

The Writing on the Sidewalls

Today's Trench Shoring & Shielding Systems Offer Contractors Solutions to Make Any Project More Productive

By Nick Zubko

If you have ever seen an excavator dig a hole, or heck, if you've ever hand dug your garden, you probably notice that the soil has a tendency to return from whence it came — back in the hole. That's why hundreds of years ago (or probably more, no one's really sure), builders started installing support systems on the sides of large and deep trenches and excavations — because the less the dirt and soil returned to the trench, the less time it would take them to finish digging.

At least, that was its initial purpose — productivity. It wasn't until years later that the systems were perceived as more of a safety measure, as they are today. Essentially, a trench shield does exactly what it sounds like it should. It protects workers (or shields them) inside a trench from a potential cave-in. What eventually became known as trench "shoring" is an advanced take on this process, where the sidewalls of the trench are supported with



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some sort of pressure to actually prevent a cave-in. It first came about with the introduction of the “screw jack” design spreaders, which were later replaced with aluminum hydraulics.

Essentially, trench shielding is the use of a system placed in a trench after excavation has taken place, used to protect workers in the trench. They may also protect adjacent infrastructure, but that is not its primary purpose. Examples of this type of system are trench boxes of all types and aluminum hydraulic shoring. A trench box, trench shield or mule is all the same thing. According to Brian Crandall, president of Icon Equipment Distributors, trench shoring or “sheeting,” on the other hand, is driven into the ground prior to excavation or the system is placed as excavation proceeds.

“The purpose of these systems is for worker protection and the protection of adjacent infrastructure,” Crandall explains. “Typically, these systems support the excavation vertically from the top to the bottom of the excavation. Examples of this type of system are slide rail systems, wood sheeting, H-Beam and wood lagging, H-Beam and steel plates and steel sheeting. Conventional sheeting such as wood sheeting and H-Beam and wood lagging came first. Wood sheeting has been used for hundreds or maybe even thousands of years.”

Mothers of Invention

Early variations of trench shielding and shoring (at least as we know then today) began to take shape in the early 1900s, using timber shoring, followed by steel boxes that were built by contractors as far back as the

1930s. These steel boxes were usually heavier than needed and used fixed I-Beams instead of the pin-on spreaders that are common today. Contractors first started using shields that they made on their own, which could be done at that time because OSHA regulations had not yet been established for trench shoring and shielding

“The designs obviously varied depending on the contractor, but for the most part they consisted of two steel sidewalls with a spreader bar welded in place for the width,” explains Matt Vogel, who handles sales and marketing for Houston-based Cerda Industries. “They basically worked much like the shields. However they had many less features than today’s designs, which have improvements such as a pin-on spreader pipe, four-point lift systems or designed stacking assemblies.”

Up until the early 1970s, contractors either made their own shoring or used none at all. There weren’t any regulations or enforcement, so oftentimes nothing was used on the walls of the trench. They were excavated vertically or sloped ever so slightly. Those who attempted to make their own trench shields used primitive wood or steel plates, but their designs were typically not up to par.

“The equipment consisted of cable cranes, steam hammers and cable shovels. Installing deep sewers was something of an art form, and only the best contractors took on those really tough jobs,” Crandall explains. “During the 1970s, trench boxes popped up all over the country, featuring structural fabricated spreaders that were very durable, but also very heavy and expensive. Changing the width of the system was also very time consuming.”

Weighing In

As more contractors attempted to makeshift versions of their own shoring solutions throughout the 1970s, it was only a matter of time before a new industry started coming into its own. In no time, companies such as Efficiency Production, Griswold Machine & Equipment (GME) and Speed Shore led the manufacturing development. As a result, there are more sizes available and most designs use pipe spreaders that are easier to assemble rather than structural spreaders that must be bolted to the box.

“Those first trench shields were primarily made out of steel, welded solid with “I beam” spreaders that allowed little to no room for adjustment,” notes Frank Balluff, president of Pro-Tec Equipment, a Charlotte, Mich.-based manufacturer and distributor of trench shielding and shoring equipment. “The contractor had to decide how wide of a shield they needed and it came welded as a complete unit. The first shields were only available with a 6-in. sidewall thickness.”

