



City of Montpelier, Vermont
"The Smallest Capital City in the United States"

EXCAVATION AND TRENCHING

Last Updated September 12, 2003

EXCAVATION AND TRENCHING PROGRAM

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Purpose

This program was created to provide our employees with procedures and policies to properly work in and around all excavations to ensure their safety and health. This program was prepared in accordance with OSHA regulation Section 1926.650 Excavations.

Copies of this program shall be available at each excavation site and at the main shop where employees report to work.

Program Administrator

The program administrator is responsible for annual review of the program. Coordination of employee excavation safety training, purchase of equipment and incident review of injuries or illness that involve excavations is the responsibility of the department head.

Employees should refer their questions or comments about this program to the administrator.

The program administrator is

| |
|---|
| Eric Ladd, Public Works Department Supervisor |
|---|

Annual Review

The program shall be evaluated each June to determine the effectiveness of this program.

See evaluation form-page 5

Competent Persons

Only employees receiving competent person training shall be designated as the competent person for a specific excavation. *See appendix for listing.*

The person designated as the *competent person* on an excavation site shall have authority to stop work to correct or eliminate dangerous conditions at the site.

The *competent person* shall be responsible for the following:

1. Inspection of excavation site prior to digging
2. Call DIG SAFE
3. Conduct appropriate soils tests *See soils analysis checklist form-page 8*
4. Inspections of equipment
5. Determine appropriate protection plan
6. Installation of shoring or trench boxes if used
7. Monitor water removal if necessary
8. Test for hazardous atmospheres, if necessary
9. Daily inspections or inspections after changing conditions *See daily trenching log-page 10*
10. Compliance by employees with safety rules
11. Maintain documentation of inspections and tests

Employee Information and Training

In addition to employees with competent person training, any employee working at an excavation site or those who supervise employees working at an excavation site shall receive training as required by Section 1926.650. Training will include:

- a. An overview of Section 1926.651- *See Appendix A- page 15*
- b. Role of competent person at excavation site
- c. The details of this program
- d. Measures employees must use to protect themselves from hazards
- e. Overview on protective systems available to employees and correct installation
- f. Who to contact for more information

Training shall be conducted by a *competent person* as demonstrated by knowledge and experience. *See Appendix*. The name of the trainer, qualifications, training materials used, course content and date of training shall be documented.

See employee training form-page 6

Employees will be given a learning exercise to determine their understanding of the program. New hires and transfers will be trained prior to beginning their duties. Employees who do not receive 100 percent on the learning exercise will review those areas that were answered incorrectly.

See employee learning exercise – page 7

Protective Systems

The person that is designated as the competent person for an excavation site shall determine the appropriate protective system for that excavation site. In addition to sloping, other protective systems available for use are listed in the protective system form.

See protective systems form- page 14

For all excavations 20 feet or deeper, a registered engineer shall design the protective system.

Outside Contractors

The department head shall inform all contractors of the elements of this program. Contractors must also make a copy of their excavation safety program available to the program administrator. Contractors who fail to follow the program requirements will be asked to leave the premises. Contractors with an insufficient program will not be allowed to begin work until their program meets or exceeds the requirements of this program.

Violation of Excavation Safety Program

Employees who violate the excavation safety procedures will be disciplined according to the personnel policy. Employees will also be required to attend retraining on the procedures or policies that were violated.

Annual Program Evaluation

Program Name:

Excavation & Trenching

Evaluation Date:

| |
|--|
| |
|--|

Evaluation Team:

| Name | Title | Department |
|------|-------|------------|
| | | |
| | | |
| | | |

List injuries, exposures or near misses attributable to failure of program or failure to follow program:

Recommendations for additions to procedures/policies/equipment with explanation for each:

Recommendations for deletions of procedures/policies/equipment with explanation for each:

Recommendations for modifications to procedures/policies/equipment with explanation for each:

Description and date of actual modifications made:

**Excavation Safety Employee training
for**

City of Montpelier

Instructor's Name: Date:

Address:

Qualifications:

Course Outline:

List of employees receiving training

Employee Name

Signature

| <i>Employee Name</i> | <i>Signature</i> |
|----------------------|------------------|
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |

Instructor's Signature

Employee Learning Exercise For Excavation Safety

Employee: _____ Signature: _____

Score:

Date: _____

1. True False Vibrations from traffic 20 feet away will never affect an excavation.
2. True False Spoil piles shall be at least two feet from the excavation.
3. True False A competent person must stop work if he/she feels a hazard exist.
4. True False Hazardous atmospheres are not a problem in trenches.
5. True False Employees can never work in a trench with accumulating water.
6. True False Type C soil is a cohesive soil with uncompressed strength of .5 tons per square foot (tsf) or less.
7. True False Only a professional engineer can design a protection system for excavations 20 feet or deeper.
8. True False Type C soils require a maximum slope of 1:1.
9. True False Sloping and shoring should not be used together.
10. True False Plywood can be a structural part of the shoring system.
11. True False When vertical shores are used, there shall be a minimum of three shores spaced equally, horizontally, in a group.
12. True False It is the employees' duty to locate and mark underground utilities at an excavation site.
13. True False Trenches only need to be inspected once a day.
14. True False Utility poles may be surface encumbrances.
15. True False Rock is always a Type A soil.
16. True False Only a visual soil test must be done to determine the soil type.
17. True False 100 to 400 people are killed each year by cave-ins.
18. True False A cubic yard of dirt can weigh 3,000 pounds.
19. True False Trenches four feet deep or more must be provided with a means of egress.
20. True False Hard hats are optional in the trench.

SOILS ANALYSIS CHECKLIST

This checklist must be completed when soil analysis is made to determine the soil type(s) present in the excavation. A separate analysis must be performed if the excavation (trench) is stretched over a distance where soil type changes.

| | | |
|---|--------------------------|---------------------------|
| SITE LOCATION: | | |
| DATE: | TIME: | COMPETENT PERSON: |
| WHERE WAS THE SAMPLE TAKEN FROM: | | |
| EXCAVATION DEPTH: | EXCAVATION WIDTH: | EXCAVATION LENGTH: |

| VISUAL TEST | |
|--|--|
| Particle type: | Fine grained (cohesive) _____ Granular (sand/silt or gravel) _____ |
| Water conditions: | Wet _____ Dry _____ Seeping Water _____ Surface water present _____ Submerged _____ |
| Previously disturbed soils: | Yes _____ No _____ |
| Underground utilities: | Yes _____ No _____ If yes, what type? |
| Layered soils? Note: The least stable layer controls soil type. | Yes _____ No _____ |
| Layered soils dipping into excavation: | Yes _____ No _____ Unknown _____ |
| Excavation exposed to vibrations: | Yes _____ No _____ If yes, from what? |
| Crack like openings or spalling observed: | Yes _____ No _____ |
| Conditions that may create a hazardous atmosphere: | Yes _____ No _____ If yes, identify condition and source: |
| Surface encumbrances: | Yes _____ No _____ If yes, what type? |
| Work to be performed near public vehicular traffic: | Yes _____ No _____ |
| Possible confined space exposure: | Yes _____ No _____ |

Soils Analysis Checklist (continued)

| MANUAL TEST | |
|---------------|--|
| Plasticity: | Cohesive _____ Noncohesive _____ |
| Dry strength: | Granular (crumble easily) _____ Cohesive (broken with difficulty) _____ |
| Wet shake: | Water comes to surface (granular material) _____ Surface remains dry (clay material) _____ |

NOTE: The following unconfined compressive strength tests should be performed on undisturbed soils.

Thumb Test used to estimate unconfined compressive strength of cohesive soil:

| | |
|--|---|
| Test performed: | Yes _____ No _____ |
| _____ | Type A – soil indented by thumb with very great effort. |
| _____ | Type B – soil indented by thumb with some effort. |
| _____ | Type C – soil easily penetrated several inches by thumb with little or no effort. |
| If soil is submerged, seeping water, subjected to surface water, runoff, exposed to wetting. | |

Penetrometer or Shearvane used to estimate unconfined compressive strength of cohesive soils:

| | | |
|--|--|--------------|
| Test performed: | Yes _____ No _____ | Device used: |
| _____ | Type A – soil with unconfined compressive strength of 1.5 tsf or greater. | |
| _____ | Type B – soil with unconfined compressive strength greater than 0.5 tsf and less than 1.5 tsf. | |
| _____ | Type C – soil with unconfined compressive strength of 0.5 tsf or less. | |
| If soil is submerged, seeping water, subjected to surface water, runoff, exposed to wetting. | | |

