



DEPARTMENT OF DEFENSE

TÜRKIYE

FINAL GOVERNING STANDARDS

Originating Component: US Department of the Air Force

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**Approved by: Office of the Deputy Assistant Secretary of the Air Force
(Infrastructure, Energy, and Environment) (SAF/IEE)**

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DEPARTMENT OF THE AIR FORCE
WASHINGTON DC

12 May 2025

OFFICE OF THE ASSISTANT SECRETARY

MEMORANDUM FOR DISTRIBUTION

FROM: SAF/IEE
1665 Air Force Pentagon
Washington, DC 20330-1665

SUBJECT: Final Governing Standards for Türkiye (FGS-Türkiye)

References: (a) DoDI 4715.05, 1 November 2013, *Environmental Compliance at Installations Outside the United States*

(b) HAF Mission Directive 1-18, 10 JULY 2014, *Assistant Secretary of the Air Force (Installations, Environment and Energy)*

The Office of the Deputy Assistant Secretary of the Air Force (Infrastructure, Energy and Environment) (SAF/IEE), as the DoD-designated Lead Environmental Component (LEC) for Türkiye, approves the updated FGS-Türkiye (2025) (Attachment 1). SAF/IEE is responsible for the development and maintenance of the FGS-Türkiye per references a and b. DoD Components are required to begin implementation and to comply with the FGS-Türkiye (2025) upon receipt per reference a.

The FGS-Türkiye provides environmental compliance standards, criteria and best management practices to be used by all US DoD installations and organizational entities operating in Türkiye. This FGS was developed using a comprehensive review of the host nation's environmental laws and regulations as well as compliance requirements stemming from applicable international agreement to which the US and Türkiye may be a party and through a comparative analysis with the standards and criteria in DoD Manual 4715.05, Volumes 1-5, Overseas Environmental Baseline Guidance Document (OEBGD, June 29, 2020).

SAF/IEE, through the support of the Air Force Installation and Mission Support Center (AFIMSC) Detachment (Det) 4 in Europe, consulted with the appropriate in-theater DoD Components in the development of the FGS-Türkiye and coordinated the final FGS with US European Command (USEUCOM).

My point of contact regarding the FGS-Türkiye is Ms. Michelle Brown, SAF/IEE Environmental Director, at (703) 697-0989 (DSN 227) or email: Michelle.Brown.36@us.af.mil.

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NANCY J. BALKUS, P.E., SES
Deputy Assistant Secretary of the Air Force
(Infrastructure, Energy, and Environment)

Attachment: FGS – Türkiye (Jan 2025)

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EXECUTIVE SUMMARY

Department of Defense Instruction (DoDI) 4715.05, *Environmental Compliance at Installations Outside the United States*, establishes policy and assigns responsibilities for managing environmental compliance to protect human health and safety outside the United States (US) on installations under Department of Defense (DoD) control. The DoDI designates Lead Environmental Components (LECs) for specific countries and geographic locations outside the US and tasks them to perform various duties. Those duties include establishing and maintaining specific environmental compliance requirements all DoD installations located in the LEC's assigned country must obey. DoDI 4715.05 designates the Secretary of the Air Force (SECAF) as the LEC for Türkiye and authorizes SECAF to delegate LEC responsibilities through the chain-of-command to an appropriate general-level commander. At the present time, SECAF has delegated LEC responsibilities through the chain-of-command to the Deputy Assistant Secretary of the Air Force for Environment, Safety, and Infrastructure (SAF/IEE). In accordance with Air Force Instruction 32-7091, *Environmental Management Outside the United States*, the Air Force Civil Engineer Center (AFCEC) provides support to SAF/IEE in the performance of LEC responsibilities, to include updating Final Governing Standards (FGS).

The Environmental Final Governing Standards (FGS Türkiye) contained in this document are the primary environmental compliance standards, criteria, and management practices to be used by all at US DoD installations and organizational entities in Türkiye. unless an exemption or exception applies. In accordance with DoDI 4715.05, FGS do not address remediation of environmental contamination standards, environmental project planning requirements (i.e., environmental impacts analysis process), nor the management or disposal of radioactive waste, except for certain medical waste. Remediation standards are addressed under DODI 4715.08, *Remediation of Environmental Contamination Outside the United States*. Disposal of radioactive waste is addressed under DoD Instruction 4715.27, *Low Level Radioactive Waste (LLRW) Disposal Program* and Service Component directives.

The FGS Türkiye comprises Chapter 1, *Overview*, followed by 16 additional chapters, each addressing one or more environmental media or management processes. Media chapters are grouped into five volumes for the purposes of maintaining structural consistency with Department of Defense Manual (DoDM) 4715.05, *Overseas Environmental Baseline Guidance Document* (2020 OEBGD) dated 29 June 2020. Cognizance of the information provided in Chapter 1 is essential to the accurate understanding and application of standards in all sections of this document.

LIST OF UPDATES/REVISIONS

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DEFINITIONS

Unless otherwise noted, these terms and their definitions are for the purpose of this volume.

Enduring location	A location is enduring when DoD intends to maintain access and use of that location for the foreseeable future. The following types of sites are considered enduring for US Government purposes: main operating base, forward operating site, and cooperative security location. All three types of locations may be composed of more than one distinct site. Enduring locations are published in the OSD-approved Enduring Location Master List.
Final Governing Standard (FGS)	A comprehensive set of country-specific substantive environmental provisions; typically, technical limitations on effluent, discharges, etc., or a specific management practice, developed in accordance with DoDI 4715.05.
Installation	For the purposes of this document, any base, camp, post, station, yard, center, or other activity (e.g., a geographically separated unit) under the jurisdiction of the Secretary of a Military Department that is located within Türkiye or any territory, commonwealth, or possession of Türkiye.
International agreement	A multilateral or bilateral agreement, such as a base rights or access agreement, a status-of-forces agreement, or any other instrument defined as a binding international agreement in accordance with DoDD 5530.3, " <i>International Agreements</i> " (Reference (n)).
Standards	Substantive elements of US laws and federal regulations applicable to DoD installations, facilities, and actions in the United States or that have extraterritorial application.
Turkish Installation Commander	The Turkish Installation Commander is the formal Turkish representative of the installation pursuant to bilateral agreement and serves as the liaison with national authorities and the contact with local authorities and local Turkish military and civil entities.
United States	The several States, the District of Columbia, the Commonwealths of Puerto Rico and the Northern Mariana Islands, American Samoa, Guam, Midway and Wake Islands, the US Virgin Islands, any other territory or possession of the United States, and associated navigable waters, contiguous zones, and ocean waters of which the natural resources are under the exclusive management authority of the United States.

ACRONYMS

ASD (Sustainment)	Assistant Secretary of Defense for Sustainment
DoDD	DoD Directive
DoDI	DoD Instruction
EO	Executive Order
FGS	Final Governing Standard
LEC	lead environmental component
OEBGD	Overseas Environmental Baseline Guidance Document
OSD	Office of the Secretary of Defense
US	United States
USC	United States Code
USD(A&S)	Under Secretary of Defense for Acquisition and Sustainment
USEUCOM	United States European Command

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CHAPTER 1: OVERVIEW

The Environmental Final Governing Standards (FGS) for Türkiye are the primary environmental compliance standards, criteria, and management practices to be used by all United States (US) Department of Defense (DoD) installations and organizational entities in Türkiye. Cognizance of the information provided in this chapter is essential to the accurate understanding and application of all volumes, chapters, and sections of this document.

1.1. GENERAL ISSUANCE INFORMATION

Department of Defense Instruction (DoDI) 4715.05, Environmental Compliance at Installations Outside the United States, establishes policy and assigns responsibilities for managing environmental compliance to protect human health and safety outside the United States (US) on installations under DoD control. The DoDI designates Lead Environmental Components (LECs) for specific countries and geographic locations outside the US and tasks them to perform various duties. The FGS Türkiye are an update to the 2016 FGS Turkey, with updates as 30 September 2017 (published 2019). This update is based on Department of Defense Manual (DoDM) 4715.05, Overseas Environmental Baseline Guidance Document (OEBGD), published 29 June 2020. The standards were developed by comparing and adopting the more protective criteria of the OEBGD, applicable Turkish laws and regulations, and relevant international agreements. Turkish laws of general applicability include those specifically delegated to regional or local governments for implementation by the national government and that are generally applied to the Turkish Armed Forces.

