DEPARTMENT OF ECOLOGY
State of Washington

Focus on: Treatment by Solidification

The dangerous waste regulations require that sites treating dangerous waste obtain a permit.[1] However, Ecology allows generators to conduct certain types of waste treatment in accumulation tanks and containers. This focus sheet explains how to treat some dangerous wastes through on-site solidification. This guidance does not pertain to treating environmental media at clean-up sites.

You don't need a permit or written approval to solidify dangerous waste if you comply with this guidance and our Focus On: Treatment by Generator publication. However, you must notify us using the Site Identification Form.[2] When you complete the form, mark the Treatment by Generator (TBG) box on the State Waste Activities Section, and add the TBG activities in the comments section of the form.

Related information

- Dangerous waste treatment by generator webpage[3]
- Focus on: Treatment by Generator[4]

Ecology may require your site to stop treatment activities if the process poses a threat to public health or the environment. For more details about treatment by generator, see the generator requirements[5] in the Dangerous Waste Regulations.[6]

What is solidification and stabilization?

Solidification and stabilization are techniques that limit the solubility and mobility of dangerous waste constituents. Solidification immobilizes a waste through physical means and stabilization immobilizes the waste by bonding or chemically reacting with the stabilizing material. These processes use additives to reduce the mobility and/or toxicity of pollutants.

1 ecology.wa.gov/Regulations-Permits/Permits-certifications/Dangerous-waste-permits
2 apps.ecology.wa.gov/publications/documents/ecy070133.pdf
3 ecology.wa.gov/dw-treatment-by-generator
4 apps.ecology.wa.gov/publications/documents/2004017.pdf
5 app.leg.wa.gov/wac/default.aspx?cite=173-303-170
6 app.leg.wa.gov/wac/default.aspx?cite=173-303

Some dangerous wastes, appropriately solidified and stabilized, can meet federal Land Disposal Restriction (LDR) treatment standards. Ecology considers the treatment of waste streams that require stabilization and solidification to meet federal LDR treatment standards to be regulatorily and technically complex, and therefore recommends hiring a consultant to be able to do the following, where applicable:

- Develop a Waste Analysis Plan(WAP)[7] that describes:
  - How representative waste samples will be taken.
  - The types and frequency of laboratory testing to be completed.
  - Procedures and all information necessary to comply with LDR Treatment Standards
- Completing LDR notification and certification paperwork.
- Keeping required records, including but not limited to treatment logs, notices, certifications, and waste analysis data.

Limitation and Criteria

This guidance is limited to dangerous waste that:

- You treat in containers or tanks.
- Remains a dangerous waste after solidification (i.e., not treated to meet federal Land Disposal Restriction Treatment Standards).
- Won't be left on site to be closed as a landfill.
- Won't change from an extremely hazardous waste (EHW) designation to a dangerous waste (DW) designation after solidification.

The placement of bulk or noncontainerized liquid dangerous waste or dangerous waste containing free liquids in any landfill is prohibited. Outside a few exceptions listed in WAC 173-303-140(4)(b)(ii)[8], all free liquids must be removed from dangerous waste before it's disposed in a landfill. You can do this in different ways, with one of them being solidification.

You may treat your waste by solidification if:

- You first use a reduced-scale test with known ratios of treatment material and waste, to verify the full-scale solidification process will meet EPA's Paint Filter Liquids Test Method 9095B[9] standard.
- The solidified waste passes the Paint Filter Liquids Test 9095B as described in "Test Methods for Evaluating Solid Wastes, Physical/Chemical Methods" EPA Publication SW-846. This test assesses the amount of free liquid in the waste.
- You use a non-biodegradable solidification material, such as:
  - Inorganic minerals, other inorganic materials, and elemental carbon (e.g., aluminosilicates, clays, smectites, Fuller's earth, bentonite, calcium bentonite, montmorillonite, calcined montmorillonite, kaolinite, micas (illite), vermiculites, zeolites; calcium carbonate (organic free limestone); oxides/hydroxides, alumina, lime, silica (sand), diatomaceous earth; perlite (volcanic glass); expanded volcanic rock; volcanic ash; cement kiln dust; fly ash; rice hull ash; activated charcoal/activated carbon); or
  - High molecular weight synthetic polymers such as polyethylene, high density polyethylene (HDPE), polypropylene, polystyrene, polyurethane, polyacrylate, polynorbornene, polyisobutylene, ground synthetic rubber, cross-linked allyl styrene and tertiary

[7] www.epa.gov/sites/default/files/2015-04/documents/tsdf-wap-guide-final.pdf
[8] app.leg.wa.gov/wac/default.aspx?cite=173-303-140
[9] www.epa.gov/hw-sw846/sw-846-test-method-9095b-paint-filter-liquids-test

