

Hydraulic Shoring Saves Time & Money

Aluminum hydraulic shoring was developed in the late 1950s in California, and has proven to be one of the easiest and fastest ways to shore a trench. Aluminum hydraulic shoring consists of two rails, which come in various lengths, connected by hydraulic cylinders, which come in various sizes. The hydraulic cylinders are pressurized with a hand-pump, which compresses the soil behind the rails, producing an arching effect.

There are two types of aluminum hydraulic shoring:

- **Horizontal Walers** – Relatively rare in the Mid-South
- **Vertical Shores** – Very common in the Mid-South, and are the focus of this issue.

RAILS & CYLINDERS

The rails of a vertical shore are generally 8 inches wide, and are commonly available in lengths of 1.5', 3', 5', 7', 9', 12', and 16'. Shores always have at least 1 cylinder. Many have 2, and some may have 3-4 cylinders, depending upon the size needed.

The cylinders of vertical shores are available in two diameters: 2 inches (very common) and 3 inches (not very common). Although each manufacturer's cylinders will vary, typical stroke (length) ranges are:

- 17" to 27" stroke
- 22" to 35" stroke
- 28" to 46" stroke
- 34" to 55" stroke
- 42" to 69" stroke
- 52" to 88" stroke

Extensions are also available for lengths greater than 88".

HAND PUMPS

Hand pumps consist of a metal or plastic pump can – which generally holds 5 gallons of the special fluid – and the manual hand pump. There are two types of hydraulic shoring fluid:



- **Standard Grade** – Typically mixed at 1 quart of concentrated fluid to 5 gallons of clean water. It sells for about \$5 per quart.
- **No-Freeze Grade** – Used in below freezing temperatures. The amount of concentrate required will vary based on the temperature. The lower the temperature, the more concentrate will be required.

It is important to follow the specific manufacturer's instructions when mixing hydraulic shoring fluid. The instructions are typically on the labels of the concentrated fluid containers. MSDS sheets, as required by OSHA, should also be available.

Workers can sometimes get "confused" and will

See "Hydraulic Shoring" on page 2...

INSTALLATION



1. Connect hydraulic hose from pump, and lower shore into trench.



2. Pump the hydraulic pressure in the shore to minimum pressure of 750 psi.



3. Shoring is now in place. Use release tool to disconnect hose fitting.

REMOVAL



1. Use the removal tool to release the pressurized hydraulic fluid.



2. Use the release hook to collapse and lift the shore.



3. Walk backward while pulling the shore out of the trench.

“Hydraulic Shoring” from page 1

want to use hydraulic oil in a vertical shore. **Hydraulic oil WILL NOT WORK**, and it may damage the shore. Of course, it also creates an environmental problem.

Installation and removal of vertical shores is quick and easy, as shown in the photographs above. Using two specialized tools – the release tool and the removal hook – helps with the installation and removal. Proper installation and removal techniques insure that everything is done “topside” – outside the trench – before workers enter the trench.

See “Hydraulic Shoring” on page 3...

Excavation Safety News

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TrenchSafety and Supply, Inc.
www.trenchsafety.com

3000 Ferrell Park Cove • Memphis, TN 38116
 (901) 346-5800 • (800) 865-5801 • FAX (901) 346-1060

North Little Rock, AR
 (501) 955-3800 • (800) 243-6408 • FAX (501) 955-2044

This newsletter provides a brief overview of safety regulations and systems. It is not intended to provide specific legal or engineering advice. Please refer to OSHA CFR 29, Part 1926, Subpart P, “Excavation and Trenches,” to other governmental regulations, and to manufacturers’ instructions for specific information.

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“Hydraulic Shoring” from page 2

COMPETENT PERSON RESPONSIBILITIES

The on-site “Competent Person” will want to refer to the manufacturer’s tabulated data for the correct spacing of the vertical shores. If the manufacturer’s tabulated data is not available, the Competent Person can refer to the charts in

VERTICAL SHORING SYSTEM SELECTION GUIDE

Depth of Trench (feet) (SK7)	Max. Horiz. Spacing (feet)	Max. Vert. Cylinder Spacing (feet) (SK7)	Max. Width of Trench (feet) (1)	Sheeting (2)
TYPE "A" SOIL				
Up To 10	8	4	12'	(3)
11 To 15	8	4		
16 To 20	8	4		
21 To 25	8	4		
TYPE "B" SOIL				
Up To 10	8	4	12'	(3)
11 To 15	7	4		
16 To 20	6	4		
21 To 25	5	4		
TYPE "C-60" SOIL				
Up To 10	8	4	12'	(4)
11 To 15	6	4		
16 To 20	4	4		
21 To 25	3	4		
21 To 25	4	3		

NOTES:
 (1) Unless EFFICIENCY 7 inch diameter hydraulic cylinders with standard or heavy duty extension system as required for desired excavation width. Trenches wider than 8 require EFFICIENCY's Steel Overbeams extending the full collapsed length.
 (2) Plywood sheeting shall consist of 1 1/2 inch CDX plywood or 7/8 inch, 14 ply Arctic Birch.
 (3) Plywood sheeting required if raveling or sloughing is likely to occur. (see installation diagrams)
 (4) Plywood sheeting shall be used.
 (5) Material can stand with unsupported vertical elements long enough for shoring installation.
 (6) Vertical shoring shall be EFFICIENCY standard or heavy duty vertical rail sections. (see page 6)
 (7) Depth & spacing ratings assume short term usage which is less than 24 hours.

