Volume 2
Number 4
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EXCAVATION SAFETY News

Easy-to-follow steps that will help you learn…

How to Size a Trench Shield

Several dimensions, along with knowledge of the soil type you'll be working in, are the factors you must consider when making the decision about trench shield size.

Copy and use the pocket-size work sheet below to correctly determine the safest and most cost-efficient trench shield for your job.

To Size a Trench Shield

Depth of trench _____
(Refer to Depth Certification Chart)

Soil Condition
(Refer to Depth Certification Chart)
Type A (25#) _____
Type B (45#) _____
Type C (60#) _____
Hydrostatic _____

Outside Pipe Diameter _____
(Shield should be 12" wider than the pipe's outside diameter)

Pipe Length _____
(Shield should be 2'-4' longer than the pipe)

Bucket Widths _____
(For inside the shield, 12" less than the shield. For outside the shield, 4" more than the shield.)

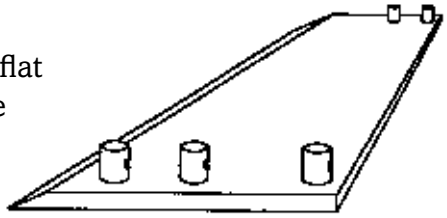
Machine Lift Capacity _____
(1.5 times the shield weight at a 20' radius at grade.)

Maximize Safety and Productivity When You Use Trench Shields

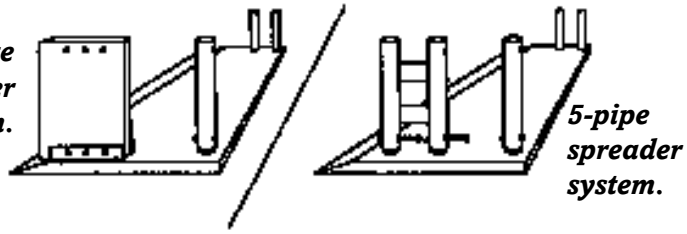
Following proper procedures when assembling and using trench shields greatly increases worker safety ***and*** your crew's productivity. The following steps are provided to help you and your field crews get the most out of the trench shields you install.

Assembly

Lay one side panel flat on the ground, with the collar sockets pointing up.



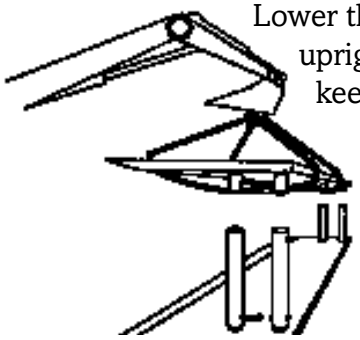
Place the spreader pipes and/or plates onto the collars, or into the brackets, and pin them in place. Be sure to secure the pins with the keepers. A minimum of two spreader units (pipes and/or plates) are required at each end of each shield.

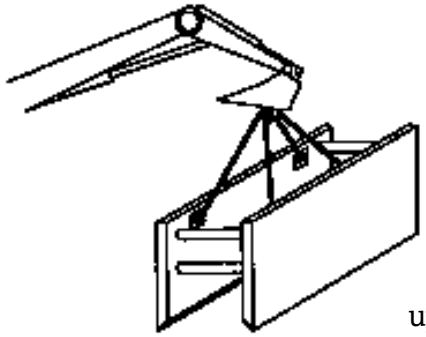


Mud plate spreader system.

5-pipe spreader system.

Lower the second sidewall panel onto to the upright spreaders, then pin and secure with keepers.





Stand the trench shield upright, and it is ready for installation.

See "Shield Safety" on page 6…

Pipe Plug Safety: *Don't Let the Pressure Get to You*

By David Grant, Cherne Industries, Inc.

The importance of pipe plugs has increased significantly. For years pipe plugs were viewed as only occasionally used either to stop a pipe's flow or for conducting a pressure test. Today, plugs are essential tools in infrastructure and maintenance activities—whether for flood abatement, environmental-spill protection, rescue work, sanitary-sewer or storm-sewer cave-ins, or for mandatory pressure tests.