    - butyl copolymers. This does not include polymers derived from biological material or polymers specifically designed to be degradable; or
    - Mixtures of these nonbiodegradable materials.
- The nonbiodegradable sorbent must be determined to be nonbiodegradable under ASTM Method G21-96 (2002) - Standard Practice for Determining Resistance of Synthetic Polymer Materials to Fungi; or under the Organization for Economic Cooperation and Development (OECD) Test 301B: [CO2 Evolution (Modified Sturm Test)].
- The solidified material is resistant to thermal cycling, wet/dry cycling, radiation exposure, chemical exposure, and compressive forces.
- You don't solidify your dangerous waste to dilute it.
- Prior to beginning treatment, you develop a waste analysis plan (WAP). For more details about waste analysis, see WAC 173-303-300.[10]

How does solidification of dangerous waste work?

For dangerous waste with free liquids, solidification can prepare the dangerous waste to meet:

- Waste acceptance criteria of a permitted Treatment, Storage, and Disposal Facility.
- Special waste exclusion requirements and disposal at a municipal solid waste landfill, provided that it's permitted and willing to accept this type of waste.
- State LDRs for disposal at a hazardous waste landfill.

You're responsible for complying with all applicable federal, state, and local requirements relating to on-site waste management.

Permit by Rule

If your solidification process is part of a wastewater treatment operation (regulated by Permit by Rule),[11] this isn't considered a treatment by generator activity. Instead, the waste treatment is regulated under the Clean Water Act. Ecology may require your site to stop treatment processes if it's determined to pose a threat to public health or the environment.

Solidification Examples

1) A facility generates 800 pounds of dangerous waste every month that with a state criteria WT02 waste code with a Toxic Category B. They test the waste using Method 9095B paint filter liquids test and the material contains free liquids. The facility conducts some small-scale experiments with bentonite and their waste to determine the most efficient mixing technique. After three tries, they produce a waste form that passes the paint filter liquids test (i.e., no liquid passes through the filter).

   With this treatment plan documented in their waste analysis plan, the facility begins full-scale solidification in their Central Accumulation Area. They maintain a treatment log with the date and amount of waste treated and ship their waste from the site every two months to an out of state Hazardous Waste Landfill.

2) A facility routinely generates a filter cake waste that designates with a state criteria WT02 waste code with a Toxic Category D. From past testing, the generator knows the waste contains free liquids and will not pass the Method 9095B paint filter liquids test. The facility conducts some small-scale experiments with montmorillonite clay and their waste to determine the most efficient ratio and mixing technique.

10 app.leg.wa.gov/wac/default.aspx?cite=173-303-300
11 apps.ecology.wa.gov/publications/SummaryPages/2104014.html

The facility allows enough expansion space in the mixing container to account for any expansion of the montmorillonite clay. After two tries, they produce a waste form that passes the paint filter liquids test.

With this treatment plan documented in their waste analysis plan, the facility begins full-scale solidification of the filter cake waste in their Central Accumulation Area. They maintain a treatment log with the date and amount of waste treated and then manage and dispose of the treated waste in accordance with the special waste exclusion requirements in WAC 173-303-073.[12] See Focus on: Special Waste Exclusion[13] for more information.

Where can I learn more?

For more information, please contact a dangerous waste specialist in your region's office.

Southwest Regional Office: 360-407-6300
Counties: Clallam, Clark, Cowlitz, Grays Harbor, Jefferson, Mason, Lewis, Pacific, Pierce, Skamania, Thurston, Wahkiakum

Northwest Regional Office: 206-594-0000
Counties: Island, King, Kitsap, San Juan, Skagit, Snohomish, Whatcom

Industrial Section: 360-407-6916

Central Regional Office: 509-575-2490
Counties: Benton, Chelan, Douglas, Kittitas, Klickitat, Okanogan, Yakima

Eastern Regional Office: 509-329-3400
Counties: Adams, Asotin, Columbia, Ferry, Franklin, Garfield, Grant, Lincoln, Pend Oreille, Spokane, Stevens, Walla Walla, Whitman

Nuclear Waste Program: 509-372-7950

ADA Accessibility

To request an ADA accommodation, contact Ecology by phone at 360-407-6700 or email at hwtrpubs@ecy.wa.gov, or visit ecology.wa.gov/accessibility.[14] For Relay Service or TTY call 711 or 877-833-6341.

[12] https://app.leg.wa.gov/wac/default.aspx?cite=173-303-073
[13] https://apps.ecology.wa.gov/publications/SummaryPages/2104013.html
[14] https://ecology.wa.gov/accessibility