

Course Learning Outcomes for Unit II

Upon completion of this unit, students should be able to:

2. Examine key attributes of solid and hazardous wastes.
 - 2.1 Analyze the Resource Conservation and Recovery Act (RCRA) definitions for solid and hazardous waste.
 - 2.2 Explore the role of risk assessment in defining a hazardous waste.

Course/Unit Learning Outcomes	Learning Activity
2.1	Unit Lesson Article: "'Ain't Necessarily So!': The Brake Industry's Impact on Asbestos Regulation in the 1970s" Unit II PowerPoint Presentation
2.2	Unit Lesson Article: "Chemical Risk Assessment: Traditional vs Public Health Perspectives" Unit II PowerPoint Presentation

Required Unit Resources

In order to access the following resources, click the links below.

Gwinn, M. R., Axelrad, D. A., Bahadori, T., Bussard, D., Cascio, W. E., Deener, K., ... Burke, T. A. (2017). [Chemical risk assessment: Traditional vs public health perspectives](https://libraryresources.columbiasouthern.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=bsu&AN=123619540&site=ehost-live&scope=site). *The American Journal of Public Health*, 107(7), 1032–1039. Retrieved from <https://libraryresources.columbiasouthern.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=bsu&AN=123619540&site=ehost-live&scope=site>

Rosner, D., & Markowitz, G. (2017). ["Ain't necessarily so!": The brake industry's impact on asbestos regulation in the 1970s](https://libraryresources.columbiasouthern.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=bsu&AN=124558316&site=ehost-live&scope=site). *American Journal of Public Health*, 107(9), 1395–1399. Retrieved from <https://libraryresources.columbiasouthern.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=bsu&AN=124558316&site=ehost-live&scope=site>

Unit Lesson

Introduction

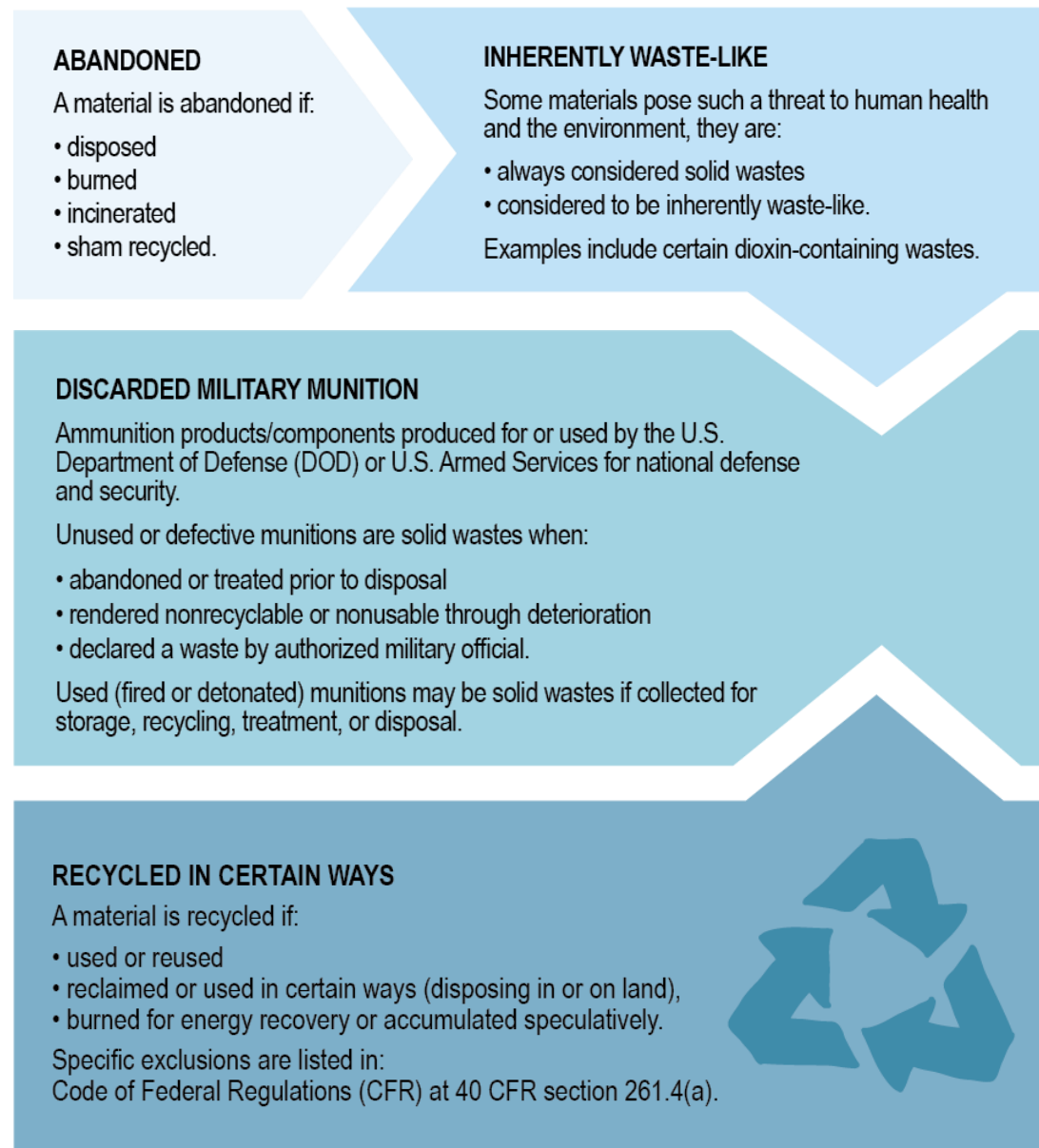
Welcome to Unit II. Previously, we learned about the impact of industrial and hazardous wastes on human populations. Now in Unit II, we will examine the key attributes of solid and hazardous wastes. Since the United States Environmental Protection Agency (EPA) writes the regulations for solid and hazardous wastes, it is helpful to use its definitions. Because the definitions are, in part, determined by risk analysis, this unit's assigned articles include discussion of chemical risk assessment in relation to solid and hazardous wastes and a specific discussion of the regulation of asbestos.