1.1.1. Scope and Purpose.

1.1.1.1. The purpose of these Final Governing Standards (FGS) is to provide specific standards for environmental compliance at Department of Defense (DoD) installations in Türkiye. This document implements DoD Instruction (DoDI) 4715.05, "*Environmental Compliance at Installations Outside the United States*," and is based on the OEBGD.

1.1.1.2. DoD Components will consult with the DoD Lead Environmental Component (LEC) or, if no DoD LEC is designated, with the applicable Combatant Commander on actions that could seriously affect mission, involve a substantial commitment of funds, or set a precedent.

1.1.2. Applicability.

1.1.2.1. These FGS apply to:

1.1.2.1.1. The Office of the Secretary of Defense (OSD), the Military Departments, the Office of the Chairman of the Joint Chiefs of Staff and the Joint Staff, the Combatant Commands, the Office of the Inspector General of the Department of Defense, the Defense Agencies, the DoD Field Activities, and all other organizational entities within the DoD (DoD Components).

1.1.2.1.2. Actions of the DoD Components on installations, as defined in DoDI 4715.05, under DoD control in Türkiye.

1.1.2.1.3. Support functions for US military vessels, ships, aircraft, or space vehicles provided by the DoD Components, including the management and disposal of off-loaded waste or hazardous materials.

1.1.2.2. These FGS do not apply to:

1.1.2.2.1. Operations of United States (US) military vessels, ships, aircraft, or space vehicles.

1.1.2.2.2. Off-installation training.

1.1.2.2.3. Contingency locations, which are addressed in DoDI 4715.22, “*Environmental Management Policy for Contingency Locations*”.

1.1.2.2.4. Facilities and activities associated with the Naval Nuclear Propulsion Program, in accordance with Executive Order (EO) 12344 and conducted pursuant to Section 7158 of Title 42, United States Code (USC).

1.1.2.2.5. Actions to remediate environmental contamination, which are addressed in DoDI 4715.08, “*Remediation of Environmental Contamination Outside the United States (Incorporating Change 2, August 31, 2018)*”.

1.1.2.2.6. Environmental analyses conducted in accordance with EO 12114, “*Environmental Effects Abroad of Major Federal Actions*”.

1.1.2.2.7. DoD installations that do not have the potential to affect the natural environment (e.g., activities that are primarily administrative) or where, in consultation with the Assistant Secretary of Defense for Sustainment (ASD(Sustainment)), the geographic Combatant Commander concerned has determined that no significant force health protection or environmental threats exist.

1.1.2.2.8. Leased, joint use, and similar facilities to the extent that the DoD does not control the instrumentality or operation that a criterion seeks to regulate.

1.1.2.2.9. Activities, systems, operations, and areas where DoD has no authority or responsibility including Cooperative Security Locations.

1.1.2.2.10. Status-of-forces agreements between host nations (HNs) and US exceptions.

1.1.2.3. Rights or Obligations.

These standards do not create any rights or obligations enforceable against the US, the DoD, or any of its Components, nor does it create any standard of care or practice for individuals. Although this document refers to other DoDDs, DoDIs, and DoD manuals, it is intended only to coordinate the requirements of those directives as required to implement the policies found in DoDI 4715.05. This document does not change other DoDDs, DoDIs, or DoD manuals or alter DoD policies.

1.2. RESPONSIBILITIES.

1.2.1. DoD Component Heads. The DoD Component heads plan, program, and budget to meet the standards contained in this document.

1.2.2. Commander, United States European Command (USEUCOM).

1.2.2.1. The Commander, USEUCOM, is designated as the DoD Theater Environmental Coordinator for Europe due to the unique construct and influence of the European Union, and oversees the consistent application of this document at installations within Türkiye. Additional guidance is provided in Enclosure 4 of DoDI 4715.05.

1.2.2.2. The Commander provides general oversight and coordination with the DoD LECs, as necessary, to carry out their missions in accordance with the FGS.

1.2.2.3. The Commander adjudicates requests for exceptions to the requirements of this document in accordance with DoDI 4715.05, when the Military Department requesting the exception is also the DoD LEC. When the Combatant Commander is the DoD LEC and requests an exception, the request is elevated to the ASD(S) for adjudication.

1.2.3. Lead Environmental Component (LEC).

1.2.3.1. The LEC for these FGS is the Deputy Assistant Secretary of the Air Force (Environment, Safety, and Infrastructure). However, the point of contact for environmental compliance issues is Air Force Installation and Mission Support Center, Detachment 4/Installation Management Branch (AFIMSC Det 4/CEI).

1.2.3.2. Questions or comments pertaining to this FGS should be directed to the AFIMSC Det 4/CEI:

AFIMSC Det 4/CEI
Unit 3122
APO AE 09094-3122
DSN Voice: 480-6482
Commercial: +49-6371-47-6482
Email: AFIMSCDet4.CEI.InstallationMngt@us.af.mil

1.2.3.3. LEC responsibilities include:

1.2.3.3.1. Developing and maintaining the FGS for its Area of Responsibility

1.2.3.3.2. Planning, programming, and budgeting for preparation and maintenance of the FGS.

1.2.3.3.3. Identifying applicable Turkish environmental standards, monitoring regulatory trends, and maintaining copies of applicable Turkish environmental documents, standards, and regulations.

1.2.3.3.4. Consulting with Turkish authorities on environmental issues, as appropriate, to maintain effective cooperation on environmental matters.

1.2.3.3.5. Consulting with the chief of the US diplomatic mission in Türkiye, the affected Military Services through the chain of command, the geographic Combatant Commanders, and the USD(P) on significant issues arising from DoD environmental policy in Türkiye.

1.2.3.3.6. Preparing and maintaining the FGS in countries that the USD(AT&L) designates, including providing technical, legal, and programmatic support to the process.

1.2.3.3.7. Adjudicating requests for exceptions from the DoD Components in accordance with procedures included in Section 7 of enclosure 3 of DoDI 4715.05.

1.2.3.3.8. Keeping DoD Components informed of current environmental developments and trends.

1.2.3.3.9. Performing other responsibilities as may be assigned in other DoD issuances or guidance.

1.3. GENERAL GUIDANCE.

The FGS Türkiye ensures consistent application of environmental standards for all installations operated by DoD Components within Türkiye. These standards represent minimum criteria. DoD Components may impose additional criteria provided those policies and directives do not conflict with this document. DoD Components may issue supplementary criteria that are more protective of the environment than those required by the FGS Türkiye, provided they first obtain written concurrence from the DoD LEC.

1.3.1. Use of the FGS Türkiye.

1.3.1.1. These FGS provide environmental standards for DoD Components in Türkiye. These standards apply to all facilities, tenants, operations, and activities under DoD control on the installation.

1.3.1.2. DoD Components must use the FGS Türkiye as standards for environmental compliance rather than the individual source documents that have been reconciled by the LEC in the creation of the FGS Türkiye.

1.3.1.3. In cases where updates or revisions to the OEBGD have not yet been considered and incorporated into the FGS, installations must comply with the more protective standard, whether it is found in this document or the OEBGD.

1.3.1.4. Conflicts, issues, or concerns related to the FGS Türkiye should be presented to the LEC or the Combatant Commander (USEUCOM), as appropriate.

1.3.1.5. DoD Components will consult with the LEC on actions that could seriously affect mission, involve a substantial commitment of funds, or set a precedent.

