

Increasing Job-Site Safety & Reducing Costs

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Modern trench shoring and shielding hardware and practices yield three major benefits.

- They increase your job site safety.
- They help you meet OSHA and other governmental regulations.
- They reduce your costs and improve your crew's productivity.

The first two reasons get a lot of attention from most job site managers. And well they should. But the third point—cost savings—is frequently overlooked. Trench shoring and shielding, properly used, can frequently “pay for themselves,” helping your crew work more efficiently and cost effectively.

BACKGROUND

Excavation and trenching is statistically the most hazardous work in the construction industry in the U.S. Frequent news stories from around the country attest to the danger. More than 100 workers are killed each year in trench cave-ins alone. Countless others are injured or maimed, physically and psychologically.

Recognizing the need for more effective regulations on excavation safety, the Occupational Safety and Health Administration (OSHA) published a revised federal standard in 1990 to

establish more clearly the requirements for protecting employees in excavations. The definitive standard greatly increases the flexibility you and your workers have in choosing protective systems.

Responsible contractors know that life-threatening cave-ins are clearly preventable. Such managers take precautions to insure worker safety. Modern trench shoring and shielding devices provide for a quick and easy means of creating a safe and productive environment for below-ground workers. Most systems are adaptable to various trench depths and widths. Properly configured, installed, and maintained, shoring and shielding devices prevent accidents and insure worker safety in the trenches.

Most cave-ins result from a superficial inspection of a site that indicated no apparent chance of a trench collapse. In fact, the vast majority of cave-ins actually occur in clay-based soils (where wall failures are not anticipated), as opposed to sandy conditions where failures normally would be indicated. Also, most cave-ins happen in trenches between five and 15 feet deep, where many managers and workers falsely believe they can quickly escape if a trench wall collapses.

Failure to support or shield the trench as excavation proceeds, even in apparently “good” soil, invariably exposes workers to great danger.

A WORD ABOUT TRENCH SHIELDING...

A trench shield is a structure that protects employees within the structure because it is able to withstand the force imposed on it by a cave-in (*see photos below*). Shields can be pre-manufactured or built on the job site in accordance with OSHA regulations.

Professionally manufactured trench shields come in a wide variety of side-wall thicknesses, heights, lengths, and weights, and are usually constructed from steel or aluminum. With appropriate shield capacities, they can be stacked to accommodate virtually any depth and soil condition.

In choosing a shield for a particular site, you should assure yourself that the structure was designed by a qualified Registered Professional Engineer, and that the shield is capable of withstanding the most extreme lateral earth pressure that may be encountered on the job.

Trench shields generally use quick-connect spreaders of fixed length. The spreaders determine the shield's width. End panels may also be used on one or both ends to provide protection in three- or four-sided excavations. This all-around protection is particularly helpfully when doing repair work or setting manholes or similar structures.

A pipeline contractor used two trench boxes when repairing a "live" jet- fuel line near Memphis International Airport. The boxes were 8' high x 20' long with walls 4" thick and spreaders 96" wide.

They significantly reduced the cost of completing the project, since without them, the trench would have been 48 feet wide (minimum) at the surface. The contractor provided access and egress by sloping the trench, at rear.



For safety's sake, all trenches should be considered potentially lethal, until adequately sloped, shored, or shielded.

You must consider several variables—all vitally important to assuring the selection of a safe and productive trench safety system—when determining the particular trench safety requirements of a particular job:

- Soil condition
- Depth and width of the trench
- Ground water seepage: saturated or submerged soils
- Nearby utility services or structures
- Surcharge loads: stored material, equipment, traffic, spoil, etc.
- Vibrations
- Type of excavator to be used
- Working space requirements
- Potential changes in the weather

AVAILABLE OPTIONS

Three alternatives are available to you for providing a safe working environment for trench workers: sloping, shoring, and shielding.

Sloping requires the cutting back of trench walls to an angle that will insure no collapse into

A water and sewer contractor used three 8'-high x 16'-long trench shields with 36" spreaders on a deep sewer project near Hernando, Miss. The stacked shields provided 24 feet of vertical protection. Please note: When working in "good" soil, as pictured here, there is the temptation not to use a shield, or slope. That's dangerous, because every trench will eventually cave in (unless you're working in solid rock). In the foreground, you can see that this trench did, in fact, cave in, (sometime



during the night before this photo was taken). Had workers been in the trench without the shield, they surely would have been injured or killed.

A WORD ABOUT ALUMINUM HYDRAULIC SHORING...

Aluminum hydraulic shoring (*see photo at right*) is a pre-engineered shoring system with aluminum hydraulic cylinders used in conjunction with vertical or horizontal rails. Such systems are designed to support the sidewalls of an excavation, thereby preventing cave-ins.

Because hydraulic shoring is constructed of lightweight aluminum, it is easy to handle. The units are installed and removed from above ground, increasing worker safety throughout the shoring process. The equipment uses a gauge-regulated pump and a water-based pressurized fluid to evenly pre-load the trench walls.

the work area. Shoring devices pre-load the trench walls and provide a positive restraint to soil movement, thus preventing cave-in hazards. Shielding devices are not designed to prevent trench wall collapse, but serve to “shield” workers should a cave-in occur.

SLOPING IS AN EXPENSIVE CHOICE

Although each of the three options are appropriate for specific projects, sloping generally proves the most expensive alternative when compared to shoring or shielding. To properly slope a trench often requires the acquisition of expensive right of way, along with the additional costs of excess excavation, refilling, compaction, and reinstatement. With a vertical cut, few, if any, of these factors are involved.

