

APPENDIX B

CRITERIA FOR HAZARDOUS WASTE STORAGE FACILITIES

Section 1. GENERAL

1. APPLICABILITY. The criteria set forth herein will be used worldwide for the construction of Department of Defense hazardous waste storage facilities where the Corps of Engineers is the design agency. These facilities will be programmed for and constructed on the host installation in accordance with current regulatory requirements. Installations acquiring facilities for their own use may supplement these criteria as required.

2. GENERAL DISCUSSION. Hazardous waste may be stored in a short-term or long-term storage facility. Short-term storage facilities, where materials are stored for periods of less than 90 days, are "generators." Here hazardous wastes generated onsite are stored until they can be moved. Short-term storage facilities usually do not require a permit to operate, but operations are required to meet packaging and labeling requirements and to date the receipt of hazardous wastes. The requirements for short-term facilities are given in 40 CFR 262.34. Long-term storage facilities are used for materials stored longer than 90 days. The long-term facility is a permanent facility subject to the requirements of 40 CFR, parts 264 and 265, and the permit requirements of 40 CFR, part 270. The National Pollutant Discharge Elimination System (NPDES) requirements of 40 CFR Part 122 may also apply to facility operation.

3. REFERENCES. Appendix A contains a list of references used in this document.

4. POLICY.

a. Justification. Minimum quantities of hazardous waste to be stored will be established in order to justify the cost of construction of a permanent new facility. Availability of existing, conforming storage facilities within the local geographical area should be determined before considering construction of a new facility.

b. Criteria. The facility will be designed to meet Federal, State, and local environmental criteria. The design requirements set forth herein are mandatory for a long-term facility. Storage facilities will be either enclosed or open as required by regulation and by the nature of the material to be stored.

ETL 1110-3-459  
30 Nov 93

c. Reviewing agencies. As a minimum, final review of all permitting, planning, and design will include the Environmental Protection Agency (EPA), state, local, and regulatory authorities, as well as the host installation.

d. Environmental assessment. The environmental impact of the facility will be assessed in accordance with the provisions of the National Environmental Policy Act as required by DOD 6050.1 and component implementing directives.

5. DESIGN INFORMATION. An estimate of the quantity and type of hazardous waste to be stored, as well as the types of containers to be used, may be found in hazardous materials environmental management surveys and/or hazardous waste management plans, which can be obtained from the installation commander. All facilities that store wastes 90 days or longer will comply with the requirements of the Federal Hazardous Waste Permit Program, 40 CFR 270, and requirements of authorized state agencies. If the facility has operated in the past and there have been releases of contamination into the soil or groundwater, then 40 CFR 264 Subpart F requirements will also apply. A Resource Conservation and Recovery Act (RCRA) permit must be obtained before construction can begin.

## Section 2. DESIGN GUIDELINES

1. SITE SELECTION. Site selection will agree with the appropriate land use designation on the installation master plan.

a. Proximity to critical areas. A buffer zone of 15 meters (50 feet) will be provided between the facility and the nearest inhabited area, stream or body of water. For critical mission areas such as ordnance, Petroleum, Oil and Lubricant (POL), or flammable stores, buffer zones appropriate to those facilities will be maintained.

b. Groundwater hydrological and chemical data. The designer will determine variations in groundwater elevation and the direction of groundwater flow. These data will be used to evaluate spill or release damage potential and to assure that the design is adequate to prevent spills from contaminating surface and groundwater. Groundwater monitoring, sufficient to establish background levels, may be performed by the host installation.

c. Surface water hydrological data. The site will be above, or protected from, the 100-year flood elevation. The basis for determining the 100-year flood is given in 40 CFR 264.18.

d. Soil information. The engineering characteristics of the soil will be determined at the locations of the facility and the access roads. The cation exchange characteristics of the soil will be determined at a minimum of two points on the site. This information will be used to determine the capacity of the soil to retain pollutants in the event of a spill.

e. Geological information. If the facility is located in a political jurisdiction listed in Appendix VI of paragraph 40 CFR 264.18, the facility will not be within 60 meters (200 feet) of a fault which has had displacement in Holocene time. (Holocene time refers to the most recent geological time period, including approximately the last 11,000 years.) The 60 meters (200 feet) will be measured along a direct line perpendicular to the plane of the fault intersecting the nearest extremity (i.e., fence line) of the facility to the fault line.

f. Meteorological data. The information provided for the design of a facility includes the prevailing wind direction and other meteorological data required to establish structural and mechanical criteria, and to situate the facility so that any release of toxic gas or smoke will have minimum effect on populated or mission areas.

g. Accessibility. The facility will be located where the access roads have adequate load-bearing capacity and where routing through residential areas will not be required.