1.3.1.6. Activities and installations shall notify the LEC of any conflicting DoD Component policies or directives they discover prior to imposing criteria more protective than provided in these FGS. Requests for more protective criteria must be evaluated based on their potential impact upon other activities and installations, and upon their relationship with Turkish authorities. DoD activities and installations must clearly identify variances from the FGS Türkiye in all requests for resources.

1.3.1.7. DoD Components shall not enter into agreements with Turkish authorities at any level that establish criteria for environmental compliance that contradicts those provided in these FGS without the prior written approval of the LEC.

1.3.2. Effective Dates.

Standards identified in this manual are effective immediately upon publication. Installations and DoD Components must plan, program, and budget in accordance with Section 6 of Enclosure 3 of DoDI 4715.05.

1.3.3. Noncompliance Terminology.

Terms such as “*noncompliance*,” “*out of compliance*,” “*violation*,” “*exceedance*,” “*nonconformity*,” and “*nonconformance*” are used synonymously to describe the condition of failing to meet a standard or a specific limit or value within a standard in this document.

1.3.4. Sampling and Analytical Considerations.

1.3.4.1. Laboratory analyses necessary to comply with FGS criteria shall normally be conducted in a laboratory that has been certified by a US or Turkish regulatory authority, or accredited through the DoD Environmental Laboratory Accreditation Program, for the applicable test method and follows required quality assurance and quality control protocol. In the absence of a certified laboratory, analyses may also be conducted at a laboratory that has an established reliable record of high-quality assurance compliance with standards for the applicable test method that are generally recognized by appropriate industry or scientific organizations.

1.3.4.2. DoD Components shall establish and implement an environmental audit program to ensure that overseas installations assess compliance with these FGS at least once every 3 years at all major installations.

1.3.4.3. Unless otherwise specified, all recordkeeping requirements, including assessments, inspection records, logs, manifests, notices, forms, and formats, are described in accordance with DoD 8910.01-M, Volume 1, “*DoD Information Collections Manual: Procedures for DoD Internal Information Collections*.”

1.3.4.4. Field sample and data collection must be conducted by personnel with demonstrated experience in the applicable test method and sampling. All procedures used for testing, quality assurance, and reporting of results should be those commonly accepted in the field of air pollution control.

1.3.5. Recordkeeping.

All records generated while implementing the standards in this manual must be maintained by installations in accordance with the FGS, DoDI 5015.02, and DoD Component policies.

1.3.6. Compliance of Installation Tenants and Supported Activities. Installation tenants and supported activities must comply with environmental standards specified in these FGS.

1.3.7. Contractor Compliance. Contractors performing work for the DoD at DoD installations in Türkiye shall comply with all Turkish laws and regulations, including obtaining all necessary authorizations and licences. Contracts must reflect the FGS Türkiye to the extent that such requirements are relevant and practicable. Contracting services does not absolve DoD Components from compliance with this document unless exempted under Paragraph 1.3.9.

1.3.8. Owned, leased, and joint use facilities.

1.3.8.1. Leased facilities under DoD operation and control in Türkiye are subject to the standards of the FGS Türkiye.

1.3.8.2. Owned, leased, and joint use facilities that are operated or maintained by DoD Components must comply with these standards when, and to the extent that, the Component controls the operation or maintenance activity(ies).

1.3.8.3. At leased facilities operated and maintained by others, DoD Components may opt to require compliance with these standards by the lessor or contractor. In any case, lessors and contractors must fully comply with Turkish legal requirements.

1.3.9. Exceptions. DoDI 4715.05 outlines conditions that may warrant exceptions and procedures for submitting exception requests. If the requirements of the FGS Türkiye conflict with technical standards used for military systems and equipment maintenance, or otherwise impact the ability of installations to sustain weapon systems and equipment, an exception can be

requested. The senior commander or installation commander responsible for materiel system maintenance services must act as the proponent.

1.4. ADDITIONAL INFORMATION.

1.4.1. Permits and Reporting.

1.4.1.1. Formal interaction or interaction of common interest between the US and Türkiye, on environmental activities, shall be conducted with the cognizance of the Turkish Installation Commander and the LEC.

1.4.1.2. The DoD shall not directly obtain permits/authorizations from Türkiye. If a permit or authorization is required for DoD activities as listed within these FGS, the DoD Component shall request the Turkish Installation Commander to obtain such permit on their behalf.

1.4.1.3. When the Turkish Installation Commander obtains a permit/authorization on behalf of a DoD Component and the permit/authorization requires a more protective standard than prescribed in the FGS, the standard in the permit/authorization shall be the compliance standard. However, if a permit/authorization allows a less protective standard, then the FGS will be the compliance standard unless a waiver is obtained. DoD Components will assist the Turkish Installation Commander with applying for permits and providing reports and records or otherwise helping them with their liaison duties.

1.4.1.4. If the installation at issue does not appear to fall under the responsibility of any Turkish Installation Commander, the DoD installation shall request clarification from the LEC via the chain of command. The LEC will pursue having higher Turkish military headquarters resolve representational responsibility, when necessary.

1.4.1.5. If an installation requests the Turkish Installation Commander obtain a required permit on their behalf and the Turkish Installation Commander does not obtain the permit, the DoD Component will notify the LEC via the chain of command. The LEC will determine if and when to pursue further permit discussions with higher Turkish military headquarters. These FGS remain the compliance standards when the Turkish Installation Commander does not obtain a required permit for a DoD Component or activity.

1.4.1.6. Contractors performing work for the DoD on DoD installations shall comply with all Turkish laws and regulations, including obtaining all necessary authorizations. Contracting services does not absolve DoD Components from compliance with this document unless exempted under Paragraph 1.3.9.

1.4.2. Working with the LEC.

1.4.2.1. DoD Components shall consult with the LEC when specified in this document and when:

1.4.2.1.1. Significant exceedances of FGS or approval criteria occur.

1.4.2.1.2. Turkish enforcement action is initiated.

1.4.2.1.3. An issue is raised that has the potential to affect multiple installations or military services.

1.4.2.2. DoD Components shall notify the LEC when specified in this document and when:

1.4.2.2.1. Information is provided to higher Turkish military headquarters for activities requiring approval, as governed by this document.

1.4.2.2.2. Higher Turkish military headquarters or other Turkish official requests information.

1.4.2.2.3. Any Turkish official requests access to an installation in order to conduct an environmental inspection.

1.4.2.3. The LEC, working with the notifying DoD Component, may determine notification specified in this document is no longer required on a case-by-case basis.

1.4.3. Access to Installations & Information by Turkish Authorities.

1.4.3.1. Inspections and non-routine requests for information by Turkish authorities shall be coordinated with the Turkish Installation Commander and the LEC via the DoD Component chain-of-command. To the maximum extent possible, US military personnel, rather than civilian personnel, should lead the review of DoD Component activities by Turkish authorities during the inspection.

1.4.4. Legal Protections for US Forces Employees.

1.4.4.1. Legal protections afforded DoD personnel investigated or charged by Türkiye with alleged offenses arising out of any act or omission done in the performance of official duty vary depending upon the status of the individual under the NATO Status of Forces Agreement (SOFA) and other applicable international agreements. In general, there is a greater ability for the US to assert a primary right to exercise criminal jurisdiction over a military service member of the force as opposed to a member of the civilian component. There is no such right with respect to local national employees. Accordingly, military service members should assume responsibility under these FGS in lieu of DoD civilians or local national employees where non-compliance may result in a Turkish enforcement action.

1.4.4.2. Installations, activities, and personnel should immediately contact their servicing legal office when faced with possible or actual Turkish enforcement actions in order to maximize protections afforded to DoD personnel under the NATO SOFA, bilateral agreements, and US

and DoD regulations, and to secure legal representation for the subjects of the enforcement action (including local national employees). Installations will report possible or actual Turkish enforcement actions to the LEC via their chain-of-command.

