Excavation Safety

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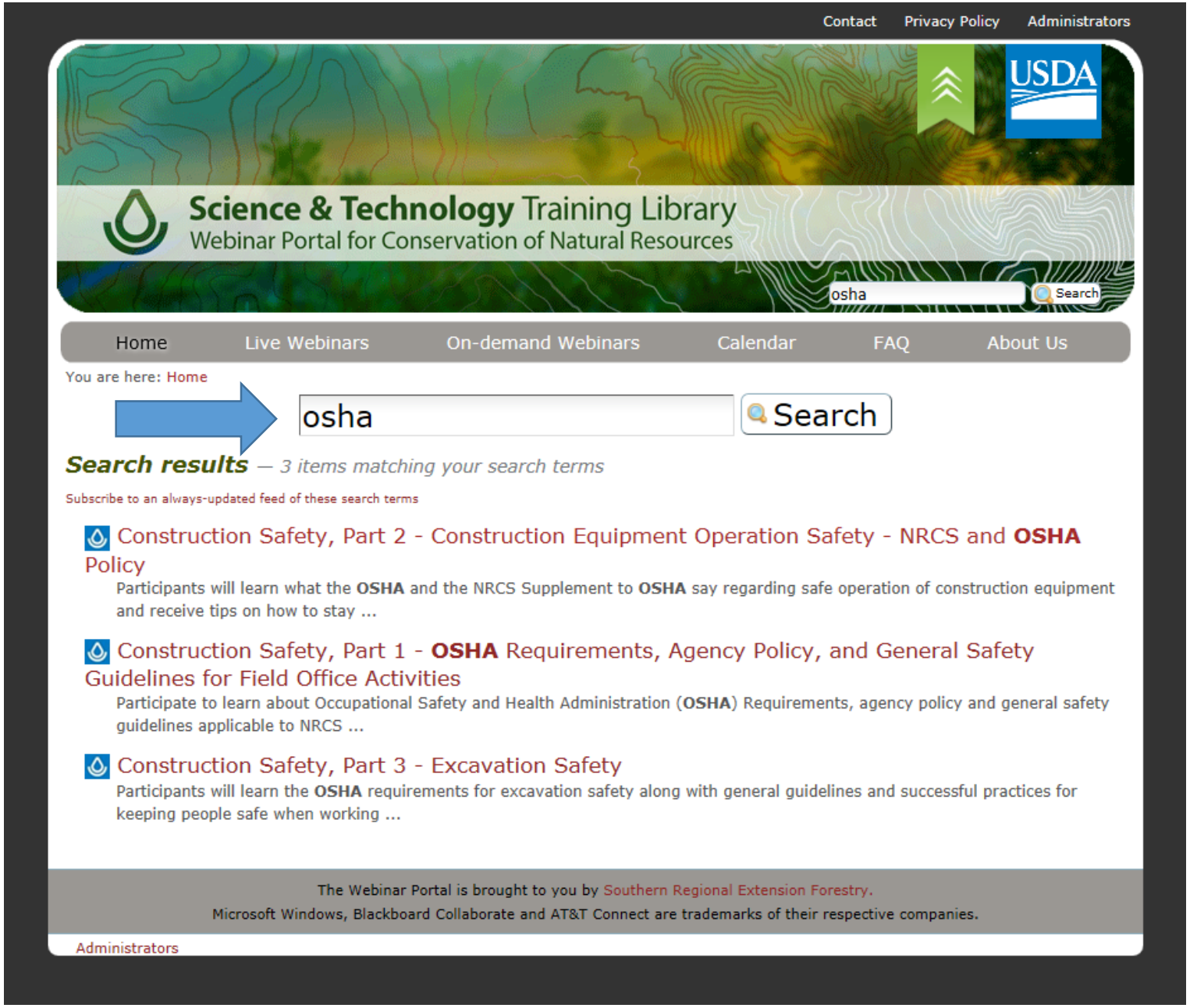

Excavation Safety

- Buried Utilities
- Trench Safety

Buried Utilities Policy, Guidance, and Regulations

- NRCS policy and guidance
  - NEM 503, Subpart A – Engineering Activities Affecting Utilities
  - NEH 645, Chapter 7, Section 1, Part (C)(3) – Buried Utilities
- OSHA regulations
  - Part 1926, Subpart P – Excavations, Standard Number 1926.651

NRCS policy and guidance says we must do the following:

- Check with the land-owner, operator, or sponsoring organization to determine if there are underground utilities known to be in the work area.
- Check for records of known utilities on file in the field office.
- Ensure NRCS–ENG–005 and 006 are completed and filed in the field office or contract file. These are located in NEH 645 Appendix B.

