



Characteristic Hazardous Wastes

In Minnesota, a waste may be hazardous for one of these reasons:

- It displays a hazardous waste characteristic
- It is recorded in one of four lists of hazardous waste – the K, F, P, or U List
- It contains polychlorinated biphenyls (PCBs)

This document discusses the six characteristics that can make a waste hazardous.

For more information on the lists, PCBs, or the lethality characteristic, see Minnesota Pollution Control Agency (MPCA) hazardous waste fact sheets #2.00, 2.01, 2.02, 2.03, 2.05, and 4.48a, available on the MPCA's hazardous waste publications webpage, <http://www.pca.state.mn.us/waste/pubs/business.html>.

Evaluating wastes for hazardous waste characteristics

All wastes that display one of the hazardous characteristics – including both used and unused products that are discarded, manufacturing and process wastes, and soil and debris contaminated with these wastes – are hazardous wastes.

A waste must be evaluated at the point of generation – when it first becomes a waste – to determine whether it displays a hazardous characteristic. A nonhazardous product can become a hazardous waste if it changes or becomes sufficiently contaminated during use so that it displays a hazardous characteristic. For example, parts washer solvent with a high flash point as a product whose flash point is lowered enough during use or that becomes contaminated with toxic constituents to the point it displays a hazardous characteristic.

Characteristic wastes in Minnesota

Wastes are hazardous in Minnesota when they display one or more of these characteristics:

- Ignitable
- Oxidizer
- Corrosive
- Reactive
- Toxic
- Lethal

Although the first five characteristics are similar to the Federal hazardous waste characteristics, some definitions are slightly different in Minnesota. Ensure you apply the correct definition. Lethality is a Minnesota hazardous characteristic.

Reducing characteristic waste

Reducing the amount of hazardous waste you generate can lower your costs as well as make it easier to comply with regulatory requirements. The Minnesota Technical Assistance Program (MnTAP) has staff that can help you assess alternate products and processes with a goal of reducing your listed waste generation. See the *Contact information* section on page six.



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Wastes mixed with characteristic waste

The status of a mixture of a characteristically hazardous waste with another waste depends on the characteristic(s) displayed by the original hazardous waste. If a waste is hazardous because:

- It is ignitable, an oxidizer, corrosive or reactive – when mixed with another waste, the resulting mixture is only hazardous if it still displays one of those hazardous waste characteristics. NOTE: You may not dilute a waste to eliminate a hazardous characteristic.
- It is toxic or lethal – when mixed with another waste, the resulting mixture becomes a toxic or lethal waste.

Ignitable characteristic

An Ignitable hazardous waste may be a liquid, solid, or compressed gas. All ignitable hazardous wastes are assigned the hazardous waste code 'D001'.

Liquid

Generally, a liquid whose flashpoint is less than 60° Celsius (140° Fahrenheit) is an ignitable hazardous waste. However, water-based solutions (50 percent or more water) containing less than 24 percent alcohol are not ignitable, regardless of their flashpoint.

For the purpose of the ignitability characteristic, *liquids* include suspensions, the liquid portion of multiphase wastes, and any fluid that can be tested using the standard closed-cup test methods. Common examples of ignitable hazardous waste liquids include oil-based paints and most solvents.

Used absorbent materials that release an ignitable liquid when compressed also are regulated as ignitable wastes. For more information on identifying and managing regulated absorbent materials, see MPCA hazardous waste fact sheet #4.61, *Managing Towels, Wipes, and Sorbents* at <http://www.pca.state.mn.us/publications/w-hw4-61.pdf>.

Note that under the U.S. Department of Transportation's (DOT) Hazardous Material Regulations (HMR), ignitable liquid hazardous wastes share the same flashpoint threshold (140° Fahrenheit) as Class 3 flammable liquids.

Solid

A waste is a solid ignitable hazardous waste if it will both:

1. Spontaneously combust, or ignite through friction or by absorbing moisture; and
2. Once ignited, will burn so vigorously and persistently that it creates a hazard.

