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CHEMICALS GENERALLY ACCEPTABLE FOR SANITARY SEWER DISPOSAL

Introduction

Some chemicals that are water-soluble and of low toxicity can be safely discarded in the sanitary sewer. Since any material poured down a drain eventually flows into the Des Moines Metropolitan Wastewater Reclamation Authority Sewage Treatment Facility, the University is regulated by the City of Des Moines Sewer Ordinance, the Iowa Department of Natural Resources, and the Environmental Protection Agency concerning the types and quantities of materials that can enter the sewer system. Beyond the legal requirements, the University also has ethical obligations to protect our environment.

Certain criteria must be met in order for materials to be safely poured down the drain, including low toxicity, high water solubility, and moderate pH. Only small quantities are allowed in the system at any time and the chemicals must be degradable by the wastewater treatment (a biological process). Large quantities or highly concentrated stock solutions of these materials should be picked up for disposal by the Environmental Health & Safety Department.

Only aqueous solutions of these chemicals can go down the lab drain; solid forms must use other disposal routes. Additional guidance is provided below.

SANITARY SEWER DISPOSAL OF LABORATORY CHEMICALS

Some chemicals that are neither Iowa regulated nor hazardous wastes, and that are either simple inorganic salts or organic materials readily digestible by the microorganisms in a water treatment plant, can generally be disposed of down the drain in limited quantities. The United States Environmental Protection Agency (EPA) and the Des Moines Metropolitan Wastewater Reclamation Authority regulate what can be disposed of through the sanitary sewer system. The following guidelines for drain disposal of chemical wastes are based on the existing regulations and on procedures outlined in the National Research Council publication *"Prudent Practices in the Laboratory: Handling and Management of Chemical Hazards, Updated Version*", (National Academy Press, Washington D.C, 2011).

Material discharged to a laboratory drain on campus enters the Des Moines Metropolitan Wastewater Reclamation Authority sanitary sewer system where it is mixed with sewage and wastewater from area households and businesses and flows to the Waste Water Treatment Facility. At the waste treatment plant the waste is subjected to bacterial degradation. Non-degradable chemicals, such as metals, are adsorbed in the sludge or potentially discharged to surface waters. The drain disposal guidelines outlined below must be followed to prevent toxic concentrations of metals or organic compounds from reaching surface waters, accumulating in the sludge, or disrupting the sewage treatment process.

Laboratories are to keep a log of all substances disposed into the sanitary sewer system. This log includes the date, substance name and amount disposed of. (See sample log attached). EHS must be notified when a laboratory disposes of 4 or more liters of approved substances (included in this document) in a month. Notification can be made to ehs@drake.edu and should be made on the same day the 4 liter threshold is met. The log will be inspected periodically by EHS.

MATERIALS THAT MAY BE DISPOSED OF THROUGH THE SANITARY SEWER SYSTEM.

- Materials appropriate for sewer disposal in limited quantities must meet the following criteria:
- They are liquids and readily water soluble (at least 3%)
- Easily biodegradable or amenable to treatment by the waste water treatment process
- Are simple salt solutions of low toxicity inorganic substances
- Have a pH between 5.5 and 12

Chemicals that can be safely disposed of down the drain include biological compounds and cellular constituents such as proteins, nucleic acids, carbohydrates, sugars, amino acids amines, surfactants and many metabolic intermediates. Other compounds include soluble salt combinations of low toxicity ions and dilute (less than 5%) aqueous solutions of low molecular weight biodegradable organic chemicals such as alcohols, aldehydes, ketones, amines, ethers, cellosolves, nitriles, esters and nitroalkanes. Examples of materials in these categories include:

Soluble salt combinations of the following ions:

Cations	Anions
Aluminum (Al^{3+})	Bicarbonate (HCO_3^-)
Ammonium (NH_4^+)	Bisulfite (HSO_3^-)
Calcium (Ca^{2+})	Bromate (BrO_3^-)
Cesium (Cs^+)	Bromide (Br^-)
Hydrogen (H^+)	Carbonate (CO_3^{2-})
Lithium (Li^+)	Chlorate (ClO_3^-)
Magnesium (Mg^{2+})	Chloride (Cl^-)
Potassium (K^+)	Hydroxide (HO^-)
Sodium (Na^+)	Iodate (IO_3^-)
Strontium (Sr^{2+})	Iodide (I^-)
Tin (Sn^{2+})	Nitrate (PO_4^{3-})
	Nitrite (NO_2^-)
	Oxide (O_2^-)
	Phosphate (PO_4^{3-})
	Sulfate (SO_4^{2-})
	Sulfite (SO_3^{2-})

Note: Before discharging into sewer make sure that all other criteria (such as pH, flammability, toxicity, etc. limits) are met.