NOTE: Type A – no soil is type A if soil is fissured, subject to vibration, previously disturbed, layered dipping into excavation on a slope of 4H:1V.

| SOIL CLASSIFICATION | | | |
|---------------------|--------------|--------------|--------------|
| Stable Rock _____ | Type A _____ | Type B _____ | Type C _____ |

| SELECTION OF PROTECTIVE SYSTEM (Appendix F) | |
|---|--|
| Protective System: | _____ Sloping (Appendix B) Specify angle _____ |
| | _____ Timber shoring (Appendix C) |
| | _____ Aluminum hydraulic shoring (Appendix D) |
| | _____ Trench shield Maximum depth in this soil _____ |

DAILY TRENCHING LOG

| | |
|----------|------------|
| DATE: | SIGNATURE: |
| WEATHER: | PROJECT: |

| |
|---|
| Was DIG SAFE System contacted: Yes _____ No _____ |
| Protective system: Trench shield (box) _____ Wood shoring _____ Sloping _____ Other _____ |
| Purpose of trenching: Drainage _____ Water _____ Sewer _____ Gas _____ Other _____ |
| Were visual soil test made: Yes _____ No _____ |
| If yes, what type? |
| Were manual soil tests made: Yes _____ No _____ |
| If yes, what type? |
| Type of soil: Stable Rock _____ Type A _____ Type B _____ Type C _____ |
| Surface encumbrances: Yes _____ No _____ |
| If yes, what type? |
| Water conditions: Wet _____ Dry _____ Submerged _____ |
| Hazardous atmosphere exists: Yes _____ No _____ |
| (If yes, follow confined space entry procedures, complete Confined Space Entry Permit, monitor for toxic gas) |
| Is trenching or excavation exposed to public vehicular traffic (exhaust emission): Yes _____ No _____ |
| (If yes, refer to confined space entry procedures, complete Confined Space Entry Permit, monitor for toxic gas) |
| Measurements of trench: Depth _____ Length _____ Width _____ |
| Is ladder within 25 feet of all workers: Yes _____ No _____ |
| Is excavated material stored two feet or more from edge of excavation: Yes _____ No _____ |
| Are employees exposed to public vehicular traffic: Yes _____ No _____ |
| (If yes, warning vests required) |
| Are other utilities protected: Yes _____ No _____ |
| (Water, sewer, gas, or other structures) |
| Are sewer or natural gas lines exposed: Yes _____ No _____ |
| (If yes, refer to confined space entry procedures policy, complete Confined Space Entry permit, monitor for toxic gas) |
| Periodic inspection: Yes _____ No _____ Last (date) _____ |
| Have all employees on-site received training in excavating: Yes _____ No _____ |

EXCAVATION CHECKLIST

(To be completed by a “Competent Person”)

| | | |
|--|--------------------------|--------------------------|
| SITE LOCATION: | | |
| DATE: | TIME: | COMPETENT PERSON: |
| SOIL TYPE (See attached form:) | | |
| SOIL CLASSIFICATION: | EXCAVATION DEPTH: | EXCAVATION WIDTH: |
| TYPE OF PROTECTIVE SYSTEM USED: | | |

(Indicate for each item: YES -- NO -- or N/A for not applicable)

| | |
|---|--|
| 1.) General inspection of job site: | |
| A. Excavations, adjacent areas, and protective systems inspected by a competent person daily Prior to the start of work. | |
| B. Competent person has the authority to remove employees from the excavation immediately. | |
| C. Surface encumbrances removed or supported. | |
| D. Employees protected from loose rock or soil that could pose a hazard by falling or rolling into the excavation. | |
| E. Hard hats worn by all employees. | |
| F. Spoils, materials, and equipment set back at least two feet from the edge of the excavation. | |
| G. Barriers provided at all remotely located excavations, wells, pits, shafts, etc. | |
| H. Walkways and bridges over excavations four feet or more in depth are equipped with standard guardrails and toeboards. | |
| I. Warning vests or other highly visible clothing provided and worn by all employees exposed to public vehicular traffic. | |
| J. Employees required to stand away from vehicles being loaded or unloaded. | |
| K. Warning system established and utilized when mobile equipment is operating near the edge of the excavation. | |
| L. Employees prohibited from going under suspended loads. | |
| M. Employees prohibited from working on the faces of sloped or benched excavations above other employees. | |
| 2.) Utilities: | |
| A. Utility companies contacted and/or utilities located. | |
| B. Exact location of utilities marked. | |
| C. Underground installations protected, supported, or removed when excavation is open. | |