A mechanical or pneumatic plug typically offers the most cost effective and reliable solution to pipe-stopping needs. Each is designed to handle specific pressures, and the type of pressure is critical.

Air or liquid are typically the media being held back. While pressure is pressure regardless of the media, air back-pressure is much more volatile—and dangerous. Because air is compressible, plug discharge can be very dangerous. Compressed air can turn a plug into a missile, while liquid typically will not result in abrupt plug movement. Even low back-pressure can create enormous pressure on a plug. A 36" plug, for example, holding back 5 PSI, is actually holding 5,000 pounds of force!

There are several specific steps in selecting and using the correct plug

1. Maximum Back Pressure—Determine the maximum possible back-pressure. Back-pressure can be calculated in either feet-of-head or PSI.

2. Pipe Inside Diameter—Determine the inside diameter of the pipe to be sealed. And remember: On larger pipe (ductile iron, for example), the outside diameter does not always indicate the actual inside diameter.

3. Access Opening—Determine the diameter of the access opening where the plug will be inserted. Underground and industrial piping does not always have equal-sized access points, often limiting the choice of usable pipe plugs.

4. Length of Time in Place—Determine the length of time the plug will be in position, and in use. Extended use requires regular inflation-pressure monitoring, or use of a permanent mechanical plug.

5. Solutions in Contact & Temperature Requirements—Non-traditional plug needs often require that the plug in contact with caustic chemicals and/or hot and cold temperatures. Determine all caustic solutions the plug will contact, as well as extreme temperature requirements.

Once you have determined these variables, you can choose

See "Plug Safety" on page 3…

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"Plug Safety" from page 2

the correct plugs. To make the correct choice, you ***must*** have accompanying performance data for all plugs you are considering.

You must first decide whether to use a ***mechanical*** or ***pneumatic*** plug. Mechanical plugs are permanent—after tightening and drawing the two plates together, the plug should stay expanded as long as needed. Also, mechanical plugs:

- Often handle higher back-pressures,
- Have narrow body widths (and, therefore, sealing contact with the pipe wall), which aide in certain usage restrictions,
- Cannot be over inflated (ruptured), nor can they be easily cut,
- Typically only require hand tightening (not exact PSI inflation pressure).

Pneumatic plugs, on the other hand, are available in multi-size configurations, as well as single-size designs. Also, pneumatic pipe plugs:

- Are small when deflated, compared to the pipe diameter to be sealed. That can make access much easier.
- Can be inflated and deflated—and today even inserted—without the user being directly in front of the insertion point, making a pneumatic plug safer.
- Inflate and mold to the inside shape of the pipe, helping insure a tight seal.
- Can be inflated with water to aide in overcoming buoyancy.

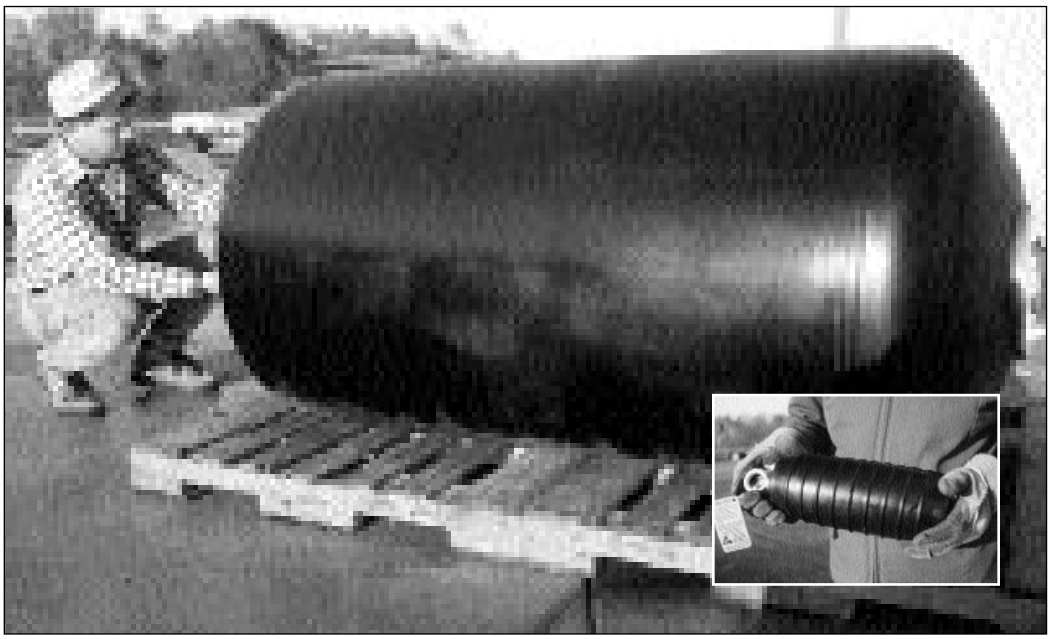
Once you have chosen the plug(s), usage instructions ***must*** be followed.