1.4.4.3. If the host nation authorities seek to question a DoD employee regarding his or her official duties, a representative from installation legal should accompany the employee. The installation legal representative should clarify with the Turkish authorities whether the employee is questioned as a suspect or a witness, and the employee advised accordingly. It may not be readily apparent whether the host nation legal proceeding is criminal or administrative in nature. This point should be clarified as soon as possible since different procedures may apply depending on the answer. Installations will report interview by Turkish authorities to the LEC via their chain-of-command.

1.4.5. Related Programs.

Additional guidance about related programs and initiatives that may apply outside the United States is included in other DoD policies and issuances. Climate change adaptation and resilience is addressed in DoDD 4715.21.

1.4.6. Website References.

1.4.6.1. References to websites that are not controlled by the DoD are intended for information purposes, solely to facilitate compliance with existing standards in this document.

1.4.6.2. Any other requirement, standard or criteria listed on the website shall not be incorporated by reference as an FGS. Reference to the website does not establish any obligation to comply with other requirements, standards, or criteria listed on the website.

1.4.6.3. Referenced websites that are not under the control of the DoD may be changed at any time without notice to the DoD.

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DEFINITIONS

Unless otherwise noted, these terms and their definitions are for the purpose of this volume.

Adverse effect	Changes that diminish the integrity or significance of historic and cultural resources.
Archeological resource	As a subset of historic and cultural resources, these may include any material remains of prehistoric or historic human life or activities. Such resources may include pottery, basketry, bottles, weapons, weapon projectiles, tools, structures or portions of structures, pit houses, rock paintings, rock carvings, intaglios, graves, human skeletal remains, or any portion of these items.
Biosecurity	Managing relevant risks to human, animal, and plant life and health, and associated risks to the environment from the introduction of disease, invasive or alien species, and pests.
Conservation	Planned management, use, and protection; continued benefit for present and future generations; and prevention of exploitation, destruction, and neglect.
Ecosystem-based management	A goal-driven approach to managing natural resources that supports present and future mission requirements; preserves ecosystem integrity; is at a scale compatible with natural processes; is cognizant of nature's timeframes; recognizes social and economic viability within functioning ecosystems; is adaptable to complex and changing requirements; and is realized through effective partnerships. It is a process that considers the environment as a complex system functioning as a whole, not as a collection of parts, and recognizes that people and their social and economic needs are a part of the whole.
Enduring location	A location is enduring when DoD intends to maintain access and use of that location for the foreseeable future. The following types of sites are considered enduring for US Government purposes: main operating base, forward operating site, and cooperative security location. All three types of locations may be composed of more than one distinct site. Enduring locations are published in the OSD-approved Enduring Location Master List.
Final Governing Standard (FGS)	A comprehensive set of country-specific substantive environmental provisions; typically, technical limitations on effluent, discharges, etc., or a specific management practice, developed in accordance with DoDI 4715.05.

Historic and cultural resources	A prehistoric or historic district, site, building, structure, or object significant in world, national, or local history, architecture, archeology, engineering, or culture. This includes artifacts, archeological resources, records, and material remains that are related to such a district, site, building, structure, or object, and also includes natural resources (plants, animals, landscape features, etc.) that may be considered important as a part of a country's traditional culture and history. A property listed on the World Heritage List or the Turkish equivalent of the US National Register of Historic Places is considered a historic and cultural resource.
Historic and cultural resources program	A program for identification, evaluation, documentation, curation, acquisition, protection, rehabilitation, restoration, management, stabilization, maintenance, recording, and reconstruction of historic and cultural resources. Includes safeguarding cultural property against the foreseeable effects of an armed conflict in compliance with the 1954 Hague Convention for the Protection of Cultural Property in the Event of Armed Conflict.
Installation	For the purposes of this document, any base, camp, post, station, yard, center, or other activity (e.g., a geographically separated unit) under the jurisdiction of the Secretary of a Military Department that is located within Türkiye or any territory, commonwealth, or possession of Türkiye.
International agreement	A multilateral or bilateral agreement, such as a base rights or access agreement, a status-of-forces agreement, or any other instrument defined as a binding international agreement in accordance with DoDD 5530.3, " <i>International Agreements</i> " (Reference (n)).
Inventory	The act of determining the location of historic and cultural resources that may have world, national, or local significance, or the record of such determinations.
Material remains	Physical evidence—whether above ground, below ground, or underwater—of human habitation, occupation, use, or activity, including the site, loci, or context in which such evidence is situated. Such evidence may include structures; artifact concentrations or scatters; whole or fragmentary tools, implements, containers, weapons, clothing, and ornaments; by-products, waste products, or debris resulting from manufacture or use; organic waste; human remains; rock carvings, rock paintings, and intaglios; rock shelters and caves; and all their portions or wreckage.
Mitigation	Specific steps designed to lessen or offset the adverse effects of a DoD action on a historic or cultural resource.

Natural resources	Living and inanimate materials, but not artifacts, existing in nature that are of aesthetic, ecological, educational, historical, recreational, scientific, or other value.
Natural resources management	Actions taken that combine science, economics, and policy to study, preserve, manage, and restore natural resources to strike a balance with the needs of people and the ability of the ecosystem to sustain and support the natural environment.
Natural resources management plan	An integrated plan focused, to the maximum extent practicable, on ecosystem-based management. It shows the interrelationships of individual components of natural resources management (e.g., fish and wildlife, forestry, land management, outdoor recreation) to mission requirements and other land use activities affecting an installation's natural resources.
Preservation	The act or process of applying measures to sustain the existing form, integrity, and material of a building, structure, or other historic or cultural resource, and the existing form and vegetative cover of a site. It may include initial stabilization work where necessary, as well as ongoing maintenance of the historic building materials.
Protection	In the context of historic and cultural resource protection in Chapter 2 of this document, the act or process of applying measures designed to affect the physical condition of a property by safeguarding it from deterioration, loss, attack, or alteration, or to cover or shield the property from danger or injury. In the case of buildings and structures, such treatment is generally temporary and anticipates future historic preservation treatment; in the case of archaeological sites, the protective measure may be temporary or permanent.
Species at risk (SAR)	Includes species on the United States Fish and Wildlife Service/National Oceanic and Atmospheric Administration Fisheries Service Foreign Species List or Turkish list designated as threatened, endangered, country-specific protected species, or a species that is a candidate for listing. SAR may also include species whose potential designation as threatened, endangered, or country-specific protected species could require conservation efforts that may substantially affect a military mission. The Foreign Species List can be found on the United States Fish and Wildlife Service website under Endangered Species: http://www.fws.gov/endangered . To find foreign species at the site, click on “More species searches” under “Quick Searches” then click on “Foreign Species” under “Listed Species.

Significant natural resources	Natural resources identified as having special importance to an installation or its ecosystem. Natural resources may be significant on a local, regional, national, or international scale. Threatened or endangered species and SAR and their habitats are significant natural resources.
Standards	Substantive elements of US laws and federal regulations applicable to DoD installations, facilities, and actions in the United States or that have extraterritorial application.
Turkish Installation Commander	The Turkish Installation Commander is the formal Turkish representative of the installation pursuant to bilateral agreement and serves as the liaison with national authorities and the contact with local authorities and local Turkish military and civil entities.
Turkish protected species	Any species of flora or fauna listed or designated by Türkiye, because continued existence of the species is, or is likely to be, threatened, and is therefore subject to special protection from destruction or adverse modification of associated habitat. Lists of Turkish protected species can be obtained from the LEC (contact information can be found in Paragraph 1.2.3.).
United States	The several States, the District of Columbia, the Commonwealths of Puerto Rico and the Northern Mariana Islands, American Samoa, Guam, Midway and Wake Islands, the US Virgin Islands, any other territory or possession of the United States, and associated navigable waters, contiguous zones, and ocean waters of which the natural resources are under the exclusive management authority of the United States.