Dilute (<5%) aqueous solutions of low molecular weight biodegradable organic chemicals appropriate for sanitary sewer discharge include:

Alcohols

Alkanols with fewer than 5 carbon atoms
Alkanediols with fewer than 8 carbon atoms
Sugars and sugar alcohols
Alkoxyalk anols with fewer than 7 carbon atoms
butanol, 1-(*n*- butyl alcohol)
butanol, 2- (sec- butyl alcohol) ethanol
ethanol,2-(2-butoxyethoxy) ethylene glycol
glycerol
methyl 1-propanol, 2- (isobutyl alcohol)
methyl 2- butanol, 2- (t-amyl alcohol)
methyl 2-propanol, 2- (*tert* - butyl alcohol)
propanol, 1- (*n* - propyl alcohol)
propanol, 2- (isopropyl alcohol)

Aldehydes

Aliphatic aldehydes with fewer than 5 carbon atoms
butyraldehyde
gluteraldehyde
propionaldehyde

Amides

$RCONH_2$ and RCONHR with fewer than 5 carbon atoms
$RCONR_2$ with fewer than 11 carbon atoms
formamide
propionamide
methylpropionamide, N-
butanamide

Amines

Aliphatic amines with fewer than 7 carbon atoms
Aliphatic diamines with fewer than 7 carbon atoms
benzylamine
butylamine, N-

Carboxylic Acids

Alkanoic acids with fewer than 6 carbon atoms
Alkanedioic acids with fewer than 6 carbon atoms
Hydroxyalkanoic acids with fewer than 6 carbon atoms
Aminoalkanoic acids with fewer than 7 carbon atoms
Ammonium, Sodium, and Potassium salts of the above acid classes with < 21 carbon atoms
acetic acid
citric acid
oxalic acid
potassium binoxalate
propanoic acid
sodium acetate
sodium citrate

Esters

Esters with fewer than 5 carbon atoms
isopropyl acetate
methyl acetate
methyl formate
methyl propionate
propyl formate, n-

Ethers

dioxolane

Ketones:

Ketones with fewer than 6 carbon atoms
pentanone, 2-

Nitriles:

propionitrile

Sulfonic Acids:

Sodium or potassium salts of most are acceptable

Note: Before discharging any of these materials into sewer make sure that all other criteria (such as pH limits and flammability) are met.

When discharging waste to the sanitary sewer, you should:

- Never dispose of anything that might lead to a storm sewer rather than a sanitary sewer.
- Use a sink that does not have a history of clogging or overflowing.
- Use a sink in your laboratory.
- Flush with at least 5 fold excess of water (Biological) or 100 fold excess (Chemical) after drain disposal to thoroughly rinse out the sink and sink trap, and to dilute the waste.
- Wear gloves, eye protection and a laboratory coat.
- Inactivate biological materials (e.g., autoclave or bleach-treat) before releasing to sewer.

THE FOLLOWING MATERIALS SHOULD NEVER BE DISPOSED OF THROUGH THE SANITARY SEWER SYSTEM.

- Any waste chemical that meets the EPA's criteria for being hazardous, either as a listed or characteristic waste.
- Oil, grease, or other water insoluble chemicals
- Materials that are not biodegradable or would pass through the sewage treatment plant into the Des Moines River and be toxic to aquatic organisms or accumulate in sediments.
- Flammable and combustible solvents (flashpoints less than 140oF) (unless sufficiently diluted in water as part of the laboratory process such that the solution has a flashpoint greater than 140^{o}F)
- Discharges with a pH below 5.5 or higher than 12
- Materials that could interfere with the biological processes of sewage treatment or would contaminate the sludge-making disposal through the normal methods difficult or impossible.
- All compounds that could result in the presence of toxic gases or vapors within the POTW in a quantity that may cause acute worker health and safety problems
- Malodorous compounds or volatile organic chemicals that can escape from the plumbing system (such as dry traps) causing exposures or obnoxious odors (such as mercaptans or thiols).
- Metallic ions and salts of the heavy metals in solutions or suspension in concentrations exceeding the following:

Element	Concentration (mg/l)
Arsenic	0.05
Barium	5.0
Boron	5.0
Cadmium	0.1
Chromium	1.0
Copper	1.0
Cyanide	0.1
Lead	0.1
Manganese	1.0
Mercury	0.01
Nickel	1.0
Selenium	0.02
Silver	0.1
Zinc	1.0

- Organic compounds in solutions or suspension in concentrations exceeding the following:

Element	Concentration (mg/l)
Benzene	0.5
Carbon tetrachloride	0.5
Chlorobenzene	100
Chloroform	6
Cresol (or total of o-, m- and p-Cresol)	200
1,4-Dichlorobenzene	7.5
1,2-Dichloroethane	0.5
1,1-Dichloroethylene	0.7
2,4-Dinitrotoluene	0.13
Hexachlorobenzene	0.013
Hexachlorobutadiene	0.5
Hexachloroethane	3.0
Methyl ethyl ketone	200
Nitrobenzene	2.0
Pentachlorophenol	100
Pyridine	5.0
Tetrachloroethylene	0.7
Toxaphene	0.5
Trichloroethylene	0.5
2,4,5-Trichlorophenol	400
2,4,6-Trichlorophenol	2.0
Vinyl chloride	0.2

- Pesticides in solutions or suspension in concentrations exceeding the following:

Element	Concentration (mg/l)
Chlordane	0.3
2,4-D	10.0
Endrin	0.02
Heptachlor (and its epoxide)	0.008
Lindane	0.4
Methoxychlor	10.0
2,4,5-TP (Silvex)	1.0

Laboratory Sanitary Sewer Discharge Log

Date	Substance	Amount	PH