EXCAVATION CHECKLIST(cont.)

| | |
|---|--|
| 3.) Means of Access and Egress: | |
| A. Lateral travel to means of egress no greater than 25 feet in excavations four feet or more in depth. | |
| B. Ladders used in excavations secured and extended three feet above the edge of the trench. | |
| C. Structural ramps used by employees designed by a competent person. | |
| D. Structural ramps used for equipment designed by a registered professional engineer. | |
| E. Ramps constructed of materials of uniform thickness, cleated together on the bottom, equipped with no-slip surface. | |
| F. Employees protected from cave-ins when entering or exiting the excavation. | |
| 4.) Wet Conditions: | |
| A. Precautions taken to protect employees from the accumulation of water. | |
| B. Water removal equipment monitored by a competent person. | |
| C. Surface water or runoff diverted or controlled to prevent accumulation in the excavation. | |
| D. Inspections made after every rainstorm or other hazard increasing occurrence. | |
| 5.) Hazardous Atmosphere: | |
| A. Atmosphere within the excavation tested where there is a reasonable possibility of an oxygen deficiency, combustible, or other harmful contaminant exposing employees to a hazard. | |
| B. Adequate precautions taken to protect employees from exposure to an atmosphere containing less than 19.5 percent oxygen and/or to other hazardous atmosphere. | |
| C. Ventilation provided to prevent employee exposure to an atmosphere containing flammable gas in excess of 10 percent of the lower explosive limit of the gas. | |
| D. Testing conducted often to ensure that the atmosphere remains safe. | |
| E. Emergency equipment, such as breathing apparatus, safety harness and lifeline, and/or basket stretcher readily available where hazardous atmospheres could or actually do exist. | |
| F. Employees trained to use personal protective and other rescue equipment. | |
| G. Safety harness and lifeline used and individually attended when entering bell bottom or other deep confined excavations. | |
| 6.) Support Systems: | |
| A. Materials and/or equipment for support systems selected based on all analysis, trench depth, and expected loads. | |
| B. Materials and equipment used for protective systems inspected and in good condition. | |
| C. Materials and equipment not in good condition have been removed from service. | |
| D. Damaged materials and equipment used for protective systems inspected by a registered professional engineer after repairs and before being placed back into service. | |
| E. Protective systems installed without exposing employees to the hazards of cave-ins, collapses, or threat of being struck by materials or equipment. | |
| F. Members of support system securely fastened to prevent failure. | |
| G. Support systems provided to ensure stability of adjacent structures, buildings, roadways, sidewalks, walls, etc. | |

EXCAVATION CHECKLIST(cont.)

| | |
|---|--|
| H. Excavations below the level of the base or footing supported, approved by an RPE. | |
| I. Removal of support systems progresses from the bottom and members are released slowly as to note any indication of possible failure. | |
| J. Backfilling progresses with removal of support system. | |
| K. Excavation of material to a level no greater than two feet below the bottom of the support system and only if the system is designed to support the loads calculated for the full depth. | |
| L. Shield system placed to prevent lateral movement. | |
| M. Employees are prohibited from remaining in shield system during vertical movement | |

Protective Systems

Department:

Report equipment problems to:

For excavations, the following equipment is available:

Trench Box:

Description:

Limits or Rating:

Shoring:

Description:

Limits or Rating:

Other Equipment:

- Barricades
- Fencing
- Two appropriate ladders
- Water pump and hose

Equipment shall be inspected prior to and after use. Broken or malfunctioning equipment must be immediately reported.

Appendix A

The following employees have received competent person training:

| Name | Department | Date of Appointment |
|------|------------|---------------------|
| | | |
| | | |
| | | |
| | | |
| | | |

Copies of Competent Person Training will be included as an appendix to this program.

To view and download the Section 1926.650 Excavations regulations from the OSHA web site, click on the following link:

http://www.osha-slc.gov/OshStd_data/1926_650.html

Print out a copy of the standard and mandatory appendices to include with your program.

APPENDIX B

**Employee Learning Exercise
For
Excavation Safety**

Employee: _____ Signature: _____

Score:

Date: _____

1. True False Vibrations from traffic 20 feet away will never affect an excavation.
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