Key Attributes of Solid and Hazardous Wastes

Subtitles D and C of the 1976 Resource Conservation and Recovery Act (RCRA) provide definitions of solid and hazardous wastes, respectively.

Solid waste: The EPA (2016) defines solid waste:

RCRA states that “solid waste” means any garbage or refuse, sludge from a wastewater treatment plant, water supply treatment plant, or air pollution control facility and other discarded material, resulting from industrial, commercial, mining, and agricultural operations, and from community activities. Nearly everything we do leaves behind some kind of waste. (para. 3)



Solid wastes characterized
(EPA, 2016)

Items that are not considered solid waste are listed at the EPA's website, [Criteria for the Definition of Solid Waste and Solid and Hazardous Waste Exclusions](#). Some of these are domestic wastewater, used cathode ray tubes (such as from old televisions), and waste from in-situ mining, among others.

Hazardous waste: In general, a hazardous waste causes harm to human health or the environment. However, determining if a material is defined as a hazardous waste is rather meticulous. Figure 1 helps to determine whether a material is hazardous (EPA, 2015b).

The Hazardous Waste Identification Process



Figure 1. Hazardous Waste Identification Process
(EPA, n.d.)

The first step is to determine if the material is a solid waste. The previous section of this lesson can be used. If the material is not a solid waste, then it cannot be a hazardous waste.

If a substance is a solid waste, then, in accordance with Figure 1, one must determine if the substance is excluded. This means looking at the list of excluded wastes—wastes that are considered neither solid nor hazardous is excluded from the definition of a solid waste or hazardous waste. A few excluded solid wastes were listed above in this lesson. Excluded hazardous wastes include household hazardous waste, agricultural waste, mining overburden, used oil filters, and injected groundwater, among others (EPA, 2016).

If the material is a solid waste and is not excluded, then one must determine if the waste is a listed waste or has the characteristics of a hazardous waste. The lists are the F, K, P, and U lists. The characteristics of a hazardous waste include toxicity, reactivity, ignitability, or corrosivity—often abbreviated as TRIC. In RCRA parlance, the waste must have the characteristics of TRIC (EPA, 2015a).