Over the years, trench shields have changed dramatically. Hydraulic shoring looks and works very similar to the first ones that were put on the market. Trench shields became available in many wall thicknesses including 4-, 6-, 8-, and 10-in. thick. Original shields were built with A – 36 mild steel and today high-strength steel is used. Shields today use pipe spreaders and can easily be adjusted to a wide range of widths. They are stackable for various depths.

New versions of hydraulic excavators (similar to the ones we know today) were introduced around the same time and became an instant hit, as they made moving and placing trench boxes and other shoring apparatuses significantly easier and more accurate. The weight of the systems still posed a challenge, and eventually prompted an evolution to lighter-weight, aluminum hydraulic shoring.

“Manufacturers refer to aluminum hydraulic shores as vertical shores, which consist of two aluminum rails with two hydraulic shores joined by a hose that distributes the pressurized hydraulic fluid. This is a shielding system and is placed after the excavation has taken place,” Crandall explains. “Vertical shoring refers to a sheeting system, which is driven into the

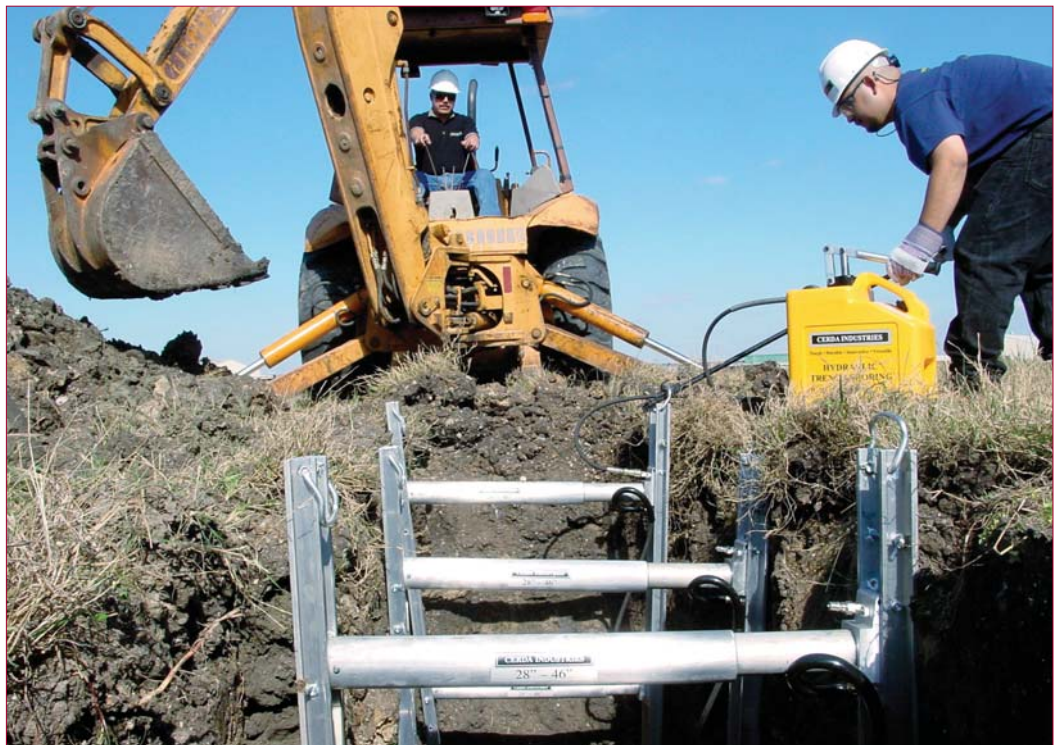
ground or placed as the excavation proceeds. The end result is the excavation is vertical and the excavation is supported at all times from original ground to the sub-grade of the excavation.”

Aluminum also became a common material for use in building light weight shields for smaller equipment to be able to handle and for modular units that can be transported in a pickup truck and hand assembled at the job-site. Over the years, manufacturers started making lighter shields for use with smaller machines and advanced into aluminum shoring for contractors with backhoes not excavators.

“Developments in both shielding and shoring systems dictated how contractors did their work,” says Balluff. “In the North, steel trench boxes were heavy and so the excavators had to be large. And because the winters were severe working with steel systems rather than water based hydraulic systems worked better. In the South, warm weather worked well with the aluminum hydraulic systems and the contractors could use smaller excavators.

Another factor that determined hydraulics vs. steel boxes was the nature the native soils. The Northern areas had “glacial till” that was easier to shore with steel boxes and the Southern soils tended to be more stable and could be shored easier with hydraulic shoring.

