



Characteristic and Listed Hazardous Wastes Technical Guidance Document HW-2011-G2

Hazardous waste generators need to know which waste codes apply to their waste in order to properly manage that waste. This technical guidance document (TGD) describes how to determine waste codes for different types of waste. This guidance is not designed for every waste stream and should not be used without consulting the regulations. The Federal Regulations referred to in this document are adopted by Kansas in KAR 28-31-261.

The Environmental Protection Agency (EPA) has established two categories of hazardous wastes: characteristic and listed. A waste can be both a characteristic hazardous waste and a listed hazardous waste. Each characteristic and each listing has a waste code associated with it. These waste codes should be used by the generator on hazardous waste manifests, land disposal restriction (LDR) forms, and on any waste determination documents, such as those provided with TGD HW-2011-G1, Hazardous Waste Determinations and Documentation.

Characteristic Hazardous Waste

A waste can exhibit the characteristics of:

- Ignitability (waste code D001);
- Corrosivity (waste code D002);
- Reactivity (waste code D003); and/or
- Toxicity (waste codes D004 to D043).

Knowledge of the process that produced the waste and/or the results of analytical testing can be used to determine if the waste is a characteristic hazardous waste. Analytical testing should be done by a laboratory certified by the Kansas Department of Health and Environment (KDHE). If there is any doubt about whether or not a waste exhibits a hazardous characteristic, it is the generator's responsibility to have the waste analyzed at least once, using appropriate tests to make an adequate waste determination. The analytical testing will only need to be repeated if the generator changes something in their process, including the source of raw materials.

The first three characteristics are fairly easy to determine:

- Ignitable hazardous waste has a flashpoint of less than 140 degrees Fahrenheit (°F).
- Corrosive hazardous waste has a pH of 0 to 2 or 12.5 to 14.
- Reactive hazardous waste is waste that is normally unstable, reacts violently with water, generates toxic gases when exposed to water or corrosive materials, or is capable of detonation or explosion when exposed to heat or flame. There is no analytical test currently approved by EPA to determine if a waste is reactive.

The fourth characteristic, toxicity, is more difficult to determine. EPA has set regulatory limits for 40 toxic compounds. To determine if a waste meets or exceeds these regulatory limits, a representative sample of the waste should be collected and submitted to a KDHE-certified laboratory. The laboratory should prepare the sample for analysis using the Toxicity Characteristic Leaching Procedure (TCLP) extraction method and analyze the sample, using EPA-approved test methods, for the contaminants listed in 40 CFR § 261.24.

A generator can use knowledge of the process that generated the waste to reduce analytical costs. For example, if a generator knows that the process does not use pesticides, herbicides, semi-volatile organic compounds (SVOCs), or mercury, then there is no need to test for those contaminants. When the generator submits the representative sample of their waste to a KDHE-

certified laboratory, only two tests would be requested: TCLP Volatile Organic Compounds (VOCs) and TCLP metals minus mercury. This will be significantly less expensive than having the laboratory analyze for the entire list of TCLP compounds. The generator should maintain documentation, such as Material Safety Data Sheets (MSDS), showing that the raw materials used in the process do not contain the contaminants for which tests were not run.

The analytical results received from the laboratory should be compared to the regulatory limits found in 40 CFR § 261.24. If the concentration of any constituent is equal to or greater than the regulatory limit, then the waste is a hazardous waste. The waste code of each constituent that meets or exceeds the regulatory limit should be used for the waste.

Listed Hazardous Waste

Wastes that are included in EPA's "F", "K", "P", or "U" lists are hazardous wastes. Each list has a different focus and can be found in 40 CFR § 261.31 through 261.33.

F-Listed Wastes

F-listed wastes are hazardous wastes from non-specific sources. Most of the F-list is fairly easy to understand. Some examples follow.

F019 is the waste code for wastewater treatment sludges from the chemical conversion coating of aluminum. If a generator uses a chemical conversion coating process for aluminum, and if the wastewater is treated on-site, then the sludge from that wastewater treatment is a listed hazardous waste with the F019 waste code.

F006 is the waste code for wastewater treatment sludges from electroplating operations **except** from the following processes: (1) Sulfuric acid anodizing of aluminum; (2) tin plating on carbon steel; (3) zinc plating (segregated basis) on carbon steel; (4) aluminum or zinc-aluminum plating on carbon steel; (5) cleaning/stripping associated with tin, zinc and aluminum plating on carbon steel; and (6) chemical etching and milling of aluminum. Therefore, if a generator

has a chrome-plating operation and the wastewater is treated on-site, the sludge from the treatment of that wastewater is a listed hazardous waste with the waste code F006.

