



NEBRASKA DEPARTMENT OF ENVIRONMENTAL QUALITY

ENVIRONMENTAL GUIDANCE SHEET

05-176

September 2005

Waste Determinations & Hazardous Waste Testing

This Environmental Guidance Document discusses the topic of hazardous waste determinations, who needs to do determinations, what a waste determination entails, and considerations concerning analytical testing. The department has found that this topic can be complex and involves decisions that are often technical in nature. References are to Title 128 – Nebraska Hazardous Waste Regulations.

1. Who must do hazardous waste determinations?

- Businesses, governments, schools, and organizations that generate solid waste (this includes liquids too) must determine if that waste is a hazardous waste (Title 128, Chapter 4, §002). Household waste is exempt from this requirement.

2. What does a hazardous waste determination entail?

- The waste generator should first determine if the waste is excluded from being a hazardous waste by regulation (Title 128, Chapter 2, Sections 008 through 013).
 - Some examples of excluded solid or hazardous wastes include household waste, punctured and hot drained oil filters, scrap metal that is recycled, certain ash wastes from the combustion of coal, cement kiln dust waste from kilns that don't burn hazardous waste, and domestic sewage and other wastes that pass through a sewer system to a publicly owned treatment works (municipal wastewater treatment plant).
- Next, determine if the waste is *listed* as a hazardous waste in Title 128, Chapter 3, Sections 013 through 016.
 - *Listed* wastes are wastes from certain nonspecific and specific defined sources. The actual lists for the F, K, P, and U listed wastes are found at Tables 4 through 7 of Title 128.

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- The P and U *listed* wastes are commercial chemical products. If the waste is a technical grade or off-specification product having *only* the generic name as listed then the waste is P or U *listed*. If the listed ingredient is the sole active ingredient in the disposed commercial chemical product, then the waste is a P or U *listed* waste.
- Practically, this means that just because your waste has a chemical on the P or U list at Tables 6 or 7, does not necessarily mean the waste is a P or U *listed* waste.
- F *listed* wastes are much more common than P or U *listed* wastes. The first five (F001 through F005) are spent solvents and contain certain percentages of listed constituents before use. Always check Table 4 closely when dealing with spent solvents.
- Next, determine whether the waste is *characteristic* as identified in Title 128, Chapter 3, Sections 005 through 010. *Characteristic* wastes can be any combination of ignitable, corrosive, reactive, or toxic. You may identify the characteristics by doing either of the following as appropriate:
 - The generator may apply knowledge of the hazardous characteristic in light of the materials or processes used. Be able to back up your knowledge of the waste with some kind of documentation. If you can't do that then you need to do the following;
 - Test the waste using specified analytical methods.
- Last, if the waste is determined to be hazardous, refer to Title 128 chapters 2, 3, 7, 20 through 22, and 25 for possible exclusions or restrictions pertaining to management of the waste.

3. What's a good way to apply generator knowledge of the waste in light of the materials or processes used without having to test?

- A waste generator can use valid generator knowledge to perform waste determinations. Material Safety Data Sheets (MSDSs) can provide useful information and you must have them for Occupational, Safety, and Health Act (OSHA) purposes anyway. Be aware that MSDSs often do not list constituents below de minimus levels of 1%. This is important because a 100% solid product with constituent "X" present at 0.9% can still have constituent levels of "X" as high as 450 mg/L (ppm) in a TCLP test. A 100% liquid, using the same example, would have constituent "X" present at 9,000 mg/L!

4. As a practical matter, the department has found that the following waste streams are quite variable in nature and contaminants are present that are there due to cleaning or wear that cannot be predicted using so-called generator knowledge; analytical testing would be required for these wastes:

- Spent Parts Washer Solvent
- Spent Antifreeze
- Sludges from sumps and pits
- Spent sorbents used to sorb used oil such as "kitty litter," socks, and pillows

5. What does analytical testing refer to?

- Analytical testing for hazardous waste refers to determining if any of the 40 toxicity characteristic (TC) constituents listed in Table 3 of Title 128, Chapter 3, § 010 are present in a *representative sample* of your waste at or above the stated regulatory levels. It is essential that proper sampling techniques are used. These are leachable levels, not actual levels present, and are stated in milligrams per liter (mg/L). The analytical test for determining leaching levels is the *toxicity*

characteristic leaching procedure (TCLP). This test simulates the conditions in a landfill and how those conditions will affect your waste over an extended time. It essentially determines how much, if any, of the TCs will leach from your waste and enter the environment.

