

Use a Box or Slope that Trench?

Most contractors know how much a trench box costs to buy or rent. But do you know how much the alternative costs?

According to OSHA regulations, if trench boxes or other shoring are not used, the sides of the trench must be sloped to prevent cave-ins. How much they must be sloped depends on the kind of soil. OSHA recognizes three soil types:

Type A – Most stable: clay, silty clay and hardpan (resists penetration); no soil is Type A if it is fissured, is subject to vibration of any type, has previously been disturbed or has seeping water

Type B – Medium stability: silt, sandy loam, medium clay and unstable dry rock; previously disturbed soils unless otherwise classified as Type C; soils that meet the requirements of Type A soil but are fissured or subject to vibration

Type C – Least stable: gravel, loamy sand, soft clay, submerged soil or dense, heavy unstable rock, and soil from which water is freely seeping

No sloped trench may be more than 20 feet deep. Type A soil must be trenched at a 53 degree angle (nine inches back for every foot deep) except that a "short term" excavation of less than 12 feet in depth may be sloped at 63 degrees (a half foot back for each foot deep). Type B soil requires at

Without Proper Use, Trench Box is No Protection

A recent fatality in a Cincinnati suburb highlights the importance of careful planning and the need for proper tools and equipment in trench work.

The contractor was digging a 30-foot deep trench and installed a 20-foot steel trench box to prevent collapse (see diagram). However, the trench caved-in below the box and killed a 28 year-old worker who was working at the bottom. It took rescue crews four and a half hours to recover the victim.

"It seems obvious from this example," says LHSFNA Occupational Safety and Health Division Director Scott Schneider,

least a 45 degree slope (one foot back for every foot deep), and Type C requires a 34 degree angle (one and a half feet back for every foot deep). If the soil is in layers of different types, each layer of soil must be sloped according to its own type or the type below it, whichever is least stable.

Because sloping requires no trench boxes or other shoring equipment, contractors often assume it is the least expensive method. However, the cost of removing soil and moving it away from the edges of a trench can be expensive and may exceed the cost of boxes or shoring. This is particularly the case in long, narrow trenches (such as pipelines) where shoring and boxes can be used over and over as the trench is dug and filled but sloping requires extensive soil moving along the entire length of the trench.

For instance, the chart below compares soil removal quantities and costs for a two-mile trench that is five feet wide and 15 feet deep.

	Cubic yards	Cost @ \$1.00/cu yd	Cost @ \$1.50/cu yd
No sloping	29,333	\$29,333	\$44,000
Type A slope	95,333	\$95,333	\$143,000
Type B slope	117,333	\$117,333	\$176,000
Type C slope	161,333	\$161,333	\$242,000

“but trench boxes must reach very near to the bottom of the trench. Otherwise, in unstable earth, the sides can collapse and slip in below the box. If the gap between the floor of the trench and the bottom of the box is wider than a worker is tall, the worker has little chance of survival in a full-scale collapse.”

More information on trench safety is available from the LHSFNA OSH Division.

