Systems

- 4.2.12 To prevent or protect from cave-ins, utilize one of the following: shoring, sloping or benching, trench boxes, or some other equivalent means.
- 4.2.13 All surface encumbrances that are located so as to create a hazard to employees will be removed or supported, as necessary, to safeguard employees and to prevent undermining adjacent structures.
- 4.2.14 Protective systems for excavations of 20 feet or greater in depth must be designed and inspected by a Registered Professional Engineer prior to entry.
- 4.2.15 Materials and equipment used for protective systems (e.g., shoring) will be free from damage or defects that might impair their proper function.

### 4.3 Excavation Work Activity Guidelines

#### General

- 4.3.1 Inspect excavation to verify compliance with applicable regulatory requirements and the site-specific excavation plan.
- 4.3.2 No employee shall enter or exit the trench or excavation or perform work outside of the protective system provided.
- 4.3.3 Employees should not be allowed in a trench box when they are being installed, removed, or moved horizontally or vertically.
- 4.3.4 Employees should not step on cross members installed to support the trench sidewalls.
- 4.3.5 Where employees or equipment are required to cross over excavations, 6 feet or more above lower levels, walkways or bridges with standard guardrails will be provided as fall protection.
- 4.3.6 Provide sufficient lighting to facilitate safe operations at each work location.



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- 4.3.7 When an excavation is within 10 feet of a pipeline facility, an Operator Qualification (OQ) qualified representative shall be continuously present during all excavation and backfilling activities to ensure the excavation and backfilling criteria are being met.
- 4.3.8 When excavation operations approach the estimated location of underground installations, the exact location of the installations will be determined by safe and acceptable means, such as excavating by hand using a shovel and a protective bar should be installed across the backhoe teeth to prevent an accidental puncture or gouge of the pipeline.
- 4.3.9 Personnel 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 (.61 m) 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.
- 4.3.10 Use a spotter if there are overhead power lines, underground utilities or tight working conditions in the work area. The spotter plus two additional control layers such as the ones listed below will be used to provide for employee and property protection from an overhead utility strike.
- Signage
  - Physical Barriers (Goal Posts)
  - Proximity Alarms
  - Utility Controls
- 4.3.11 If excavation work interrupts the natural drainage of surface water (such as streams), diversion ditches, dikes, or other suitable means will be used to prevent surface water from entering the excavation and to provide adequate drainage of the area adjacent to the excavation.
- 4.3.12 Means of egress at a minimum lateral travel distance of 25 feet shall be on both sides of the trench if there is an obstacle (e.g., pipe) in the trench that cannot be easily stepped over for escape. If ladders are used, their tops should extend at least three (3) feet above the top of the bank and be sufficiently secured to ensure proper positioning.
- 4.3.13 In excavations greater than 4 feet in depth or where there is an oxygen deficiency, flammable gases or liquids, or where other hazardous atmospheres exist or may be anticipated, the atmospheres in the excavation shall be tested before employees enter.
- 4.3.14 If the excavation requires a person's head to be below ground level, appropriate precautions shall be in place to address hazardous atmospheres. If personnel entry is necessary, cave-in protection may be required if the soil exhibits unstable soil characteristics.



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- 4.3.15 Verify, prior to backfilling, that equipment, materials, or other debris generated during the process of work activities are removed.
- 4.3.16 Personnel exposed to vehicular traffic shall be provided with, and shall wear, warning vests or other suitable garments marked with or made of reflectorized or high-visibility material suitable for the traffic hazard(s) they are exposed.

### Protective Systems

- 4.3.17 Assure that proper sloping, benching, or shoring techniques are utilized in excavations of five feet or greater in depth. (Solid Rock - 90 degrees; Type A Soil - 53 degrees; Type B - 45 degrees; Type C - 34 degrees)
- 4.3.18 Where the stability of adjoining buildings, walls, utility poles, or other structures is endangered by excavation operations, support systems (e.g., shoring, bracing, or underpinning) will be provided to ensure the stability of such structures for the protection of employees, except when the excavation is in stable rock or a registered professional engineer has determined that such excavation work will not pose a threat to employees.
- 4.3.19 Adequate protection will 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 will 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.
- 4.3.20 Use guardrails or barricades to mark the limits of the work area. If an excavation is left unattended in populated areas, use guardrails or barricades sufficient in size to prevent unintentional entry.
- 4.3.21 Use trench shields during trenching operations, when required.
- 4.3.22 Inspect protective systems to verify that they meet regulatory and design requirements and are in agreement with the site-specific excavation plan.

