

Protective Systems

Protective systems are required in excavations 5 feet or more in depth. They are also required in excavations less than 5 feet in depth, when there is an indication of a potential cave-in.

Protective systems for excavations over 20 feet in depth must be designed by a registered professional engineer.

Types of protection systems include:

- Sloping
- Benching
- Shoring (including aluminum hydraulic/pneumatic, timber, soldier piles and lagging, soldier piers, pressure/chemical grouting, soil nails and Shotcrete, plate/beam system, and slide rail system)
- Shielding (mainly trench boxes)

Companies must select and construct protective systems in accordance with the requirements set forth in:

- OSHA Appendix A, B, C, and D
 - Appendix A – Soil Classification
 - Appendix B – Sloping and Benching
 - Appendix C – Timber Shoring for Trenches
 - Appendix D – Aluminum Hydraulic Shoring for Trenches
- Manufacturer’s tabulated data
- Designs using other tabulated data
- Designs by a registered professional engineer

Sloping and Benching

The maximum allowable slopes for each soil type are specified below:

- Stable rock – Vertical (90°)
- Type A – ¾: 1 (53°)
- Type B – 1: 1 (45°)
- Type C – 1 ½: 1 (34°)

Important rules to follow when sloping and benching include:

- Benching can only be performed in Type A, B, or cohesive soils
- Multiple benching requires the first bench to have a greater width

Signature of Employees in Attendance:

DATE:

Aluminum Hydraulic Shoring

Although the exact requirements for aluminum hydraulic shoring might differ depending on its design, the following rules typically apply:

- The vertical spacing from the top edge of the excavation to the centerline of the first shore must be no more than 18-24 inches
- The vertical spacing from the centerline of the top shore and centerline of the bottom shore must be no more than 4 feet
- Shoring rails must not be elevated more than 2 feet from the base of the excavation, assuming the shoring is rated for the full depth and there are no signs of weakness

Trench Boxes

Although the exact requirements for shielding (trench boxes) might differ depending on its design, the following rules typically apply:

- Trench boxes must extend 18 inches above the toe of the slope when there are sloped upper portions over vertical lower portions
- Trench boxes can be level with the grade when the trench has vertical walls without a sloped upper portion
- The bottom of the trench box can be elevated 2 feet above the bottom of the trench, if there are no signs of weakness or underpinning and the box is rated for a capacity equal to or great than the total depth of the trench
- Trench boxes can be stacked to work in deeper excavations
- Employees shall not be inside a trench box being moved horizontally or when trench boxes are being installed, removed, or moved vertically
- Employees shall be protected from cave-in hazards when entering and exiting trench boxes

The following precautions must be taken when installing and removing protective systems:

- Tabulated data accompanying a protective system shall be maintained at the jobsite during construction of that system
- Members must be securely connected together to prevent sliding, falling, kickouts, or other failures
- Systems shall be installed and removed in a manner that protects employees from cave-ins, structural collapses, or from being struck by members of the support system
- Support systems and rigging equipment that is used to lift them must be inspected before use
- Proper rigging procedures shall be followed and employees shall stay clear of swinging or elevated loads
- Removal of shoring systems shall begin at the bottom of the excavation. Members shall be release slowly so as to note any indication of possible failure
- Backfilling shall progress with the removal of support systems

Signature of Employees in Attendance:

DATE:

Photos to include in presentation:



Photo of deep excavation without protective system

Signature of Employees in Attendance:

DATE:

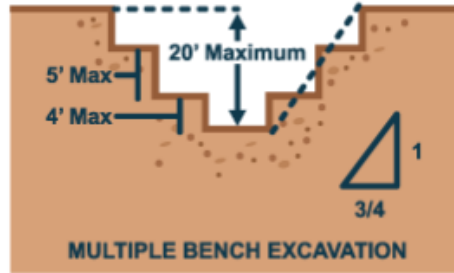
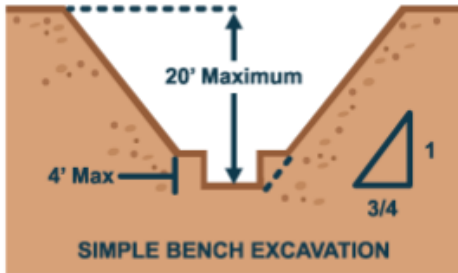