If your waste is in granular or paste-like form, or if your waste which may be cut into strips, you should use Environmental Protection Agency (EPA) Test Method 1030 to determine whether the waste will burn vigorously or persistently enough to create a hazard. Wastes with a burn rate of 2.2 millimeters per second or greater are considered to create a hazard under this definition. Many common waste forms, such as rags and filter materials, may likely fail this test. If your waste is in a form which cannot be tested using Method 1030, you must use other available knowledge to evaluate your waste to determine whether it burns vigorously and persistently enough to create a hazard.

Examples of solid ignitable hazardous wastes include rags soaked with linseed oil, aluminum dust, and phosphorus.

Compressed gas

A waste compressed gas is an ignitable hazardous waste if, when not compressed, it will either:

- Burn when mixed at 13 percent or less with air; or
- Has a flammability range of 12 percent or more, regardless of the lower limit.

Common examples of compressed gas ignitable hazardous wastes include acetylene, propane, and the propellant of most commercial and consumer aerosol products.

For more information on managing aerosols, see MPCA hazardous waste fact sheet #4.00, Managing Waste Aerosols at <http://www.pca.state.mn.us/publications/w-hw4-00.pdf>.

Oxidizer characteristic

A waste is classified as a hazardous waste oxidizer if it either:

3. Is defined as an oxidizer under the DOT Hazardous Materials Regulations
4. Readily supplies oxygen to a chemical reaction or acts similarly to oxygen in a reaction

Hazardous waste oxidizers are assigned the hazardous waste code 'D001' (the same code as ignitable waste).

Oxidizers under DOT Hazardous Materials Regulations

DOT Hazardous Materials Regulations define oxidizers as:

- Solids with a mean burning time less than or equal to that of a 3:7 mixture of potassium bromate and cellulose
- Liquids that spontaneously ignite or which will rise in pressure faster than a 1:1 mixture of nitric acid and cellulose

Wastes that readily supply oxygen or act similarly to oxygen in to a chemical reaction

Oxidative materials include, but are not limited to:

- Bromine, bromates, and perbromates
- Chlorine, chlorates, and perchlorates
- Chromates and dichromates
- Fluorine
- Iodine, iodates, and periodates
- Nitric acid and both organic and inorganic nitrates
- Oxygen, ozone, oxides, and both organic and inorganic peroxides
- Perborates, permanganates, perrhenates, and persulfates

While you may commonly find information about a product's status as an oxidizer in a Material Safety Data Sheet (MSDS) or other product literature, remember that absence of a specific warning that a product is an oxidizer is not evidence that the product is not a hazardous waste oxidizer.

Corrosive characteristic

In Minnesota, only liquids are subject to evaluation for corrosivity; however, you must ensure that hygroscopic solid wastes that may absorb enough water to become a liquid during accumulation or

transport are also evaluated for the corrosive characteristic. All corrosive hazardous wastes are assigned hazardous waste code D002.

A waste is hazardous for the corrosive characteristic if it is:

- An aqueous waste (20 percent or more water) having a pH of 2 or less, or 12.5 or more; or
- Any other liquid that will corrode steel faster than ¼ inch per year.

Examples of hazardous wastes displaying the corrosive characteristic include ferric chloride and laboratory acids.

Reactive characteristic

Reactive hazardous wastes include wastes that may explode or release toxic fumes in common waste situations. Reactive hazardous wastes are assigned hazardous waste code 'D003'.

A waste is hazardous for the reactive characteristic if it:

- Is normally unstable and readily undergoes violent change without detonating
- Reacts violently with water
- Forms potentially explosive mixtures with water
- Releases toxic fumes in dangerous quantities when mixed with water
- Is a cyanide- or sulfide-bearing waste and releases toxic fumes in dangerous quantities when exposed to pH conditions between 2.0 and 12.5
- Is capable of detonation or explosion if subjected to a strong initiating source or heated under confinement
- Is readily capable of detonation or explosive decomposition or reaction at standard temperature and pressure
- Is a Division 1.1, 1.2, or 1.3 or forbidden explosive under DOT Hazardous Materials Regulations

Common examples of hazardous wastes displaying the reactive characteristic include crystallized picric acid and cyanide-containing plating solutions.