Chemicals from the P and U lists
(Petrov, n.d.; Ragsac19, n.d.; Skorpion87, 2005)

Listed hazardous wastes: Listed hazardous wastes are from industrial processes that typically produce hazardous wastes. The F list provides a generic list of nonspecific source hazardous wastes. These include solvent wastes, electroplating waste, wood preservative waste, petroleum refinery sludge, and others. The K list indicates wastes from specific industries: iron and steel production, aluminum production, pesticide production, and others.

Whereas the F and K lists are byproducts of production, the P and U lists are final products that are left over. For instance, on the P list, *barium cyanide* is a commercial-grade chemical but may not be fully used by the organization that purchased it. If the organization has leftover chemicals, then it is considered hazardous waste. There are many additional chemicals on the P list including copper cyanide, phosgene, aldrin, and nitric oxide. Chemicals on the U list include acetone, benzene, calcium chromate, and others (U.S. Government Publishing Office [GPO], n.d.).

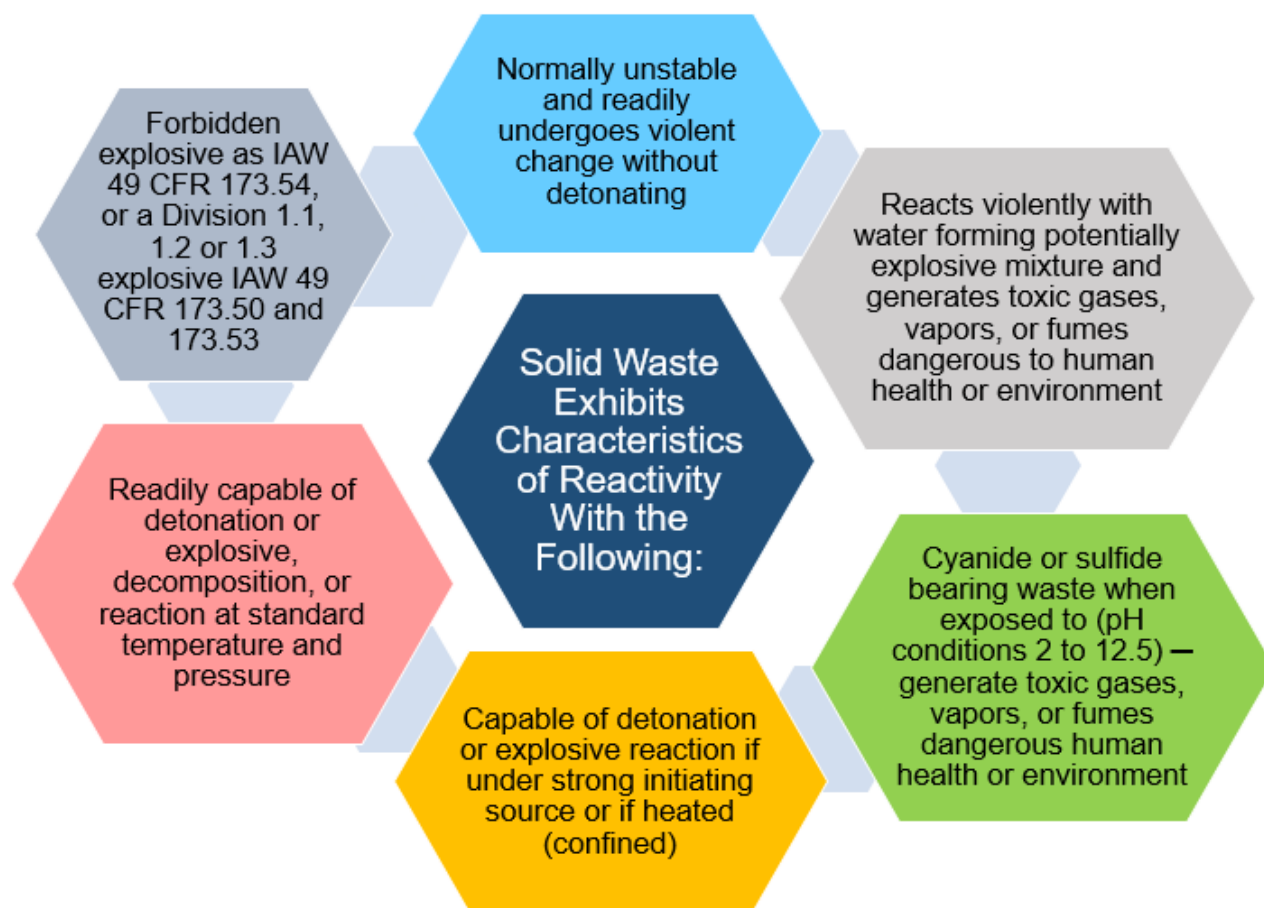
Characteristics of a hazardous waste: If a waste displays the characteristic of a hazardous waste, it is considered a hazardous waste. These are the TRIC characteristics.