Photos of a deep unprotected trench and a trench with a collapsed wall of soil

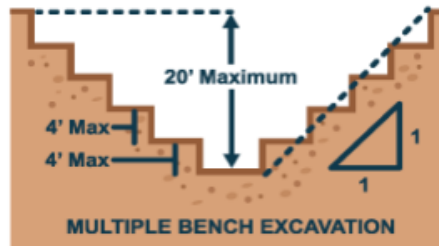
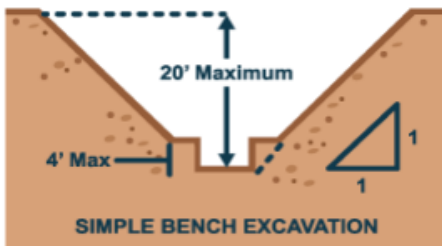
Signature of Employees in Attendance:

DATE:

TYPE A SOIL BENCHING

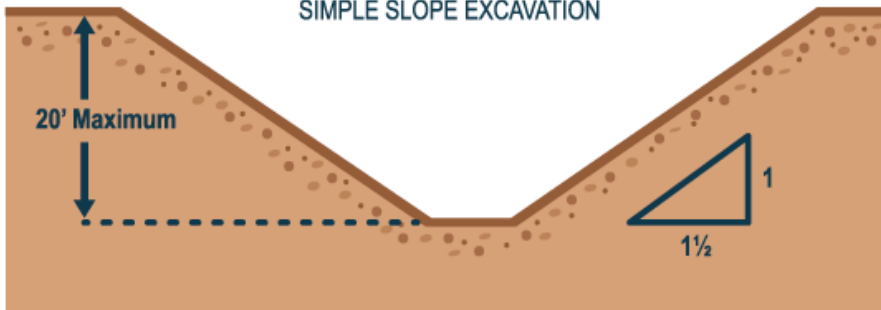


TYPE B SOIL BENCHING



TYPE C SOIL

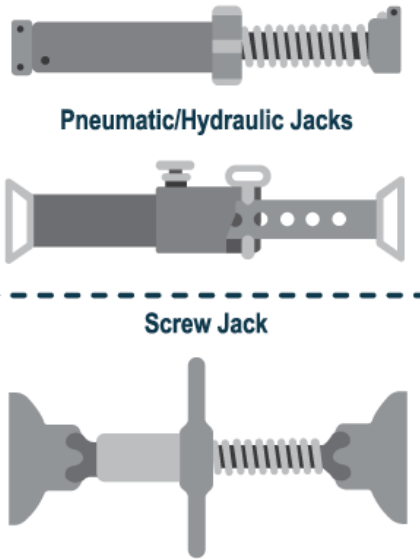
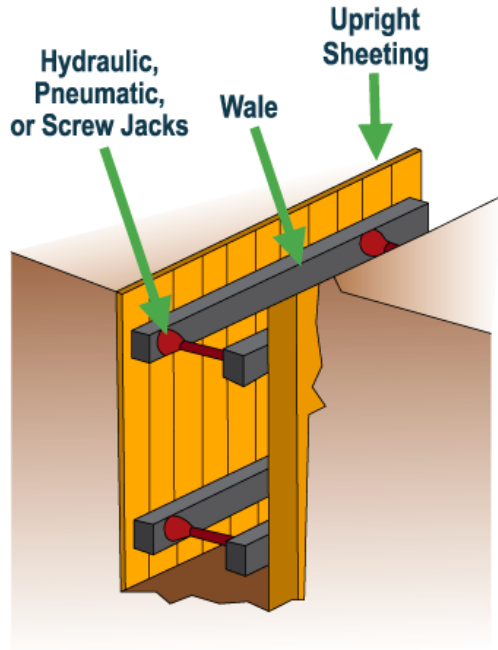
SIMPLE SLOPE EXCAVATION



Signature of Employees in Attendance:

DATE:

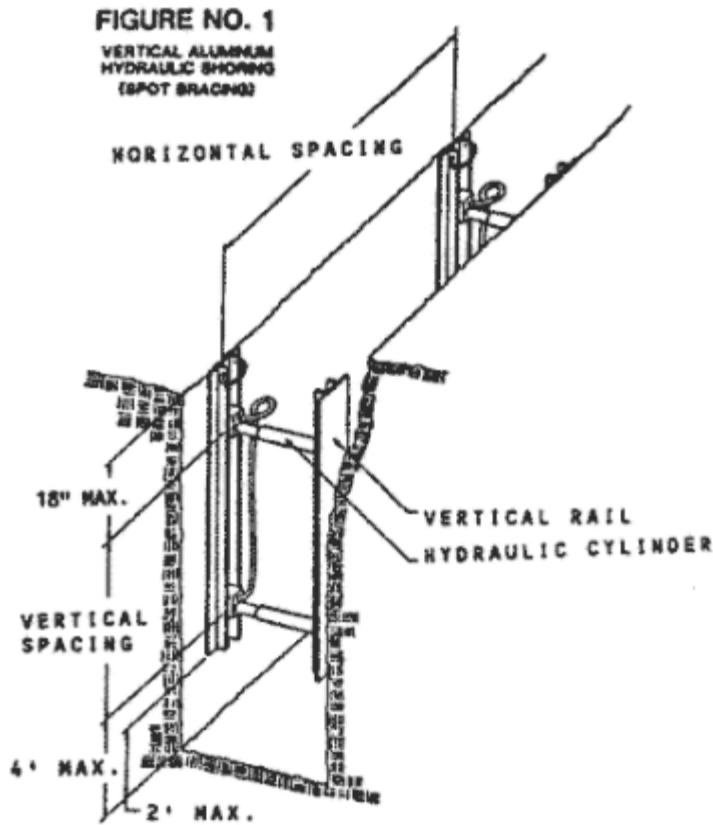
SHORING VARIATIONS



Example of shoring with waler system

Signature of Employees in Attendance:

DATE:



Example of the simplest form of shoring without plywood sheets or walers

Signature of Employees in Attendance:

DATE:



Photo showing the allowable gap between the bottom of the trench box and trench bottom

Signature of Employees in Attendance:


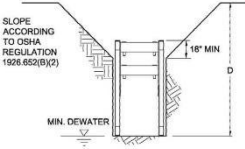

DATE:



Photo showing a trench box without soil backfilled against the sides of the box

Signature of Employees in Attendance:

DATE:

 <p>SBH NORTH AMERICA P.O. BOX 750963 Houston, TX 77275 Phone: (713) 672-0252 Fax: (713) 672-4455</p>	<p>8 x 12 TRENCH SHIELD MANUFACTURER'S TABULATED DATA</p>									
<p>MODEL NUMBER: DW40812 SERIAL NUMBER: 1102001 PRESSURE CAPACITY: 1400 PSF SPREADER SIZE: 8" SCH. 80 PIPE</p>	<p>SHIELD HEIGHT: 8 ft SHIELD LENGTH: 12 ft SHIELD THICKNESS: 4 in MAX. SPREADER LENGTH: 18 ft</p>									
<p>SPECIFICATIONS FOR USE</p> <ol style="list-style-type: none"> 1. ALL EXCAVATIONS SHALL BE IN ACCORDANCE WITH OSHA CFR 29, PART 1926, SUBPART P. 2. SOIL SHALL BE CLASSIFIED IN ACCORDANCE WITH OSHA APPENDIX A BY A COMPETENT PERSON, OR BY A REGISTERED CIVIL ENGINEER PRIOR TO INSTALLING THE EQUIPMENT. 3. CONTRACTOR IS RESPONSIBLE FOR ENSURING CONSTRUCTION MATERIALS AND EQUIPMENT SURCHARGE DOES NOT EXCEED 72 PSF ON SHORING SHIELDS, OTHERWISE CERTIFIED DEPTHS ARE INVALID. 4. BOTTOM OF SHIELD MUST NOT BE MORE THAN TWO FEET ABOVE THE TRENCH BOTTOM PER FEDERAL OSHA 29 CFR PART 1926.652(G)(2). 5. THIS TABULATED DATA IS A GENERAL SET OF GUIDELINES & CHARTS TO ASSIST THE COMPETENT PERSON IN SELECTING A SAFETY SYSTEM WITH PROPER SHORING EQUIPMENT. THE COMPETENT PERSON HAS SOLE RESPONSIBILITY FOR JOB SITE SAFETY & THE PROPER SELECTION OF SHORING EQUIPMENT. 6. THIS TABULATED DATA IS NOT INTENDED TO BE USED AS A JOB SPECIFIC EXCAVATION SAFETY PLAN, BUT SHALL BE USED BY THE COMPETENT PERSON TO SUPPLEMENT HIS TRAINING, HIS KNOWLEDGE & EXPERIENCE OF JOB CONDITIONS & SOIL TYPES. 7. MEANS METHODS AND SAFETY PROCEDURES ASSOCIATED WITH THE EXCAVATION, INSTALLATION & REMOVAL OF THE SHORING SYSTEM, OR DEWATERING SYSTEM ARE THE SOLE RESPONSIBILITY OF THE CONTRACTOR. 8. CERTIFICATION IS NOT VALID IF SHIELD IS MODIFIED IN ANY MANNER BY ATTACHING, WELDING OR RESTING ANY OTHER SHIELDS OR PLATE TO EXTEND THE SPECIFIED HEIGHT, LENGTH OR CLEARANCES OUTLINED ABOVE. NEVER LEAN OR BEAR SHEETING OR PLATES ON SPREADERS TO CLOSE OFF ENDS OF EXCAVATION WITHOUT WRITTEN APPROVAL FROM LICENSED PROFESSIONAL ENGINEER. 9. GROUND WATER LEVEL MUST BE LOCATED OR DRAWN DOWN TO BELOW BASE OF EXCAVATION, OR OTHERWISE SOIL MUST BE CLASSIFIED AS TYPE C-80. 10. FILL ALL VOIDS BETWEEN TRENCH WALL AND SHIELD. 11. SPREADER INSTALLATION MUST INCLUDE THE USE OF 2" DIAMETER SPREADER PINS. ANY USE OF THE SHIELDS WITHOUT PROPER 2" PINS WILL VOID THIS TABULATED DATA AS WELL AS THE WARRANTY, AND COULD CAUSE INJURY OR DEATH. 12. ANY USE OF THIS TRENCH SHIELD WITHOUT SBH NORTH AMERICA RECOMMENDED SPREADER SIZE, SPREADER WALL THICKNESS, SEAMLESS SPREADER MATERIAL AND PROPER SBH NORTH AMERICA RECOMMENDED SPREADER PINS, WILL VOID THIS TABULATED DATA & WARRANTY. 13. TRENCH SHIELDS ARE DESIGNED TO BE PUSHED TO GRADE IF NECESSARY. ANY ABUSE OF THIS PRODUCT BY THE EXCAVATOR AND OR OPERATOR WILL VOID THIS TABULATED DATA AND WARRANTY. 14. THE CONDITION OF THE SHIELD, SPREADERS AND SPREADER PINS MUST BE INSPECTED BY THE COMPETENT PERSON BEFORE EACH USE. THIS CERTIFICATION IS NOT VALID IF ANY VISIBLE WEAR OR DAMAGE IS OBSERVED, OR REPAIRS HAVE BEEN MADE TO THE SHIELD THAT HAVE NOT BEEN DOCUMENTED AND CERTIFIED BY A REGISTERED PROFESSIONAL ENGINEER. 	<p>MAXIMUM ALLOWABLE TRENCH SHIELD DEPTH 'D' PER SOILS TYPES:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td>Type A</td><td>40 ft</td></tr> <tr><td>Type B</td><td>30 ft</td></tr> <tr><td>Type C-60</td><td>28 ft</td></tr> <tr><td>Type C-80</td><td>21 ft</td></tr> </table> <p>THE SOIL TYPE SHALL BE CLASSIFIED BY A COMPETENT PERSON PER FEDERAL OSHA CONSTRUCTION SAFETY ORDERS, CFR 29 APPENDIX A</p> <p>DEPTH RATINGS ACCOUNT FOR 72 PSF MINIMUM OSHA SURCHARGE</p>  <p>SLOPE ACCORDING TO OSHA REGULATION 1926.652(B)(2)</p> <p>MIN. DEWATER</p>	Type A	40 ft	Type B	30 ft	Type C-60	28 ft	Type C-80	21 ft	<p>CERTIFIED BY MUST BE SIGNED & DATED</p>  <p>TBPE#12345 2/24/2011</p>
Type A	40 ft									
Type B	30 ft									
Type C-60	28 ft									
Type C-80	21 ft									

Example of a tabulated data sheet

Signature of Employees in Attendance:

DATE:



Photo showing a trench box lowered or moved in a trench

Signature of Employees in Attendance:

DATE:
