

## EXCAVATIONS

### A. BEFORE EXCAVATION BEGINS

1. A Dig Safe must be obtained before any excavation below one foot is made. Vermont Dig Safe has 48 hours to respond to an emergency call. If utilities fail to respond in the prescribed time, or if they cannot find the exact location of the utilities, excavation may proceed with caution. Use locating personnel if needed. The Company also has insulated protective gloves. If questions exist about locations of underground power lines, persons involved in jack hammering, picking etc. should have these on.
2. Survey the job zone and determine if there are any other utilities or hazards that are not covered by Dig Safe. (ie. private lines, water, sewer, lighting circuits, etc.) The Company has locating equipment on hand and you can call in company locating personnel if necessary.
3. Remove or support all objects in the excavation area that could create a hazard to public or employees. (ie., trees, rocks, sidewalk, etc.)
4. Before excavation begins, a competent person must be designated to take charge of excavation operations and protective systems.
5. Before excavation begins the entire area of work must be secured. If working in or near the roadways, men working signs and adequate traffic control must be in place. (ie., signs, cones, barricades, barriers, lighted signs, etc.). All personnel must have their basic protective equipment including hard hats (on head) and safety glasses (when needed). All persons working in the road or in traffic must wear a safety vest. Keep safety in mind at all times for both workers and the public.
6. Formulate an initial job plan before beginning work. Some things to keep in mind: Protective systems to be used, nearness of structures and their conditions, soil conditions, surface and ground water, utilities above and below ground, weather, and time of day.
7. All employees shall be familiar with the OSHA Standard Excavation Handbook which contains the basic information needed for most operations. These booklets are available in the office. More in depth publications are also available in the office including the actual OSHA Standards. Portions of the standard are attached to this document. Any questions that cannot be clearly answered must be directed to your supervisor or safety director.

## A. BEFORE EXCAVATION BEGINS (Cont.)

8. Make sure all employees are qualified for their assigned duties. Brief all employees on the excavation plan, protective systems to be used, all posed or potential hazards involved with the job, and any other specific information that is pertinent.

## B. DURING EXCAVATION

1. The competent person must inspect the excavation daily, and continually evaluate conditions during the course of the job. Examples of things to monitor are as follows.
  - a. Traffic conditions and site protection
  - b. Weather
  - c. Employee Conduct
  - d. Nearness of structures and their conditions
  - e. Soil Conditions
  - f. Water table and surface water
  - g. Protective system condition and OSHA compliance
  - h. Any other unforeseen problems/hazards

The competent person is responsible for the safety of employees and the public at the site as well as VOSHA/OSHA compliance.

2. Walls and faces of excavations 5 FEET OR MORE IN DEPTH, and ALL excavations in which employees are exposed to POTENTIAL CAVE IN, MUST BE GUARDED by appropriate SHIELDING, SHORING, OR SLOPING. No employee may enter an unsafe or unprotected excavation at any time. The only time a protective system is not needed is when the excavation is made entirely in stable rock, or the excavation is less than 5 feet in depth with No indication of potential cave in.
3. An adequate means of Access and Egress must be provided in any excavation 4 feet or more in depth. This can be in the form of ladders, stairs, or ramps, and must conform to the following:
  - a. Safe means of access and egress (exit) must be placed as to require no more than 25 feet of lateral travel for employees in the excavation.
  - b. Ladder or handrail must extend at least 3 feet above landing.
  - c. Ladders must be retrained from sliding and or tipping.
  - d. Guard rails must be provided for walkways or bridges crossing over an excavation, where a fall of 6 feet or more could result.

4. Any break above 19 inches must be sloped or stepped for employees to safely get out.
5. Spoil piles must be set back at least 2 feet from the edge of any excavation. Maintain spoil piles so that objects will not readily roll off and hit employees or public.
6. No excavation is allowed more than 2 feet below the bottom of a trench box or shoring.
7. Wet conditions in any excavation must be controlled. Use of crushed stone and pumps should be standard practice for wet situations.
8. Employees must **NEVER** be permitted under loads that are handled by lifting/excavating equipment.
9. Employees working below others must be adequately protected from falling objects and/or debris.
10. While excavation is open, underground installations must be protected, supported, or removed as necessary to safeguard employees. Adjacent structures must be evaluated and supported if necessary to avoid possible collapse. Special care must be taken when digging next to existing duct banks, foundations, and pipelines. A professional engineer can determine soundness of walls etc. Never dig below footings or structures without underpinning or bracing. If any question exists contact the office.
11. Whenever a hazardous atmosphere exists or could possibly exist, have it tested by certified personnel to determine the problem and severity. Under no circumstances will an employee enter an excavation where a hazardous atmosphere exists without proper training and equipment. All excavation below 4 feet where a hazardous atmosphere exists must be treated as a confined space with a hazardous atmosphere. Follow procedures.
12. Soil Classification: Application and use of protective systems depends on soil classification. All soil and rock deposits at the excavation site may be classified as Stable Rock, Type A Soil, Type B Soil, or Type C Soil. Soil type can be determined by Competent Persons Only. The Company will treat all soils as Type C unless specific testing is done by the competent person to classify otherwise.