Toxic (toxicity) characteristic

A toxic hazardous waste is a waste that will leach one of 40 contaminants at a concentration greater than the threshold concentration given in [Minn. Rules 7045.0131](#), Subp. 8 (also see page seven). A toxic hazardous waste is assigned a hazardous waste code based on the leachable contaminant.

Examples of wastes commonly hazardous for the toxicity characteristic include used parts washer solvent and paints containing 'heavy' (toxic) metal pigments.

Toxicity Characteristic Leaching Procedure (TCLP)

The test to evaluate a waste for the toxicity characteristic is the Toxicity Characteristic Leaching Procedure (TCLP). This test simulates conditions that may occur within a landfill and assesses a waste's potential to leach a toxic contaminant into surface waste or ground water. You, your hazardous waste transporter, or an analytical laboratory may perform the TCLP. While there is no requirement to use a certified laboratory, the Minnesota Department of Health (MDH) maintains a voluntary laboratory accreditation program. For assistance finding an MDH-accredited laboratory, contact the MPCA or the MDH.

- Solid wastes are subjected to a leaching test using an acidic solution. The concentration of contaminants in the leachate is then compared to the thresholds specified in Table 1 on page 8 of this fact sheet. The waste is hazardous if a contaminant is present in the leachate at or above the threshold concentration.

- Liquid wastes (contain less than 0.5 percent filterable solids) are tested directly by comparing the concentration of contaminants in the waste to the thresholds specified in Table 1 on page 8. The waste is hazardous if a contaminant is present in the waste at or above the threshold concentration.
- A multi-phase waste containing both solid and liquid components is separated and each component tested as above. The entire multi-phasic waste is assigned the hazardous waste code(s) determined for any component.

Evaluating for the toxicity characteristic 'by knowledge' using a Material Safety Data Sheet

The most commonly available technical document for many products is the MSDS prepared by manufacturers to meet requirements of the U.S. Occupational Safety and Health Administration (OSHA). Unfortunately, only hazardous constituents present at a concentration of one percent or more (0.1 percent for carcinogens) are required to be listed on an MSDS by Federal OSHA Regulations. This limit is many times higher than any of the TCLP hazardous waste thresholds.

Therefore, a toxic contaminant may be present in a product at concentrations that would make the product hazardous for the toxicity characteristic without being listed on the MSDS at all. In addition, products that do not contain any contaminants may pick up toxic contaminants during use, particularly products used as solvents or cleaners. So, for:

- Products that will be disposed of without being used, or whose use would not reasonably result in contamination – you may only rely on explicit statements in an MSDS or other product literature stating a product does not contain toxic contaminants or only contains toxic contaminants at a concentration less than hazardous waste thresholds.
- Products that will be used and then disposed of – you may not use an MSDS to evaluate a resulting waste for the toxicity characteristic. You must perform a TCLP test or rely on other knowledge that the waste does not contain toxic contaminants.

'Rule of 20'

The TCLP can be expensive. Solid wastes, and the solid component of multi-phase wastes, may be evaluated (at least initially) using the 'totals' test. Since the TCLP test involves a 20-fold dilution of the leachate, you may test a solid waste (or consult available documentation, such as an MSDS), to determine the maximum total concentration of toxic contaminants that may be present in the solid waste. Then:

- If the total concentration for any contaminant is less than 20 times the hazardous waste threshold concentration for that contaminant, you may assume the waste is not hazardous for that contaminant.
- If the total concentration for a contaminant is 20 times or more than the hazardous waste threshold concentration for that contaminant, you must either perform the TCLP or consider the waste hazardous for that contaminant.

Liquid wastes may not be evaluated using the 'Rule of 20'.

Lethal characteristic

Lethality is a characteristic specific to Minnesota, although some other states have similar classifications. A waste is hazardous for the lethality characteristic if its oral or dermal median lethal dose (LD50) or inhalation median lethal concentration (LC50) is less than the hazardous waste threshold. Lethal hazardous wastes are assigned hazardous waste code 'MN01'.