For maximum safety, at least 15 usage steps must be followed when using pneumatic plugs (see box on page 4).

A couple of additional items to keep in mind: When using a plug in corrugated pipe, standard back-pressure performance ratings should be cut in half. When you need to plug an oval pipe, some standard pneumatic plugs can be used. Measure the overall circumference of the oval to determine the plug that will seal the pipe.

When storing a plug—mechanical or pneumatic—you should take special care:

- a minimal amount of air should be kept in a pneumatic plug so that it retains the shape the plug had when it came out of its original box.



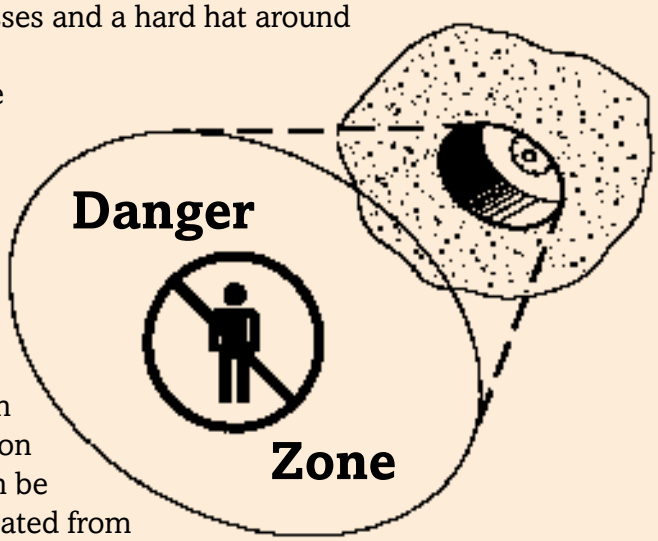
Scott Purdy, TrenchSafety Sales Representative, inspects the largest pneumatic plug in TrenchSafety's extensive rental inventory. TrenchSafety stocks pneumatic plugs from 6" (inset photo) to 60" for virtually any application. If the particular plug you need is not in stock, we will do everything possible to get it and deliver it to your jobsite when you need it.

- A silicone-like "rejuvenator" can be applied to help eliminate dry rot.
- Larger plugs should be hung so that none of the rubber comes in contact with the ground.
- Plugs should be stored inside, away from ultraviolet light.

When the proper steps are followed, there is no better way to seal a pipe than with a carefully designed mechanical or pneumatic pipe plug. Engineered plugs are built to handle the extreme pressures that can develop. Having the assurance that the right plug is being used, and that the usage instructions are understood, will mean that your job is safer, easier, and is completed as quickly as possible.