2. GENERAL REQUIREMENTS. Facilities will be designed to store non-leaking containers/above ground tanks labeled in accordance with DOT/EPA criteria. The use of underground containers (i.e., tanks) will not be acceptable.

a. General criteria. General criteria for fire protection, electrical design, ventilation and materials of construction are summarized in table 1.

b. Safety.

(1) Access. Access to and from the storage facility will be restricted to periods when the facility is manned. During periods when the facility is not manned, entrance will be restricted through locked gates or doors or both. In accordance with 40 CFR 264.14 (c), a legible sign visible from 10 meters (32 feet) will be placed on all access roads and entrances to the storage facility. The sign will have the legend: "Danger - Unauthorized Personnel Keep Out" written in English and in any other language predominantly used in the area surrounding the facility.

ETL 1110-3-459  
30 Nov 93

(2) Showers and eye-wash station. Emergency eyewash and shower equipment will be provided in accordance with ANSI Standard Z358.1. Eyewash and showers will be located such that travel distance and time does not exceed 30 meters (100 feet) or 10 seconds from any given location on the facility. The required delivered water temperature will be determined based on the atmospheric conditions of each area where the units are to be installed and will be maintained at a temperature that will be safe for the user. A minimum temperature of 15 degrees C (60 degrees F) is recommended. Water heaters, recirculating pumps, and other appurtenances will be provided as needed.

(3) Ventilation. Occupied areas (administrative, latrines, etc.) will be ventilated as recommended by the American Conference of Government Industrial Hygienists (ACGIH) Industrial Ventilation Manual. Ventilation systems will be designed to ensure that contaminated air does not migrate from the storage and handling areas into the occupied areas. Storage and/or transfer areas containing materials hazardous to health will be ventilated at a minimum rate of six air changes per hour. A minimum mechanical ventilation rate of one air change per hour is acceptable for heated storage areas during unoccupied periods if all materials are stored in vapor tight containers. Ventilation will conform to 29 CFR 1910.106(d)(4)(iv) and NFPA 30 for flammable liquid vapors.

(4) Fire protection. Fire protection will be provided as required by the Corps of Engineers Architectural and Engineering Instructions (AEI), Design Criteria. Special consideration should be given to areas designed for the storage of reactive wastes. These areas should be water sprinklered, completely unprotected and enclosed, or entirely separate from the rest of the building. When considering water sprinkling, the volatility and the quantities of reactive wastes to be stored must be considered. Halon fire extinguishing systems will not be used.

(5) Floor densities. The floor densities required for the various storage areas will be determined by DOD 4145.19-R-1.

(6) Sprinkler systems. In most cases, the fire riser into the storage facility requires only a single check valve, however, the designer must verify that specialized backflow prevention is not required by the user or State or local ordinances. Sprinkler heads will be suitable for installation in a corrosive environment. Rack storage of hazardous materials may require an in-rack sprinkler system designed in accordance with

TABLE 1 GENERAL DESIGN REQUIREMENTS  
HAZARDOUS WASTE STORAGE AND TRANSFER FACILITIES

NOTE: Fire-resistant materials are required.

<u>A. SPRINKLER DENSITY: 0.16 gallons per minute, Sanitary sewer drains may be used:</u>	<u>ELECTRICAL NEMA TYPE</u>
Office; Clean, Dirty and Mechanical Rooms	1
Lavatory	4
<u>B. SPRINKLER DENSITY: 0.35 gallons per minute; corrosion-resistant. non-absorbent materials and captured drains are required:</u>	
Acid Wastes	4X
Caustic Wastes	4X
Toxic Wastes	4X
Oxidizer Wastes	4X
<u>C. Same as B. above. plus explosion-proof construction and explosion venting:</u>	
General Wastes and Combustible Liquids	7
<u>D. SPRINKLER DENSITY: 0.60 gallons per minute; corrosion- resistant. non-absorbent materials. captured drains. explosion-proof construction and explosion venting are required:</u>	
Flammable Liquids	7
<u>E. NO SPRINKLER: corrosion-resistant, non-absorbent materials and captured drains, explosion-proof construction and explosion venting are required</u>	
Water-reactive Wastes	7