A waste is toxic if it causes harm to humans when it is ingested or absorbed. Waste toxicity is determined by using the Toxicity Characteristic Leaching Procedure (TCLP). After performing the TCLP test on a waste sample, chemical concentrations in the extracts are compared to regulatory standards. If the concentration of a chemical exceeds the standard, the waste is hazardous. For instance, the regulatory level for mercury is 0.2 mg/liter, in other words, 0.2 milligrams of mercury per liter of water (GPO, n.d.).

A waste that exhibits the characteristics of reactivity is essentially unstable at normal conditions, detonates readily, reacts with water, or gives off toxic fumes (GPO, n.d.).



Normal mercury test results involve a lab technician comparing a mercury specimen with a result chart. (Jarun011, n.d.)



Solid characteristic of reactivity
(GPO, n.d.)

A solid waste that exhibits the characteristic of reactivity has the EPA Hazardous Waste Number of D003 (GPO, n.d.).

There are specific test methods that are used to determine ignitability. An ignitable waste is hazardous by the following definition (EPA, 2015a):

Wastes that are hazardous due to the ignitability characteristic include liquids with flash points below 60 °C, nonliquids that cause fire through specific conditions, ignitable compressed gases and oxidizers. EPA assigned D001 as the waste code for ignitable hazardous wastes. (Characteristic Wastes section, para. 2)

The last category of TRIC is corrosivity. If a liquid waste has a pH less than or equal to 2 or greater than or equal to 12.5 or can corrode steel, it is considered a hazardous waste (EPA, 2015a).

Delisted waste: Referring back to Figure 1, if the waste is a solid waste; is not excluded from the definitions of a solid or hazardous waste; is on the F, K, P, or U lists; or displays the characteristics of TRIC, there is still one more step to check to see if it is hazardous. There is a list of delisted wastes. A hazardous waste generator can petition the U.S. EPA or equivalent state regulatory agency to get a hazardous waste delisted. The hazardous waste generator must prove that the waste does not meet the criteria of a hazardous waste. For instance, Union Carbide Corporation in Taft, Louisiana, successfully petitioned to have 11,000 cubic yards of soil contaminated with less than 9 ppm (parts per million) of acrolein delisted (GPO, n.d.). This allows

the company to dispose of the soil in a less cumbersome manner (at far less cost) than if the soil was considered a hazardous waste.

If the waste gets to Step 4 in Figure 1 and is not delisted, then the waste is considered to be hazardous.

Conclusion

This lesson has presented the key attributes of solid and hazardous wastes. It has illustrated the steps required to determine if a waste is solid or hazardous. In addition to this lesson, there are two assigned articles. The articles relate to risk assessment and to a specific material—*asbestos*. Risk assessment is a scientific method utilized to determine harmful concentrations of substances. The maximum allowable chemical concentrations in the toxicity characteristic regulations discussed in this lesson were determined by risk assessment. Also, whether or not a chemical is a listed waste (F, K, P, or U list) is determined by risk assessment. The *asbestos* article illustrates the role of industry in influencing regulatory agencies.