ACRONYMS

ASD (Sustainment)	Assistant Secretary of Defense for Sustainment
DoDD	DoD Directive
DoDI	DoD Instruction
EO	Executive Order
FGS	Final Governing Standard
LEC	lead environmental component
OEBGD	Overseas Environmental Baseline Guidance Document
OSD	Office of the Secretary of Defense
SAR	species at risk
US	United States
USC	United States Code
USD(A&S)	Under Secretary of Defense for Acquisition and Sustainment
USEUCOM	United States European Command

CHAPTER 2: HISTORIC AND CULTURAL RESOURCES

2.1. INTRODUCTION.

This chapter contains standards on the preservation and management of historic and cultural resources.

2.2. GENERAL.

In consideration of the World Heritage List and Turkish equivalent of the US National Register of Historic Places, installations must take into account the effect of any action on a property listed on such lists for the purpose of avoiding or mitigating any adverse effects.

2.3. PERSONNEL QUALIFICATIONS.

Installations must ensure that:

2.3.1. Personnel performing historic or cultural resource functions have the necessary expertise in world, national, and local history and culture.

2.3.2. Personnel directing historic and cultural resource functions are trained and qualified to the level of their responsibilities in the management of historic or cultural resources.

2.4. CULTURAL RESOURCES MANAGEMENT PLAN.

Installations must:

2.4.1. After consultation with the Turkish installation commander or similar appropriate Turkish authorities:

2.4.1.1. Develop and maintain an inventory of historic and cultural resources in areas under DoD control using records searches and visual surveys. Installations should use geospatial referencing to document locations of historic and cultural resources, when possible.

2.4.1.2. Establish appropriate measures to protect and preserve known historic or cultural resources, including measures to prevent DoD personnel from disturbing or removing historic or cultural resources without permission of the appropriate Turkish authorities-

2.4.2. If cultural resources are identified in areas under DoD control, prepare, maintain, and implement a historic and cultural resources management plan that includes the information needed to:

2.4.2.1. Make appropriate decisions about historic and cultural resources identified on the installation inventory.

2.4.2.2. Mitigate any adverse effects, as necessary.

2.5. AVOIDANCE AND MITIGATION OF ADVERSE EFFECTS.

Installations must ensure that the possible adverse effects of DoD actions on historic and cultural resources are avoided or mitigated, to the extent practicable.

2.5.1. Before planning any major construction, major repair work, or ground-disturbing activity, evaluate the proposed project site, in consultation with the appropriate Turkish authorities, and consider all practicable means to appropriately avoid, minimize, and mitigate any adverse effects on historic and cultural resources. Unless a prior analysis has cleared the site, the analysis must include at a minimum.

2.5.1.1. Preparing a site plan illustrating the limit of construction and work. Modifications to the project boundaries after approval require re-evaluation of the project.

2.5.1.2. Determining the presence or absence of historic and cultural resources that may be affected by the project.

2.5.1.3. Assessing the effect or potential effect of the proposed project on historic or cultural resources.

2.5.1.4. Identifying any appropriate mitigation for potential adverse effects and specifying limitations, restrictions, or provisions. Mitigation may include, but is not limited to:

2.5.1.4.1. Limiting the magnitude of the action.

2.5.1.4.2. Relocating the action in whole or in part.

2.5.1.4.3. Repairing, rehabilitating, or restoring the affected resources or property.

2.5.1.4.4. Recovering and recording data from cultural properties that may be destroyed or substantially altered.

2.5.2. Maintain records of processed actions.

2.5.3. If potential historic or cultural resources not previously inventoried are discovered in the course of a DoD action:

2.5.3.1. Preserve and protect the newly discovered items pending consultation with appropriate Turkish authorities and a decision on final disposition by the Turkish Installation Commander.

2.5.3.2. Consult with the Turkish Installation Commander or appropriate Turkish authorities prior to determining the appropriate treatment of the historic or cultural resource.

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CHAPTER 3: NATURAL RESOURCES AND ENDANGERED SPECIES

3.1. INTRODUCTION.

This chapter establishes standards on the conservation of natural resources. Conservation measures may include protection of significant natural resources, including any species of flora or fauna or considered species at risk (SAR), by either US or Turkish governments. Such measures may include protection of the habitats of those species.

3.2. GENERAL.

Installations must evaluate natural resources for significance.

3.2.1. Installations must determine the presence of SAR, all of which are considered significant natural resources, through surveys or other methods.

3.2.2. Installations that actively manage fish and wildlife, forestry, vegetation and erosion control, agricultural activities, grazing activities, or wetlands protection normally have significant resources, but must consider the following items when determining significance:

3.2.2.1. The degree of active management needed.

3.2.2.2. Special natural features.

3.2.2.3. Aesthetics.

3.2.2.4. Outdoor recreational opportunities.

3.2.2.5. The ecological context of the installation.

3.3. PERSONNEL QUALIFICATIONS.

Installations must ensure that personnel who:

3.3.1. Perform natural resources functions have the requisite expertise or training in their discipline (e.g., SAR, wetlands, soil stabilization, habitats, ecosystems, and other ecological systems of concerns).

3.3.2. Direct natural resources functions are trained in natural resources management.

3.4. NATURAL RESOURCES MANAGEMENT PLAN.

Installations with significant natural resources must prepare a natural resources management plan.

3.4.1. Natural resources management plans must:

3.4.1.1. Incorporate the principles of ecosystem-based management.

3.4.1.2. Contain information needed to make appropriate decisions about natural resources management.

3.4.1.3. Maintain a relevant and updated baseline list of plant and animal species located at each installation for all pertinent taxonomic and regionally important groups.

3.4.1.4. Ensure that biologically or geographically significant or sensitive natural resources, such as threatened and endangered species, are monitored and managed for their protection and long-term sustainability.

3.4.1.5. Address natural resource management in support of biosecurity requirements.

3.4.1.6. Ensure no net loss of installation capabilities and capacity to train, test, or perform other mission-essential functions. Enhance installation capabilities and capacity to the maximum extent practicable.

3.4.2. Natural resources management plans should be coordinated with the Turkish Installation Commander or, after consulting the LEC, another Turkish representative, as appropriate.

3.5. NATURAL RESOURCES MANAGEMENT PLAN IMPLEMENTATION.

Installations with significant natural resources must take steps to protect and enhance those resources.

3.5.1. Maintain, or have access to, the current list of species established by Chapter 35 of Title 16, USC, also known as the “Endangered Species Act,” as well as a current list of Turkish protected species.

3.5.2. Through surveys or other methods, determine the presence of any SAR and their habitats.

3.5.3. Notify the Turkish Installation Commander or, after the LEC has been consulted, another Turkish representative, as appropriate, of the discovery of any SAR not previously known to be present on the installation.

3.5.4. Emphasize the maintenance and protection of habitats favorable to the reproduction and survival of indigenous flora and fauna, as appropriate.

3.5.5. Maintain grounds to support designated mission uses, and use native vegetation to maintain the natural landscape, wherever practical.

3.5.6. Ensure land and vegetative management activities are consistent with current conservation and land use principles (e.g., ecosystem protection, biodiversity conservation, mission-integrated land use, wildfire prevention, and invasive species control), as appropriate.

3.5.7. Use protective vegetative cover or other standard soil erosion and sediment control practices to control dust, stabilize sites, and avoid silting of streams, as appropriate.

3.6. RECORDKEEPING.

Installations must maintain records of natural resources management plan development and implementation, and other records associated with management of natural resources and SAR.

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VOLUME II: AIR AND TOXICS

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DEFINITIONS

Unless otherwise noted, these terms and their definitions are for the purpose of this volume.