### Vehicles, Equipment and Tools

- 4.3.23 When any object projects into a roadway, it should be adequately marked and in accordance with the approved traffic control plan.
- 4.3.24 Review the impact loading near the trench to ensure that adequate bracing is in place.
- 4.3.25 Do not drive or park machinery or vehicles within 10 feet of the edge of the excavation unless the banks are frequently inspected and confirmed to be stable.
- 4.3.26 When mobile equipment is operated 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) will be utilized.



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- 4.3.27 Instruct all personnel to remain clear of all active machinery including but not limited to excavators, backhoes, frontend loaders and side-booms. Operators will not be allowed to swing or lift in any way, objects over people's heads.
- 4.3.28 Do not store propane and/or compressed gas in the excavation. Remove it from the excavation after pre-heating is complete.

### Spoil Piles

- 4.3.29 Possible hazards to consider regarding spoil piles include, but are not limited to:
- Insufficient clearance for walking path on spoils side causing a fall hazard.
  - Spoils pile overburden closer to the trench resulting in wall collapse.
  - Excessively large rock or clods of hard clay causing a falling object hazard.
  - Excessive height spoils pile resulting in land slide.
  - Rain events causing spoils to slide or cave in.
- 4.3.30 Tap large clods to break up and embed into the spoils pile, keep spoils as spread out as possible and check spoils pile/trench after rain events for signs of potential land slide or cave in.

## 5.0 TRAINING

- 5.1 All personnel engaged in work activities, shall be given orientation/training including orientation to excavation safety.
- 5.2 Prior to exposure or an assignment to excavation activities, personnel engaged in excavation work activities will complete training that will include site specific requirements, hazard identification, safe work practices, the contents of this guidance document.
- 5.3 Periodic refresher training will be conducted when the need for refresher training is recognized.
- 5.4 Atmospheric monitoring training should be provided to personnel engaged in such monitoring.
- 5.5 Properly train all equipment operators to operate the equipment safely, in accordance with the equipment manufacturer's operating maintenance instructions, and as per applicable regulatory requirements.
- 5.6 Designated employees should be trained and/or qualified to the Competent Person level allowing them to identify and address excavation hazards.



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### 6.0 REFERENCES

Current versions of the references automatically supersede the references listed below.

#### 6.1 Occupational Safety and Health Administration (OSHA)

- 6.1.1 OSHA 1926 Subpart P – Excavations
  - OSHA 1926.650 – Applicable scope, application, and definitions
  - OSHA 1926.650, Subpart P, Appendix A - Soil Classification
  - OSHA 1926.650, Subpart P, Appendix B - Sloping and Benching
  - OSHA 1926.650, Subpart P, Appendix C - Timber Shoring for Trenches
  - OSHA 1926.650, Subpart P, Appendix D - Aluminum Hydraulic Shoring for Trenches
  - OSHA 1926.650, Subpart P, Appendix E - Alternatives to Timber Shoring
  - OSHA 1926.650, Subpart P, Appendix F - Selection of Protective Systems
- 6.1.2 OSHA 1926.651 – Specific Excavation Requirements
- 6.1.3 OSHA 1926.652 – Requirements for Protective Systems

#### 6.2 INGAA Foundation

- 6.2.1 Guidelines for Parallel Construction of Pipelines (F-2008-05)

### 7.0 HISTORY OF REVISIONS

Number	Date	Description
0	September 2012	Initial publication of this INGAA Foundation Construction Safety Consensus Standard.
1	June 2019	General Update/refresh according to review cycle guidelines