PRE-ENGINEERED...AND RELIABLE

Today's trench shoring and shielding systems are generally pre-engineered, and the designs come with a history of proven reliability. Most modern devices ensure that at no point in your operation—initial excavation, system installation, system removal, back-filling, or compaction—is it necessary for personnel to be exposed to dangers in an unshored trench. Most systems are installed and removed from above the ground. Also, the range of systems available is large, enabling you to have a shield or shore of just about any conceivable combination of trench width and depth delivered right to your job site.



A water and sewer contractor used 9' and 12' vertical shores on a project in Rogers, Ark. This particular section of the project involved the installation of a 21" sewer line approximately 14 feet deep down the center of a street. The shores could be placed around crossing utilities.

Because of the number of the utilities (gas, water, and other sewers lines), it would have been difficult to use a trench shield.

ABOUT THOSE COST REDUCTIONS...

In addition to the safety benefits of modern trench shoring and shielding systems, often overlooked advantages include increased productivity and reduced costs. As we discussed, the savings associated with a vertical cut compared to sloping are dramatic (*see chart on next page*). Likewise, productivity increases greatly when you integrate the excavation and shoring operations. Pre-assembled systems are quick and easy to use, fewer skilled workers are involved, and your work force is more productive when working in a well shored or shielded environment—a place where they can focus on the tasks at hand.

AN EXAMPLE OF COST SAVINGS

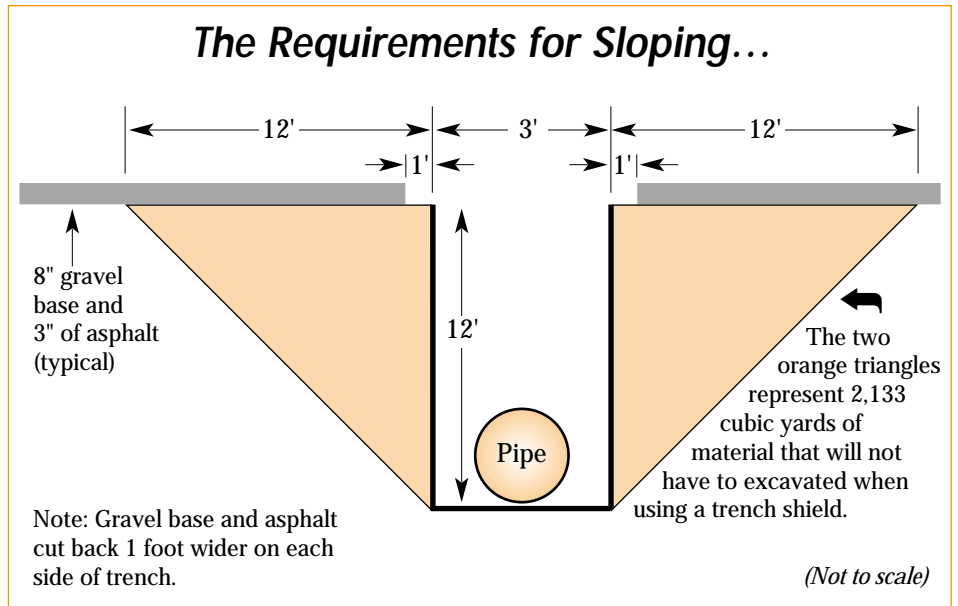
The following example is based on numerous similar real-life situations that contractors and crews find themselves in often.

Suppose that your company is bidding on a 400-linear-foot sewer line that will cut across the parking lot of an existing shopping center. The sewer line must be 12 feet deep. It will not be necessary to remove or cut across any curbs, gutters, or sidewalks. In addition, you will not have to remove any light poles, trees, or shrubbery.

Your choices for trench protection are sloping or using a trench shield. Because you will be working in OSHA “Type B” soil, if you slope the

angle will need to 1:1 (H:V). We are assuming that you will need three feet of width at the bottom of the trench to lay the sewer pipe (see drawing at right).

What will your costs be to excavate, backfill, and restore the surface versus using the trench shield? (See chart below.)
Note: This example is of a trench needed for a sewer line, but the same savings apply for virtually any trench, regardless of depth, width, or utility service—water, gas, electrical, telephone, cable TV, etc.



	SLOPING				TRENCH SHIELD			
	Qty.	Units	Cost/unit	Total cost	Qty.	Units	Cost/unit	Total cost
Saw-cut asphalt	800	LF	\$3.00	\$2,400	800	LF	\$3.00	\$2,400
Remove 3" asphalt and 8" gravel base	1,288	Sq. Yd.	\$4.50	\$5,796	222	Sq. Yd.	\$4.50	\$999
Excavate soil and haul away	2,666	Cu. Yd.	\$5.00	\$13,330	533	Cu. Yd.	\$5.00	\$2,665
Backfill with sand	2,666	Cu. Yd.	\$8.00	\$21,328	533	Cu. Yd.	\$8.00	\$4,264
Replace 8" gravel base	1,288	Sq. Yd.	\$10.00	\$12,880	222	Sq. Yd.	\$10.00	\$2,220
Replace 3" asphalt	1,288	Sq. Yd.	\$12.00	\$15,456	222	Sq. Yd.	\$12.00	\$2,664
Trench shield rental				\$0				\$750
Totals				\$71,190				\$15,962

As you see, the total cost for this rather simple job is *\$55,228 higher when using sloping* instead of a trench shield. And that figure doesn't take into consideration the most important factor: your workers' safety, which can't be measured in dollars and sense.

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This information provides a brief overview of certain 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.