

**North Carolina Department of Labor
Occupational Safety and Health Division**

Raleigh, NC

Field Information System

CPL 02-00-165

Subject: Compliance Directive for the Excavation Standard, 29 CFR 1926, Subpart P

A. Discussion.

This instruction is intended to serve as a standard-specific reference for OSHA Compliance Safety and Health Officers (CSHOs) regarding the application of Subpart P of 29 CFR Part 1926, providing supplemental compliance inspection guidance and citation policies.

B. History.

- i. Excavation work continues to be one of the most hazardous types of construction work. As contemplated in the preamble to the Final Rule for Subpart P - Excavations, OSHA believes there is a potential for a cave-in or collapse in virtually all excavations. OSHA requires that employees exposed to potential cave-in or other excavation hazards must be protected. (54 FR 45894, 45895, 45927, October 31, 1989)
- ii. OSHA began regulating trenching and excavation work activities in 1971. For almost two decades, the trenching and excavation standards were discussed, reviewed, and subject to technical amendments. Following a public hearing and comments, OSHA issued a new construction standard, 29 CFR 1926, Subpart P, for excavation work in 1989.
- iii. On October 31, 1989, OSHA published revisions to Subpart P - Excavations, sections 29 CFR 1926.650, 29 CFR 1926.651, and 29 CFR 1926.652 to make the standard easier to understand, permit the use of performance criteria where possible, and to provide construction employers with options when classifying soil and selecting employee protection methods.
- iv. On February 20, 1990, OSHA published *CPL-02-00-87, Inspection Procedures for Enforcing the Excavation Standards - 29 CFR 1926, Subpart P*, which established inspection procedures and provided clarification for uniform enforcement of the Subpart P excavation standards.
- v. On July 1, 2021, OSHA published *CPL-02-00-165, Inspection Procedures for Enforcing the Excavation Standards, 29 CFR 1926, Subpart P*, which provided updated guidance and inspection procedures for the enforcement of Subpart P.

C. **Action.**


Most of the directive has been adopted verbatim, except for the following items:

- i. Throughout the CPL, CSHOs will disregard references to federal documents not adopted by the OSH Division and will follow guidance located on the Field Information System (FIS).
- ii. References to the Field Operations Manual (FOM) and Regional Administrator or other federal personnel will mean the North Carolina Field Operations Manual and the appropriate OSH Division management person (District Supervisor, Bureau Chief, Assistant Director or Director).
- iii. Section X - General Inspection Procedures Recommendation: When utilizing subpoenas, CSHOs will follow instructions as provided under FOM Chapter III - Inspection Procedures.
- iv. Section X - General Inspection Procedures Recommendation: CSHOs will contact their District Supervisor if there is a need to verify a registered professional engineer's credentials to ensure that the engineer acted within their discipline.
- v. Section XI - Inspection and Citation Guidance – the North Carolina OSH Division does not have “*de minimis*” violations. CSHOs will follow instructions as provided under FOM Chapter IV - Violations.
- vi. Section XI - Inspection and Citation Guidance. For all protective system violations cited under sections § 1926.652(b) and (c), further discussion with the Director's Office may be needed to consider citing § 1926.652(a)(1) in the alternative.

D. **Effective Date.**

This CPL is effective on the date of signature. It will remain in effect until revised or canceled by the director.


Altagracia Guzman
Safety Standards Officer


Kevin Beauregard
Director

12/17/2021
Date of Signature



OSHA INSTRUCTION

U.S. DEPARTMENT OF LABOR

Occupational Safety and Health Administration

DIRECTIVE NUMBER: CPL 02-00-165

EFFECTIVE DATE: 7/1/21

SUBJECT: Compliance Directive for the Excavation Standard, 29 CFR 1926, Subpart P

ABSTRACT

- Purpose:** This instruction provides guidance and inspection procedures for the enforcement of Subpart P.
- Scope:** This instruction applies OSHA-wide.
- References:**
1. 29 CFR Part 1926 Subpart P – Excavations.
 2. OSHA Instruction CPL-02-00-161, *National Emphasis Program on Trenching and Excavation*, October 1, 2018.
 3. OSHA Instruction, CPL 02-00-164, *Field Operations Manual (FOM)*, April 14, 2020.
- Cancellations:** This instruction supersedes OSHA Instruction CPL 02-00-087, *Inspection Procedures for Enforcing the Excavation Standards - 29 CFR 1926, Subpart P*, issued February 20, 1990.
- State Impact:** Notice of intent and equivalency required.
- Action Offices:** National, Regional, and Area Offices.
- Originating Office:** Directorate of Construction (DOC).
- Contact:** Director, Office of Construction Services
200 Constitution Ave. NW, Room N3476
Washington, DC 20210
Phone (202) 693-2020

By and Under the Authority of

James Frederick
Principal Deputy Assistant Secretary

Executive Summary

This instruction provides current information and guidance to the Occupational Safety and Health Administration (OSHA) National, Regional, and Area Offices concerning OSHA's policy and procedures for conducting excavation inspections, and for the enforcement of 29 CFR 1926, Subpart P – Excavations.

Significant Changes

1. Addition of Inspection Guidance and Citation Policy for specific provisions in 29 CFR 1926, Subpart P.
2. Addition of general inspection procedures.
3. Inclusion of 29 CFR 1926, Subpart P standard interpretations.
4. Insertion of hyperlinks to referenced OSHA documents.

Table of Contents

I.	Purpose.....	5
II.	Scope. This instruction applies OSHA-wide.	5
III.	References.....	5
IV.	Cancellations.....	5
V.	Expiration Date.	5
VI.	Action Offices.....	5
VII.	Federal Program Change - Notice of Intent and Equivalency Required.	6
VIII.	Background.....	6
IX.	CSHO Training, Safety, and Equipment.....	7
	A. Training.....	7
	B. Safety.	7
	C. Equipment.....	8
X.	General Inspection Procedures.	9
	A. Documentation of Violations.....	9
	1. Photographs or video of the excavation.....	9
	2. Sketches of the excavation.....	10
	3. Soil Samples and Analysis.....	11
	4. Measurements.	14
	5. Documenting Employee Exposure.	16
	6. Excavation Protection Programs.....	16
	B. Interviews.....	17
	1. Competent Person	18
	2. Requesting Documentation from the Employer.	20
XI.	Inspection and Citation Guidance.....	21
	A. § 1926.650. Scope, Application, and Definitions Applicable to this Subpart.	21
	B. § 1926.651. Specific excavation requirements.	22
	1. § 1926.651(a). Surface Encumbrances.	22
	2. § 1926.651(b). Underground Installations.....	23
	3. § 1926.651(c). Access and Egress.	25

4.	§ 1926.651(d). Exposure to Vehicular Traffic.....	26
5.	§ 1926.651(e). Exposure to Falling Loads.....	27
6.	§ 1926.651(f). Warning System for Mobile Equipment.....	28
7.	§ 1926.651(g)(1). Hazardous atmospheres - Testing and controls.....	28
8.	§ 1926.651(g)(2). Emergency rescue equipment.....	31
9.	§ 1926.651(h). Protection from Hazards Associated with Water Accumulation. .	32
10.	§ 1926.651(i). Stability of Adjacent Structures.....	33
11.	§ 1926.651(j). Protection of Employees from Loose Rock or Soil.	35
12.	§ 1926.651(k). Inspections.....	36
13.	§ 1926.651(l). Walkways.....	38
C.	§ 1926.652. Requirements for protective systems.....	38
1.	§ 1926.652(a). Protection of employees in excavations.....	38
2.	§ 1926.652(b). Design of sloping and benching systems.....	40
3.	§ 1926.652(c). Designs of support systems, shield systems, and other protective systems.....	44
4.	§ 1926.652(d). Materials and equipment.....	46
5.	§ 1926.652(e). Installation and removal of support systems.....	47
6.	§ 1926.652(f). Sloping and Benching Systems.....	50
7.	§ 1926.652(g). Shield Systems.....	51
XII.	Links to Appendices to Subpart P.....	53
	Appendix A to Subpart P - Soil Classification	53
	Appendix B to Subpart P - Sloping and Benching	53
	Appendix C to Subpart P - Timber Shoring for Trenches	53
	Appendix D to Subpart P - Aluminum Hydraulic Shoring for Trenches	53
	Appendix E to Subpart P - Alternatives to Timber Shoring	53
	Appendix F to Subpart P - Selection of Protective Systems.....	53

I. Purpose.

This instruction is intended to serve as a standard-specific reference for OSHA Compliance Safety and Health Officers (CSHOs) regarding the application of Subpart P of 29 CFR Part 1926, providing supplemental compliance inspection guidance and citation policies.

II. Scope. This instruction applies OSHA-wide.

III. References.

- A. [29 CFR Part 1926, Safety and Health Regulations for Construction.](#)
- B. [29 CFR Part 1926, Subpart P- Excavations.](#)
- C. OSHA Instruction, [CPL 02-00-164](#), *Field Operations Manual (FOM)*, April 14, 2020.
- D. OSHA Instruction, [ADM 04-00-003](#), *Field Safety and Health Manual*, May 6, 2020.
- E. OSHA Instruction [CPL 02-00-124](#), *Multi-Employer Citation Policy*, December 10, 1999.
- F. OSHA Technical Manual (OTM) [TED 01-00-015](#), Section V, Chapter 2 - Excavations: Hazard Recognition in Trenching and Shoring.
- G. OSHA Instruction [CPL-02-00-161](#), *National Emphasis Program on Trenching and Excavation*, October 1, 2018.
- H. OSHA Instruction, [CPL 02-01-054](#), *Inspection and Citation Guidance for Roadway and Highway Construction Work Zones, Section XI, Compliance Personnel Training and Safety*, October 16, 2012.
- I. [OSHA Method ID-194](#), Version 3.0, *Classification of Soils for Excavations*, March 2019.
- J. OSHA OTI Training Course [#3010](#) - *Excavation, Trenching, and Soil Mechanics*.

IV. Cancellations.

This directive supersedes OSHA Instruction CPL 02-00-87, *Inspection Procedures for Enforcing the Excavation Standards - 29 CFR 1926, Subpart P*, issued February 20, 1990.

V. Expiration Date.

This instruction will remain in effect until canceled, or superseded by another instruction or notice.

VI. Action Offices.

- A. Responsible Office. Directorate of Construction (DOC), Office of Construction Services (OCS).
- B. Action Offices. OSHA's National, Regional, and Area Offices. Regional Administrators and Area Directors shall ensure that CSHOs follow the inspection guidance provided in this instruction when inspecting worksites where excavation work is being conducted.
- C. Information Offices. Directorate of Training and Education, Directorate of Cooperative and State Programs, and OSHA Consultation Project Managers.

VII. Federal Program Change - Notice of Intent and Equivalency Required.

Notice of Intent and Equivalency Required. This Instruction describes a federal program change that establishes policies and procedures necessary for the enforcement of Subpart P of 29 CFR Part 1926. State Plans are required to establish enforcement policies and procedures that are at least as effective as those in this Instruction and are available for review. Within 60 days of the date of issuance of this Instruction, State Plans must submit a notice of intent indicating if the State Plan will adopt policies and procedures identical to those in this Instruction or will adopt or maintain policies and procedures that are different from the federal program.

If the State Plan adopts or maintains policies and procedures that differ from the federal program, the State Plan must identify the differences and either post its policies and procedures on its website and provide a link to OSHA, or submit an electronic copy to OSHA with information on how the public may obtain a copy. State Plan adoption, either identical or different, shall be accomplished within 6 months. Documentation of State Plan adoption, and the date of adoption, must be provided to OSHA within 60 days of the date on which the State Plan adopts the new procedures or decides to maintain its own inspection procedures. If the State adopts identical policies and procedures, it must provide the date of adoption to OSHA within 60 days of the date of adoption. OSHA will post summary information of the State Plan responses to this Instruction on its website (www.osha.gov).