“The use of aluminum has made a large change in the industry,” says Vogel. “It has allowed contractors who could not lift the heavy steel shields to have an alternative. Lighter shields are also more common, for use with smaller machines. Also they advanced into the aluminum shoring for contractors with backhoes in addition to the large excavators.”



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Slide Rail Systems

Another type of shoring system on the market today is called a slide rail, which was introduced in Europe for more than 50 years only caught on in the United States — to varying degrees — in the last 20 years. These systems consist of “slide rails” that are supported by at least two braces that cross the trench and steel lining plates that interlock with the rails to form a modular system.

“Slide rail systems are a “pre-engineered” shoring/sheeting system that can be pushed into the ground as the excavation proceeds,” explains Crandall. “They are pushed vertically into the excavation as the excavator removes soil. As this happens the plates are also pushed, so the system sinks into the excavation as soil is removed and always supports the entire excavation wall.”

A slide rail is typically built with five main components: panels (similar to trench shields), a corner post, a spreader post, a roller beam and spreader beams. It can be set up in a number of different ways to achieve the end result that the job requires. Much like other systems, slide rail systems are typically durable and flexible, but according to manufacturers, they allow for greater depths and much larger clear spans. Slide rails are also commonly used as an alternative to sheeting, wood or beam and lag shoring.

“The big difference between a slide rail and a trench shield is that the slide rail provides active soil support when it is being installed, while it is in place and when it is being removed, so you have minimum soil disturbance,” says Balluff. “The panels slide down in tracks, telescoping

down while digging and pushing. When removing the bottom panels can be pulled up in increments while backfilling and compaction takes place. A trench shield is put into an open excavation and does not prevent soil from moving but protects the workers in the excavation from getting hit by soil that caves in.”

Most manufacturers agree that the acceptance and success of the slide rail system has been one of the most important developments the industry has seen over the last decade. They serve as an economical alternative to tight sheeting methods and provide a unique “dig and push” system that can be installed from the top down and removed from the bottom up. Having replaced conventional sheeting, the innovation has pushed the sheeting solution from a field problem to a manufactured product solution — reducing labor and equipment costs while improving safety.

Selection Criteria

With the wide variety of support solutions on the market today, it’s important to determine the right equipment for each individual project. In simple excavations (referred to as “dig and lay”), that require that you dig the hole, put something in it and backfill, a single trench box a little longer than the length of pipe to be laid is sufficient.

“The dimension of the trench, including depth, length and width, play an important part, in addition to soil conditions, crossing utilities, pipe size and the type of machine being used,” explains Vogel. “You also need to

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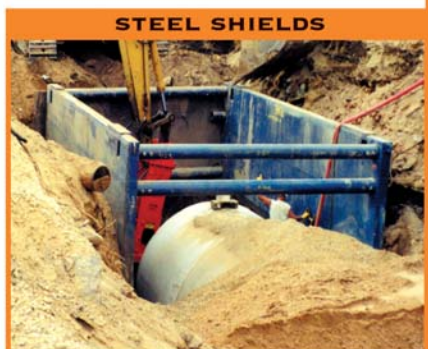
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take into account if there are any special clearances needed. If you have to worry about adjacent infrastructure, then a slide rail system may be an alternative. It comes down to application. The more basic or simple the construction, the shorter the system you will need. Every shoring or shielding product has a limitation so you must determine your usage around the application you are trying to work in.”

In addition, as project becomes more complicated, a longer shoring system might be required. An example would be a pipeline project that requires the pipe to be placed on wood piles or engineering fabric and house connections to existing utilities have to be connected as construction proceeds. Each operation that must take place before backfill requires a safe working space to operate. In shallow excavations vertical hydraulic shielding can be used to open up a sufficient length of trench. Deeper excavations are ideal for multi-bay slide rails system. In complicated urban projects it is not unusual to see slide rail systems of six to 12 bays being utilized.