Examples of wastes often displaying the lethality characteristic include poisons, pesticides, and some pharmaceuticals. If a waste is hazardous for the lethality characteristic, you must list the MN01

hazardous waste code on the uniform hazardous waste manifest as one of the six hazardous waste codes when you ship it off site for disposal.

Hazardous waste thresholds for the lethality characteristic are:

- Oral LD50 (rat) 500 milligram per kilogram (mg/kg)
- Dermal LD50 (rabbit) 1000 mg/kg
- Inhalation LC50 (rat)
 - dust/mist 2000 milligrams per cubic meter of air (mg/m3)
 - gas/vapor 1000 parts per million (ppm)

To help you evaluate waste for the lethality characteristic, the MPCA has compiled a list of attributes that indicate that a waste may be lethal. For the list and more information about the lethality characteristic, see MPCA hazardous waste fact sheet #2.05, The Lethality Characteristic, available at <http://www.pca.state.mn.us/publications/w-hw2-05.pdf>.

Contact information

Your metropolitan county and the MPCA have staff available to answer waste management questions. For more information, contact your metropolitan county hazardous waste office or your nearest MPCA regional hazardous waste staff. For information about waste reduction, contact the Minnesota Technical Assistance Program.

Metro County Hazardous Waste Offices

Anoka 763-422-7093
Carver 952-361-1800
Dakota 952-891-7557
Hennepin 612-348-3777
Ramsey 651-266-1199
Scott 952-496-8475
Washington 651-430-6655
Web sites [http://www.co.\[county\].mn.us](http://www.co.[county].mn.us)

Minnesota Technical Assistance Program

Toll free..... 1-800-247-0015
Metro 612-624-1300
Web site <http://www.mntap.umn.edu>

Minnesota Pollution Control Agency

Toll free (all offices) 1-800-657-3864
Brainerd 218-828-2492
Detroit Lakes 218-847-1519
Duluth 218-723-4660
Mankato 507-389-5977
Marshall 507-537-7146
Rochester 507-285-7343
St. Paul 651-296-6300
Willmar 320-214-3786
Web site <http://www.pca.state.mn.us>

Table 1. Maximum concentration of contaminants for the toxicity characteristic

Hazardous waste code	Contaminant	CAS #	Maximum concentration (mg/L)	Notes
D004	Arsenic	7440-38-2	5.0	7
D005	Barium	7440-39-3	100.0	
D018	Benzene	71-43-2	0.5	1,8
D006	Cadmium	7440-43-9	1.0	
D019	Carbon tetrachloride	56-23-5	0.5	1,8
D020	Chlordane	57-74-9	0.03	1
D021	Chlorobenzene	108-90-7	100.0	1,8
D022	Chloroform	67-66-3	6.0	1
D007	Chromium	7440-47-3	5.0	4
D023	o-Cresol	95-48-7	200.0	1,6,8
D024	m-Cresol	108-39-4	200.0	1,6,8
D025	p-Cresol	106-44-5	200.0	1,6,8
D026	Cresol	-----	200.0	1,6,8
D016	2,4-D	94-75-7	10.0	1
D027	1,4-Dichlorobenzene	106-46-7	7.5	
D028	1,2-Dichloroethane	107-06-2	0.5	
D029	1,1-Dichloroethylene	75-35-4	0.7	1
D030	2,4-Dinitrotoluene	121-14-2	0.13	1,3
D012	Endrin	72-20-8	0.02	2
D031	Heptachlor (and its epoxide)	76-44-8	0.008	2
D032	Hexachlorobenzene	118-74-1	0.13	1,3
D033	Hexachlorobutadiene	87-68-3	0.5	1
D034	Hexachloroethane	67-72-1	3.0	1
D008	Lead	7439-92-1	5.0	
D013	Lindane	58-89-9	0.4	1
D009	Mercury	7439-97-6	0.2	1,9
D014	Methoxychlor	72-43-5	10.0	1
D035	Methyl ethyl ketone	78-93-3	200.0	1,8
D036	Nitrobenzene	98-95-3	2.0	1,8
D037	Pentachlorophenol	87-86-5	100.0	
D038	Pyridine	110-86-1	5.0	1,3,8
D010	Selenium	7782-49-2	1.0	
D011	Silver	7440-22-4	5.0	5
D039	Tetrachloroethylene	127-18-4	0.7	1,8
D015	Toxaphene	8001-35-2	0.5	2
D040	Trichloroethylene	79-01-6	0.5	1,8
D041	2,4,5-Trichlorophenol	95-95-4	400.0	
D042	2,4,6-Trichlorophenol	88-06-2	2.0	
D017	2,4,5-TP (Silvex)	93-72-1	1.0	
D043	Vinyl chloride	75-01-4	0.2	1