VIII. Background.

- A. Excavation work continues to be one of the most hazardous types of construction work. As contemplated in the preamble to the Final Rule for Subpart P - Excavations, OSHA believes there is a potential for a cave-in or collapse in virtually all excavations. OSHA requires that employees exposed to potential cave-in or other excavation hazards must be protected. (54 FR 45894, 45895, 45927, October 31, 1989))
- B. OSHA began regulating trenching and excavation work activities in 1971. For almost two decades, the trenching and excavation standards were discussed, reviewed, and subject to technical amendments. Following a public hearing and

comments, OSHA issued a new construction standard, 29 CFR 1926, Subpart P, for excavation work in 1989.

On October 31, 1989, OSHA published revisions to Subpart P - Excavations, sections 29 CFR 1926.650, 29 CFR 1926.651, and 29 CFR 1926.652 to make the standard easier to understand, permit the use of performance criteria where possible, and to provide construction employers with options when classifying soil and selecting employee protection methods.

On February 20, 1990, OSHA published *CPL-02-00-87, Inspection Procedures for Enforcing the Excavation Standards - 29 CFR 1926, Subpart P*, which established inspection procedures and provided clarification for uniform enforcement of the Subpart P excavation standards.

- C. This directive supersedes *CPL-02-00-87*, and it is intended to serve as a standard-specific reference for CSHOs regarding the enforcement of Subpart P of 29 CFR Part 1926.

IX. CSHO Training, Safety, and Equipment.

A. Training.

Only CSHOs who are trained in evaluating, controlling, and documenting trench and excavation hazards may conduct these inspections. The training must address OSHA's trenching and excavation inspection protocols and procedures, evidence gathering techniques, interviewing questions, and soil evaluation techniques. Training can be achieved through in-person courses, online courses, webinars, and/or on-the-job training. The OSHA Training Institute (OTI) currently incorporates trenching and excavation inspection techniques in the following courses:

1. #2000 Construction Standards
2. #3010 Excavation, Trenching and Soil Mechanics
3. #0134 Documenting Trenching Inspections Webinar.

B. Safety.

CSHO safety is paramount while conducting excavation inspections. CSHOs shall avoid exposure to hazards they are likely to encounter while performing such inspections. CSHOs shall adhere to the following:

1. OSHA Field Safety and Health Manual, [ADM 04-00-003](#)
2. Field Operations Manual (FOM), [CPL 02-00-164](#), Chapter 3 Inspection Procedures

3. Inspection and Citation Guidance for Roadway and Highway Construction Work Zones, CPL [02-01-054](#), Section XI, Compliance Personnel Training and Safety
4. Utilize the appropriate PPE, and other equipment outlined in paragraph C of this section.
5. Never enter a trench excavation, regardless of depth.
6. Never approach an excavation without inspecting for tension cracks, fissures, undermined areas, and any other circumstances that could lead to a potential collapse or cave-in, such as a spoil pile next to the edge of an excavation. When possible, inspect from multiple angles prior to approaching an excavation.
7. Avoid all struck-by and caught-in between hazards due to equipment operation near the excavation.

C. Equipment.

When conducting excavation inspections the CSHO shall use the following appropriate equipment, if needed:

1. Safety and Personal Protective Equipment (PPE).
 - a. High-visibility vest.
 - b. Head protection.
 - c. Safety-toe footwear.
 - d. Eye protection.
 - e. Hearing Protection. The CSHO shall have ready access to hearing protection. The CSHO shall evaluate noise levels and wear adequate hearing protection as set out in OSHA Instruction PER ADM 04-00-003, Hearing Conservation Program.
 - f. Gloves. The CSHO shall have ready access to the appropriate hand protection. The CSHO shall evaluate soil sampling hazards and wear adequate hand protection as set out in [OSHA Instruction ADM 04-00-003, Personal Protective Equipment](#).
2. Other Equipment.
 - a. Camera and/or video equipment (extra batteries and memory storage).
 - b. Paper (graphing preferred), and writing instruments.
 - c. Engineering rod (telescoping rod used for measurements, also called a trench rod).
 - d. Trench-Mate kit.
 - e. Spray paint.
 - f. Grading stakes.
 - g. 25 ft., or greater measuring tape.

- h. Measuring wheel.
- i. Penetrometer.
- j. Hand-held vane shear device (Torvane).
- k. Circular bubble level or post level.
- l. Optical range finder.
- m. Compass.
- n. Angle indicator device.
- o. Optical clinometer.
- p. Small Unmanned Aerial System (SUAS).
- q. Small shovel, gardening trowel, or similar equipment for taking and/or cutting a flat surface on soil samples.
- r. Direct-reading portable gas monitor.

X. General Inspection Procedures.

This section includes general guidance that should be considered for any compliance inspection of a worksite where there is an excavation. The Inspection and Citation Guidance section of this directive should be referenced for requirement-specific guidance.

A. Documentation of Violations.

During an excavation inspection, the CSHO shall obtain and include in the case file the following evidentiary information:

1. Photographs or video of the excavation.

CSHOs shall never enter the trench excavation to take photographs or videos. Nor shall the CSHO request the employer or any employees to enter and take photos of the excavation. *Note: Obtaining photos which clearly convey depth of the excavation or the slope of its sides can be difficult. Thus, CSHOs should provide other evidence of excavation depth, in addition to photographs, to support violations.*

The CSHO shall take photographs of the following:

- a. The ends of the excavation to visually reflect slope angles. This can be done using an engineering rod against a sidewall from a safe distance from the edge.
- b. The workers in the excavation and any evidence showing that they had previously been inside the excavation to establish employee exposure. CSHOs should be ready to take photographs immediately upon entry to the excavation site as employees often climb out of an excavation once they become aware that OSHA is onsite. Photographic evidence is important for documenting both actual exposure and access to the zone of

danger (potential exposure where employees were not in the excavation at time of inspection). *Note: If violative conditions are apparent in the excavation, ask the competent person or a manager to remove employees immediately.*

- c. Close-up photos of different work areas within the excavation, including any possible signs of employees being inside the trench (e.g. equipment, footprints, materials, any tools used), and evidence that soil movement has occurred (e.g. fissures, tension cracks, sloughing, undercutting, water seepage, and bulging at the bottom of the excavation).
- d. Views at a distance to capture the entire scope of the worksite, including proximity to roadways and equipment operating close to the excavation.
- e. If two or more CSHOs are inspecting an excavation together, it is a good practice for one to photograph while the other CSHO is taking measurements, to depict how the measurements were taken and where they were performed. Photos of the CSHO obtaining soil samples should also be taken.
- f. Measurements shown on the pocket penetrometer and the hand-held vane shear device, if used.

Note: If a Small Unmanned Aircraft System (SUAS) is available, SUAS videos and photos can often provide a good view of the site and document the working conditions. Procedures from current SUAS policy guidance shall be followed at all times.

2. Sketches of the excavation.

Where feasible, CSHOs should create rough worksite sketches during the inspection depicting an overhead view of the excavation and any surrounding conditions. The sketch does not need to be drawn to scale as its primary purpose is to record relational information and approximate locations. On the sketch, CSHOs should include:

- a. Measurements and approximate locations of where the measurements are taken (e.g. M1, M2, M3).
- b. Locations of people or objects inside and around the excavation (e.g. E1, E2, E3).
- c. Locations where soil samples were taken (e.g. SS1, SS2, SS3).
- d. Compass points relative to the excavation and any access roadways.

3. Soil Samples and Analysis.

a. Soil Samples.

CSHOs shall never enter a trench excavation to collect soil samples.

During an inspection, the CSHO should collect at least two soil samples from different locations. The number of soil samples taken is a matter of judgement based on observed conditions and the size of the project. If the project is so large that more than one crew is working in separate locations, samples should be taken in each area where employees are working.

Soil samples are taken to determine the different soil types that may be present at a worksite, including the soil classification(s) of the areas in the excavation where employees were present and/or potentially exposed to a cave-in hazard.

When conducting soil sampling, the CSHO should first identify the designated competent person for the excavation to determine whether that person is familiar with the requirements of OSHA's standard. The competent person should be interviewed to determine whether the protective system is appropriate for the soil types present on site. For example, the CSHO should ask the competent person how long the excavation has been open, what soils are present, whether a protective system has been implemented, and, if so, why the protective system is appropriate. The competent person should know what types of soil are present in order to select an adequate protective system for employees. (See additional guidance on interviewing the competent person in section X.B.1 below.)

If examination of the excavation side walls reveals visible soil stratification (i.e. the presence of different layers of soil), then the CSHO should attempt to obtain samples from each layer. In most cases, stratification should be recognizable because of color differences in the layers. The CSHO should avoid mixing soils from different strata, which should be left intact for lab analysis or other means used to determine classification.

Since the soil at any level in the side wall of an excavation must support all of the soil above it, the protective system selected must be appropriate to the classification of the soil at the lowest level. For example, if the soil at the bottom of the side wall is type C granular soil, then the protective system employed must be appropriate for type C soil, even if most of the side wall above consists of type A soil. CSHOs should therefore try to obtain at least one sample of soil from the bottom of the excavation.

Many times digging operations may be ongoing during the inspection, so the CSHO should be able to determine where the last spoil load was dumped and

sample at that location. If necessary, the CSHO may ask the operator to excavate an additional cut, provided no employees or other persons are in the excavation.

The CSHO should document on the field-drawn sketch locations at the excavation site, including where in a particular spoil pile soil samples are taken, along with any descriptive information, such as color and consistency, to help match the sample to its original location.

In some cases, such as utility projects, the excavation may follow and partially obstruct a roadway. To minimize the obstruction to the flow of traffic, a contractor may be required to load excavated material directly onto trucks instead of placing it onto the roadway. In such cases, the CSHO may be able to take a sample directly from the topside of a side wall of the excavation. As another option, if the employer has an excavator in position or nearby, the employer may be willing to scrape the bottom of the excavation and allow a sample to be taken from the backhoe bucket. CSHOs must avoid exposing themselves to the hazard of being struck by vehicles traveling on the roadway.

On some projects, the employer has engineering studies completed prior to starting the project, which may include soil core samples taken from the site, or from along the planned route of a utility line. In these cases, the CSHO should ask for copies of the engineering reports and any core sample test reports.

If the job site is on or near a roadway, the applicable transportation authority will likely also have a permit for the work or an engineering report that may include an analysis of jobsite soils. The CSHO should try to obtain such reports from the employer, where present. These reports shall not serve as a substitute for the CSHO taking soil samples.

Note the following sampling procedure techniques as stated in Classification of Soils for Excavations, [OSHA Method ID-194](#):

A bulk soil (excavated earth material) sample is collected and placed in a clear plastic storage bag. Take care not to break up clumps. The minimum sampling size is 1 kilogram (approximately 2 pounds), which is approximately one third to one half of a one-gallon clear plastic storage bag.

Obtain a representative sample for each soil layer in the excavation by using any safe means. Place the sample inside an airtight plastic bag and seal across the length of the opening with moisture-resistant tape. Place this bag inside a second airtight plastic bag and again seal across the length of the opening with moisture-resistant tape. Place Form OSHA-21 across the seal lengthwise.