Abatement	In the context of LBP in Chapter 6, any set of measures designed to permanently eliminate LBP or LBP hazards. Abatement includes the removal of LBP and lead-contaminated dust, the permanent enclosure or encapsulation of LBP, the replacement of components or fixtures painted with LBP, and the removal or covering of lead-contaminated soil. Abatement also includes all preparation, cleanup, disposal, and post-abatement clearance activities associated with such measures.
Asbestos containing material (ACM)	Any material containing more than 1 percent asbestos by weight. Category I nonfriable ACM. Asbestos containing packings, gaskets, resilient floor covering, and asphalt roofing products containing more than 1 percent asbestos. Category II nonfriable ACM. Any material, excluding Category I nonfriable ACM, containing more than 1 percent asbestos that when dry cannot be crumbled, pulverized, or reduced to powder by hand pressure. Friable ACM. Friable asbestos material; Category I nonfriable ACM that has become friable; Category I nonfriable ACM that will be or has been subjected to sanding grinding, cutting, or abrading; or Category II nonfriable ACM that has a high probability of becoming or has become crumbled, pulverized, or reduced to powder by the forces expected to act on the material in the course of demolition or renovation operations.
Adequately wet	Sufficiently mixed or penetrated with liquid to prevent the release of particulates. If visible emissions coming from ACM are observed, then that material has not been adequately wetted. However, the absence of visible emissions is not sufficient evidence of being adequately wet.
Air curtain incinerator	See definition of “MWC units.”
Air pollutant	Any air pollution agent or combination of such agents, including any physical, chemical, biological, or radioactive substance or matter that

is emitted into the ambient air, including precursors to the formation of an air pollutant.

Asbestos

Generic term used to describe six distinctive varieties of fibrous mineral silicates, including chrysotile (CAS No. 12001-29-5 and CAS No. 132207-32-0), amosite (CAS No. 12172-73-5), crocidolite (CAS No. 12001-28-4), tremolite asbestos (CAS No. 77536-68-6), anthrophyllite asbestos (CAS No. 77536-67-5), actinolite asbestos (CAS No. 77536-66-4), and any other of these materials that have been chemically treated or altered.

Bare soil

Soil, including sand, not covered by grass, sod, or other live ground covers, or by wood chips, gravel, artificial turf, or similar covering.

Capacitor

A device for accumulating and holding a charge of electricity and consisting of conducting surfaces separated by a dielectric.

Small capacitor. A capacitor that contains <1.36 kg [3 lbs.] of dielectric fluid.

Large high-voltage capacitor. A capacitor that contains 1.36 kg [3 lbs.] or more of dielectric fluid and that operates at 2,000 volts (alternating current or direct current) or above.

Large low-voltage capacitor. A capacitor that contains 1.36 kg [3 lbs.] or more of dielectric fluid and that operates below 2,000 volts (alternating current or direct current).

**Category I
nonfriable ACM**

See definition of “ACM.”

**Category II
nonfriable ACM**

See definition of “ACM.”

**Chemical waste
landfill**

A landfill where a high level of protection against risk of injury to human health or the environment from migration of deposited PCBs to land, water, or the atmosphere is provided by incorporating special methods for locating, engineering, and operating the landfill.

**Child-occupied
facility**

A facility, or portion of a facility, visited regularly by the same child, under 6 years of age, on at least two different days within any week, provided that:

- Each days' visit lasts at least 3 hours;
- The combined weekly visits last at least 6 hours; and
- The combined annual visits last at least 60 hours.

Child-occupied facilities may include, but are not limited to, day-care centers, preschools, playgrounds, and kindergarten classrooms.

Clearance	Visual evaluation and testing (collection and analysis of environmental samples) conducted after LBP hazard reduction activities, interim controls, and standard treatments to determine that the work is complete and no lead-contaminated bare soil or lead-contaminated settled dust exist in a facility frequented by children under 6 years of age.
Cold cleaning machine	Any device or piece of equipment that contains or uses liquid solvent, into which parts are placed to remove soil and other contaminants from the surfaces of the parts or to dry the parts. Cleaning machines that contain and use heated, non-boiling solvent to clean the parts are classified as cold cleaning machines.
Comfort cooling	An air-conditioning appliance used to provide cooling in order to control heat or humidity in occupied facilities including but not limited to residential, office, and commercial buildings. Comfort cooling appliances include, but are not limited to, chillers, commercial split systems, and packaged roof-top units.
Commercial refrigeration	A refrigeration appliance used in the retail food and cold storage warehouse sectors. Retail food appliances include the refrigeration equipment found in supermarkets, convenience stores, restaurants and other food service establishments. Cold storage includes the refrigeration equipment used to store meat, produce, dairy products, and other perishable goods.
Commercial/retail waste	See definition of “MSW.”
Commercial RICE	See definition of “Stationary RICE.”
Construction	Fabrication, erection, or installation of an affected facility.
Decontamination	All operations which enable equipment, objects, materials or fluids contaminated by PCBs to be reused, recycled, or disposed of under safe conditions, and which may include replacement of PCBs with suitable fluids not containing PCBs (as defined in below).
Deteriorated paint	Any interior or exterior paint or other coating that is peeling, chipping, chalking, cracking, or is otherwise damaged or separated from the substrate.
DoD school	A primary or secondary school that serves dependents of the U.S. military and civilian personnel and is operated by the DoD Education Activity.
Dust-lead hazard	See definition of “LBP hazard.”
Emergency combustion turbine	Any stationary gas turbine which operates as a mechanical or electrical power source only when the primary power source for a facility has been rendered inoperable by an emergency situation.

Emergency compression ignition or emergency spark ignition RICE	See definition of “Stationary RICE.”
Emission	Direct or indirect emission of substances, vibration, heat, or noise from a singular or non-point source to air.
Emission Limit Values	Mass, concentration and /or an emission level not to be exceeded in specified time intervals and expressed with specified parameters for an air emissions source.
Encapsulation	The application of any covering or coating that acts as a barrier between the LBP and the environment. Encapsulation may be used as a method of abatement if it is designed to be permanent.
Enclosure	The use of rigid, durable construction materials that are mechanically fastened to the substrate to act as a barrier between LBP and the environment. Enclosure may be used as a method of abatement if it is designed to be permanent.
Enduring location	A location is enduring when DoD intends to maintain access and use of that location for the foreseeable future. The following types of sites are considered enduring for US Government purposes: main operating base, forward operating site, and cooperative security location. All three types of locations may be composed of more than one distinct site. Enduring locations are published in the OSD-approved Enduring Location Master List.
Energy use systems	Systems located on-site that use energy (steam, hot water, process heat, or electricity) from a boiler. Includes, but is not limited to, process heating; compressed air systems; machine drive (motors, pumps, fans); process cooling; facility heating, ventilation, and air-conditioning systems; hot water systems; building envelope; and lighting.
Evaluation	In the context of LBP in Chapter 6, a visual evaluation, risk assessment, risk assessment screen, paint inspection, paint testing, or a combination of risk assessment and paint inspection to determine the presence of deteriorated paint, LBP, or an LBP hazard.
Existing installation	Any facility/building, source or project in use or under construction before 1 October 1994, unless it is subsequently substantially modified.
Facility	A unit or a collection of units with emissions to the atmosphere along with machines, tools, and other fixed assemblies; and properties where materials are stored, unloaded, and work is performed.
Final Governing Standard (FGS)	A comprehensive set of country-specific substantive environmental provisions; typically, technical limitations on effluent, discharges,

	etc., or a specific management practice, developed in accordance with DoDI 4715.05.
Freeboard ratio	The ratio of the solvent cleaning machine freeboard height to the smaller interior dimension (length, width, or diameter) of the solvent cleaning machine.
Friable ACM	Any material containing more than 1 percent asbestos that, when dry, can be crumbled, pulverized, or reduced to powder by hand pressure.
Friction surface	An interior or exterior surface that is subject to abrasion or friction, including, but not limited to, window, floor, and stair surfaces.
Halogenated solvent	Solvents that contain a halogen such as chlorine, bromine, or iodine.
Hazard reduction	Measures designed to reduce or eliminate human exposure to LBP hazards through various methods, including interim controls or abatement or a combination of the two.
Hospital and infectious medical waste incinerator (HIMWI)	Any device that combusts any amount of hospital waste or infectious medical waste, as defined in Chapter 16 of this manual. Large HIMWI units. An HIMWI whose maximum design waste burning capacity is more than 227 kg [500 lbs] per hour; A continuous or intermittent HIMWI whose maximum charge rate is more than 227 kg [500 lbs] per hour; or Batch HIMWI whose maximum charge rate is more than 1,814 kg [4,000 lbs] per day. Medium HIMWI units. An HIMWI whose maximum design waste burning capacity is more than 91 kg [200 lbs] per hour but less than or equal to 227 kg [500 lbs] per hour; A continuous or intermittent HIMWI whose maximum charge rate is more than 91 kg [200 lbs] per hour but less than or equal to 227 kg [500 lbs] per hour; or A batch HIMWI whose maximum charge rate is more than 726 kg [1,600 lbs] per day but less than or equal to 1,814 kg [4,000 lbs] per day. Small HIMWI units. An HIMWI whose maximum design waste burning capacity is less than or equal to 91 kg [200 lbs] per hour; A continuous or intermittent HIMWI whose maximum charge rate is less than or equal to 91 kg [200 lbs] per hour; or

A batch HIMWI whose maximum charge rate is less than or equal to 726 kg [1,600 lbs] per day.