Explanation of Table 1 notes

1. Any waste disposed of without being used and containing this contaminant as the sole active ingredient is a U-listed hazardous waste regardless of the concentration of the contaminant. For more information on the U List, see MPCA hazardous waste fact sheet #2.03, U List of Hazardous Waste at <http://www.pca.state.mn.us/publications/w-hw2-03.pdf>.
2. Any waste disposed unused and containing this contaminant as the sole active ingredient is a P-listed acute hazardous waste regardless of the concentration of the contaminant. For more information on the P List, see MPCA hazardous waste fact sheet #2.02, P List of Acute Hazardous Waste at <http://www.pca.state.mn.us/publications/w-hw2-02.pdf>.
3. Though the Minnesota Rules do not contain this annotation, the Federal Regulations note that these contaminants may have quantitation limits greater than the hazardous waste threshold concentration. The quantitation limit is the lowest concentration that can be reliably measured within specified limits of precision and accuracy during routine laboratory operating conditions. The specific quantitation level is determined by current accepted inter-laboratory studies or, in the absence of such studies, is five times the established minimum detection limit for each contaminant. If the current quantitation limit is greater than the stated hazardous waste threshold concentration, then the quantitation limit becomes the effective hazardous waste threshold concentration.
4. Wastes containing chromium which is exclusively or nearly exclusively trivalent which are generated from processes using exclusively or nearly exclusively trivalent chromium and do not generate hexavalent chromium are not D007 hazardous wastes if managed in non-oxidizing environments.
5. Silver-containing x-ray and photographic film and sludge from silver recovery units which will be recycled may be managed under reduced requirements. For the reduced requirements for photographic waste management, see MPCA hazardous waste fact sheet #4.46, Managing Photographic and X-ray Waste at <http://www.pca.state.mn.us/publications/w-hw4-46.pdf>.
6. If the concentration of each form of cresol cannot be differentiated, then the total cresol concentration must be used to evaluate the waste. If the total cresol concentration must be used, the hazardous waste concentration threshold is 200mg/L.
7. Arsenic-treated wood waste disposed of after structural use may be managed under reduced requirements without determining whether it leaches arsenic. Treated wood waste that is disposed of after any other use must be evaluated fully. For the reduced requirements for structural arsenic-treated wood management, see MPCA hazardous waste fact sheet #4.67, Treated Wood: Use, Disposal, and Alternatives for Businesses at <http://www.pca.state.mn.us/publications/w-hw4-67.pdf>.
8. Wastes containing this contaminant may meet the definition of F-listed hazardous waste regardless of the concentration of the contaminant, depending on their intended or actual use. For more information on the F List, see MPCA hazardous waste fact sheet #2.00, F List of Hazardous Waste at <http://www.pca.state.mn.us/publications/w-hw2-00.pdf>.
9. Fluorescent and high-intensity discharge lamps, such as neon, sodium vapor, and mercury vapor lamps, and mercury-containing devices, such as thermostats, thermometers, and pressure gauges, which would be U151 or D009 hazardous wastes for mercury, may be managed under reduced requirements as Universal Wastes. Mercury is not considered an exempt scrap metal. For more information about Universal Wastes and their management requirements, see MPCA hazardous waste fact sheet #4.62, Universal Waste at <http://www.pca.state.mn.us/publications/w-hw4-62.pdf>.