- Analytical testing can also include testing for D001, ignitibility (finding the temperature a liquid will flash at); D002, corrosivity (finding the pH of an aqueous solution); and D003, reactivity for cyanides or sulfides that may generate toxic gases. If the waste is not aqueous do not waste you're money obtaining a pH. Solid sodium hydroxide, for example, is not a corrosive hazardous waste. It is, however, most definitely a very hazardous material and one that is hygroscopic. Over a period of time it could absorb sufficient atmospheric moisture to have an aqueous phase.
- Ensure the test method selected has a detection level at least as low as the TC regulatory level for the contaminant in question. A detection limit that only goes as low as 10 mg/L TCLP for arsenic will not tell you if the sample is a hazardous waste for arsenic when the TCLP regulatory level is 5.0 mg/L.

6. Do I have to use the "TCLP" test all the time? I've heard it can be expensive.

- The TCLP itself may be run for constituents of concern. By running the TCLP for constituents of concern you will get the actual TCLP results and, if the sampling was correctly performed, you will have unambiguous results. However, the TCLP is expensive and can take considerable time. There may be times when you can test using a less expensive alternative.
- A less expensive alternative to running the TCLP is to do a "totals" analysis on the waste stream for the constituents of concern. The totals analysis can be selected when there is a reasonable expectation that the waste stream will not contain the constituent of concern at or above Table 3 regulatory levels. Totals analysis can also be used if you believe the waste will "fail" for the constituents of concern and you are not concerned about managing the resulting hazardous waste. Do not use the totals analysis to test for hazardous waste if you are interested in positively excluding the possibility that the waste is hazardous and there is some reason to believe the results may be close.
 - Only single phase waste streams should be selected for a totals analysis. Single phase means either all solid or all liquid.
 - For liquids with less than 0.5% solid present the totals analysis is the actual TCLP result.
 - With **100% solid** samples, the totals result may be divided by 20 to determine if the waste sample may exhibit hazardous waste toxicity characteristics. For example, if a **100% solids** sample exhibits a 90 mg/kg (or ppm) level for **total** lead, you can state the sample is not a hazardous waste for lead. Divide 90 ppm by 20 and the result is 4.5 ppm. That is less than the 5.0 ppm (or mg/L) regulatory level for the TC of lead. The assumption is that 20 is the dilution factor for the TCLP extraction and if the sample were *fully* leachable in the extraction, it could not attain the TC level.

$$\frac{90 \text{ mg/kg total lead result}}{20 \text{ (TCLP dilution factor)}} = 4.5 \text{ mg/kg } (< 5.0 \text{ mg/L lead TCLP limit})$$

Note that for this purpose mg/L and mg/kg are both parts per million.

7. Do I have to test for all the chemicals that are on Table 3?

- Testing for waste streams should only be done for those constituents that may reasonably be expected to be present. For example, if a facility had a parts washer, the parts washer may reasonably be expected to contain leachable metals. (Chromium or cadmium is often a coating or constituent from bearings, pistons, or other metal products.) Since pesticides would not reasonably be expected to be present in normal parts washer operations, do not test for any of the pesticides that are in Table 3.
- If you are unfortunate enough to have a waste that is absolutely unknown, you will probably need to test for all the TC constituents on Table 3 of Title 128. This situation could occur, for example, if a 55 gallon drum of unknown liquid was abandoned on your property and you could not find the original owner. This waste would need a full determination for the TC constituents and other characteristics.

8. Do I have to do analytical testing for F, K, P, or U listed wastes?

- Analytical testing for hazardous waste identification is generally only useful for characteristic and TC hazardous waste. It is usually unnecessary to test for *listed* hazardous waste. *Listed* wastes refer to the F, K, P, or U wastes listed in Title 128, Chapter 3, Tables 4, 5, 6, or 7. For example, if you did an extensive analysis that showed acetone was present in a waste stream that would not automatically mean the waste is a F003 or U002 waste. *Listed* wastes do not have a corresponding concentration level that makes the waste hazardous. In this case, the waste **might** be F003, but only if the waste was a spent solvent meeting the F003 definition, mixed with a spent F003 solvent, derived from a F003 solvent, or mixed with discarded, unused commercial chemical product acetone (U002). It is the actual source or activity that makes a solid waste a *listed* waste.