Submit the sample and an associated Form OSHA-91A for analysis. Request Substance Code S777 for soil analysis by OSHA Method ID-194. Do not place the Form OSHA-91A or any other accompanying documentation inside the sample bag with the soil. Substance Code S777 includes all the tests prescribed in the regulation as well as a quantitative gradation to determine sand and gravel content, as described in Section 3, Analytical Procedure. Quantitative moisture and specific gravity tests on soils are not performed at SLTC.

It is important to note that any sample sent from outside the continental United States (OCONUS) must be packaged in accordance with the instructions described in this method, and in addition must include a copy of a current soil permit and have a USDA PPQ Form 550 attached to the outside of the container. Refer to Appendix A in [OSHA Method ID-194](#) for instructions on how to obtain a current permit and detailed instructions on sending samples from OCONUS.

b. Soil Analysis.

Unless the employer provides a protective system sufficient to meet the level of protection needed for type C soil, Subpart P requires employers to use protective systems based on a soil analysis of at the excavation site. Under [Appendix A of Subpart P](#), the employer must conduct one visual test and one manual test of the soil to meet this requirement. Paragraph (d) of Appendix A describes acceptable visual and manual tests. The visual inspection requirements will be followed to determine qualitative information regarding the excavation site in general, the soil adjacent to the excavation, the soil forming the sides of the open excavation, and the soil taken as samples from excavated material.

The CSHO shall ask the employer's management representative (or competent person where one is present) what type of soil is present in the excavation, and to describe the soil and what tests, if any, were conducted to determine the soil classification.

The CSHO shall also conduct at least one visual test and should conduct one manual test while at the site to verify whether the soil is granular or cohesive. If there are no clumps of soil in the spoils banks, or if the clumps which are present easily break into very small fragments, then the soil is typically granular.

If the soil is found to be cohesive, hand-held vane shear device or pocket penetrometer testing should be conducted, preferably on a clod of soil that is taken from beneath the surface of the spoils bank and that has not been exposed to sun or the air at the surface of the bank for a long period of time. These tests yield estimates of soil strength and may not serve as sufficient evidence of the soil type, but they will still yield useful information concerning soil stability and classification. These devices measure the unconfined compressive strength of the soil, which may change with changes in water content. Tests with the hand-held vane shear device or pocket penetrometer should be performed immediately after extracting soil.

The CSHO should also make note of any factors that may preclude a determination that the soil is type A or B, such as vibrations nearby or presence of previously disturbed soil.

If the CSHO determines that the soil is granular in texture, the soil is type B or type C, and therefore no need to determine the soil's unconfined compression strength. If the soil at the bottom of the excavation side walls is submerged in water, the soil of the entire slope is type C. Although the standard allows employers to base their soil classification decisions on various visual and manual field tests, soil samples taken by CSHOs should be sent to OSHA's Salt Lake City laboratory or State Plan accredited laboratory for analysis.

CSHOs may also conduct their own analysis of soil samples taken back to the office, including performing sedimentation tests and screening of samples through progressive sieves to determine the percentages of sand, silt and clay particles present. The CSHO must have been trained to perform these tests and follow written standard operating procedures.

4. Measurements.

NOTE: CSHOs shall not endanger themselves in obtaining measurements of the depth of the trench. Also, CSHOs shall not request the employer or employer's representative to be exposed to hazardous conditions to obtain measurements for a CSHO.

- a. During an excavation inspection, the CSHO shall take several measurements of the excavation to include at a minimum:
 - The depth, width, and length of the excavation in several locations.
 - The distance from the spoil pile to the edge of the excavation in several locations, because this distance may vary at different points, provided this can be done in a safe manner.
 - If applicable, the distance from nearby equipment to the edge of the excavation. Equipment located near the excavation can cause superimposed loading and vibrations during operation, which increases the probability of a collapse. Document the weight of this equipment if available. Also, equipment operating near the excavation could cause a hazardous atmosphere if exhaust gases are discharged inside an excavation.
 - Where present, the location and height of any ladder used for access and egress and the distance that the ladder extends above grade (surface). In addition, obtain the manufacturer name, model, and rung distances of the ladder if possible.
 - If shoring is present, measure the distance between each wale (horizontal structures) to determine if they have been properly placed.
- b. Ways to obtain measurements while minimizing exposure to potential excavation-related hazards:
 - Count rungs of a ladder which may be present in the excavation and then calculate the total length or height based on the distance between the rungs.
 - Use reference objects with known dimensions such as wood, a concrete vault, etc., to assist in estimating the depth and width.
 - Measure the height of an employee who was observed/photographed in the excavation (with employees' permission).
 - Use an engineering rod (trench rod) horizontally with an eyebolt attached at the end, a string threaded through the eyebolt and a plumb bob attached to the string. (*Note: A Trench-mate kit can be used if*

available). The telescoping rod should be placed on the ground. The plumb bob should touch the ground at the bottom of the excavation and the string should be taut. Tape or hold the string tight to the trench rod to ensure that the length of the string remains unchanged. Remove the trench rod from the excavation and measure the length of the string from the eyebolt to the end of the plumb bob with a measuring tape. Document and take a photo of the measurement.

5. Documenting Employee Exposure.

CSHOs shall document the following information to establish employee exposure during the inspection:

- a. The identity of each exposed employee including name, address, job title, supervisor, and time employed with the company.
- b. What exposures the CSHO observed, and those that were documented through employee or witness statements.
- c. A description of the work being performed by each exposed and potentially exposed employee, including specific tasks and who required the employee to enter the excavation.
- d. The length of time the each exposed employee was in the excavation exposed to the hazard, and whether exposures to the hazard were reoccurring, if this can be determined.
- e. Where the employees were working and where the employees enter or exit the excavation. This should be documented in notes, as well as on the field sketch.
- f. Descriptions and locations of tools used in the excavation, foot prints, uncovered utilities, etc. Note these locations in photographs and on the sketch.

6. Excavation Protection Programs.

CSHOs should ask to review any excavation protection programs, safety and health programs, work rules, or training programs that the employer may have. When evaluating such programs and rules, the CSHO should consider asking the competent person, or other employer's management representative, the following questions:

- a. Does the employer have a safety and health program in accordance with § 1926.20(b)—Accident prevention responsibilities? How is the program communicated to the employees?

- b. Does the safety program have specific rules/provisions addressing excavation hazards pursuant to § 1926.21(b)(2)? What do those safety rules state?
- c. Do those rules track the requirements in OSHA's excavation standard? What system is used for tracking the requirements?
- d. How are the work rules enforced?
- e. Does the company enforce its rules through use of a progressive disciplinary system?
- f. Are employees trained on the requirements of the program? What topics are covered in the training? Is the training documented?
- g. Do the foremen/supervisors receive any specific training regarding the hazards of excavations and/or the OSHA excavation standard? What training do the foremen/supervisors receive?
- h. Who is the competent person for the jobsite? What are the specific duties assigned to the competent person?
- i. Does the employer have engineering diagrams/plans or registered professional engineer stamp on the plan?
- j. Ask the competent person or management employee to explain the basis for the employer's safety work rules and how they relate to excavation hazards and the standard.

Interview a representative cross-section of affected employees to verify implementation of the employer's safety program. This shall include an evaluation of the training of affected employees and the effectiveness of the employer's enforcement of its program, including any monitoring of adherence to work rules and disciplinary measures when rules were violated. Failure to provide training applicable to the recognition and avoidance of hazards employees may encounter could warrant a citation of § 1926.21(b)(2).

Evaluate compliance with training requirements identified by periodic inspections or changes in hazards, equipment and/or procedures. This shall include an evaluation of the employer's inspection procedures and training program for assessment and correction of incidents resulting in near misses and/or injuries or circumstances indicating additional safety measures were necessary.

B. Interviews

This section supplements information provided in the *Field Operations Manual* regarding interviews at the site such as the controlling employer, exposing employer, creating employer, correcting employer, and employees. Identify and

interview all persons (competent person, supervisor, registered professional engineer, etc.) responsible for excavation activities and/or operations. In addition to employee/employer interviews, if the inspection involves investigation of a collapse that first responders were involved in rescuing and removing employees from the trench, interviews should be conducted with the responders.

Interview statements should be signed and dated. All interview statements should include at a minimum: the name of the individual, job title, description of job duties and requirements, the name of the supervisor, and a description of the events that led up to the inspection or event.

1. Competent Person

NOTE: Several requirements in Subpart P - Excavations require a “competent person.” Section 1926.650(b) of the standard defines a competent person as: 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.

Subpart P includes multiple provisions that require a competent person. A person who qualifies as a competent person with respect to one provision of Subpart P (i.e. inspections in § 1926.651(k)) may also qualify as a competent person with respect to a different provision in Subpart P (i.e. design of structural ramps in § 1926.651(c)(1)(i)). In practice, there is usually one competent person at the site.

Often, the competent person is in a supervisory position at the worksite. CSHOs should evaluate the competent person’s knowledge of trenching hazards and any hazards specific to the worksite. To be a “competent person” under the standard, a person must have had training in, and be knowledgeable about, soils analysis, the use of protective systems, and the requirements of this standard. The competent person must be capable of identifying existing and predictable hazards in excavation work and have the authority to take prompt measures to abate those hazards. Thus, for example, a backhoe operator who would otherwise meet the requirements of the definition is not a competent person if they lack authority to take prompt corrective measures to eliminate existing or potential hazards. Interviews of competent persons should be conducted to document any relevant credentials and level of experience as set forth below.

To establish competency, the individual (or individuals) identified as a competent person should be asked to describe:

- Relevant knowledge of soil types and classification.

- Authority to identify, correct, and control hazards, such as failures in protective systems, hazardous atmospheres, and other hazards including those associated with confined spaces.
- Use of protective systems.
- Requirements of 29 CFR Part 1926, Subpart P.
- The extent and duration of the individual's trenching and excavation experience.
- Any certificates, degrees, or other supporting documents related to the subject matter.

To support a potential citation(s), the CSHO should ask the competent person or management employees the following questions:

- Is the competent person or management employee aware of the worksite conditions as work progresses throughout the day?
- Is the competent person or management employee aware of the requirements of the excavation Standard?
- Does the competent person or management employee know and understand the type (or types) of soil in the excavation? What tests, if any, were performed to determine the soil classification? (See also the additional soil type guidance and questions in the previous section).
- How long has the excavation been open? What is the length of time the competent person or management employee has been doing this work activity? Have conditions changed on site? How many times has this individual entered this excavation and when?
- What is the excavation depth? Does this depth differ from the planned depth? If so, what was the original planned depth and what is the reason for the deviation?
- How far from the edge of the excavation are the spoil piles? What distance do OSHA regulations require between the spoil pile and the edge of the excavation?
- Are employees exposed to excavation hazards? Why are employees exposed to the hazards? What systems should be in place to protect from cave-in hazards?
- Has the competent person instructed employees about the use of a trench box or other protection systems such as sloping/shoring? If not, why not? If so, what were the instructions?

- How often is the competent person or management employee at the jobsite? How long do they stay on the job site during the day?
- What inspections (if any) did the competent person conduct? Evaluate compliance with requirements for periodic inspection of excavations. See 29 CFR 1926.651(k)(1).
- Does the competent person or management employee consider anyone else to be the competent person? If so, who is that person?

2. Requesting Documentation from the Employer.

As a general practice, the CSHO should make note of the date, time, and who provided documentation during the inspection, such as employee certifications, employer-developed procedures, engineering data, equipment operations manuals, inspection records, soil analysis data, and training records.

The CSHO should document the employer's reasons for any measures taken on the jobsite to protect employees in the excavation.