## SOIL CLASSIFICATION (Copied from Excavation Handbook)

Each soil and rock deposit at an excavation site must be classified by a competent person as stable rock, Type A, Type B, or Type C soil.

Stable rock refers to natural solid mineral mater which can be excavated with vertical sides and remain intact while exposed.

Type A soil is cohesive with an unconfined compressive strength of 1.5 tons per square foot (tsf). Type A soils include clay, silty clay, sandy clay, clay loam, caliche, hardpan, and sometimes silty clay loam and sandy clay loam. No soil should be classified as Type A if it is fissured; subject to vibration from traffic, pile driving, or similar effects; previously disturbed; or part of a sloped, layered system where the slope is four horizontal to one vertical or greater.

Type B soil is cohesive soil with an unconfined compressive strength greater than .5 tsf but less than 1.5 tsf. Type B soils include granular cohesion less soils like angular gravel, silt, silt loam, sandy loam and sometimes silty clay loam and sandy clay loam; previously disturbed soils that are not Type C; fissured soils and soils subject to vibration that would otherwise be classified as Type A; dry rock that is not stable; and material that is part of a sloped, layered system where the layers dip on a slope less steep than four horizontal to one vertical.

Type C soil is cohesive soil with an unconfined compressive strength of .5 tsf or less. Type C soils include granular soils such as gravel, sand, and loamy sand; submerged soil; soil from which water is freely seeping; submerged rock that is not stable; or material in a sloped, layered system.

### 13. SLOPING AND BENCHING

Refer to your OSHA Excavating Standard Handbook and the attached diagrams, tables, and information for specific in depth information on sloping and benching.

Basic information on sloping is as follows:

- a. The degree of sloping and benching depends on soil type and conditions.

#### MAXIMUM ALLOWABLE SLOPES

| Soil or Rock Type | Maximum Allowable Slopes (Horizontal & Vertical)<br><u>(for excavations less than 20' deep)</u> |
|-------------------|---|
| Stable Rock       | Vertical (90°)  |
| Type A            | 3/4 : 1 (53°)   |
| Type B            | 1:1 (45°)   |
| Type C            | 1 ½: 1 (34°)  |
| Loose Sand        | 2:1 (26°)   |

Further information on special cases can be found in the attached literature and in the Excavation Handbook. (ie., for short term excavations, some special cases exist where the degree of sloping can be reduced).

- b. Sloping and benching for excavations greater than 20' deep must be designed and approved by a registered professional engineer.
- c. Whenever sloping and benching cannot be done according to spec. approved shoring must be used. (ie., Trench Box, Hydraulic Shoring, Timber Shoring).

14. Hydraulic Shoring, Timber Shoring, and Trench Boxes:

Whenever digging below 5 feet any vertical sides must be shielded or supported to a height at least 18 inches above the top of the vertical sides. From 18 inches below the top of the shoring and up, the excavation must be sloped outwards according to soil type, The Company will assume type C soil unless otherwise directed. This gives a slope of 1 vertical on 1 ½ horizontal. For excavations less than 5 feet shoring and sloping must

Be used if there is an indication of potential cave-in.

a. Aluminum Hydraulic Shoring:

The aluminum hydraulic shoring should be used according to the manufacturers' tabulated data and guide. As with other shoring techniques the design and use of hydraulic shoring is dependent on soil type, depth of cut, and site specific conditions. Deviations from the manufacturer's specifications, recommendations, or limitations are only allowed upon written approval of the manufacturer. This written approval must be kept at the job site during construction of the protective system. If the manufacturer's data cannot be used refer to the OSHA specs and tables for Aluminum Hydraulic Shoring attached to this document. Other design options include other tabulated data approved by a registered P.E. or having a registered P.E. design the system.

b. Timber Shoring:

Designs for Timber Shoring can be determined using one of 4 methods.

1. OSHA tables found in appendixes A & C of the standard 3 of these tables are also found in the OSHA Excavation Standard Handbook.
2. Manufacturer Data for Shoring Panels.
3. Tabulated Data approved by a P.E.
4. Registered P.E. Design of System.

OSHA tables refer to actual dimensions of lumber. To use nominal size lumber dimensions, refer to additional tables in appendix C of the OSHA Standard.

Remember, all OSHA Tables for shoring are dependent on soil type.

## **TRENCH BOXES**

1. Trench boxes must be used in accordance with manufacturer specs and instructions. This information must be kept with the box at all times and includes:
  - a. Box specifications and Identification
  - b. Limitations in use and special instructions
  - c. Box maximum depth according to soil types
  - d. Certification stamp by P.E. Any changes or modifications to the box must be certified by a P.E. and a copy of this certification must be kept with the box at all times.
  
2. The following rules have already been stated in depth. These rules are the simplest most basic rules concerning trenching and are thus re-stated in simple form.
  - a. **Never** go in an unsafe hole
  - b. **Never** dig more than 2 feet below the box or shoring
  - c. **Always** keep spoils piled at least 2 feet from trench
  - d. **Always** maintain 18 inches minimum freeboard for any shoring
  - e. **Always** use stone and pumps to control water in the hole
  - f. **Always** tie off your ladder and make sure it extends 3 feet above landing.
  - g. **Always** follow OSHA rules for sloping/benching above box
  - h. **Always** wear your hard hat and personal protection where needed
  - i. **Never** use box without certification.