9. I generate spent antifreeze. Does it require testing? What do I test?

- Spent antifreeze has no exemptions that attach so it is a solid waste whether or not it is to be recycled (Title 128, Chapter 2, §003.03C.). Because it is a solid waste, it requires a waste determination. Analytical testing is usually required because it usually is not possible to determine the constituents in spent antifreeze using generator knowledge alone. Proper sampling is essential to get valid results. See Attachment 1 for specifics regarding testing and sampling spent antifreeze. Do not be surprised if your sample turns up hazardous for a heavy metal such as selenium or a volatile such as benzene.

10. I have a parts washer that needs the solvent replaced or a filter changed periodically. Does the spent solvent require testing? Even if I use a service that changes the solvent?

- Spent parts washer solvent is a solid waste even if it is to be recycled. (Title 128, Chapter 2, §003.03C). Spent filters are also solid waste. Because they're a solid waste, they require a waste determination. Analytical testing is usually required because it usually is not possible to determine the constituents in spent solvent using generator knowledge alone. Proper sampling is essential to get valid results. This determination is required even if you have a third party pick up your solvent. A third party's waste determination based on the universe of solvent they service is not acceptable as a valid waste determination for your waste. You must get a valid waste determination for the waste you actually generate (Title 128, Chapter 4, §002). See Attachment 2 for specifics regarding testing and sampling spent solvents or filters.

11. What do I need to know about analytical laboratories?

- Be sure the analytical laboratory you contract to perform the waste analyses is able to do the test desired. Even if the laboratory you select is not in your area, most labs will provide you instructions on how to take the sample. In addition, they should send you the appropriate sample collection containers, shipping container, shipping instructions, and a “chain of custody” document that should be properly completed. See Attachments 1 or 2 for a more detailed discussion on lab considerations.
- Depending where you are in the state, you can find information on analytical labs in your local phone book. Additionally, the NDEQ publishes the Hazardous Waste Service Providers Directory. The directory has a section listing analytical laboratories that are in Nebraska and surrounding states. You can obtain a current copy from the department. This document can also be found on the NDEQ web page.

12. Contact the NDEQ Hazardous Waste Compliance Assistance Specialist at (402) 471-8308 for assistance.

HELPFUL WEB SITES:

- Title 128 – Nebraska Hazardous Waste Regulations: <http://www.deq.state.ne.us/> and click on “Rules and Regulations”
- MSDS information: <http://www.msdssearch.com/>

CONTACTS:

- NDEQ Hazardous Waste Compliance Assistance (402) 471-8308
- NDEQ Waste Management Section (402) 471-4210

ATTACHMENTS:

- Atch 1: S Spent Antifreeze Sampling
- Atch 2: Spent Parts Washer Sampling

ATTACHMENT 1
Spent Antifreeze Sampling

Parameters required to be analyzed for spent antifreeze:

Flash point by Pensky-Martens Closed Cup Tester, using the test method specified in ASTM Standard D-93-79, or D-93-80, or a Setaflash Closed Cup Tester, using the test method specified in ASTM Standard D-3278-78.

Toxicity for the **eight metals** and **ten volatile organic compounds** identified at Title 128, Chapter 3, Table 3. This analysis must be conducted by the toxicity characteristic leaching procedure (TCLP) method, which also dictates sample quantities and handling.

Maximum metal concentrations of contaminants for the toxicity characteristic

EPA Hazardous Waste Number	Contaminant	Chemical Abstracts Service Number	Regulatory Level (mg/L)
D004	Arsenic	7440-38-2	5.0
D005	Barium	7440-39-3	100.0
D006	Cadmium	7440-43-9	1.0
D007	Chromium	7440-47-3	5.0
D008	Lead	7439-92-1	5.0
D009	Mercury	7439-97-6	0.2
D010	Selenium	7782-49-2	1.0
D011	Silver	7440-22-4	5.0

Maximum volatile organic compound concentrations of contaminants for the toxicity characteristic

EPA Hazardous Waste Number	Contaminant	Chemical Abstracts Service Number	Regulatory Level (mg/L)
D018	Benzene	71-43-2	0.5
D019	Carbon tetrachloride	56-23-5	0.5
D021	Chlorobenzene	108-90-7	100.0
D022	Chloroform	67-66-3	6.0
D028	1,2 Dichloroethane.....	107-06-2	0.5
D029	1,1-Dichloroethylene	75-35-4	0.7
D035	Methyl ethyl ketone	78-93-3	200.0
D039	Tetrachloroethylene	127-18-4	0.7
D040	Trichloroethylene	79-01-6	0.5

ATTACHMENT 1
Spent Antifreeze Sampling

D043	Vinyl Chloride	75-01-4	0.2
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Selecting a contract laboratory

The laboratory you contract with must be capable of conducting the analyses by the required methodologies. Laboratories experienced in these analyses require specific volumes of waste for the analyses, and typically provide appropriate clean glassware for this purpose.

