Topic: Incompatible Wastes

Many wastes, when mixed with other waste or materials at a hazardous waste facility, can produce effects which are harmful to human health and the environment, such as (1) heat or pressure, (2) fire or explosion, (3) violent reaction, (4) toxic dusts, mists, fumes, or gases, or (5) flammable fumes or gases.

Below are examples of potentially incompatible wastes, waste components, and materials, along with the harmful consequences which result from mixing materials in one group with materials in another group. The list is intended as a guide to owners or operators of treatment, storage, and disposal facilities, and to enforcement and permit granting officials, to indicate the need for special precautions when managing these potentially incompatible waste materials or components.

This list is not intended to be exhaustive. An owner or operator must, as the regulations require, adequately analyze his wastes so that he can avoid creating uncontrolled substances or reactions of the type listed below, whether they are listed below or not.

It is possible for potentially incompatible wastes to be mixed in a way that precludes a reaction (e.g., adding acid to water rather than water to acid) or that neutralizes them (e.g., a strong acid mixed with a strong base), or that controls substances produced (e.g., by generating flammable gases in a closed tank equipped so that ignition cannot occur, and burning the gases in an incinerator).

Incompatible Chemical Waste Groups

Group 1. Potential consequences of mixing A and B materials are heat generation and violent reaction

Group 1-A	Group 1-B
Acetylene sludge	Acid sludge
Alkaline caustic liquids	Acid and water
Alkaline cleaner	Battery acid
Alkaline corrosive liquids	Chemical cleaners
Alkaline corrosive battery fluid	Electrolyte, acid
Caustic wastewater	Etching acid liquid or solvent
Lime sludge and other corrosive alkalies	Pickling liquor and other corrosive acids
Lime watewater	Spent acid
Lime and water	Spent mixed acid
Spent Caustic	Spent sulfuric acid

Group 2. Potential consequences of mixing A and B materials are fire or explosion and generation of flammable hydrogen gas

Group 2-A	Group 2-B
Aluminum	Any waste in Group 1-A or 1-B
Beryllium	
Calcium	
Lithium	
Magnesium	
Potassium	
Sodium	
Zinc powder	
Other reactive metals and metal hydrides	

Group 3. Potential consequences of mixing A and B materials are fire, explosion, or heat generation or generation of flammable or toxic gases

Group 3-A	Group 3-B
Alcohols	Any concentrated waste in Groups 1-A or 1-B
Water	Calcium
	Lithium
	Metal hydrides
	Potassium
	SO_2Cl_2, $SOCl_2$, PCl_3, CH_3, $SiCl_3$
	Other water-reactive waste

Group 4. Potential consequences of mixing A and B materials are fire, explosion, or violent reaction

Group 4-A	Group 4-B
Alcohols	Concentrated Group 1-A or 1-B wastes
Aldehydes	Group 2-A wastes
Halogenated hydrocarbons	
Nitrated hydrocarbons	
Unsaturated hydrocarbons	
Other reactive organic compounds and solvents	

Group 5. Potential consequences of mixing A and B materials are generation of hydrogen cyanide or hydrogen sulfide gas

Group 5-A	Group 5-B
Spent cyanide and sulfide solutions	Group 1-B wastes

Group 6. Potential consequences of mixing A and B materials are fire, explosion, or violent reaction

Group 6-A	Group 6-B
Chlorates	Acetic acid and other organic acids
Chlorine	Concentrated mineral acids
Chlorites	Group 2-A wastes
Chromic acid	Group 4-A wastes
Hypochlorites	Other flammable & combustible wastes
Nitrates	
Nitric acid, fuming	
Perchlorates	
Permanganates	
Peroxides	
Other strong oxidizers	

Source: "Law, Regulations, and Guidelines for Handling of Hazardous Waste." California Department of Health, February 1975 [Promulgated by USEPA in Appendix V to 40 CFR Part 264. See 46 FR 2872, Jan 12, 1981.]

Additional guidance on determining the compatibility of hazardous wastes has been issued by USEPA entitled “A Method for Determining the Compatibility of Hazardous Wastes” (EPA-600/2-80-076), April 1980.

Management of Incompatible Wastes

1. Incompatible wastes should not be mixed in the same transportation or storage container unless precautions are taken to prevent or control adverse reactions.

2. A waste should not be added to an unwashed container or waste management unit that previously contained an incompatible waste unless precautions are taken to prevent or control adverse reactions.

3. Incompatible wastes should not be combined in the same waste management unit, including but not limited to a tank system, surface impoundment, landfill, land treatment

unit, waste pile, containment building, miscellaneous unit or injection well unless precautions are taken to prevent or control the reactions and reaction products in an engineered waste management unit. Containers which hold incompatible wastes should be well separated by soil or refuse when they are placed into a landfill. Ideally, separate disposal areas should be maintained for incompatible wastes. Container storage areas storing wastes which are incompatible with other wastes or materials stored nearby should be separated from the other materials or protected from them by means of a dike, berm, or other separation device.

4. Incompatible wastes should not be incinerated together unless the reactions and products of reactions are sufficiently controlled by the design and operation of the unit.

5. Some wastes are incompatible because the mixture produces emissions of uncontrolled mists, fumes, dusts or gases. Some incompatible wastes produce noxious odors when mixed. The gases responsible for these noxious odors may not be present in toxic amounts in the vicinity of the waste management unit, but in some cases, very small amounts of such gases may constitute a serious nuisance condition. Prior to mixing wastes which have the potential to produce emissions to the air, the facility should ensure that the design and operation of the waste management unit will sufficiently control the emissions to prevent the creation of a threat to human health or the environment or an odor nuisance condition.

6. Before wastes are processed, stored, or disposed of in a waste management unit, compatibility should be determined. Often predicting the compatibility of two or more wastes based upon limited or varying composition information is difficult. Typically, wastes contain chemicals from several different reactivity groups and in varying concentration ranges. If conclusive information is not available on the compatibility two or more wastes, bench scale mixing is recommended to determine the potential consequences of mixing. With some prior knowledge of the waste, proper safety precautions, and mixing the wastes in a controlled and monitored environment, often the nature of the reactions that occur between two or more wastes may be determined. Site-specific bench scale testing methods may be developed at a waste management facility to meet specific needs based upon design and operation of the facility and with regard to the chemicals and reactions of concern. In addition, standard methods for screening of wastes are available as a resource to waste management facilities (e.g., ASTM D-5058 Standard Test Method for Compatibility Screening Analysis of Waste, ASTM D-4978 Standard Test Method for Screening of Sulfides in Waste, ASTM D-4981 Standard Test Method for Screening of Oxidizers in Waste, and ASTM D-4982 Standard Test Method for Screening Flammability Potential Screening Analysis of Waste).