General Safety & Usage Instructions for Pneumatic Plugs

1. Always inspect plug(s) for dry rot, cuts and abrasions, and worn areas before and after use.
2. Never exceed the manufacturer's stated performance data for the plug(s) being used.
3. Do not exceed recommended maximum allowable back-pressure (refer to this safety instruction manual)
4. A pneumatic plug's inflation pressure should be checked every four (4) hours, or the plug must be connected to a constant regulated air source.
5. Workers should ***never*** use an air source—whether it's a hand pump or a compressor—that does not have a working pressure gauge. The only correct way to determine if a plug is inflated properly is with a gauge, not by pulling on the plug or by simply looking at the plug in the line.
4. Never use a plug in a pipe size different from recommended usage range (refer to safety instruction manual).
5. Death, bodily injury and/or property damage may result if plug falls for any reason.
6. Always read and understand all safety instruction manuals before using plug.
7. Do not stand in front of, to the side of, or over the top of a plug(s) when it is in use.
7. Wear safety glasses and a hard hat around plugs in use.
9. Do not enter the "danger zone" when plug is in use.
10. Measure pipe diameter before selecting plug.
11. Always attach an inflation extension hose so plug can be inflated and deflated from outside the "danger zone."
12. Never remove the inflation hose until all back-pressure is released and the plug is deflated.
13. Always inflate plug to the pressure shown on plug.
14. Always use properly calibrated pressure gauges.
15. Always release back-pressure from the pipe first, before deflating plug.



With proper trench support…

You'll Save Money…and Lives

Your organization can realize real savings by using proper trench support equipment and practices. The key word is "proper."

Unfortunately, contractors sometimes use trench-support methods that are not designed—or rated—for the project at hand. Tragic reports of death and injury in trench cave-ins are repeated all too frequently in newspapers and on television across the country.

Following are eight ways you can decrease costs, and reduce these senseless tragedies. We thank the Trench Shoring and Shielding Association for the list.

1. Plan the Job

Planning is a matter of both safety and economics. Having the proper equipment at your jobsite—and available to your workers—allows them to work safely, it speeds production, and it lowers your costs.

Pre-engineered systems eliminate guess work and the cost of custom engineering. Today's modular shoring and shielding systems make installations fast and easy, without cutting, welding, nailing, or other expensive and time-consuming steps.

2. Avoid Repairs

The cost of repairing existing utility lines that are damaged by improper trench support can be substantial.

See "Savings" on next page …

"Savings" from page 4

3. Reduce Soil-Removal & Replacement Costs
In Type C soil, a ten-foot-deep, four-foot-wide trench that could supported with shoring or shielding would be 4.7 times larger if sloped. Likewise, a ten-foot-deep, ten-foot-square pit in the same soil with shoring or shielding, would be more than 7 times larger if it sloped. Sloping means significant additional costs for soil removal, replacement, and compaction.

4. Reduce Workers Compensation Claims
Your "workers comp" insurance premiums are based on your company's three-year claims experience. Injuries and fatalities can easily add more than 100% to these insurance costs. And that could translate into your losing a bid, if your competitors' insurance costs are less.

5. Avoid Damage to Adjacent Property
Loss of adjacent streets, curbs, and sidewalks are common costs that can result from using improper trench support methods and equipment. And undermining adjacent structural foundations can lead to excessive property-damage claims. Paying such claims means higher liability insurance premiums and increased out-of-pocket expenses.

6. Reduce Disposal Liabilities
Disposal of soil and debris is an expensive part of any excavation project. Eliminating unnecessary excavation can mean that those "disposal" dollars wind up in your pocket.

7. Reduce Unsafe Conditions & Increase Productivity
Crews working in unsafe excavations are not as productive as those in safe conditions. Unprotected workers must always keep a wary eye on the unstable excavation walls. The result is drastically reduced production and costly inefficiency.

8. Avoid Fines, Legal Expenses, even Jail Terms
OSHA fines can be as high as $7,000 per violation, and legal defense costs surrounding these fines can be just as damaging. And in extreme cases, OSHA can even order jail time for repeat offenders.

The point is this: Using proper trench-safety shielding and shoring equipment and methods is simply good business. It makes sense from at least two perspectives—the economic and the safety points of view.

Editor's Note: *In response to numerous requests, the following article is reprinted from the very first issue of* **Excavation Safety News**, *published in the Fall 1994.*

Who IS Responsible for Jobsite Safety?

The law says every employer. Some details will prove helpful.

What if you're the general (prime) contractor?