Figure 2

OSHA’s Subpart P – Excavations and Trenches. This manufacturer’s tabulated data, or the OSHA charts, must be kept at the jobsite while vertical shores are in use.

The chart (Fig. 2, above) from Efficiency Production’s tabulated data, shows the correct spacing when using their vertical shores.

For example, an 8-foot-deep trench in Type B soil will require that the horizontal spacing between the hydraulic cylinders must be 8 feet or less, and the vertical spacing between the hydraulic cylinders must be 4 feet (48 inches) or less.

HOW MANY SHORES DO I NEED?

Using the horizontal spacing called for in Fig. 2, the number of shores needed can easily be determined using this formula:

$$\frac{\text{Length of trench}}{\text{Horizontal Spacing}} + 1 = \text{Number of Shores Needed}$$

The drawing at right (Figure 3) also indicates that the top cylinder must be within 1-2 feet of the top of the trench, and the bottom cylinder must be within 4 feet of the bottom of the trench.

FINFORM IS OFTEN USED

In some cases, finform – a special plywood produced in

Finland – will be required between the rails and the soil. The finform is used to control raveling or sloughing of the trench walls. It is not considered a structural member. In some cases, the use of



Finform is used to control local raveling and sloughing of the trench walls.

finform will be optional, per determination of the Competent Person. In other cases, the use of finform will be required, as specified in the manufacturer’s tabulated data.

Finform is 3/4" plywood, made of 14 layers of arctic white birch. It is very rugged, and weighs 94 pounds per 4' x 8' sheet. As

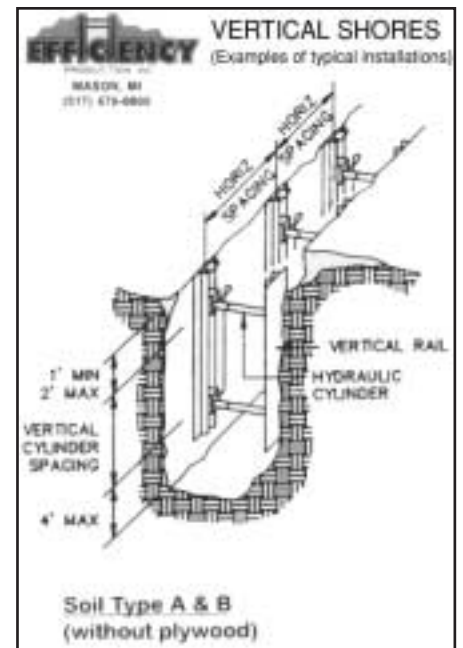


Figure 3

ALWAYS REMEMBER...

The best shoring or shielding systems available are useless if workers stray outside them. **Workers must remain INSIDE the protected area at all times!**

TrenchSafety and Supply, Inc.

3000 Ferrell Park Cove
Memphis, TN 38116

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How Does a Vertical Shore Work?

As you pump-up the hydraulic cylinder on a vertical shore, the soil behind cylinder is compressed. Cylinders are pressured to between 750 and 1,500 pounds per square inch (psi). Since a 2-inch hydraulic cylinder has an area of 3.14 square inches, there is a force of between 2,355

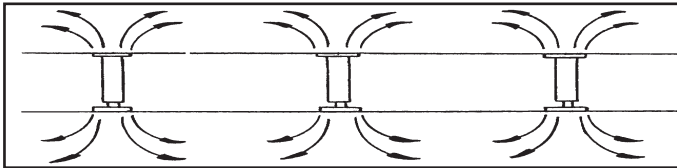


Figure 1

pounds and 4,710 pounds behind each cylinder. This force creates an arching effect that holds the walls of the trench in place. See Fig. 1 above.

Pump-cans have a gauge that indicates the pressure in the cylinder. Most manufacturers also include a green arc on the face of gauge that shows the 750-pound to 1,500-pound working range.

It is critical that the hydraulic cylinders hold the required pressure. Once the cylinder has been pressured to 750-1,500 psi, the “Competent Person” should leave the hose connected to the shore, and monitor the gauge for 15-20 seconds. If the gauge will not hold the pressure, either the hydraulic shore or the pump can require servicing. Substitute another hydraulic shore and/or pump can to identify where the problem is located. Clearly tag the defective component as “needing repair” and remove it from service.

Training is Available in the Use of Vertical Shores

OSHA requires that a properly trained and authorized “Competent Person” be on every job site when workers are exposed in an excavation. Sources of training and information about safe use of vertical shores include:

- **Tabulated Data** – Most manufacturers include procedures on installation and removal, inspections, etc. in their data.
- **Videos** – TrenchSafety offers a training video – available for no-charge – on the use of vertical shores. The video was produced by Efficiency Production, Inc., one of the leaders in the trench shoring and shielding industry.
- **NUCA “Competent Person” Training** – More than 5,000 people attended the National Utility Contractors Association (NUCA) “Competent Person” course taught by

TrenchSafety. The classes are offered at locations throughout the Mid-South. Check www.trenchsafety.com for details about upcoming classes.

- **OSHA** – OSHA’s Subpart P – Trenches and Excavations, includes information about shoring and shielding equipment.



Many OSHA offices also offer training. If you need additional assistance, call TrenchSafety. In Memphis, **901/346-5800** or **800/865-5801**. In North Little Rock, **501/955-3800** or **800/853-6501**.