NRCS policy says the landowner, operator, sponsoring organization, or prime contractor must do the following:

- Call the State one-call number to ascertain the presence of utilities.
- Notify the utility owner of the time, place, and type of work to be done.
- Request that the buried utility be located and marked by the utility owner.
- Request that a representative of the utility owner be present during excavation operations.
- Notify the excavation contractor of the location of known utilities.
- Complete, sign, and return the NRCS–ENG–005 to the NRCS.

U.S. Department of Agriculture
Natural Resources Conservation Service

NRCS-ENG-005

U.S. Department of Agriculture
Natural Resources Conservation Service

OFFICIAL BUSINESS
Penalty for Private Use, $300

TO:

Landowner's name	Address
Utility company	Address
Utility representative notified (*Name*)	Title
If Utility notified by letter, date of acknowledgement of receipt	
Utility representative will locate and stake	Yes ☐ No ☐
Utility representative will be present during construction	Yes ☐ No ☐
Contractor notified (*Name & Title*)	Date
Owner—Operator—Sponsor (*Signature*)	Date

U.S. Department of Agriculture
Natural Resources Conservation Service

NRCS-ENG-005

Dear

Because of the great hazard to life and property from the disturbance of utilities by construction or foundation investigation equipment and because the conservation work to be done on land controlled by you is in the vicinity of _____ (UTILITY CO.) _____ (TYPE OF UTILITY),
before work proceeds it is your responsibility to do the following:

1. Notify the utility company of the location and kind of work to be done and the proposed date that work will start.
2. Request that the utility owner assist in locating and staking the utility on-site.
3. Request that a utility company employee be present during construction within the utility right-of-way.
4. Notify contractor of location of utility.
5. Fill out and sign the attached postcard and return to the Natural Resources Conservation Service.

_____
DISTRICT CONSERVATIONIST

U.S. Department of Agriculture
Natural Resources Conservation Service

OFFICIAL BUSINESS

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Natural Resources Conservation Service

NRCS-ENG-006

NEH 645 WS NRCS-ENG-006

UTILITY CHECK SHEET

Farm Name _____ Location _____

Utilities Involved and Location _____

_____

Landowner or operator notified _____ _____
Who By whom

How _____ Date _____

Work to be done _____ When _____

Utility Company Notified _____ _____
Who By whom

How _____ Date _____

Request to locate utility _____

Work to be done _____ When _____

Request for Company representative to be present _____

Utility marked or staked _____ Date _____

Representative present during construction _____

Contractor Notified _____ _____
Who By whom

How _____ Date _____

Type of utility _____ Location _____

Vertical location in relation to work _____

Horizontal location in relation to work _____

Contractor shown markings or stakes _____

Utility location shown on plans _____

Other remarks _____

_____

_____
Signature

OSHA requires the items listed below [OSHA 1926.651(b)]:

- Contact utility owner, advise them of the proposed work, and asked them to establish the location of the underground utility prior to the start of excavation.

- When utility companies or owners cannot respond to a request to locate underground utility installations within 24 hours (unless a longer period is required by state or local law), or cannot establish the exact location of the utility, excavation may proceed with caution provided detection equipment or other acceptable means to locate utility installations are used.

OSHA requires the items listed below [OSHA 1926.651(b)]: (continued)

- When excavation operations approach the estimated location of the underground installations, determine the exact location of the utility by safe and acceptable means.

- While the excavation is open, protect, support or remove underground installations as necessary to safeguard employees.

Trench Safety

- OSHA defines a trench as a narrow excavation (in relation to its length) made below the surface of the ground. In general, the depth is greater than the width, but the width of a trench (measured at the bottom) is not greater than 15 feet.

Dangers of Trenching and Excavation

- Cave-ins, falls, falling loads, hazardous atmospheres, and incidents involving mobile equipment.