The most common F-listed waste codes used in Kansas are F001, F002, F003, F004, and F005. These are the waste codes for specific spent solvents, and they appear frequently because many wastes generated from painting operations and from parts washers contain solvents. Each of these spent solvent listings is defined by how a specific solvent is used and the percentage of a specific constituent in the solvent before it is used. Please be aware that more than one of these F-listings may apply to a single waste stream.

F001, F002, F004, and F005 Waste Codes

When a solvent mixture contains a total of 10% or more of one spent solvent, or a combination of spent solvents, from the F001, F002, F004, and F005 listings, then all appropriate F-listings will apply to the mixture. In order to clarify how to apply these listings, the following two scenarios are presented.

Scenario 1 – A generator has a parts washer with a solvent that has become too dirty to use anymore. The generator must now make a hazardous waste determination on the spent solvent so that it can be properly disposed of. The generator looks at the MSDS for the solvent and it lists: trichloroethylene (65%) and methylene chloride (35%). These solvents are found both on the F001 and F002 lists. The parts washer is not part of a degreasing (large-scale cleaning) operation and therefore the F001 listing does not apply. The F002 listing does apply to this waste, since the combination of trichloroethylene and methylene chloride makes up 10% or more of the mixture (in this case 100%). Therefore, this mixture is a listed hazardous waste carrying the F002 waste code.

Scenario 2 – A generator uses methyl ethyl ketone (MEK) to thin paint. The waste paint is poured into a 55-gallon drum. The generator also cleans the paint gun and lines with MEK,

but this waste is put in a 15-gallon drum that is kept segregated from the waste paint. The generator looks at the F005 listing and sees that MEK that has been used as a solvent is a listed hazardous waste carrying the F005 waste code. Therefore the 15-gallon drum of spent solvent (MEK) is a listed hazardous waste (F005). The 55-gallon drum of waste paint is not a **listed** hazardous waste because the MEK was used as an ingredient in the paint; it was not used as a solvent. However, the waste paint may be a hazardous waste if it exhibits the characteristic of ignitability (D001) and/or MEK toxicity (D035). An analysis of a representative sample would be necessary to determine if the waste paint is **characteristic** for MEK toxicity.

F003 Waste Code

The definition of an F003-listed waste is more complicated. There are two ways that a spent solvent mixture can meet the F003 listing:

- The mixture contains only F003 constituents that are pure or technical grade; or
- The mixture contains one or more F003 constituents and a total of 10% or more of the other listed solvents (F001, F002, F004, and/or F005) before use.

In either of the above cases, the spent solvent mixture must be ignitable (have a flashpoint of less than 140 °F) at the point of generation in order for the F003 listing to apply. If the spent solvent mixture is not ignitable at the point of generation, then the listing will not apply.

Below are five scenarios that demonstrate how to apply the F003 listing.

Scenario 1 – A generator uses a solvent for cleaning. The MSDS shows acetone at 99.9% and water at 0.1%. This would be considered a technical grade for acetone.

1. The generator looks at the F003 list and sees that acetone is on the list.
2. The generator determines that the spent solvent is ignitable because it has a flash point of less than 140 °F at the point of generation.

Therefore, the spent acetone will be a listed hazardous waste carrying the waste code F003

because the spent solvent is composed only of a pure or technical grade (essentially 100%) F003-listed solvent and is ignitable at the point of generation.

In most painting and parts washer applications, F003-listed solvents are not used in pure or technical grade form. These solvents are usually mixed/blended with other solvents. The next three examples will show how to apply the F003 listing for a solvent mixture.

Scenario 2 – A generator uses a solvent for cleaning. The MSDS for the solvent shows: acetone (65%), toluene (6%), and MEK (5%). Determining the applicable waste codes can be broken down into the following steps:

1. The generator looks at the F005 list and sees that toluene and MEK are both on the list. The combined percentage of the toluene and MEK is 11%, which meets the listing definition of a total of 10% or more. Therefore, the spent solvent is a listed hazardous waste with the waste code F005.
2. The generator also looks at the F003 list and sees that acetone is on the list. The generator sees that by definition the listing applies if the spent solvent contains one or more of the solvents on the F003 list (in this case, acetone) and a total of 10% or more of one or more of the solvents listed in the F001, F002, F004, and F005 lists (in this case, 11% of F005-listed solvents). Therefore, if the spent solvent is ignitable at the point of generation it will meet the definition of a F003-listed waste.
3. The generator determines that the spent solvent is ignitable because it has a flash point of less than 140 °F at the point of generation. Therefore, the spent solvent meets the definition of a F003-listed waste.

The spent solvent in this scenario would carry both the F003 and F005 waste codes. The important thing to remember is that the percentage of the F003-listed solvent does not matter as long as there is a total of 10% or more of the other F-listed solvents (F001, F002, F004, and/or F005) and the spent solvent is ignitable at the point of generation.

In the above example, if the generator had determined that the spent solvent was not ignitable at the point of generation, then the F003 listing would not have applied and the only applicable waste code would have been F005.

