A Citizen's Guide to Solidification and Stabilization

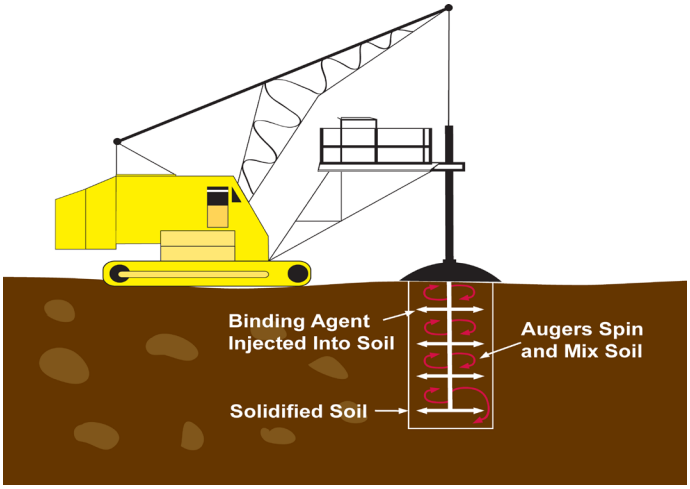
What Are Solidification And Stabilization?

Solidification and stabilization refer to a group of cleanup methods that prevent or slow the release of harmful chemicals from wastes, such as contaminated soil, sediment, and sludge. These methods usually do not destroy the contaminants. Instead, they keep them from "leaching" above safe levels into the surrounding environment. Leaching occurs when water from rain or other sources dissolves contaminants and carries them downward into groundwater or over land into lakes and streams.

Solidification binds the waste in a solid block of material and traps it in place. This block is also less permeable to water than the waste. Stabilization causes a chemical reaction that makes contaminants less likely to be leached into the environment. They are often used together to prevent people and wildlife from being exposed to contaminants, particularly metals and radioactive contaminants. However, certain types of organic contaminants, such as PCBs and pesticides, can also be solidified.

How Does It Work?

Solidification involves mixing a waste with a binding agent, which is a substance that makes loose materials stick together. Common binding agents include cement, asphalt, fly ash, and clay. Water must be added to most mixtures for binding to occur; then the mixture is allowed to dry and harden to form a solid block.



Binding agents can be injected into soil and mixed using augers.

Similar to solidification, stabilization also involves mixing wastes with binding agents. However, the binding agents also cause a chemical reaction with contaminants to make them less likely to be released into the environment. For example, when soil contaminated with metals is mixed with water and lime — a white powder produced from limestone — a reaction changes the metals into a form that will not dissolve in water.

Additives can be mixed into the waste while still in the ground (often referred to as "in situ"). This usually involves drilling holes using cranes with large mixers or augers, which both inject the additives underground and mix them with the waste. The number of holes needed depends on the size of the augers and the contaminated area. Dozens of holes may need to be drilled. When the waste is shallow enough, the contaminated soil or waste is excavated and additives are mixed with it above ground (often referred to as "ex situ"). The waste is either mixed using backhoes and front end loaders or placed in machines called "pug mills." Pug mills can grind and mix materials at the same time.

Solidified or stabilized waste mixed above ground is either used to fill in the excavation or transported to a landfill for disposal. Waste mixed in situ is usually covered with a "cap" to prevent water from contacting treated waste (See *A Citizen's Guide to Capping* [EPA 542-12-004].)

How Long Will It Take?

Solidification and stabilization may take weeks or months to complete. The actual time it takes will depend on several factors. For example, they may take longer where:

- The contaminated area is large or deep.
- The soil is dense or rocky, making it harder to mix with the binding agent.
- Mixing occurs above ground, which requires excavation.
- Extreme cold or rainfall delays treatment.

Are Solidification And Stabilization Safe?

The additives used in solidification and stabilization often are materials used in construction and other activities. When properly handled, these materials do not pose a threat to workers or the community. Water or foam can be sprayed on the ground to make sure that dust and contaminants are not released to the air during mixing. If necessary, the waste can be mixed inside tanks, or the mixing area can be covered to minimize dust and vapors. The final solidified or stabilized product is tested to ensure that contaminants do not leach. The strength and durability of the solidified materials are also tested.

Large augers inject and mix binding agent with contaminated soil.

How Might It Affect Me?

Nearby residents or businesses may notice increased truck traffic as equipment and additives are brought to the site or as treated waste is transported to a landfill. They also may hear earth-moving equipment as waste is excavated or mixed. When cleanup is complete, the land often can be redeveloped.

Why Use Solidification Or Stabilization?

Solidification and stabilization provide a relatively quick and lower-cost way to prevent exposure to contaminants, particularly metals and radioactive contaminants. Solidification and stabilization have been selected or are being used in cleanups at over 250 Superfund sites across the country.

Contaminated soil mixed with cement in a pug mill is spread on the ground as pavement.

Example

Solidification and stabilization were used to clean up contaminated sludge and soil at the South 8th Street Landfill Superfund site in Arkansas. From the 1960s to 1970s, municipal and industrial wastes were disposed at the site, including a 2.5-acre pit of waste-oil sludge. In the 1980s, that area was found to be contaminated with oily wastes, PCBs, pesticides, and lead.

In 1999, cranes with augers were used to inject and mix limestone, fly ash, and Portland cement with 40,000 cubic yards of sludge and soil in the pit. These additives helped solidify the mixture as well as stabilize the lead and other metals. The hardened material was left in place and covered with a soil cap. Evaluations in 2004 and 2009 indicated that the cleanup approach is still protecting human health and the environment. The site has been deleted from the National Priorities List, the list of the nations most serious hazardous waste sites.

For More Information

For more information about this and other technologies in the Citizen's Guide Series, visit:

www.cluin.org/remediation
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