- Falling objects such as rock or soil; one cubic yard of soil can weigh as much as a car and cubic foot of soil weighs approximately 100 lbs.

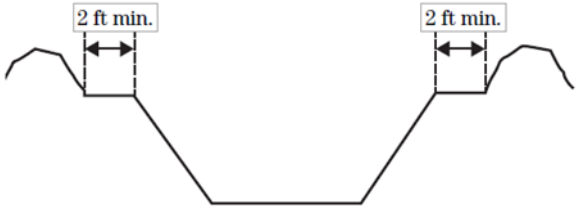
Trench Safety Policy, Guidance, and Regulations

- NRCS policy and guidance
  - NEH 645, Chapter 7, Section 1, Parts (C) (1) & (2) – Buried Utilities
- OSHA regulations
  - Part 1926, Subpart P – Excavations, Standard Number 1926.651

NRCS policy and guidance says we must verify the following:

- Qualifications of equipment operators and the conditions of the excavating equipment comply with safety regulations.
- The contractor's excavation safety plan is re-viewed and discussed with all employees.
- All employees have been informed of what to do in emergency situations.
- Contractor operations comply with OSHA regulations related to excavations.
- Trenching operations are supervised by a competent person.

NRCS policy and guidance says we must verify the following: (continued)

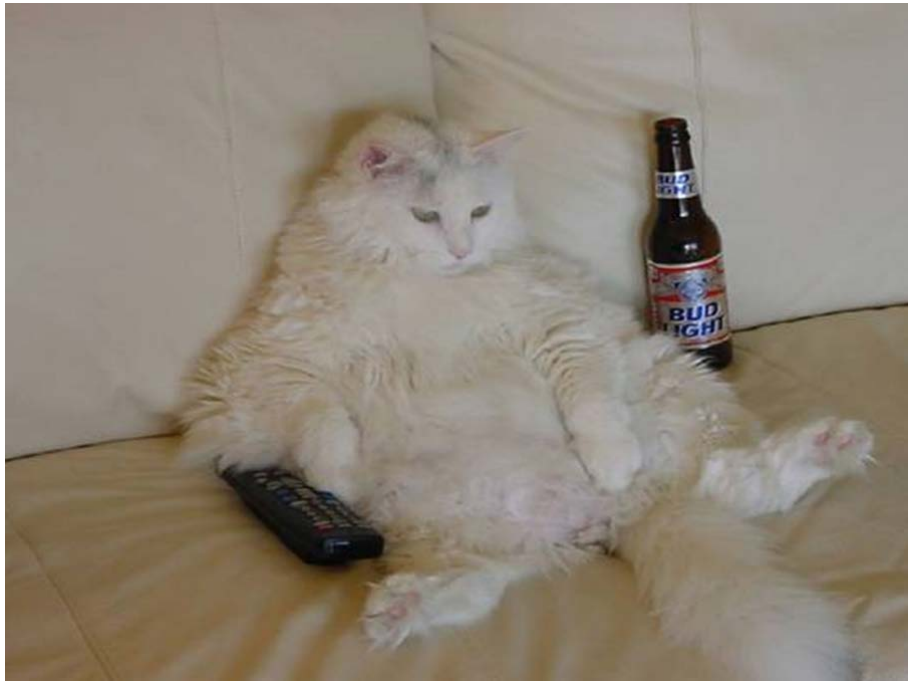


- Spoil materials are placed a safe distance (2 ft. minimum) from top of excavated slopes.
- Confined space air quality is considered where applicable.
- The amount of trench excavated at any one time is limited to no more than can be maintained.
- Shoring, trench boxes, and trench access ladders are installed per OSHA requirements
- Consideration is given to changing soil conditions of moisture and freeze/thaw, surcharge loads, equipment operation, and other conditions that may cause excavations to be unstable.

OSHA Protective System Requirements

- Trenches 5 feet deep or greater require a protective system unless the excavation is made entirely in stable rock. If less than 5 feet deep, a competent person may determine that a protective system is not required.
- Trenches 20 feet deep or greater require that the protective system be designed by a registered professional engineer or be based on tabulated data prepared and/or approved by a registered professional engineer in accordance with 1926.652(b) and (c).

Competent Person



- OSHA defines a competent person as an individual who is capable of identifying existing and predictable hazards or working conditions that are hazardous, unsanitary, or dangerous to workers, soil types and protective systems required, and who is authorized to take prompt corrective measures to eliminate these hazards and conditions.

OSHA access and egress requirements [OSHA 1926.651(c)]:

- OSHA requires safe access and egress to all excavations, including ladders, steps, ramps, or other safe means of exit for employees working in trench excavations 4 feet or deeper.
- These devices must be located within 25 feet of all workers.
- Refer to OSHA Part 1926.651(c)(1)(i) for specific ramp requirements.

OSHA's General Trenching and Excavation Rules

- Keep heavy equipment away from trench edges.
- Identify other sources that might affect trench stability.
- Keep excavated soil (spoil material) and other materials at least 2 feet from trench edges.
- Know where underground utilities are located before digging.
- Test for atmospheric hazards such as low oxygen, hazardous fumes and toxic gases when working in excavations greater than 4 feet deep.

OSHA's General Trenching and Excavation Rules

- Inspect trenches at the start of each shift.
- Inspect trenches following a rainstorm or other water intrusion.
- Do not work under suspended or raised loads and materials.
- Inspect trenches after any occurrence that could have changed conditions in the trench.
- Ensure that personnel wear high visibility or other suitable clothing when exposed to vehicular traffic.

Soil classification categories [OSHA 1926 Subpart P Appendix A]:

- Stable rock can be excavated with vertical sides that remain intact.

Soil classification categories [OSHA 1926 Subpart P Appendix A]:

- Type A includes cohesive soils with a minimum unconfined compressive strength of 1.5 tons per square foot (tsf). Examples include: clay, silty clay, sandy clay, and clay loam. Certain conditions preclude soil from being classified as Type A. For example, no soil is Type A if it is fissured or has been previously disturbed.

Soil classification categories [OSHA 1926 Subpart P Appendix A]: (continued)

- Type B includes cohesive soil with an unconfined compressive strength greater than 0.5 tsf but less than 1.5 tsf and granular cohesionless soils (such as angular gravel, similar to crushed rock, silt, silt loam, sandy loam, and, in some cases, silty clay loam and sandy clay loam).

Soil classification categories [OSHA 1926 Subpart P Appendix A]: (continued)

- Type C includes cohesive soil with an unconfined compressive strength of 0.5 tsf or less, granular soils (including gravel, sand, and loamy sand), submerged soil or soil from which water is freely seeping, submerged rock that is not stable, or material in a sloped, layered system where the layers dip into the excavation or with a slope of four horizontal to one vertical (4H:1V) or steeper.

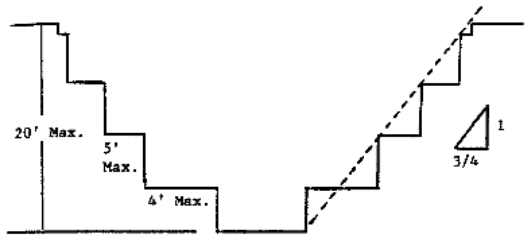
Tests for Unconfined Compressive Strength

- Laboratory testing

- Estimated in the field using a pocket penetrometer or thumb penetration test (ASTM D2488 - Standard Recommended Practice for Description of Soils (Visual - Manual Procedure))