References

- Jarun011. (n.d.). *Normal mercury test result (ID 136098798)* [Photograph]. Retrieved from <https://www.dreamstime.com/normal-mercury-test-result-blood-sample-tube-image136098798>
- Petrov, V. (n.d.). *Nitric oxide powder (ID 31552741)* [Photograph]. Retrieved from <https://www.dreamstime.com/stock-image-nitric-oxide-powder-isolated-white-background-image31552741>
- Ragsac19. (n.d.). *Dangerous chemicals (ID 25661548)* [Photograph]. Retrieved from <https://www.dreamstime.com/royalty-free-stock-photos-dangerous-chemicals-image25661548>
- Skorpion87. (2005). *Acetone1* [Photograph]. Retrieved from <https://commons.wikimedia.org/wiki/File:Acetone1.jpg>
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- United States Environmental Protection Agency. (2015a). Defining hazardous waste: Listed, characteristic and mixed radiological wastes. Retrieved from <https://www.epa.gov/hw/defining-hazardous-waste-listed-characteristic-and-mixed-radiological-wastes>
- United States Environmental Protection Agency. (2015b). Learn the basics of hazardous waste. Retrieved from <https://www.epa.gov/hw/learn-basics-hazardous-waste>
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- U.S. Government Publishing Office. (n.d.). Electronic code of federal regulations, Title 40, Part 261- Identification and listing of hazardous waste. Retrieved from <https://www.ecfr.gov/cgi-bin/text-idx?SID=43a12e65fc62ad2c4af072873b86c581&mc=true&node=pt40.26.261&rgn=div5#se40.26.261>

Suggested Unit Resources

In order to access the following resources, click the links below.

The following video segments are from the full video, *Waste Generation, Characterization, Collection, Transfer and Disposal*, and discuss the amount of waste generated and disposal options.

- [Successful Waste Disposal Programs video segment](#)
- [Lafayette's Green Waste Program video segment](#)
- [Hazardous Household Waste video segment](#)

Wild Hare Productions (Producer). (1999). *Waste generation, characterization, collection, transfer, and disposal* [Video file]. Retrieved from <https://libraryresources.columbiasouthern.edu/login?auth=CAS&url=https://fod.infobase.com/PortalPI/aylists.aspx?wld=273866&xtid=11470>

The transcript for these videos can be found by clicking on "Transcript" in the gray bar to the right of the video in the Films on Demand database.

To learn more about the key attributes of solid and hazardous wastes, please visit the following web pages.

United States Environmental Protection Agency. (2014). [Defining hazardous waste: Listed, characteristic and mixed radiological wastes](https://www.epa.gov/hw/defining-hazardous-waste-listed-characteristic-and-mixed-radiological-wastes). Retrieved from <https://www.epa.gov/hw/defining-hazardous-waste-listed-characteristic-and-mixed-radiological-wastes>

United States Environmental Protection Agency. (2015). [Learn the basics of hazardous waste](https://www.epa.gov/hw/learn-basics-hazardous-waste). Retrieved from <https://www.epa.gov/hw/learn-basics-hazardous-waste>

United States Environmental Protection Agency. (2016). [Criteria for the definition of solid waste and solid and hazardous waste exclusions](https://www.epa.gov/hw/criteria-definition-solid-waste-and-solid-and-hazardous-waste-exclusions). Retrieved from <https://www.epa.gov/hw/criteria-definition-solid-waste-and-solid-and-hazardous-waste-exclusions>

Learning Activities (Nongraded)

Nongraded Learning Activities are provided to aid students in their course of study. You do not have to submit them. If you have questions, contact your instructor for further guidance and information.

This [Learn the Basics of Hazardous Waste web page](#) contains an interactive activity that relates to the key attributes of solid and hazardous waste. By selecting items 1 through 4 in the Hazardous Waste Identification Process diagram, you can learn how to classify a waste.

This [Unit II Chemical Risk Assessment Matching activity](#) reinforces the Unit II Lesson and required resource articles. For more information on the matching, please see the required resource article, "Chemical Risk Assessment: Traditional vs Public Health Perspectives." Complete the activity to check your knowledge.

You can refer to this [PDF of Unit II Chemical Risk Assessment Matching activity](#) if you need assistance.