While at the excavation site, the CSHO should record all verbal document requests made in field notes, and include the date, time, and the name of the individual who was verbally asked to provide the documents. The CSHO should take a photograph of any written requests and give the request to the employer. If a document request is not conducted in the field, it may be done by subpoena after the inspection.

For accident investigations, verbal onsite document requests shall be followed up with a written request to the employer, including issuing a subpoena for the desired information.

3. Registered Professional Engineers (RPE) and Review of Engineering Design.

- a. CSHOs shall verify with the employer whether (and which aspects of) the protective system selected to protect employees has been designed or approved by a registered professional engineer. For example, a registered professional engineer is required to approve protective system designs for all excavations deeper than 20 feet. If the CSHO determines that the employer relied on a registered professional engineer for any equipment, shoring devices, shields or any aspects of an employer's protective system, this shall be noted on the Violation Worksheet. The individual's name, or, if a firm, the firm's name, the name of the engineer of record that approved the work for the firm, and the registration number shall be recorded.

- b. Area Offices may review the status of a registered professional engineer's certification with the State Board of Certification and Registration for Professional Engineers and Land Surveyors in their respective states.
- c. The CSHO shall examine and ensure that tabulated data for protective systems (other than the tabulated data provided in the appendices of Subpart P or the manufacturers data) was approved by a registered professional engineer where required, and that the protective system is used and installed in accordance with the tabulated data.
- d. While onsite, the CSHO should observe all excavation conditions, even if the employer indicates that the excavation is under the direct supervision of a registered professional engineer.
- e. All inquiries relating to a registered professional engineer working outside of his or her discipline or the adequacy of the engineering design shall be referred to the Regional Office.

Note: In novel cases, the Regional Office may refer potentially deficient or inadequate engineering designs of protective systems to the State Board of Certification, and Registration for Professional Engineers and Land Surveyors. Prior to any referral, the Regional Office shall consult the Directorate of Construction, Office of Engineering Services for assistance.

XI. Inspection and Citation Guidance.

This section provides compliance inspection guidance and discussions of citation policies for Subpart P requirements. This section supplements compliance inspection guidance in the FOM. Note that this section and the FOM both often include recommended subject matter that should be covered during interviews.

A. § 1926.650. Scope, Application, and Definitions Applicable to this Subpart.

This section sets forth the scope of applicability for Subpart P and defines key terms in the standard. Subpart P applies to all open excavations made in the earth's surface and includes requirements for the use of support systems, sloping and benching systems and other protection systems to protect against excavation cave-ins. In addition, Subpart P regulates the means of access to and egress from excavations, and addresses hazards at excavation sites, including employee exposure to vehicular traffic, falling loads, hazardous atmospheres, water accumulation, and unstable structures in and adjacent to excavations.

Under Subpart P, excavations are defined to include trenches. All trenches are excavations; all excavations may not be trenches. Section 1926.650(b) defines an excavation as any man-made cut, cavity, trench, or depression in an earth surface, formed by earth removal. A trench is defined as a narrow excavation (in relation to its

length) made below the surface of the ground. In general, the depth of a trench is greater than its width, but the width of a trench (measured at the bottom) is not greater than 15 feet (4.6 m). Provisions that apply only to trenches are clearly indicated by use of the word "trench" within the provision.

NOTE: Subpart P applies to trench and excavation hazards, even if the work activity being performed inside the excavation is considered a general industry task. See, for example, OSHA's February 26, 2013, letter of interpretation concerning the applicability of Subpart P to burial vaults:

<https://www.osha.gov/laws-regs/standardinterpretations/2013-02-26>

B. § 1926.651. Specific excavation requirements.

This section contains requirements for the protection of employees against several different types of hazards of excavation-related work.

1. § 1926.651(a). Surface Encumbrances.

This section establishes the employer's responsibility to locate and address all surface encumbrances that create a hazard to employees. Existing site features, such as curbs, roads, trees, utility poles and other structures adjoining the excavation, are examples of potential surface encumbrances. These surface encumbrances must be removed or supported if they present a hazard to employees.

Inspection Guidance

Visually inspect the area in and around the excavation and note conditions such as:

- Excavating near utility poles, fence lines or trees.
- Excavating near structures such as pavement, sidewalks, curbs, or walls.

If these conditions are present during excavation operations, establish through interviews any efforts made to remove or support surface encumbrances.

Citation Policy

§ 1926.651(a). If surface encumbrances create a hazardous condition for employees and were not removed or supported, consider a citation of § 1926.651(a).

NOTE: § 1926.651(i) Stability of adjacent structures sets forth the employer's responsibility to support adjacent structures (e.g. buildings, walls, or other structures). See the discussion of citation policy for § 1926.651(i) below.

2. § 1926.651(b). Underground Installations.

Establishes minimum criteria regarding the employer's responsibility to locate and address utility installations reasonably expected to be encountered during excavation operations.

Underground installations include all types of utility lines either in service or abandoned, including sewer, telephone, fuel (gas or liquid), electric, and water lines. They also include foundations and underground storage tanks.

Inspection Guidance

Determine whether the employer has complied with the requirements to locate and address utility installations:

- Inspect the excavation to determine if underground installations are/were present.
 - Observe, record, video, and/or take photos of utility installations encountered during excavation operations.
- Establish through interviews whether the employer called 811 (the designated nationwide number for contractors to call prior to excavating) and/or contacted the appropriate local utility companies to locate underground installations prior to excavation work.
- If underground utility installations are present, document the following information:
 - Was the appropriate utility company or owner(s) involved contacted within established or customary local response times?
 - Who contacted the utility company?
 - Was the utility company advised of proposed work?
 - Request written verification of contact with the utility company (e.g. email confirmation) and any provided location documentation.
 - If the utility company or owner could not respond within 24 hours (or the minimum time established by state or local law), did the employer proceed with caution and use detection equipment or other means to locate utility installations?

- Were the underground installations protected, supported or removed as necessary to safeguard employees?
- If the employer uses its own detection equipment or other means to locate utility installations, ask to see the equipment used. Often, metal rods with uninsulated handles are used. Such tools pose a potential electrocution hazard.

Citation Policy

- a. § 1926.651(b)(1). If the locations of utility installations were not estimated prior to opening the excavation, consider a citation of § 1926.651(b)(1).
- b. § 1926.651(b)(2). If the utility company or owner was not contacted within established or customary local response time to communicate the project scope and request utility location, consider a citation of § 1926.651(b)(2). If the utility company or owner could not respond within 24 hours (or longer period required by state or local law) and an exact location could not be determined, the employer may proceed if detection equipment or other means to locate utility installations are used.
- c. § 1926.651(b)(3). If the excavation operation approaches the estimated location of a utility installation, consider a citation of § 1926.651(b)(3) if the employer fails to determine the exact location of the utility installation, or attempts to determine the location, but does not use safe or acceptable means to do so.
- d. § 1926.651(b)(4). If underground installations are not protected, supported or removed as necessary to safeguard employees while the trench or excavation is open, consider a citation of § 1926.651(b)(4).

NOTE: OSHA does not consider “probing with hand tools” a safe and acceptable means to locate utility installations unless used in conjunction with detection equipment. However, non-conductive hand tools, hydro-vacuum excavation equipment, or other technologies may constitute “safe and acceptable means” when used with appropriate caution. See, for example, OSHA’s October 23, 2003, letter of interpretation concerning the use of hydro-vacuum excavation equipment and other acceptable means to locate underground utility installations:

<https://www.osha.gov/laws-regs/standardinterpretations/2003-10-23>

NOTE: "Owner" in § 1926.651(b)(2) means the owner of the utility installation. During the rulemaking, it was noted that some utility installations were privately owned. OSHA amended the Final Rule to state that the employer must request utility companies or utility owners locate their utility installations prior to the start of any excavation. Utility owners may not necessarily be the landowners, and land ownership is not relevant to this requirement since requests for utility installation location must be directed to utility companies or utility installation owners rather than landowners. See, for example, OSHA's September 21, 2001, letter of interpretation concerning clarification of utility "owner" as used in Subpart P:

<https://www.osha.gov/laws-regs/standardinterpretations/2001-09-21-0>

3. § 1926.651(c). Access and Egress.

This section establishes requirements for safe access to and egress from excavations. Section 1926.651(c)(1) establishes minimum criteria for the design and construction of structural ramps, defined in § 1926.650(b) as a ramp built of steel or wood, usually used for vehicle access. A ramp made of soil or rock is not considered to be a structural ramp. The intent of § 1926.651(c)(1) is to prevent the collapse of structural ramps due to under-designed members or connections. Section 1926.651(c)(2) requires that adequate means of egress must be provided within proximity to the area where employees are working in a trench excavation.

Inspection Guidance

Verify employers have provided ladders, steps, ramps, or other safe means of egress for workers working in trench excavations at least 4 feet (1.22 meters) deep. The means of egress must be located so that no worker needs to travel more than 25 feet (7.62 meters) laterally within the trench to reach it. Even if the CSHO does not observe a worker working more than 25 feet from the egress, the point of egress would be inadequate if the area is larger than 25 feet and employees would reasonably be expected to venture beyond that distance from the egress.

The sloped end of a trench, i.e. an earth ramp, may be considered a safe means of egress if the earth ramp was designed for such use. Consider such factors as the degree of the slope, depth of the excavation, soil and environmental conditions, and the presence of any obstructions in determining whether or not the earth ramp can be used for safe egress.

Any structural ramps used for worker access or egress must be designed by a competent person. Structural ramps used for access or egress of equipment must also be designed by a competent person qualified in structural design. (See additional competent person guidance in section X.B.1 of this instruction.)

Examine any structural ramps for other potential deficiencies:

- Structural members used for ramps or runways must be uniform in thickness, and designed and joined in a manner to prevent tripping or displacement (e.g. with the use of cleats).

Citation Policy

- a. § 1926.651(c)(1). Consider citing provisions under § 1926.651(c)(1) if structural ramps were not designed by a competent person, or, for ramps used for access or egress of equipment, if such ramps were not designed by a competent person qualified in structural design (§ 1926.651(c)(1)(i), or if structural ramps do not meet the specific design criteria in § 1926.651(c)(1)(ii)-(v)).
- b. § 1926.651(c)(2). Consider a citation of § 1926.651(c)(2) if the a trench excavation is at least 4 feet deep and there is no safe means of egress, or workers must travel more than 25 feet laterally within the trench to reach the egress.

NOTE: OSHA does not consider lifting equipment to be a "safe means of egress" under § 1926.651(c)(2). For example, employees riding in a backhoe bucket is not safe egress to either enter or exit trench excavations.

Aluminum forms are also not to be used as egress, as they do not permit a quick and easy means of escape in case of an emergency. See, for example, OSHA's May 11, 2004, letter of interpretation concerning the use of aluminum forms as an exit route from trench excavations:

<https://www.osha.gov/laws-regs/standardinterpretations/2004-05-11-0>

4. § 1926.651(d). Exposure to Vehicular Traffic.

This section requires employers to provide employees exposed to vehicular traffic with warning vests or other suitable reflective or high-visibility garments, to reduce the risks of struck-by hazards.

Inspection Guidance

If the excavation is located near a roadway, the CSHO should verify that employees are equipped with vests or garments that meet the requirements of this

standard. (Note that requirements under 29 CFR 1926 Subpart G - Signs, Signals, and Barricades may also apply.)