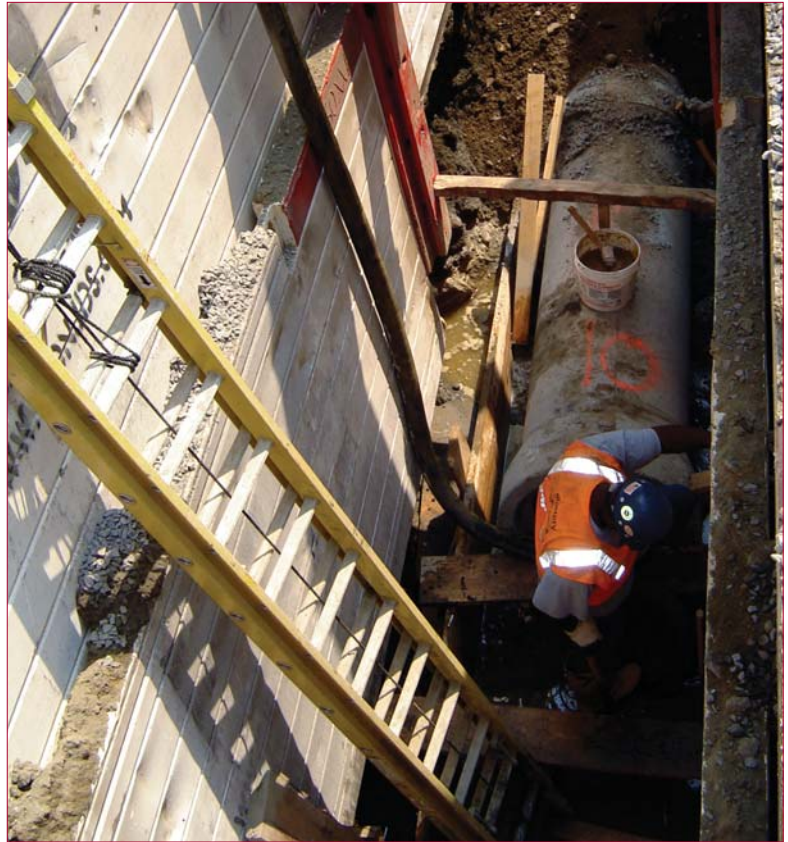
“For the most part, the main factors that will determine which shoring method to use are soil conditions and the machinery on the jobsite,” Balluff explains. “Hydraulic shoring systems are not to be used in excavation where water is present. That’s because if the sidewalls are muddy, there wouldn’t be enough resistance from the ground to allow the systems to be usable. As far as machinery goes, for a system like a slide rail, the machinery that would be required to allow the system to be installed and removed as easily and quickly as possible is going to be a 90,000-plus pound machine.”

“If done properly, all the systems are safe,” Crandall adds. “If you’re interested in protecting adjacent infrastructure, then you use a shoring or sheeting system. If excavation past the vertical plane will incur a lot of restoration costs, shoring or sheeting systems may be used. An excavation that is deep and has to stay open more than two or three days may need shoring/sheeting. If there is a lot of working room and worker safety is the main concern then a shielding system may be considered.”

Safe & Productive

Today, both trench shoring and shielding help to insure the safety of the workers and can also increase the production on the job. As federal regulations became more defined in the 1970s, education, training and the use of better and more frequent use shielding/shoring equipment became increasingly common.

And while the industry still has room to grow and mature, manufacturers say nearly every factor in excavation practices has improved dramatically over the past 25 years — from excavation safety and man-hour production to general worker knowledge of how to be safe in an excavation.



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“Workers who feel safe in an excavation work faster and are more efficient,” says Crandall. “Improving the bottom line is always important to a successful company and reduction of accidents help employee morale, the bottom line and public relations. Federal regulations become more defined many years ago and this has led to more education training, use of better and more shielding/shoring equipment and safer worksites.”

Shoring has played a very important part in the growth utility construction industry. Because of deaths and injuries from trench cave-ins that have occurred in the past, OSHA put significant effort into the enforcement of its safety standards. Contractors today are required to understand the standard and have employees that understand it. Manufacturers and distributors have trained tens of thousands of people over the years and these efforts continue to this day. Not to mention that the industry continues to mature and the variety and availability of shoring and shielding systems allows every contractor to work safely and more productively.

“No matter what kind of excavation a contractor is faced with, it’s likely there is a shoring solution for it,” notes Balluff. “With the tremendous growth in distribution over the past ten years, it’s also likely that the equipment is available for sale or rent anywhere in the country. Bottom line is that there is no excuse for not using proper shoring to protect people. The equipment is readily available and reasonably priced.”

Nick Zubko is associate editor of *Utility Contractor*.

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