TECHNICAL OUTREACH
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Capping as a Cleanup Method

A TOSC Fact Sheet

What is capping?

Capping is a process used to cover contaminated soils to prevent the migration (movement) of the pollutants. This migration can be caused by rainwater or surface water moving over or vertically through the site, or by the wind blowing over the site. Caps are generally made of a combination of such materials as synthetic fibers, heavy clays, and sometimes concrete. The caps are designed to meet several goals.

- They must prevent the vertical movement of water through the contaminated soil
- They must provide efficient draining of surface water from the site to prevent the occurrence of standing water
- They must be easily maintained.
- They must be resistant to damage caused by the settling and consolidation of soils and other adverse conditions (heat, cold, UV radiation, etc.)
- They need to be capable of funnel away as much water as the underlying filter or soils are capable of handling.

What are caps used for?

Capping is required when contaminated soils and/or materials are to be left in place at a site. It can be used when

- the underground contamination is so extensive that it prohibits excavation and removal.
- the chemicals present in the contaminated soils do not migrate (to any significant degree) if water does permeate the soil.
- the removal of contaminated soils from the site would pose a greater threat to human health and the environment than simply leaving them in place.

Capping is often used in combination with groundwater extraction (removal) or containment technologies to reduce and, if possible, prevent contaminant migration. Groundwater monitoring wells are often used in the area where a cap has been installed to detect any migration of the wastes, that may unexpectedly occur. Capping is also associated with surface water controls such as ditches, dikes, and berms. These structures are used to receive rainwater drainage that flows from the cap.

How must caps be maintained?

All caps require periodic inspection for settling of the overlying soils, standing water, erosion, or disturbance by deep-rooted plants. In addition, the groundwater monitoring wells, usually associated with caps, need to be sampled periodically and maintained.

Caps having only a synthetic liner as a barrier to the flow of outside liquids are usually designed to last a minimum of 20 years. The use of a synthetic liner that is supported by a non-porous base, such as clay can extend the design life to over 100 years as long as the contaminants are kept above the water table. Proper maintenance will extend the life of the cap even longer.

Rigid barriers such as concrete are subject to cracking and chemical deterioration. However, these cracks can be exposed, cleaned, and repaired with relative ease. Concrete covers may have a design life of about 50 years.

A final cap should be inspected on a regular basis for signs of erosion and settling of the soil. Maintenance of the final cap should be limited to periodic mowing of the vegetation to prevent any deep-rooted plants from growing. Any signs of settling should be addressed immediately by removing the soil cover to inspect and repair the affected areas.

What do caps look like?

The primary purpose of a cap is to minimize contact between rain or surface water and the contaminated soil. The only type of cap that is generally acceptable is the multi-layer cap. This type of cap generally has four layers: vegetation, drainage, water-resistant and foundation. The vegetation layer prevents erosion of the soils of the cap. The drainage layer channels rainwater away from the cap and keeps water from collecting on the water-resistant layer which covers the waste.

The foundation layer is composed of soil materials that are structurally capable of supporting the weight of the finished cap. The foundation material should be spread over the wastes in six-inch increments and compacted. Structural stability tests should be run on each increment to assure uniformity.

The water-resistant layer is placed in six-inch increments and compacted with a bulldozer or other heavy equipment. The thickness of the water-resistant layer should be at least two feet, but should be increased if settling is expected in the underlying contaminated soils. A synthetic liner should be placed and sealed according to the manufacturers specifications. The liner should be at least 20 mils thick. (One mil is equal to one-thousandth of an inch.) A thicker liner should be used if more than a few inches of settling is expected.

The drainage layer is also placed in six-inch increments and should be at least one foot thick. If the drainage layer is placed directly over the liner, the soil material must be free of sharp objects that could puncture the liner. Filter fabric should be placed above the drainage layer to prevent the soil from the vegetation layer from clogging the drainage pores. The pore size of this layer should be large enough to allow for proper drainage, but small enough to prevent the soil from moving into the drainage layer.

The vegetation layer should be at least two feet thick to accommodate root penetration. It should be spread evenly and not overly compacted. The vegetation should be non-woody plants, preferable grasses, which will require low maintenance and do not have deep roots.

How “good” is a cap?

Capping is a reliable technology for sealing off contamination from the aboveground environment and significantly reducing underground migration of pollutants away from the site. Caps can be constructed over virtually any site, and can be completed relatively quickly if the ground is not frozen or saturated with water. The soils and other material for capping are readily available in most areas of the country. Standard road construction equipment is used in this method of remediation. Capping is an attractive alternative when excavation or treatment is not cost-effective or protective of human health and the environment.

The information in this fact sheet was taken from Common Cleanup Methods at Superfund Sites, a U. S. Environmental Protection Agency Publication, June 1992.