NOTE: Effective 7/15/2019, OSHA has revised Subpart G to update the incorporation by reference of Part 6 of the MUTCD to the November 4, 2009 MUTCD (“2009 Edition”), including Revision 1 and Revision 2, both dated May 2012. See Part VI of the Manual on Uniform Traffic Control Devices:

https://mutcd.fhwa.dot.gov/htm/2009r1r2/part6/part6_toc.htm

Citation Policy

§ 1926.651(d). If suitable high-visibility or reflective garments have not been provided to employees exposed to public vehicular traffic, a citation should be considered.

5. § 1926.651(e). Exposure to Falling Loads.

This section prohibits employees from being underneath loads and exposed to the hazard of being struck by any spillage or falling material while vehicles are loaded or unloaded during excavation activities.

Inspection Guidance

If gravel or other material is being dumped into or in proximity to the excavation while employees are working underneath, evaluate where the materials are being dumped relative to the employees’ location. Evidence of approximate distances should be documented using photographs, videos, or drawings. Employees should be at a distance sufficient to avoid being struck by dumped materials. The prohibition against employees working under loads handled by lifting or digging equipment includes excavated materials as well as slung loads (pipe, etc.). (Note that the operator is permitted to remain in the cab of a vehicle being unloaded or loaded, provided that the cab has a shield or canopy that is adequate to protect the operator from shifting or falling materials, pursuant to § 1926.601(b)(6).)

Citation Policy

NOTE: Under § 1926.651(e), an employee is not permitted to stay in a trench box underneath a load being lowered into the trench by a backhoe. See, for example, OSHA's December 19, 2007, letter of interpretation concerning the applicability of Subpart P to employees working underneath loads handled by lifting or digging equipment:

<https://www.osha.gov/laws-regs/standardinterpretations/2007-12-19>

§ 1926.651(e). Consider a citation of § 1926.651(e) where the employer fails to keep employees from working under loads.

6. § 1926.651(f). Warning System for Mobile Equipment.

This provision specifies when mobile equipment warning systems are needed and identifies the types of acceptable warning systems to protect vehicle operators and workers in excavations.

Inspection Guidance

Determine whether an adequate warning system has been provided for mobile equipment operating adjacent to, or without a clear view of, the edge of the excavation. This provision requires the employer to use warning systems such as stop logs, chock blocks, barricades, or hand or mechanical signals to remind mobile equipment operators of their proximity to excavations.

Citation Policy

§ 1926.651(f). A citation under this standard should be considered if equipment is adjacent to, or has the potential to go beyond the edge of an excavation, the operator does not have a clear, direct view of the edge, and a warning system was not used.

7. § 1926.651(g)(1). Hazardous atmospheres - Testing and controls.

Section 1926.651(g)(1) provides protections for employees working in excavations deeper than 4 feet in locations where hazardous atmospheres are likely to be encountered. Adequate precautions and controls, such as atmospheric testing, ventilation, and respiratory protection, must be provided to prevent employee exposure to atmospheres containing less than 19.5 percent oxygen, as well as other hazardous atmospheres. These requirements apply in addition to applicable atmospheric hazard requirements in 29 CFR 1926, Subpart D (§§ 1926.50 – 66), and Subpart E (§§ 1926.95 - 1926.107).

Inspection Guidance

§ 1926.651(g)(1) does not require evidence that a hazardous atmosphere exists before it requires atmospheric testing. The standard requires atmospheric testing when a hazardous atmosphere *could reasonably be expected to exist*.

Evaluate the likelihood of hazardous atmospheric conditions based on the work activity in the excavation and surrounding factors or conditions. For example, an atmosphere may be hazardous where the work involves the extension or maintenance of sewer or gas utility systems, work near refineries or areas where petroleum distillates are handled or stored, work near landfills or hazardous waste dumps, areas where generators are running, where vehicular traffic is proximate and ongoing, or where sewerage lines are in or close to the excavation in a manner that may affect the working conditions inside. In addition, welding work may need to be completed in the excavation, which may expose employees to gases and hazardous atmospheres.

If an atmospheric hazard could reasonably be expected to exist, the employer must test the atmosphere. Ask the competent person or other employer's representative on site if hazardous atmospheres could reasonably be expected to be encountered and, if so, whether testing was conducted, and the results of that testing. Request testing documentation.

- Testing shall be conducted before employees enter the excavation and should be done regularly to ensure that the excavation remains safe. This includes checks for flammable gases, atmospheric contaminants, and oxygen (O₂) deficiency.
- The frequency of testing should be increased if hazardous atmosphere producing equipment is operating in or near the excavation.
- When controls are used 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.
- Testing equipment should be on site.
- Testing equipment should be properly calibrated.
- Interview the individual who conducts the testing, and ask that individual to explain and demonstrate the process of how testing for atmospheric hazards is conducted.

CSHOs should ensure that the employer had the proper equipment for testing the atmosphere to verify whether a hazardous atmosphere may be present. Document the date, time, equipment used, calibration date, and readings of the equipment.

If the employer conducted atmospheric hazard testing and determined hazardous atmospheres are present, then determine whether the requirements of §

1926.651(g)(1)(ii) have been met, including providing respiratory protection or ventilation.

Citation Policy

§ 1926.651(g)(1)(i). If an atmospheric hazard could reasonably be expected to exist but testing was not conducted, or was conducted incorrectly, consider a citation of § 1926.651(g)(1)(i).

§§ 1926.651(g)(1)(ii)-(iii). Where employees are exposed to atmospheres containing less than 19.5 percent oxygen and other hazardous atmospheres, but adequate precautions and controls to prevent exposure to harmful levels of atmospheric contaminants were not implemented, consider citations under §§ 1926.651(g)(1)(ii)-(iii).

§ 1926.651(g)(1)(iv). Where initial testing was conducted and controls were used to reduce the level of atmospheric contaminants to acceptable levels but testing was not conducted as often as necessary to ensure a safe atmosphere, consider a citation under § 1926.651(g)(1)(iv).

NOTE: The requirements of § 1926.651(g)(1) apply in addition to applicable atmospheric hazard requirements Subparts D and E (§§ 1926.50 - 1926.107). For example, if proper respiratory protection or ventilation was not provided in accordance with Subparts D and E, a citation of § 1926.651(g)(1)(ii) grouped with the applicable requirement of D and E should be considered. Additionally, some excavations may be confined spaces, as defined under 29 CFR 1926, Subpart AA – Confined Spaces in Construction. However, Subpart AA does not apply to trenches and excavations.

NOTE: § 1926.651(k)(1) requires that the competent person conduct daily inspections that include looking for evidence of potentially hazardous atmospheric conditions. Such inspections would not ordinarily require testing, unless a hazardous atmospheric condition could reasonably be expected to exist. Where such areas or situations are identified, the requirements of paragraph (g) apply. Citations under § 1926.651(k)(1) should also be considered, and in some circumstances grouped with applicable provisions of § 1926.651(g)(1), if the competent person does not conduct a daily inspection and hazardous atmospheric conditions could reasonably be expected to be present.

NOTE: For employers engaged in Natural Gas Transmission and Distribution, §§ 1926.651(g)(1)(iii) and 1926.651(g)(2)(i) address working conditions that are covered by Department of Transportation and cannot be enforced by OSHA See OSHA's August 1, 1990 Memorandum to Regional Administrators:

<https://www.osha.gov/laws-regs/standardinterpretations/1990-08-01>

8. § 1926.651(g)(2). Emergency rescue equipment.

Under § 1926.651(g)(2)(i), employers must take additional precautionary measures to ensure that emergency rescue equipment is available if hazardous atmospheric conditions exist or may reasonably be expected to develop. Section 1926.651(g)(2)(ii) requires that employees entering bell-bottom pier holes or similar deep and confined-footing excavations, wear a harness with a lifeline and be attended to while in the hole.

Inspection Guidance

If hazardous atmospheric conditions exist onsite, or may reasonably be expected to develop, determine the availability of emergency rescue equipment, such as a breathing apparatus, a safety harness and line, or a basket stretcher.

If the work involves employees entering into deep and confined footing excavations, such as bell-bottom pier holes, determine through observation or interviews whether: 1) the employees have used/are using a harness and lifeline, 2) employees in the hole were attended to at all times, and 3) the lifeline is separate from any line used to handle materials.

Document the presence of any work operations or hazardous atmospheric conditions that may trigger these requirements.

Citation Policy

§ 1926.651(g)(2)(i). Consider a citation under this provision if emergency rescue equipment, such as breathing apparatus, a safety harness and line, or a basket stretcher, was not readily available where hazardous atmospheric conditions existed or could reasonably be expected to develop, or if employees using emergency rescue equipment were not attended to.

§ 1926.651(g)(2)(ii). Consider a citation under this provision if employees entering bell-bottom pier holes, or other similar deep and confined footing excavations, did not wear a harness with a lifeline securely attached to it or if the lifeline was not separate from any line used to handle materials.

9. § 1926.651(h). Protection from Hazards Associated with Water Accumulation.

This section prohibits employers from allowing workers to enter an excavation where water has accumulated or is accumulating unless precautions are taken to protect workers.

Inspection Guidance

If water is observed in an excavation, document all evidence of employee exposure to the water hazard, as well as accumulated water in the excavation. Mere presence of water, without evidence of actual or potential employee exposure, would not be a violation of this section.

Attempt to determine the depth of the accumulated water by the use of trench rod. Document the approximate depth of the water, where the water is coming from, how long the water has been present, and employees exposed while working in the excavation. If it is not possible to safely measure the depth of the water due to weather conditions, take photographs of conditions that prevented obtaining the measurement.

Document through interviews and observation, any methods or precautions the employer used to prevent and/or control water accumulation, and whether a competent person was monitoring the water removal equipment and operation while the employees were in the excavation.

Methods for controlling standing water and water accumulation and preventing employee exposure may include:

- Water removal equipment, used and monitored by a competent person.
- Use of special support or shield systems, such as one approved by a registered professional engineer.
- Surface water diverted away from the excavation.
- Removal of employees from the excavation during rainstorms.

NOTE: Under § 1926.651(k)(1), excavations must also be inspected by a competent person after each rain and before employees are permitted to re-enter the excavation.

An inspection is required by a competent person for excavations subject to runoff from heavy rains. If excavation work interrupts the natural drainage of surface water, determine whether the employer used diversion ditches, dikes, or other suitable means to prevent surface water from entering or provide adequate

drainage of the adjacent area. Observe the land topography to determine where the water is coming from. Document any relevant information concerning elevation by referencing any available engineering drawings indicating natural drainage and any drainage systems in place.

Citation Policy

- a. § 1926.651(h)(1). Consider a citation if employees are working in an excavation where water has accumulated or is accumulating, and the employer fails to take precautions to control water compromising the excavation. CSHOs should document the particular hazards posed to employees by any water accumulation.
- b. § 1926.651(h)(2). Consider a citation if employees are working in an area where water removal equipment is operating, and the competent person is not monitoring the operation.
- c. § 1926.651(h)(3). Consider a citation if natural drainage is interrupted by the excavation, where diversion ditches, dikes, or other means of preventing the surface water from entering the excavation are not implemented, or if the competent person fails to conduct an inspection of excavations subject to heavy rains.

NOTE: It is not necessary to remove all water from an excavation where employees are expected to work, since not all water accumulated in excavations poses a hazard. The standard requires adequate precautions to protect employees from the hazards of “accumulating” water. In large excavations, there may be pockets of water located within the excavation. Where there is uncontrolled accumulating water and there is employee exposure to a hazard (such as a cave-in due to walls being compromised), a citation should be issued.

10. § 1926.651(i). Stability of Adjacent Structures.

This section provides requirements concerning the stabilization of structures that are adjacent to excavations. Section 1926.651(i)(1) requires employers to provide support systems, such as shoring, bracing, or underpinning, when necessary to ensure that adjacent structures (including adjoining buildings and walls) remain stable for the protection of workers. Section 1926.651(i)(3) requires similar support for sidewalks, pavements and appurtenant structures. Under § 1926.651(i)(2), excavation below the level of the base or footing of any foundation or retaining wall that could pose a hazard to employees is not permitted unless a support system, such as underpinning, is provided, the excavation is in stable rock, or a registered professional engineer has determined there is no hazard.

Inspection Guidance

Through observation and interviews, determine if there are buildings, walls, sidewalks, pavement, or other adjacent structures, that are or could be compromised or subject to collapse due to excavation operations. If so, determine if the employer has provided any support systems, such as shoring, bracing, or underpinning, if the excavation is in stable rock, or if a registered professional engineer has determined no hazard is present.

During an investigation involving a potentially compromised adjacent structure, ask the following questions:

- Is there an effective support system in place for excavations below the level of the base or footing of a foundation, retaining wall, sidewalk, or other structure?
- Were employees working in areas adjacent to these structures? Superimposed loading of adjacent structures may not be limited to the immediate area of the structure, but may also extend some distances from the structure. This distance varies with the depth of the excavation.
- Has a registered professional engineer made a determination that an excavation near adjacent structures will not pose a hazard to employees? Request to see documentation of registered professional engineer plans and approval.

NOTE: This standard serves to protect not only employees in excavations, but also employees using the sidewalk or pavement area above. Observe and document whether employees are working near the edge or on an unsupported structure, sidewalk or pavement area.

Citation Policy

- a. § 1926.651(i)(1). Consider a citation of § 1926.651(i)(1) if the stability of adjoining buildings, walls, or other structures is endangered by excavation operations, and no support system has been provided for the protection of employees.
- b. § 1926.651(i)(2). Consider a citation of § 1926.651(i)(2) if there is an 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, and none of the criteria in §§ 1926.651(i)(2)(i)-(iv) have been met (no support system has been provided, the excavation is not in stable rock, and there has not been registered professional engineer approval).

- c. § 1926.651(i)(3). Consider a citation of § 1926.651(i)(3) if a sidewalk, pavement, existing utility lines or other connecting structure has been undermined, without providing a support system or another method of employee protection from possible collapse.

11. § 1926.651(j). Protection of Employees from Loose Rock or Soil.

This section addresses hazards associated with loose rock or soil that could fall from the face of an excavation, as well as excavated materials (i.e. spoil piles), other materials, or equipment that could pose a hazard by falling or rolling into excavations.

Inspection Guidance

During an inspection, examine the perimeter of the excavation for potential loose soil or rock hazards, spoil piles/spoils banks, other materials, or equipment that may be within two feet of the edge of the excavation. If hazards are identified, determine through observation and interviews whether there is reasonable danger to employees of soil, rock/spoils, equipment, or materials falling into the excavation and causing harm. CSHOs should further document if the spoil pile is within two feet of the excavation's edge, whether the employer provided any alternative protective measures and, why the two-foot set-back requirement in § 1926.651(j)(2) was not followed.

Note: This standard provides protection to employees who are working in an excavation in addition to the requirements for cave-in protection. If soil is not placed, sloped, scaled, or benched away from protection systems, employees may be exposed to the hazard of being struck by rolling or loose soil.

Citation Policy

- a. § 1926.651(j)(1). If there is loose rock or soil that poses a hazard by falling or rolling from the excavation face, the employer has failed to provide protection (such as installation of protective barricades), and employee exposure can be documented, consider a citation for violation of § 1926.651(j)(1).
- b. § 1926.651(j)(2). A citation for violation of § 1926.651(j)(2) should be considered if excavated or other materials or equipment are placed within 2 feet of the edge of the excavation, are falling or potentially rolling into the

excavation (such as spoils/rocks rolling down) and strike employees below, and there are no protective or retaining devices in place.

12. § 1926.651(k). Inspections.

This section sets forth criteria for inspections that must be conducted by a competent person whenever employee exposure can be reasonably anticipated (i.e. if employees are expected to work in the excavation). During the course of work in excavations, hazards may develop due to changing conditions at the worksite. The purpose of these inspections is to identify any hazardous conditions and implement corrective actions to protect employees.

Under § 1926.651(k)(2), where the competent person finds evidence of conditions that could result in a cave-in, indications of failure of existing protective systems, hazardous atmospheres, or other hazardous conditions, the competent person must exercise the authority to remove employees from the hazardous area.

Inspection Guidance

Determine through observation and interview whether daily inspections were conducted by an onsite competent person or others. If inspections were not conducted, determine the reason, and whether employees were expected to enter the excavation to complete the work. Request any documentation available for daily inspections conducted from the employer. (See additional guidance for determining whether an individual meets the requirements for a competent person in section X.B.1). In addition, observe the site for indications that a routine inspection did *not* take place, including hazardous conditions that would necessitate the removal of employees from the excavation under § 1926.651(k)(2). If there is evidence of hazards, such as a situation that could result in a possible cave-in, failure of a protective system, or employees exposed to hazardous atmospheres, determine why employees were not removed from the excavation.

Under § 1926.651(k)(1), inspections should be conducted by a competent person whenever employee exposure can be reasonably anticipated:

- Daily prior to the start of each shift.
- As needed throughout each shift.
- If there are changes in the excavation or surrounding conditions that could increase hazards.
- After every rainstorm.
- After other events that could increase hazards, such as a snowstorm, windstorm, thaw, earthquake, etc.

- When fissures, tension cracks, sloughing, undercutting, water seepage, bulging at the bottom, or other similar conditions are present.

NOTE: If the competent person asserts that a daily inspection was performed, and there are hazardous conditions visibly present, the CSHO should ask the reason employees are exposed to those conditions. Section 1926.651(k)(2) requires exposed employees to be removed from the hazardous area of the excavation until necessary precautions are taken. The standard does not require all employees to be removed from an otherwise adequately protected excavation. For instance, if there is a large excavation where employees are working in different locations, only those employees who are working proximate to a newly emerging hazard or unprotected area are required to be removed.

Citation Policy

- a. § 1926.651(k)(1). Consider a citation of § 1926.651(k)(1) if the competent person did not conduct daily or other necessary inspections of the excavation jobsite where employee exposure could be reasonably anticipated (i.e. employees were expected to work in the excavation), or if inspections were not conducted by a competent person (including, for example, if the person designated as the “competent person” lacks the authority to remove employees from an excavation), See definition of competent person in § 1926.650(b)). Note that there is no requirement for written documentation of daily inspections.

NOTE: Interplay between § 1926.651(k)(2) and § 1926.652(a)(1). The purpose of an inspection performed by a competent person under § 1926.651(k)(1) is to verify that protective systems have not been compromised or that new hazards have not developed. For example, if shoring is used, the competent person should conduct inspections to ensure that shoring remains in good condition. If no protective system has been selected by the employer and employees are exposed to cave-in hazards, do not cite § 1926.651(k)(2). Rather, a citation for failure to have a protective system under § 1926.652(a)(1) should be cited by itself and not grouped with § 1926.651(k)(2). (See additional discussion of citations under § 1926.652(a)(1) below).

- b. § 1926.651(k)(2). Consider a citation of § 1926.651(k)(2) when a previously-compliant excavation becomes compromised or when a new hazard emerges (i.e., an existing protective system appears to be failing or employees enter an unprotected area), and the competent person fails to remove employees from that area. Note that if there is no competent person (including where an

otherwise-competent person lacks the authority to remove employees from the excavation), then § 1926.651(k)(1) should be cited *instead* of § 1926.651(k)(2).

13. § 1926.651(l). Walkways.

This section provides criteria for walkways where employees or equipment are required or permitted to cross over excavations. Employers must provide guardrails that comply with § 1926.502(b) for walkways that are 6 feet (1.8 m) or more above lower levels.

Inspection Guidance

During the inspection, if there are walkways that cross over an excavation, measure the height of the walkway and determine whether adequate guardrails have been provided.

Citation Policy

§ 1926.651(l). Consider a citation if walkways were not provided where employees or equipment were required or permitted to cross over excavations, or if walkways 6 feet (1.8 m) or more above lower levels were not provided with guardrails complying with § 1926.502(b).

NOTE: OSHA considers crossing narrow trenches (30 inches or less in width) without a walkway with guardrails to be a de minimis condition. Therefore, walkways or bridges with standard guardrails must be provided when employees or equipment are required or permitted to cross over excavations only when the excavation is at least 6 feet in depth and wider than 30 inches at the top. See, for example, OSHA's August 10, 1995, letter of interpretation concerning the applicability of Subpart P to narrow trenches:

<https://www.osha.gov/laws-regs/standardinterpretations/1995-08-10-0>

C. § 1926.652. Requirements for protective systems.

Section 1926.652 details the requirements for protective systems in excavations.

1. § 1926.652(a). Protection of employees in excavations.

§ 1926.652(a)(1). This section requires employers to provide adequate protective systems to protect employees from cave-ins. Protective systems must meet the requirements of § 1926.652(b), which covers sloping and benching systems, or § 1926.652(c), which addresses support systems, shield systems, and other protective systems.

The standard does not require the installation and use of a protective system when an excavation is made entirely in stable rock (§ 1926.652(a)(1)(i)), or when the excavation is less than 5 feet (1.52 meters) deep and a competent person has examined the excavation and found no indication of a potential cave-in hazard (§ 1926.652(a)(1)(ii)).

Inspection Guidance

Determine whether the excavation has a protective system, and whether a protective system is required based on the exceptions in §§ 1926.652(a)(1)(i) and (ii). Through interviews, tests, and observation, verify the following information:

- Does the excavation consist entirely of stable rock? How did the employer come to that conclusion?
- What is the soil type in the excavation?
- Who is the competent person? Did the competent person evaluate the soils and the protective systems in place? (See also general guidance regarding evaluating the competent person in section X.B.1.)
- What is the depth/width of the excavation?
- Is there a protective system in place? What type of system is it? Was the system designed in accordance with § 1926.652(b) or § 1926.652(c)? (See additional guidance about evaluating compliance with §§ 1926.652(b) and (c) below.)
- Have employees been in the excavation? Will the work require employees to enter the excavation?
- Safely examine the excavation for any signs of collapse or other hazards. However, note that if the exceptions in §§ 1926.652(a)(1)(i) and (ii) are not met, and employees are exposed to an unprotected excavation, no further evidence of cave in need be documented as a cave-in hazard exists in virtually all excavations.

Citation Policy

- a. § 1926.652(a)(1). Consider a citation of § 1926.652(a)(1) if employees are working in an excavation that is not entirely in stable rock, and that is either at least 5 feet (1.52 meters) deep or is less than 5 feet deep and a competent person failed to assess that there was no indication of a potential cave-in.
- b. § 1926.652(a)(1) verses § 1926.652(b) or (c). Where a protective system is required, the employer is obligated to provide one designed in accordance with §§ 1926.652(b) or 1926.652(c). If a protective system has been provided but does not meet the criteria in §§ 1926.652(b) or (c), consider a citation

specific to the appropriate/applicable provisions of (b) or (c), described below. A citation of § 1926.652(a)(1) should not be considered if a protective system is provided and in place, yet inadequate.

- c. § 1926.652(a)(1) verses § 1926.651(k)(2). As noted previously, citing both § 1926.652(a)(1) and § 1926.651(k)(2) is generally not appropriate. Consider a citation of § 1926.652(a)(1) where there is no protective system in place and employees are exposed to cave-in hazards. Citations under § 1926.651(k)(2) may be appropriate if an otherwise-compliant excavation has become compromised and the competent person failed to remove employees from the hazardous area. (See previous discussion on § 1926.651(k)(2)).