Pocket Penetrometer

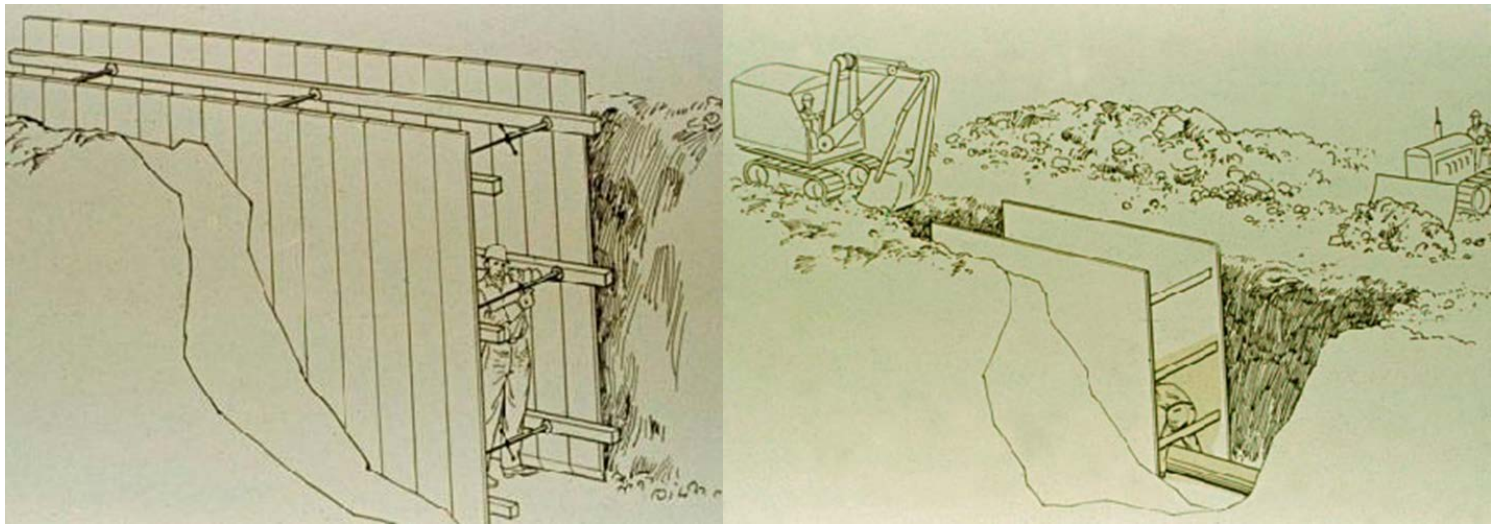
Protective Systems



MULTIPLE BENCH

- Benching means 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. Benching cannot be done in Type C soil.
- Sloping involves cutting back the trench wall at an angle inclined away from the excavation.
- Shoring requires installing hydraulic or other types of supports to prevent soil movement and cave-ins.

Protective Systems (continued)



- Shielding protects workers by using trench boxes or other types of supports to prevent soil cave-ins.
- Designing a protective system can be complex because you must consider many factors: soil classification, depth of cut, water content of soil, changes caused by weather or climate, surcharge loads (e.g., spoil, other materials to be used in the trench) and other operations in the vicinity.

Sloping and benching systems [OSHA 1926.652(b)]:

- Option 1 – Slope sides no steeper than 1.5:1 or excavate to conform to configurations shown in OSHA 1926 Subpart P Appendix B for Type C soil.
- Option 2 - Determine slopes and configurations using Appendices A and B.
- Option 3 – Design using other tabulated data such as tables and charts.
- Option 4 - Design by a registered professional engineer.

OSHA 1926 Subpart P Appendices A & B

- Appendix A describes a method of classifying soil and rock. It contains definitions, sets forth requirements, and describes acceptable visual and manual tests for use in classifying soils.

- Appendix B shows several diagrams of various excavation configurations including simple slopes, benching, various combinations of sloping and benching, and sloping with shoring or a trench box. The soil classifications determined by Appendix A procedures are matched to the applicable configurations.

Shoring and shielding systems [OSHA 1926.652(c)]:

- Must be designed using one of four options:
  - Option 1 – Using appendices A, C and D.
  - Option 2 - Using manufacturer's tabulated data.
  - Option 3 - Using other tabulated data such as tables and charts.
  - Option 4 - Design by a registered professional engineer.

Shoring and shielding systems [OSHA 1926.652(c)]:

- At least one copy of the design must be maintained at the jobsite during construction of the protective system. After that time, the design may be stored off the jobsite, but a copy of the design must be made available to the OSHA upon request.

Vehicular traffic [OSHA 1926.651(d)]:

- Employees exposed to public vehicular traffic must be provided with, and must wear, warning vests or other suitable garments marked with or made of reflectorized or high-visibility material.

Falling loads [OSHA 1926.651(e)]:

- No employee shall be permitted underneath loads handled by lifting or digging equipment.

Warning systems for mobile equipment [OSHA 1926.651(f)]:

- When mobile equipment is operated adjacent to an excavation, or when such equipment is required to approach the edge of an excavation, and the operator does not have a clear and direct view of the edge of the excavation, a warning system must be utilized such as barricades, hand or mechanical signals, or stop logs. If possible, the grade should be away from the excavation.

Hazardous atmospheres [OSHA 1926.651(g)]:

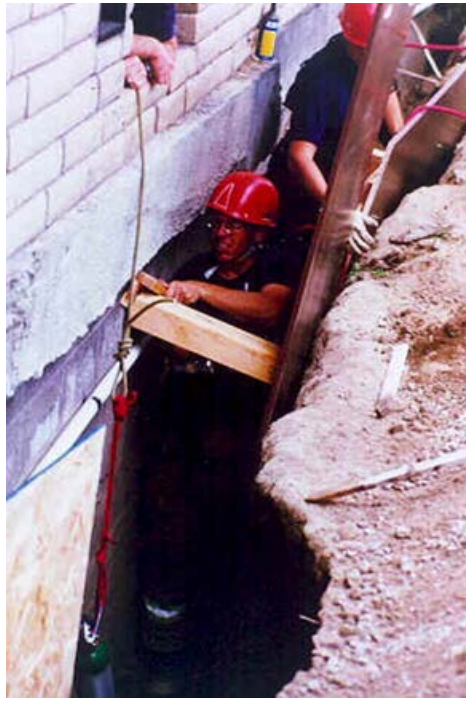
- Test atmospheres in the excavation before employees enter excavations greater than 4 feet in depth if there is a chance the atmosphere is hazardous.
- Provide proper respiratory protection or ventilation if needed.
- Emergency rescue equipment, such as breathing apparatus, a safety harness and line, or a basket stretcher, must be readily available where hazardous atmospheric conditions may exist.
- Employees entering deep and confined footing excavations, must wear a harness with a lifeline securely attached to it.

Water accumulation [OSHA 1926.651(h)]:

- Precautions must be taken to adequately protect employees from hazards associated with water accumulation. These precautions vary with each situation, but could include special support or shield systems to protect from cave-ins, water removal to control the level of accumulating water, or use of a safety harness and lifeline.

Stability of adjacent structures [OSHA 1926.651(i)]:

- Where the stability of adjoining buildings, walls, or other structures is endangered by excavation operations, support systems such as shoring, bracing, or underpinning must be provided to ensure the stability of such structures for the protection of employees.



Protection from loose rock or soil [OSHA 1926.651(j)]:

- Adequate protection must be provided to protect employees from loose rock or soil that could pose a hazard by falling or rolling from an excavation face. Such protection may consist of scaling to remove loose material; installation of protective barricades at intervals as necessary on the face to stop and contain falling material; or other means that provide equivalent protection.

Inspections [OSHA 1926.651(k)]:

- Daily inspections of excavations, the adjacent areas, and protective systems must be made by a competent person.
- An inspection must be conducted by the competent person prior to the start of work and as needed throughout the shift. Inspections must also be made after every rainstorm or other hazard increasing occurrence.
- Inspections are only required when employee exposure can be reasonably anticipated.

Walkways [OSHA 1926.651(l)]:

- Walkways must be provided where employees or equipment are required or permitted to cross over excavations. Guardrails which comply with 1926.502(b) must be provided where walkways are 6 feet or more above lower levels.

Resources

- NRCS policy and guidance on buried utilities and excavation
  - NEM 503, Subpart A – Engineering Activities Affecting Utilities
  - NEH 645, Chapter 7, Section 1, Parts (C) (1) - Excavation Safety & (2) -Trench Excavation
  - NEH 645, Chapter 7, Section 1, Part (C)(3) - Buried Utilities
- NRCS checklists for excavation [NEH 645, Appendix A]
  - NEH 645 CL 4.1 – Construction Safety Checklist, Part 34 – Excavations, Trenching, and Shoring.
  - NEH 645 CL 7.3 – Excavation Inspection Checklist, Part 1 – Safety and Part 2 – Buried Utilities.
- NRCS worksheets [NEH 645, Appendix B]
  - NRCS-ENG-005 – Notification to owner of responsibilities related to buried utilities
  - NRCS-ENG-006 – Utility Check Sheet
- OSHA regulations on buried utilities and excavation
  - OSHA Part 1926, Subpart P – Excavations, Standard Number 1926.651