Scenario 3 – The generator from Scenario 2 recycles his solvent in a distillation unit on-site. Still bottoms (i.e. pancakes, still cakes, pucks, solids) are generated from this process. These solids will also be a listed hazardous waste carrying the F003 and F005 waste codes because the definition for both F003 and F005 listings states that they include “still bottoms from the recovery of these spent solvents and spent solvent mixtures.” This is the only case where it doesn’t matter whether the waste is ignitable at the point of generation; the F003 listing applies entirely because of the still bottoms definition (40 CFR § 261.31).

Scenario 4 – A generator uses a solvent for cleaning. The MSDS for the solvent shows: acetone (65%) and water (35%). The generator looks at the F003 list and sees that acetone is on it. However, based on the MSDS, the solvent is not pure or technical grade acetone (because it does not contain essentially 100% F003-listed solvent). Also, the solvent does not contain any other F-listed (F001, F002, F004, or F005) constituents. Therefore, the spent solvent does not meet the definition of an F-listed spent solvent, and does not carry any of those listed waste codes. However, if the spent solvent is ignitable at the point of generation, it will carry the characteristic waste code for ignitability, D001.

Scenario 5 – A generator uses a solvent for cleaning paint brushes. The MSDS for the solvent shows: toluene (65%), methylene chloride (5%), xylene (5%), and water (25%). Determining the applicable waste codes can be broken down into the following steps:

1. The generator finds toluene on the F005 list.
2. The generator finds methylene chloride on both the F001 and the F002 lists. The F001

listing applies to the listed solvents used in large-scale industrial degreasing operations. The F002 listing applies to the listed solvents used for other applications than large-scale industrial degreasing. In this example, F002 is the applicable waste code because the generator is using the solvent to clean paint brushes, which is not large-scale, industrial degreasing.

3. The generator combines the percentages of toluene (65%) and methylene chloride (5%), for a total percentage of 70%. By both the F002 and F005 definitions, the spent solvent would be listed for both waste codes because the solvent contains 10% or more of a solvent, or a combination of solvents, listed in F001, **F002**, F004, and **F005**.
4. The generator finds xylene in the F003 list. The generator sees that by definition the listing applies if the waste (spent) solvent contains one or more of the solvents on the F003 list (in this case, xylene) and a total of 10% or more of one or more of the solvents listed in the F001, F002, F004, and F005 lists (in this case 70% of F002- and F005-listed solvents). Therefore, if the spent solvent is ignitable at the point of generation it will meet the definition of a F003-listed waste.
5. The generator determines that the spent solvent is ignitable because it has a flash point of less than 140 °F at the point of generation. Therefore, the spent solvent meets the definition of an F003-listed waste.

The spent solvent in this scenario will carry the F002, F003, and F005 waste codes.

In the above example, if the generator had determined that the spent solvent was not ignitable at the point of generation, then the F003 listing would not have applied and the only applicable waste codes would have been F002 and F005.

It is important to note that on the one-time land disposal restriction (LDR) notification for a spent solvent that carries the F003 waste code, the D001 waste code must be included in addition to the F003 waste code. This ensures

that the spent solvent will be treated for the characteristic of ignitability.

K-Listed Wastes

K-listed wastes are hazardous wastes from specific sources. A generator must utilize the specific process listed in the definition in order to have a K-listed waste. An example of K-listed hazardous waste is distillation bottoms from the production of acetaldehyde from ethylene, which carries a waste code of K009.

P- and U-Listed Wastes

P- and U-listed wastes are discarded commercial chemical products, off-specification species, container residues, and spill clean-up materials from any of these that must be disposed for some reason. The difference between the “P” and “U” lists lies in the toxicity of the product. The acutely toxic products are on the P-list and less toxic products are on the U-list. The product will only become a waste at the point the generator no longer has a use for it and

determines that it must be discarded (or if it is spilled and cleaned up).

P- and U-listed hazardous wastes are unused (not spent) materials. If the discarded material is a solution, the generator should look at the active ingredient of the solution. Some common examples of P- and U-listed wastes are:

- Discarded nicotine patches (P075)
- Warfin (P001)
- Acetone (U002)
- Benzene (U019)
- Toluene (U220)

Remember that a material must be **unused** to meet the definition of P- or U-listed waste.

P-listed wastes are less common, but due to their acute toxicity they are regulated at a much smaller quantity than other hazardous wastes. A facility that generates or accumulates on-site as little as 2.2 pounds of P-listed hazardous waste is regulated as a Large Quantity Generator.

For additional information regarding proper management of solid or hazardous waste in Kansas, you may contact the Bureau of Waste Management at (785) 296-1600 or the address at the top of this document, or visit the Bureau’s website at <http://www.kdheks.gov/waste/>.