Hospital waste

Discards generated at a hospital, except unused items returned to the manufacturer. Hospital waste does not include human corpses, remains, and anatomical parts that are intended for interment or cremation.

Impact surface

An interior or exterior surface that is subject to damage by repeated sudden force, such as certain parts of doorframes.

In or near commercial buildings

Within the interior of, on the roof of, attached to the exterior wall of, in the parking area serving, or within 30 meters (98.4 feet) of a non-industrial, non-substation building.

Incinerator

In the context of:

PCB disposal in Chapter 7, an engineered device using controlled-flame combustion to thermally degrade PCBs and PCB items. Examples include rotary kilns, liquid injection incinerators, cement kilns, and high-temperature boilers.

Air emissions in Chapter 4, any furnace used in the process of burning solid or liquid waste for the purpose of reducing the volume of the waste by removing combustible matter, including equipment with heat recovery systems for either hot water or steam generation.

Industry standards and practices

Applicable or recognized standards and practices relevant to the design, construction, installation, operation and maintenance, inspection, and repair of facilities and equipment.

Infectious solid waste

Solid waste produced by medical facilities that is specially managed because it has the potential to cause disease in humans or animals, or may pose a risk to both individuals or community health if not managed properly, and that includes the following classes:

Microbiology waste, including cultures and stocks of etiologic agents that, due to their species, type, virulence, or concentration, are known to cause disease in humans.

Pathology waste, including tissues and organs, amputated limbs or other body parts, fetuses, placentas, and similar tissues from surgery, delivery, or autopsy procedures. Waste contaminated with an infectious agent, including carcasses, body parts, blood, and bedding are also included. Non-contaminated carcasses of animals that died from natural causes or vehicular impact are typically not considered pathology waste and are disposed of as solid waste where local regulations permit.

Blood and blood products (including serum, plasma, and other blood components), items contaminated with liquid or semi-liquid

blood or blood products and items saturated or dripping with blood or blood products, and items caked with blood or blood products that are capable of releasing these materials during handling.

Potentially infectious materials, including fluids such as semen, vaginal secretions, cerebrospinal fluid, pericardial fluid, pleural fluid, peritoneal fluid, amniotic fluid, saliva in dental procedures, any body fluid that is visibly contaminated with blood, and all body fluids in situations where it is difficult or impossible to differentiate between body fluids.

Sharps, including hypodermic needles, syringes, biopsy needles, and other types of needles used to obtain tissue or fluid specimens, needles used to deliver intravenous solutions, scalpel blades, Pasteur pipettes, specimen slides, cover slips, glass petri plates, and broken glass potentially contaminated with infectious waste.

Infectious waste from isolation rooms, but only including those items that were contaminated or likely to have been contaminated with infectious agents or pathogens, including bodily excretions and discarded materials contaminated with blood.

Institutional RICE

See definition of “Stationary RICE.”

Institutional waste

See definition of “MSW.”

Institutional waste incinerator

See definition of “MWC units.”

Interim controls

A set of measures designed to temporarily reduce human exposure or likely exposure to LBP hazards. Interim controls include, but are not limited to, repairs, occasional and ongoing maintenance, painting, temporary containment, specialized cleaning, clearance, ongoing activities, and the establishment and operation of management and resident education programs.

International agreement

A multilateral or bilateral agreement, such as a base rights or access agreement, a status-of-forces agreement, or any other instrument defined as a binding international agreement in accordance with DoDD 5530.3, “*International Agreements*” (Reference (n)).

Industrial Process Refrigeration (IPR)

Complex customized appliances that include industrial ice machines, appliances used directly in the generation of electricity, and ice rinks. Where one appliance is used for both industrial process refrigeration and other applications, it is considered industrial process refrigeration equipment if 50 percent or more of its operating capacity is used for industrial process refrigeration.

Large high-voltage capacitor

See definition of “capacitor.”

Large HIMWI	See definition of “HIMWI.”
Large low-voltage capacitor	See definition of “capacitor.”
Lead-based paint (LBP)	Paint or other surface coatings that contain lead equal to or exceeding 1.0 milligram per cm ² , or 0.5 percent by weight or 5,000 ppm by weight.
Lead-based paint (LBP) hazard	Includes paint-lead hazard, dust-lead hazard, or soil-lead hazard: paint-lead hazard. A paint-lead hazard is any of the following: Any LBP on a friction surface that is subject to abrasion and where the lead dust levels on the nearest horizontal surface underneath the friction surface (e.g., the window sill or floor) are equal to or greater than the dust-lead hazard levels identified in the definition of dust-lead hazard. Any damaged or otherwise deteriorated LBP on an impact surface that is caused by impact from a related building component (such as a doorknob that knocks into a wall or a door that knocks against its doorframe). Any chewable lead-based painted surface on which there is evidence of teeth marks. Any other deteriorated LBP in any residential building or child-occupied facility or on the exterior of any residential building or child-occupied facility. Dust-lead hazard. Surface dust in a residential dwelling or child-occupied facility that contains a mass-per-area concentration of lead equal to or exceeding 40 µg/ft² on floors or 250 µg/ft² on interior window sills based on wipe samples. Soil-lead hazard. Bare soil on residential real property or on the property of a child-occupied facility that contains total lead equal to or exceeding 400 ppm (microgram per gram) in a play area, or an average of 1,200 ppm of bare soil in the rest of the yard based on soil samples.
Lead-containing paint	Paint or other similar surface coating materials containing lead or lead compounds in which the lead content (calculated as lead material) is in excess of 0.009 percent by weight of the total nonvolatile content of the paint or the weight of the dried paint film.
Leak	In the context of PCBs in Chapter 7, any instance in which a PCB article, container, or equipment has any PCBs on any portion of its external surface.

Leak inspection	The examination of an appliance to determine the location of refrigerant leaks.
Leak rate	The rate at which an appliance is losing refrigerant, measured between refrigerant charges. The leak rate is expressed in terms of the percentage of the appliance's full charge that would be lost over a 12-month period if the current rate of loss were to continue over that period.
Malfunction	Any sudden, infrequent, and not reasonably preventable failure of air pollution control equipment, process equipment, or a process to operate in a normal or usual manner which causes, or has the potential to cause, the emission limitations in an applicable standard to be exceeded. Failures that are caused in part by poor maintenance or careless operation are not malfunctions.
Medium HIMWI	See definition of "HIMWI."
Modification	In addition to the definition in Section 60.2 of Title 40, CFR: Routine maintenance, repair, and replacement is not considered a physical change, and the following are not considered a change in the method of operation: An increase in the production rate, if such increase does not exceed the operating design capacity of the source. An increase in the hours of operation. Use of an alternative fuel or raw material if, prior to the effective date of a paragraph in this part of the CFR that imposes conditions on or limits modifications, the source is designed to accommodate such alternative use.
Motor vehicle	Any commercially available vehicle that is not adapted to military use which is self-propelled and designed for transporting persons or property on a street or highway, including, but not limited to, passenger cars, light-duty vehicles, and heavy-duty vehicles.
Municipal solid waste (MSW)	Any residential, commercial or retail, or institutional waste. Residential waste includes material discarded from residential dwellings, hotels, motels, and other similar permanent or temporary housing. Commercial or retail waste includes material discarded by stores, offices, restaurants, warehouses, nonmanufacturing activities at industrial facilities, and other similar establishments or facilities.