The prime contractor, according to OSHA, "assumes all obligations" and "in no case…shall be relieved of overall responsibility for compliance with the requirements of the part for all work to be performed under the contract." This included work being done by all subcontractors at your jobsites.

What if you're a subcontractor?

Again, the law states, "with respect to subcontracted work, the prime contractor and any subcontractor…shall be deemed to have joint responsibility." The subcontractor "of any tier" is still responsible for the safety of workers involved in his part of the job.

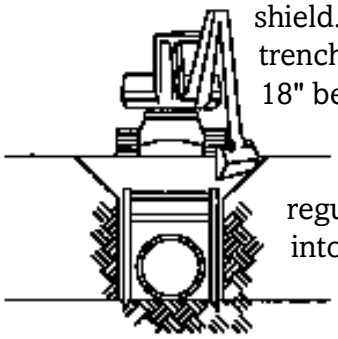
Who can be fined?

The general contractor, the subcontractor, and even the owner of the project are subject to enforcement and fines when it can be shown they "could have had (such) knowledge with the exercise of reasonable diligence." The standard says: "Where joint responsibility exists, both the general (prime) contractor and his subcontractor or subcontractors, regardless of tier, shall be considered subject to the enforcement provisions of the Act."

"Shield Safety" from page 1

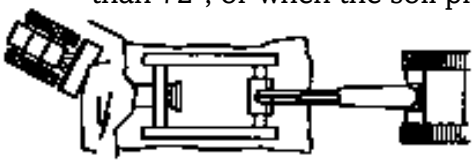
Using a Trench Shield in Stable Soil

Excavate to grade slightly wider than the trench shield.Excavate the walls of the trench vertically to a minimum of 18" below the top of the shield. Slope the soil above the shield according to OSHA regulations. Lower the shield into the trench.



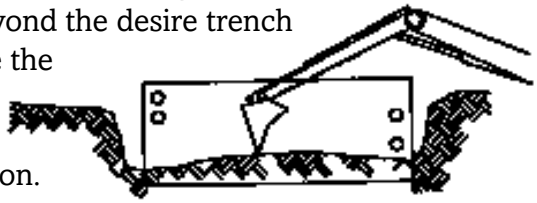
Excavate in front of the shield as the work progresses.

Pull the shield forward by the front, top spreader pipe, or with the pulling eyes. (Be sure to use the pulling eyes when the spreaders are wider than 72", or when the soil pressure is severe enough to cause the spreader to deflect.

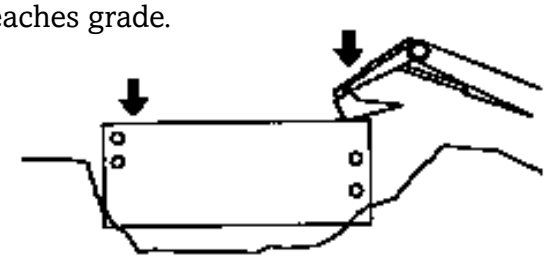


Using a Shield in Unstable Soil

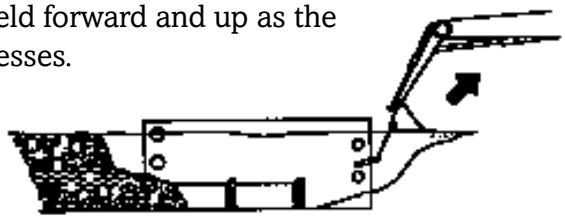
Excavate until the soil begins to crumble beyond the desire trench width. Place the shield on the line of the excavation.



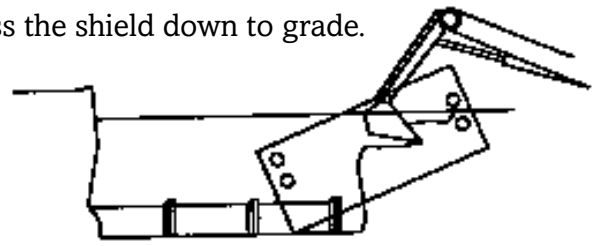
Press down on the corners of the shield until the top reaches grade.



Pull the shield forward and up as the work progresses.