ETL 1110-3-459  
30 Nov 93

NFPA 30 and NFPA 231C. Hazardous waste storage areas will be designed to contain any accidental spill including the expected amount of sprinkler water. Captured water should be analyzed to determine if it must be classified as a hazardous waste. Analysis must be performed in accordance with procedures outlined in the Part B permit, and in conjunction with the local, state, or federal regulatory authorities. In the absence of analysis, or if the analysis determines that it is hazardous, the captured water must be properly packaged, labeled, and stored. If the water is free of hazardous waste, and upon approval of the host installation commander, the water may be discharged into the sanitary sewer.

(7) Explosion venting. The design of explosion venting, where necessary, will be in accordance with NFPA Standard No. 68, Guide for Explosion venting.

(8) Personnel safety. Personal protective equipment will be provided and maintained as set forth in 29 CFR 1910.120 or as spelled out in the permit, whichever is more stringent. Lockers for this equipment will not be located in the hazardous waste storage area.

(9) Stack height. Hazardous wastes may be stored in racks not to exceed 8 meters (25 feet) in height where a materials handling system which elevates the operator (operator-up) with the wastes is used. Systems which do not elevate the operator (operator-down) will be limited to 6 meters (18 feet) in rack height. Rack design will allow for inspections as outlined in the operational plan.

c. Communications.

(1) Telephone and/or wireless communications will be provided and must be accessible for emergency calls in the event of a spill or fire.

(2) An intercommunication system will be provided for internal communications if the size of facility warrants. (40 CFR 264.34).

(3) Location of emergency alarms will provide activation from each storage area and the office. The sprinkler and/or alarm system will be equipped to transmit alarms to the fire station or to a suitable location which is continuously manned when a local fire station is not available.

d. Security. The fence for the storage area will be 5 meters (16 feet) from the outside perimeter road of the facility. The fence will have a minimum height of 2 meters (6 feet) and will be of the chain-link type.

e. Electrical.

(1) The fenced-in yard area will be illuminated to a level of not more than 5.4 lx (0.5 foot-candles).

(2) Interior lighting will generally be provided in accordance with Corps of Engineers Architectural and Engineering Instructions. Lighting in storage areas will be sufficient to ensure immediate location of leaks upon inspection.

(3) Equipment and wiring in hazardous locations will be designed and installed in accordance with the National Electrical Code (NEC) for hazardous locations.

3. HOUSING REQUIREMENTS. Additional considerations are listed below:

a. Office. Facilities may require office space although not necessarily colocated with the storage site (separate administrative areas are preferred). Access to a computer terminal may be necessary for large scale record and inventory control.

b. Sorbent material for spills. As all facilities must maintain an adequate supply of compatible sorbent material, as spelled out in the applicable permit for application to liquid spills and leaks, sufficient storage space will be provided for this and other emergency supplies.

c. Decontamination facilities. In accordance with 29 CFR 1910.120, hazardous waste storage facility design must address the problem of possible contamination to personnel and equipment while working with dangerous materials. If mandated by the decontamination procedures developed and implemented in accordance with 29 CFR 1910.120g and where adjacent facilities meeting regulatory requirements are not available, locker rooms, showers, and toilet facilities will be provided at the storage facility.

d. Loading and unloading pad. A load/unload pad should be provided at the storage facility for the loading and unloading of hazardous waste for shipping. The pad will be such that any accidental spills can be contained, preventing the release of the materials into the environment.