2. § 1926.652(a)(2) requires the employer to implement a protective system with the capacity to resist all intended or reasonably expected loads to be applied or transmitted to the system.

Inspection Guidance

In evaluating the chosen design of sloping and benching systems, refer to [Appendix B to Subpart P – Sloping and Benching](#), which contains specifications for sloping and benching when used as methods of protecting employees working in excavations from cave-ins. Appendix B can be used to evaluate the slope or bench system chosen based on the soil conditions present. (See also the discussion of § 1926.652(b) below.)

Soil type and surrounding hazards must be considered when evaluating the design of support systems, shield systems and protective systems used. Refer to any tabulated data available for the system used, as well as, if applicable, [Appendix C to Subpart P – Timber Shoring for Trenches](#) for timber shoring, and [Appendix D to Subpart P – Aluminum Hydraulic Shoring for Trenches](#) for hydraulic shoring. It is important to note that manufacturers of hydraulic systems often provide tabulated data specific to that system, in which case the CSHO would mostly likely not need to use Appendix D to evaluate the system. (See also the discussion of §§ 1926.652(c)(1) through (c)(4) below.)

If the protective system appears inadequate or in danger of failure, the employer's representative or competent person shall be notified immediately so to remove any employees in the excavation until the hazard has been abated.

Citation Policy

§ 1926.652 (a)(2). Consider a citation if the protective system is incapable of supporting all intended or reasonably anticipated loads. Where applicable, § 1926.652(a)(2) shall be grouped with the specific requirement representing the option used, §§ 1926.652(b)-(c).

- 2. § 1926.652(b). Design of sloping and benching systems.

This section provides four alternatives for the design and construction of sloping and benching systems for protecting employees working in excavations.

As defined in § 1926.650(b), “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.” “Sloping” refers to “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.”

§ 1926.652(b)(1). Option (1). Allowable configurations and slopes.

Under this Option, the excavation sides must be sloped at an angle that is not steeper than one and one-half horizontal to one vertical (1.5H:1V, 34 degrees measured from the horizontal). Employers may cut the excavation to the slope specified by this option without the need for initial testing and classifying the soil at the excavation site.

NOTE: Where the evidence shows that no support system was used and that the sides of the excavation are steeper than 1.5H:1V, the employer has the burden of proving compliance with one of the other protective system options under this section or § 1926.652(c). The CSHO, however, should document all relevant information concerning the excavation, including any protective systems in place or lack of protective systems, to support a potential citation.

NOTE: If an excavation is 20 feet or less in depth and sloped in accordance with the requirements of § 1926.652(b)(1)(i) (i.e. the slope is not greater than 34 degrees measured from the horizontal), then soil classification tests are not required. If an employer assumes type C soil is present, and provides the protection (sloping, shoring or shielding) required for type C soil, a citation should not be issued. However, soil classification tests are required if the employer uses any other option. See, for example, OSHA’s March 10, 1992, letter of interpretation regarding classification of soils for providing protective systems in excavations.

<https://www.osha.gov/laws-regs/standardinterpretations/1992-03-10-0>

§ 1926.652(b)(2). Option (2). Determination of slopes and configurations using Appendices A and B.

Under this option, the benching or sloping system for the excavation must conform with the requirements in Appendices A and B. [Appendix A to Subpart P – Soil Classification](#) contains methodology for the employer to define soil types. [Appendix B to Subpart P – Sloping and Benching](#) provides specifications for

sloping and benching that must be followed for the employer to comply with Option 2 under § 1926.652(b)(2).

Under Appendix B, Table B-1, the maximum allowable slopes for excavations 20 feet (6.0 m) or less in depth are as follows:

Soil Type	Slope	Degree of Slope
Stable rock	Vertical	90°
Type A	$\frac{3}{4}$:1	54°
Type B	1:1	45°
Type C	$1\frac{1}{2}$:1	34°
Type A (short-term)*	$\frac{1}{2}$:1	63°

*Note: *Only applicable to simple slope excavations which are open 24 hours or less and which are 12 feet or less in depth.*

Under Appendix B, benching is allowed in cohesive soil only. The two basic types of benching are single (i.e. one bench cut in the side of the excavation) and multiple (i.e. multiple benches cut in the side of the excavation). The horizontal to vertical ratio of the benched side is determined by the type of soil. As a general rule, the height of the bottom (lowest) bench in the excavation must not exceed 4 feet (1.2 m). Subsequent benches may have a height of up to 5 feet (1.5 m) in Type A soil and 4 feet (1.2 m) in Type B soil. The maximum allowable slope for bench systems is the same as the maximum allowable slope for sloping systems (see table above).

Under Appendix B, sloping or benching systems for excavations greater than 20 feet deep must be designed by a registered professional engineer.

§ 1926.652(b)(3). Option (3). Designs using other tabulated data.

This option allows the employer to design a sloping and benching system in accordance with tabulated data, such as tables and charts, approved by a registered professional engineer. This data must be in writing and include explanatory information, including the criteria for selecting a system and the limits on the use of the data. At least one copy of the data, which identifies the registered professional engineer who approved it, must be kept at the worksite during installation of the protective system. After the system is completed, the data may be stored away from the jobsite, but the employer must provide a copy to OSHA upon request.

§ 1926.652(b)(4). Option (4). Design by a registered professional engineer.

Under this option, sloping and benching systems that do not meet the criteria of Option (1), Option (2), or Option (3) are permitted if the design is approved by a registered professional engineer. The design must be in writing and include the magnitude of the slopes and configurations that were determined to be safe for the particular project and the identity of the registered professional engineer approving the design. At least one copy of the design must be kept at the worksite while the protective system is being installed. After the system is completed, the data may be stored away from the jobsite, but the employer must provide a copy to OSHA upon request.

Inspection Guidance

Evaluate whether sloping and benching systems have been designed and constructed in accordance with the requirement options of §§ 1926.652(b)(1), (b)(2), (b)(3), or (b)(4). Determine through interviews and observation what protective system the employer has implemented, and, if a sloping or benching system is used, which option, if any, the employer followed. Factors to determine compliance with specific options may include:

- Whether a competent person conducted soil testing on site, and the results of that soil testing (see additional guidance on soil testing in section X.A.3.).
- Measurements to determine the depth of the excavation, slopes of excavation walls, as well as the height and width of any benching.
- Whether a registered professional engineer approved the design of the sloping or benching system and any evidence of the engineer's design not followed by the employer.
- Copies of tabulated data or of the design that the employer relied on.

If the protective system was designed by a registered professional engineer, the CSHO should request to see a copy of the design and verify the registered professional engineer's credentials to ensure the engineer is working within their respective discipline.

Citation Policy

§ 1926.652(b). Consider a citation under § 1926.652(b) if the employer has implemented a sloping or benching system, but it does not meet the specific criteria in Option (A), Option (B), Option (C), or Option (D). Where applicable, § 1926.652(b) may be grouped with § 1926.652(a)(2).

Note: If the employer has not implemented any protective system, a citation under § 1926.652(a)(1) should be issued.

NOTE: The CSHO must prove exposure to cave-in hazards by documenting where the employees were working and how inadequate sloping or benching created a hazard at that location.

3. § 1926.652(c). Designs of support systems, shield systems, and other protective systems.

This section provides four alternatives for the design and construction of support systems, shield systems, and other protective systems.

§ 1926.652(c)(1). Option (1). Designs using appendices A, C and D.

Under this option, designs for timber shoring must conform with the requirements in Appendices A and C. Designs for aluminum hydraulic shoring must be in accordance with § 1926.652(c)(2), but if manufacturer's tabulated data cannot be used, the designs must be in accordance with Appendix D.

[Appendix A to Subpart P](#) – Soil Classification contains methodology for the employer to define soil types.

[Appendix C to Subpart P](#) – Timber Shoring for Trenches provides specifications for timber shoring as a method of protection from cave-ins in trenches that do not exceed 20 feet (6.1 m) in depth.

[Appendix D to Subpart P](#) – Aluminum Hydraulic Shoring for Trenches provides specifications for when aluminum hydraulic shoring is provided as a method of protection from cave-ins in trenches that do not exceed 20 feet (6.1 m) in depth.

See Appendices A, C, and D, and Chapter 2 of the [OSHA Technical Manual](#) for additional information.

§ 1926.652(c)(2). Option (2). Designs using Manufacturer's Tabulated Data.

This option requires the employer to design support systems, shield systems, or other protective systems from the manufacturer's tabulated data. The design must follow all the manufacturer's specifications, recommendations, and limitations. Deviations are only permitted with the manufacturer's approval. The manufacturer's specifications, as well as any approval of deviations, must be in writing, and at least one copy of such written information must be kept at the worksite during installation of the protective system. After the system is completed, the data may be stored away from the jobsite, but the employer must provide a copy to OSHA upon request. Note that under this option, there is no requirement that the manufacturer's tabulated data identify a registered professional engineer.

§ 1926.652(c)(3). Option (3). Designs using other tabulated data.

This option requires the employer to design support systems, shield systems, or other protective systems from tabulated data other than the manufacturer's tabulated data. Such data must be in writing and must include an identification of the parameters that affect the selection of a protective system drawn from such data, any limits of the use of the data, any explanatory information to assist in making a correct selection of a protective system, and the registered professional engineer that approved the data. At least one copy of such written information must be kept at the worksite during installation of the protective system. After the system is completed, the data may be stored away from the jobsite, but the employer must provide a copy to OSHA upon request.

§ 1926.652(c)(4). Option (4). Design by a registered professional engineer.

Under this option, support systems, shield systems, and other protective systems that do not meet the criteria of Option (1), Option (2), or Option (3) are permitted if the design is approved by a registered professional engineer. The design must be in writing and include the sizes, types, and configurations of materials used in the protective system and the name of the registered professional engineer approving the design. At least one copy of the design must be kept at the worksite during the construction of the protective system. After the system is completed, the data may be stored away from the jobsite, but the employer must provide a copy to OSHA upon request.

Inspection Guidance

Determine through observation and interviews what type of protective system was used by the employer, and if the employer used a support system, shield system, or other protective system besides sloping or benching. Identify which option under § 1926.652(c), if any, the employer followed and evaluate whether such systems were designed and constructed in accordance with the requirements of §§ 1926.652(c)(1), (c)(2), (c)(3), or (c)(4). Necessary documentation will depend on the specific requirements of the option chosen. For example, key information to determine compliance may include:

- Whether a competent person conducts soil testing on site, and the results of the soil testing (see additional guidance on soil testing in section X.A.3).
- Measurements to determine the depth of the excavation, slopes of excavation walls, as well as the dimensions of protective systems.
- Whether a registered professional engineer approved the design of the support system, shield system, or other protective systems.
- Copies of tabulated data or of the design that the employer relied on.

If the protective system was designed by a registered professional engineer, the CSHO should request to see a copy of the design report and verify the registered professional engineer's credentials to ensure the engineer acted within their discipline. Additionally, the CSHO should request a copy of the registered professional engineer's written approval to determine if there are were deviations from the manufacturer's specifications, recommendations and limitations not approved by the manufacturer.

Note: All inquiries relating to the adequacy of the engineering design shall be referred to the respective Regional Office.

Citation Policy

§ 1926.652(c). Consider a citation under § 1926.652(c) if the employer has implemented a support system, shield system, or other protective system, but failed to meet the specific criteria in Option (A), Option (B), Option (C), or Option (D). When applicable, § 1926.652(c) may be grouped with § 1926.652(a)(2).