Excavate the soil inside the shield and again press the shield down to grade.

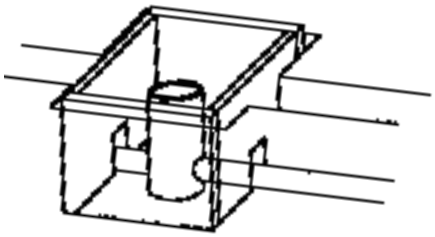


Using Shields for Point Repairs, or Tie-Ins

Center the shield over the work area. Lay the soil at the ends back according to OSHA regulations, or use the manufacturer's end plates.

Using 4-sided Shields

When using shields during manhole work, install the proper end panels, or lay the soils at the ends back according to OSHA regulations.



All drawings used with the permission of Efficiency Production, Inc., Lansing, Michigan.

Did you know…

If you have a water or wastewater license, most states will award you continuing education credits for attending TrenchSafety's "Competent Person" and "Confined Space" training sessions.

We offer classes on both topics regularly throughout the Mid-South. We'll even come to your facility and present the classes specifically for your employees.

Check the upcoming schedule in the box on page 2, or contact TrenchSafety in Memphis.

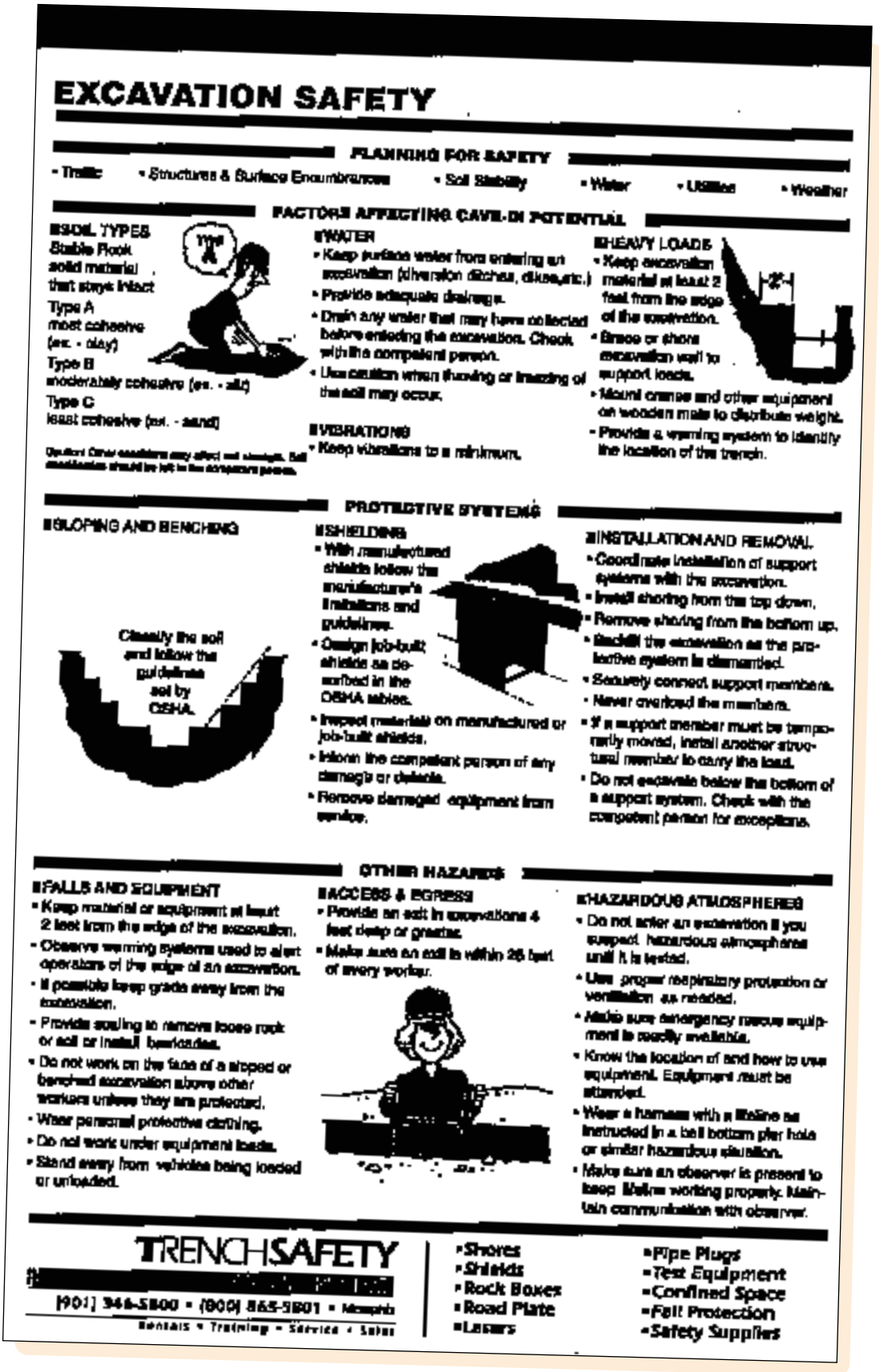
Safety Poster Now Available...and it's FREE!