Not all laboratories are capable of producing acceptable results for concentrated organic wastes, such as spent solvent and spent antifreeze. For this reason, before contracting with a laboratory we recommend advising candidate laboratories of the matrix (type of waste) involved, and stating that reporting limits must be below the regulatory thresholds for the contaminants of concern. It is best to obtain reporting limits at least one half to one tenth of the regulatory threshold, where possible.

For example, cadmium has a regulatory threshold of 1.0 ppm, therefore, we recommend a reporting limit (also known as a practical quantitation limit) of 0.1, but no higher than 0.5. Elevated reporting limits make it impossible to determine how near the regulatory threshold the contaminant is, and requires additional sampling and analysis.

Recommendations for sampling spent antifreeze

1. Antifreeze is considered spent when it is removed from the vehicle. The department allows spent antifreeze from different vehicles to be accumulated in a single container (drum or tote), and the sample to be collected from that container when it is **full**.
2. Label this container “Hazardous Waste” and when the accumulated quantity reaches 55 gallons mark it with the accumulation start date.
3. Collect the waste sample from this container using a disposable Coliwasa tube that extends to the bottom of the container. Ship the waste for disposal only after you have received the analytical results for the waste, and are satisfied that the results are accurate and defensible.
 - a. Use a disposable Coliwasa. If a re-useable device is used we recommend an equipment blank be prepared to demonstrate that the device was properly decontaminated after the previous use. Your lab can assist you in this regard.
 - b. The sampler must extend the entire depth of the container. Samples that do not extend through the complete depth of the waste are not representative and cannot be used to make the determination.
 - c. Preserve the sample according to the laboratories directions. Typically, these samples can be shipped on ice without causing an adverse effect.

If you are attempting to identify the average characteristic of the antifreeze generated at your site, a series of samples (at least three) are required. Full accumulation containers of antifreeze lend themselves to a type of sampling called “sequential sampling” where each successive batch of spent antifreeze is sampled until the required demonstration is made. SW846, Chapter 9 contains EPA

ATTACHMENT 1
Spent Antifreeze Sampling

approved statistical methods for making a hazardous waste determination on a variable waste, including the number of individual analyses needed.

Information to record and submit with your analytical results

The date the material was sampled.

The size (volume) of the waste container.

The type of sampling device used.

Did the device reach the bottom of the container?

Was the waste stirred (homogenized) prior to sampling?

The number and quantity of samples collected.

Were visible solids or more than one liquid layer present in the sample? Describe.

What was the source of the sample glassware?

How were the samples preserved?

The chain of custody for the samples.

ATTACHMENT 2
Spent Parts Washer Sampling

Parameters required to be analyzed for spent parts washer solvent:

Flash point by Pensky-Martens Closed Cup Tester, using the test method specified in ASTM Standard D-93-79, or D-93-80, or a Setaflash Closed Cup Tester, using the test method specified in ASTM Standard D-3278-78. If the product used has a flash **lower than** 140°F, you can provide a copy of the product MSDS in lieu of this analysis.

Toxicity for the eight metals and ten volatile organic compounds identified at Title 128, Chapter 3, Table 3. This analysis must be conducted by the TCLP method, which also dictates sample quantities and handling.