Note: If the employer has not implemented any protective system, a citation should be issued under § 1926.652(a)(1).

4. § 1926.652(d). Materials and equipment.

§ 1926.652(d). The provisions in paragraph (d) are intended to prevent hazards resulting from damaged or defective components of protective systems. The materials and equipment used for protective systems must be free from damage or defects that might impair their proper function (§ 1926.652(d)(1)) and used and maintained in a manner that is consistent with the manufacturer's recommendations (§ 1926.652(d)(2)). Under § 1926.652(d)(3), a competent person must evaluate any damaged material or equipment used for protective systems to determine its suitability for continued use. If the competent person cannot insure its suitability for safe use, the material/equipment must be removed from service.

Inspection Guidance

Safely examine structural members of all protective systems in place at the excavation site for visible damage or defects. The first step to this process may include a general inspection of the protective system to insure all manufacturer recommended components are in place.

Some examples of visible damage include but are not limited to:

- Significant deflection of sidewalls.
- Stress cracks or deformation of spreader receivers.

- Dented or buckled spreaders.
- Incorrect, defective, or missing spreader pins and keepers.
- Missing stacking pins.
- Cracked or otherwise compromised shoring timbers.
- Hydraulic fluid leakage at cylinders, hose body, and fittings.
- Damaged sheathing used for shielding.

If a protective system appears to be damaged, reference the manufacturer's recommendations and determine whether an evaluation was performed by the competent person to define its suitability for continued use.

- Was the protective system or components in question removed from service?
- If so, was the system or components evaluated and approved by a registered professional engineer before being returned to service?

Determine through interviews if manufactured components of the protective system were used in a manner consistent with the manufacturer's specifications to prevent employee exposure to hazards.

Citation Policy

- a. § 1926.652(d)(1). Consider a citation of § 1926.652(d)(1) if materials or equipment used for protective systems were not free from damage or defects impairing their proper function.
- b. § 1926.652(d)(2). Consider a citation of § 1926.652(d)(2) if manufactured materials and equipment used for protective systems were not used and maintained in a manner consistent with the recommendations of the manufacturer, or if they were not used in a manner that prevents employee exposure to hazards.
- c. § 1926.652(d)(3). Consider a citation of § 1926.652(d)(3) if material or equipment used for protective systems is damaged, and a competent person failed to examine the material or equipment and evaluate its suitability for continued use;

or

material or equipment used for protective systems was found to be damaged and removed from service, but was not evaluated and approved by a registered professional engineer before being returned to service.

5. § 1926.652(e). Installation and removal of support systems.

This section includes requirements for the safe installation and removal of support systems.

§ 1926.652(e)(1).

Section 1926.652(e)(1) provides specific requirements for support systems and its components/members in excavations during the installation and removal process.

Inspection Guidance

Installation and removal of support systems, which can involve significant material-handling activity, are particularly hazardous periods in excavation work. Additionally, partially completed support systems will not react to loads in the same manner as completed structures. Individual members can become overloaded and fail, leading to a general failure of other portions of the support system. Therefore, employees can be exposed to cave-ins, the collapse of adjacent structures, or collapse of the support system if the employees are not properly protected during installation and removal. (54 FR 45894, 45933 (October 31, 1989))

Determine through observation and interviews if:

- The support system components were securely connected together.
- Support systems were installed and removed in a manner that protected employees from hazards.
- Were individual members temporarily removed? If so, were any interim precautions taken?
- During support system removal, was the process started at the bottom of the excavation and in accordance with the manufacturer's instructions?
- Were the members released slowly to note any indication of system failure?
- Was the process of backfilling the excavation conducted simultaneously with removal of the system?

Citation Policy

- a. § 1926.652(e)(1)(i). Consider a citation if members of support systems were not securely connected together to prevent sliding, falling, kickouts, or other predictable failure.

- b. § 1926.652(e)(1)(ii). Consider a citation if support systems were not installed and removed in a manner that protects employees from cave-ins, structural collapses, or from being struck by members of the support system.
- c. § 1926.652 (e)(1)(iii). Consider a citation if support systems were subjected to loads that exceeded what the individual members were designed to withstand.
- d. § 1926.652(e)(1)(iv). Consider a citation if additional precautions were not taken to ensure the safety of employees, such as installing other structural members to carry the loads imposed on the support system before temporary removal of individual members.
- e. § 1926.652(e)(1)(v). Consider a citation if removal of the support system did not begin at, and progress from, the bottom of the excavation;

or

members of the support system were not released slowly so as to note any indication of possible failure of remaining structural members or possible cave-in of the sides of the excavation.

- f. § 1926.652(e)(1)(vi). Consider a citation if backfilling of the excavation did not progress together with the removal of support system.

§ 1926.652(e)(2). Additional Requirements for Support Systems for Trench Excavations.

Note: The requirements in § 1926.652(e)(2) apply only to trenches.

1926.652(e)(2)(i).

This section allows excavation up to 2 feet (.61 m) below bottom of the members of a trench support system if it is designed to resist forces calculated for the full depth of the trench and there are no indications of soil loss from behind or below the bottom of the support system. Otherwise, excavating below the bottom of the members of a trench support system is prohibited. Employers wishing to excavate deeper than 2 feet below the support system must comply with § 1926.652(c)(4), which requires design by a registered professional engineer.

Inspection Guidance

Determine through observation and interviews the depth of excavation below the support system in the trench, in addition to any evidence of soil loss from behind or below the bottom of the support system.

Citation Policy

NOTE: In instances where a trench box or trench shield may be a component of a support system, consider grouping a citation of § 1926.652(g)(2) with § 1926.652(e)(2)(i). If employers elect to excavate deeper than 2 feet below the support system, they must comply with § 1926.652(c)(4), which requires design by a registered professional engineer.

§ 1926.652(e)(2)(i). Consider a citation if the employer excavated material deeper than 2 feet (.61m) below the bottom of the members of a trench support system, and the system was not designed to resist forces calculated for the full depth or there were indications of a possible soil loss from behind or below the bottom of the support system.

§ 1926.652(e)(2)(ii).

This section states that the installation of a support system needs to be closely coordinated with the excavation of trenches. Section 1926.652(e)(2)(ii) only applies where employees are exposed to hazards or potential hazards. Coordination of the installation of the support system with the excavation of the trench will reduce the possibility that a cave-in will occur. The longer a trench is exposed to environmental conditions and other work activity, the likelihood of a cave-in increases. Therefore, support systems should be installed as soon as possible.

Inspection Guidance

Determine when support system was installed relative to the excavating operation, and the reasons for any delay in the installation.

Citation Policy

Consider a citation of § 1926.652(e)(2)(ii) if the installation of a support system was not closely timed with the excavation of the trench.

6. § 1926.652(f). Sloping and Benching Systems.

Section 1926.652(f) prohibits employees from working on the faces of sloped or benched excavations at levels above other employees, unless employees at lower levels are adequately protected from falling, rolling, or sliding material and equipment hazards.

Inspection Guidance

Determine through observation and interviews the work activity taking place proximate to the face of the excavation. If employees were working below, were they protected from hazards created by operations conducted above on the sloped or benched faces?

Citation Policy

§ 1926.652(f). Consider a citation if employees were permitted to work on the faces of sloped or benched excavations and employees working at lower levels were not adequately protected from falling, rolling, or sliding equipment or material.

7. § 1926.652(g). Shield Systems.

§ 1926.652(g)(1) This section provides requirements for shield systems used in all excavations.

Inspection Guidance

Under § 1926.652(g)(1)(i), shield systems, such as trench shields or trench boxes, shall not be subjected to loads that exceed those which the system was designed to withstand. Gather information from the employer to determine the shield system's load limits and the actual load placed on the system during work activity.

Section 1926.652(g)(1)(ii) requires shields to be installed to restrict lateral or other hazardous movement in the event sudden lateral loads are applied. Should a cave-in occur, the volume and force of the soil could potentially cause lateral movement of the shield. Determine whether the employer's competent person determined whether the shield was close enough to the wall to ensure that there would be no lateral movement. Generally, trench box manufacturers' recommendations state that the excavated area between the outside of the trench box and the face of the excavation should be as small as possible. Check manufacturer's literature, if available, for distance recommendations for any substantial gaps between the shield and the side walls of the excavation. Measure the width between the shield and the side wall of the excavation, in addition to the length and depth of the gap; these measurements will aid in determining the volume of soil which could collapse and potentially cause lateral movement.

NOTE: Although Subpart P does not set a maximum distance between a shield box and a trench face, an employer would be required to ensure that, in the event of a collapse of the face, the shield would not move laterally. See, for example, OSHA's October 20, 1999 and March 11, 2013, letters of interpretation concerning allowable gap requirement between the trench shield and trench sides:

<https://www.osha.gov/laws-regs/standardinterpretations/1999-10-20-2>

<https://www.osha.gov/laws-regs/standardinterpretations/2013-03-11>

Section 1926.652(g)(1)(iii) requires employees to be protected from cave-in hazards when entering or exiting areas protected by shields. During the inspection, determine whether the ends of shields are protected from cave-ins. Document the distance from the end of the trench shield to the exposed excavation wall.

§ 1926.652(g)(1)(iv) prohibits employees from being inside a shield while shields are installed, removed, or moved vertically.

Citation Policy

- a. § 1926.652(g)(1)(i). Consider a citation if shield system was subjected to loads exceeding what the system was designed to withstand.
- b. § 1926.652(g)(1)(ii). Consider a citation if a shield was not installed in a manner to restrict lateral or other hazardous movement in the event of the application of sudden lateral loads.
- c. § 1926.652(g)(1)(iii). Consider a citation if employees were not protected from the hazard of cave-ins when entering or exiting areas otherwise protected by a shield system.
- d. § 1926.652(g)(1)(iv). Consider a citation if employees were allowed in a shield system when shields were being installed, removed, or moved vertically.

NOTE: § 1926.652(g)(1)(iv) does not apply to the horizontal repositioning of shields. Employees can remain inside a shield being repositioned, provided the movement of the shield is horizontal and the shield is not lifted.

§ 1926.652(g)(2) This section allows excavation up to 2 feet (.61 m) below the bottom of the members of a shield system in a trench. This requirement only applies to trench excavations, if the system is designed to resist the forces

calculated for the full depth of the trench, and there are no indications of a possible loss of soil from behind or below the bottom of the shield.

Inspection Guidance

Determine through observation, measurements and interviews the excavation depth below the support system, and whether there is any evidence of loss of soil from behind or below the bottom of the support system.

Citation Policy

§ 1926.652(g)(2). Consider a citation of § 1926.652(g)(2) if the employer permitted the excavation of material deeper than 2 feet (.61m) below the bottom of shield system members in a trench, and the system was not designed to resist the forces calculated for the full depth of the trench or there were indications of a possible loss of soil from behind or below the bottom of the shield system.

Note: In instances where a trench box or trench shield may be a component of a support system, consider grouping a citation of § 1926.652(g)(2) with § 1926.652(e)(2)(i). Excavations that extend more than 2 feet below the support system must comply with § 1926.652(c)(4), which requires design by a registered professional engineer.

XII. Links to Appendices to Subpart P.

[Appendix A to Subpart P - Soil Classification](#)

[Appendix B to Subpart P - Sloping and Benching](#)

[Appendix C to Subpart P - Timber Shoring for Trenches](#)

[Appendix D to Subpart P - Aluminum Hydraulic Shoring for Trenches](#)

[Appendix E to Subpart P - Alternatives to Timber Shoring](#)

[Appendix F to Subpart P - Selection of Protective Systems](#)