TrenchSafety and Supply has recently published an extremely informative Excavation Safety Poster that can be displayed in your offices or jobsite to remind your construction team of the guidelines for trench safety.

"We wanted to provide this important information in a way that presents the guidelines quickly, yet thoroughly, while being easy to understand," David Dow, TrenchSafety's president said. "This poster does both."

The poster covers soil types and soil factors that can affect stability, as well as precautions and protective systems you can apply with potential cave-ins, falls, and trench hazardous atmospheres.

For your free copy of the 22" x 34" full-color poster, contact TrenchSafety's office in Memphis, (901) 346-5800 or (901) 346-1060 FAX.



TrenchSafety and Supply, Inc.
3000 Ferrell Park Cove
Memphis, TN 38116

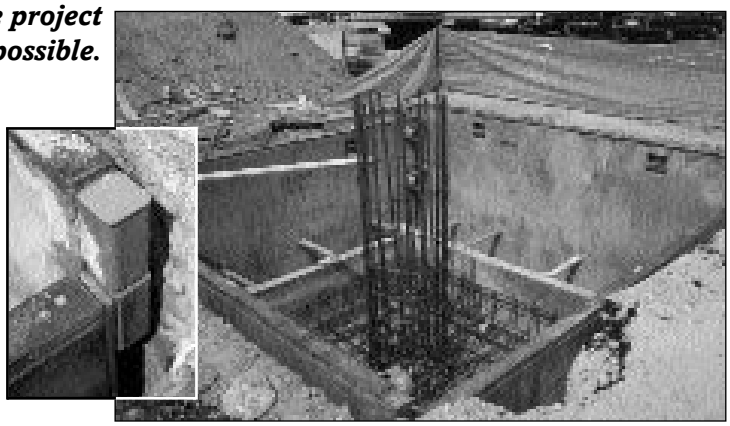
Address Correction Requested

Problem-solving Uses of TrenchSafety Shields

A water and sewer contractor used three of TrenchSafety's 8'-high x 16'-long trench shields with 36" spreaders on a deep-sewer project near Hernando, Miss. The shields were stacked to a total of 24 feet of vertical protection. The cut was 27 feet deep.

Please note: When working in "good" soil, as pictured here, there is sometimes the temptation not to slope, or use a shield system. That's dangerous, because every trench will eventually cave in (except when 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 killed.

A general contractor used TrenchSafety's shields in four-sided configurations on a concrete foundation project for 100'-tall light towers at a casino in Robinsonville, Miss. Although the excavations were relatively shallow—about 8 feet—they were in the middle of a busy parking lot. The contractor had limited space, he didn't want to tear up a lot of asphalt, and he didn't want to restore a large area after the foundation was finished. Also, the casino wanted to complete the project as quickly as possible.



The boxes on the Robinsonville project were held together at the corners with large steel pins inserted in pockets at the ends of each shield. When boxes are stacked, such as at the Hernando jobsite, the steel pins and pockets are also used to tie the stacked shields together.