4. STORAGE FACILITIES. The storage area will be designed to prevent surface or groundwater contamination and to capture each class of waste individually. The access roadway and central aisles of the facility floor will be designed for H-20 wheel loading. The design must provide facilities to isolate acids, flammable materials and oxidizers from each other, and from other categories of wastes.

a. Enclosed storage. Freezing effects on liquid waste must be considered where the stored materials may be exposed to low temperatures. In cases where the container will burst as a result of freezing expansion of its contents, heating and insulating the facility to maintain a temperature just above freezing will be considered. Otherwise, the facility may be restricted to storage of containers which will not rupture upon the freezing or heating expansion of their contents. Handling methods depend on the quantity and packaging of the waste and must be considered in the design of the facility.

b. Open storage. Open facilities will provide the same protective features as the enclosed facilities insofar as is possible. Construction materials, including the electrical system, should be suitable for exposed usage. Fire protection and ventilation criteria will be relaxed, however, adequate accessible extinguisher water must be available, and siting considerations (prevailing wind direction and speed) become more important. Limiting access, in the interest of safety, must also be carefully considered and addressed.

### Section 3. OPERATIONAL GUIDELINES

1. GENERAL. This section considers the affects of the operational plan on the design of the facility. Each facility operational plan will be unique, but the following guidelines must be addressed in the design of each hazardous waste storage facility. Only non-leaking containers which are safe to handle and are correctly labeled will be stored in this facility. The containers will be stored according to type (paragraph 2 below) and in such a manner as to facilitate inspection and removal with a minimum of handling. If a fork-lift is used, it must be rated for operation in a hazardous environment, and aisle space must be adequate for safe forklift operation. The type of storage will dictate the space and quantities available and therefore must be specified during design and adhered to by the operating agency. Materials stored in open facilities must conform to EPA regulatory requirements. Liquid waste is generally not suitable for open storage, as leaks pose a containment problem compounded by the need to drain rainwater. Containers stored in open



facilities must be checked periodically for the detrimental effects of weathering. It is advisable to cover exposed containers with a tarp, however, it should be noted that this may trap fumes or heat generated by and escaping from the waste. Wastes requiring segregation or separation should not be stored in an open facility.

2. COMPATIBILITY OF WASTES. Wastes have been divided into eight categories according to their chemical characteristics as follows:

- a. Acid wastes. Wastes containing organic and inorganic acids with a pH of 4.0 and below.
- b. Caustic wastes. Wastes containing organic and inorganic bases of pH 9.0 and above.
- c. Toxic wastes. Wastes containing poisonous substances.
- d. Oxidizer wastes. Wastes containing oxidizing inorganic compounds.
- e. Reactive wastes. Wastes that react violently with water.
- f. General wastes. Wastes that are inert in nature and do not fit into any of the other categories, but are considered hazardous.
- g. Flammable (Class I) liquids. Liquids that have flash points below 730 F (22.80 C) and boiling points below 100 0 F (37.80 C).
- h. Combustible (Classes II and III) liquids. Liquids which have flash points between 100 0 F (37.80 C) and 2000 F (93.30 C).

3. STORAGE AREA LOCATIONS. The general chemical characteristics of each hazardous waste category should be considered in planning the storage area location. Table 2 should be used (with caution) to locate the storage areas on the basis of the compatibility of various categories. Compatible wastes need not be separated. Incompatible wastes will be separated in such a way as to separately contain any spilled materials and to ensure that reactions between such materials will not occur. Flammable and combustible materials will be separated by barriers designed in accordance with the National Fire Codes as published by the National Fire Protection Association (NFPA).

ETL 1110-3-459  
30 Nov 93

4. OPERATIONAL CRITERIA. The Defense Logistics Agency (DLA) or the host installation will apprise the designer of operational aspects and contingency plans which may affect the design of the facility.

TABLE 2  
COMPATIBILITY OF HAZARDOUS WASTE CATEGORIES

	Acid	Caustic	Toxic	Oxidizers	Reactive	General	Flammable & Combustible
Acid	--	NC	NC	NC	NC	NC	NC
Caustic	NC	--	NC	C	NC	NC	NC
Toxic	NC	NC	--	C	NC	NC	NC
Oxidizers	NC	C	C	--	NC	C	NC
Reactive	NC	NC	NC	NC	--	NC	NC
General	NC	NC	NC	C	NC	--	NC
Flammable & Combustible	NC	NC	NC	NC	NC	NC	--

C - Compatible, NC - Not Compatible

Note: Even though wastes may be compatible by generic type as stated above, specific wastes may not be compatible within that type. Wastes should always be reviewed individually for compatibility, and if incompatible, should not be stored together.