Maximum metal concentrations of contaminants for the toxicity characteristic

EPA Hazardous Waste Number	Contaminant	Chemical Abstracts Service Number	Regulatory Level (mg/L)
D004	Arsenic	7440-38-2	5.0
D005	Barium	7440-39-3	100.0
D006	Cadmium	7440-43-9	1.0
D007	Chromium	7440-47-3	5.0
D008	Lead	7439-92-1	5.0
D009	Mercury	7439-97-6	0.2
D010	Selenium	7782-49-2	1.0
D011	Silver	7440-22-4	5.0

Maximum volatile organic compound concentrations of contaminants for the toxicity characteristic

EPA Hazardous Waste Number	Contaminant	Chemical Abstracts Service Number	Regulatory Level (mg/L)
D018	Benzene	71-43-2	0.5
D019	Carbon tetrachloride	56-23-5	0.5
D021	Chlorobenzene	108-90-7	100.0
D022	Chloroform	67-66-3	6.0
D028	1,2 Dichloroethane.....	107-06-2	0.5
D029	1,1-Dichloroethylene	75-35-4	0.7
D035	Methyl ethyl ketone	78-93-3	200.0
D039	Tetrachloroethylene	127-18-4	0.7
D040	Trichloroethylene	79-01-6	0.5
D043	Vinyl Chloride	75-01-4	0.2

ATTACHMENT 2

Spent Parts Washer Sampling

Selecting a contract laboratory

The laboratory you contract with must be capable of conducting the analyses by the required methodologies. Laboratories experienced in these analyses require specific volumes of waste for the analyses, and typically provide appropriate clean glassware for this purpose. We recommend using a NELAP (National Environmental Laboratory Accreditation Program) accredited laboratory that is accredited for the RCRA program. A list of accredited laboratories, the programs they are accredited for, and contact information is available on the web at: <http://www.epa.gov/nerlesd1/land-sci/nelac/accreditlabs.html>.

Not all laboratories are capable of producing acceptable results for concentrated organic wastes, such as spent solvent. For this reason, before contracting with a laboratory we recommend advising candidate laboratories of the matrix (type of waste) involved, and stating that reporting limits must be below the regulatory thresholds for the contaminants of concern. It is best to obtain reporting limits at least one half to one tenth of the regulatory threshold, where possible.

For example, cadmium has a regulatory threshold of 1.0 ppm, therefore, we recommend a reporting limit of 0.1, but no higher than 0.5. Elevated reporting limits make it impossible to determine how near the regulatory threshold the contaminant is, and require additional sampling and analysis.

Recommendations for sampling spent parts washers

It is best to develop a sampling plan that identifies your sampling objectives. The *number of sampling events* required is different when the sampling objective is to determine the characteristics of one batch of spent parts washer solvent (a single sampling event), compared to determining the average characteristics expected of all batches of spent solvent from that same parts washer (a series of sampling events). However, the following recommendations can be used to collect samples for either objective.

1. Contact your waste service provider to confirm when the parts washer will next be serviced. If your parts washer is not on a service contract, do not collect a sample until you determine that the solvent can no longer be used for cleaning parts. The solvent in the parts washer is not spent until the solvent is taken out of service. Collecting a sample of solvent that is still in use does not meet the requirement for making a hazardous waste determination.
2. Accumulate in a drum, the spent solvent when it is taken out of service. Label this drum "Hazardous Waste" and mark it with the accumulation start date.
3. Collect the waste sample from this drum using a disposable Coliwasa that extends to the bottom of the container. Ship the waste for disposal only after you have received the analytical results for the waste, and are satisfied that the results are accurate and defensible.
 - a. Use a disposable Coliwasa device to collect the sample. If a re-useable device is used we recommend an equipment blank be prepared to demonstrate that the device was properly decontaminated after the previous use.
 - b. The sampling device must collect a column of waste from the entire depth of the container. Sampling devices that do not extend from the top of the waste to the bottom of

ATTACHMENT 2
Spent Parts Washer Sampling

the waste are not representative of the entire waste, and cannot be used to make the determination.

- c. Preserve the sample according to the laboratories directions. Typically, these samples can be shipped on ice without causing an adverse effect.

If you are attempting to identify the average characteristic of the waste from a parts washer, a series of samples (at least three) are required. Parts washers lend themselves to a type of sampling called “sequential sampling” where each successive batch of spent solvent is sampled until the required demonstration is made. SW846, Chapter 9 contains EPA approved statistical methods for making a hazardous waste determination on a variable waste, including the number of individual analyses needed.

Information to record and submit with your analytical results

The date the material was taken out of service (spent solvent only).

The date the material was sampled.

The size (volume) of the waste container.

The type of sampling device used.

Did the device reach the bottom of the container?

Was the waste stirred (homogenized) prior to sampling?

The number and quantity of samples collected.

Were visible solids or more than one liquid layer present in the sample? Describe.

What was the source of the sample glassware?

How were the samples preserved?

The chain of custody for the samples.