**Municipal waste
combustion (MWC)
units**

Institutional waste includes materials discarded by schools, hospitals (nonmedical waste), nonmanufacturing activities at prisons and government facilities, and other similar establishments or facilities.

Residential, commercial or retail, and institutional waste does not include yard waste and RDF; used oil; sewage sludge; wood pallets; construction, renovation, and demolition wastes (which include railroad ties and telephone poles); clean wood; industrial process or manufacturing wastes; medical waste; or motor vehicles (including motor vehicle parts or vehicle fluff).

Any equipment that combusts solid, liquid, or gasified MSW including, but not limited to, field-erected MWC units (with or without heat recovery), modular MWC units (starved-air or excess-air), boilers (for example, steam generating units), furnaces (whether suspension-fired, grate-fired, mass-fired, air curtain incinerators, or fluidized bed-fired), and pyrolysis/combustion units.

Large MWC units have a rated capacity greater than 227 Mtons [250 tons] per day.

Small MWC units have a rated capacity of 32-227 Mtons [35-250 tons] per day.

Very small MWC units have the capacity to combust less than 32 Mtons [35 tons] per day of MSW or RDF.

Air curtain incinerator. An incineration unit operating by forcefully projecting a curtain of air across an open, integrated combustion chamber (fire box) or open pit or trench (trench burner) in which combustion occurs.

Institutional waste incinerator. Any combustion unit that combusts institutional waste and is a distinct operating unit of the institutional facility that generated the waste. Institutional waste incineration units include field-erected, modular, cyclonic burn barrel, and custom built incineration units operating with starved or excess air, and any air curtain incinerator that is a distinct operating unit of the institutional facility that generated the institutional waste.

OSWI. Either a very small MWC unit or an institutional waste incineration unit.

New facility

Any facility/building, source or project with a construction start date on, or after, 1 October 1994, or a pre-existing facility that has been substantially modified since 1 October 1994.

Ozone-depleting substance (ODS)

Substances having the potential to destroy ozone in the stratosphere. They include the following and are specifically identified in Either a Class I or Class II substance as listed in Tables 4.20, 4.21, and 4.22.

- Chlorofluorocarbons (CFCs);
- Other Fully Halogenated Chlorofluorocarbons;
- Halons;
- Carbon Tetrachloride;
- 1,1,1-Trichloroethane (Methyl Chloroform);
- Methyl bromide;
- Hydrobromofluorocarbons (HBFCs);
- Bromochloromethane; and
- Hydrochlorofluorocarbons (HCFCs).

OSWI

See definition of “MWC units.”

Pathology waste

See definition of “infectious medical waste.”

Lead-paint hazard

See definition of “LBP hazard.”

Polychlorinated biphenyls (PCB)

In the context of PCBs in Chapter 7, means any of the following substances, including mixtures where the concentration of any of the listed chemicals below is more than 0.005% by weight (50 ppm):

Polychlorinated Biphenyls (PCB, CAS# 1336-36-3).

Polychlorinated Terphenyls (PCT, CAS# 61788-33-8).

Monomethyl-dibromo-diphenyl methane (DBBT, CAS# 99688-47-8).

Monomethyl-dichloro-diphenyl methane (UGILEC 121 or 21, CAS# 81161-70-8).

Monomethyl-tetrachlorodiphenyl methane (UGILEC 141, CAS# 76253-60-6).

PCB article

Any manufactured article, other than a PCB Container, that contains PCBs and whose surface(s) has been in direct contact with PCB. This includes capacitors, transformers, electric motors, pumps, and pipes.

PCB article container

Any package, can, bottle, bag, barrel, drum, tank, or other device used to contain PCB Articles or PCB Equipment, and whose surface(s) has not been in direct contact with PCBs.

PCB capacitor

Any capacitor that contains ≥ 50 ppm PCBs.

PCB container	Any package, can, bottle, bag, barrel, drum, tank, or other device that contains PCBs or PCB Articles, and whose surface(s) has been in direct contact with PCBs.
PCB-contaminated electrical equipment	Any electrical equipment including, but not limited to, transformers, capacitors, circuit breakers, reclosers, voltage regulators, switches, electromagnets, and cable, that contain greater than or equal to 50 ppm PCBs, but less than 500 ppm PCBs, or previously contained PCBs and has not been decontaminated.
PCB equipment	Any manufactured item, other than a PCB Container or a PCB Article Container, that contains a PCB Article or other PCB Equipment, and includes microwave ovens, electronic equipment, and fluorescent light ballasts and fixtures.
PCB item	Any PCB Article, PCB Article Container, PCB Container, or PCB Equipment that deliberately or unintentionally contains or has as a part of it any PCB, or PCBs at a concentration of 50 ppm or greater.
PCB transformer	Any transformer, whether in use or in storage, that contains greater than or equal to 50 ppm PCBs.
Permanent	In the context of LBP in Chapter 6, an expected design life of at least 20 years.
Pyrolysis	Thermochemical decomposition of organic material at elevated temperatures in the absence of O ₂ (or any halogen).
Qualified energy assessor	Someone with the demonstrated background, experience, and abilities to evaluate energy savings opportunities for steam generation and major energy using systems.
Re-evaluation	A visual evaluation of painted surfaces and limited dust and soil sampling conducted periodically following LBP hazard reduction where LBP is still present.
Reconstruction or reconstructed	Unless otherwise specified, the replacement of components of a source to such an extent that the fixed capital cost of the new components exceeds 50 percent of the fixed capital cost that would be required to construct a comparable new source.
Recovery	The collection and the storage of ODS-containing refrigerants from any and all machinery and equipment during servicing or before disposal.
Recycling	The reuse of a recovered ODS-containing refrigerants following a basic cleaning process such as filtering and drying. For refrigerants, recycling means recharging the ODS-containing refrigerants back into the refrigeration equipment after servicing.
Refrigerant	Any substance that is used for heat transfer purposes and provides a cooling effect.
Regulated ACM	See definition for “ACM.”

Replacement	In the context of LBP in Chapter 6, a strategy of abatement that entails removing building components that have surfaces coated with LBP (such as windows, doors, and trim) and installing new components free of LBP.
Residential RICE	See definition of “Stationary RICE.”
Residential waste	See definition of “MSW.”
Restricted access area	Areas where access by unauthorized personnel is controlled by fences, other man-made structures or naturally-occurring barriers such as mountains, cliffs, or rough terrain.
Risk assessment	An on-site investigation to determine the existence, nature, severity, and location of LBP hazards and the provision of a report explaining the results of the investigation and options for reducing LBP hazards.
Risk assessment screen	A sampling protocol that is used in dwellings in relatively good condition and where the probability of finding LBP hazards is low. The protocol involves inspecting such dwellings and collecting samples from representative locations on the floor, interior window sills, and window troughs to determine whether conducting a risk assessment is warranted.
Shutdown	The cessation of operation of an affected source or equipment. Includes, but is not limited to, periodic maintenance, replacement of equipment, or repair.
Small capacitor	See definition of “capacitor.”
Small HIMWI	See definition of “HIMWI.”
Soil lead hazard	See definition of “LBP hazard.”
Stack	Any point in a source designed to emit solids, liquids, or gases into the air, including a pipe or duct but not including flares.
Standards	Substantive elements of U.S. laws and federal regulations applicable to DoD installations, facilities, and actions in the United States or that have extraterritorial application.
Startup	The first time the source begins production or the first time additional or changed equipment is put into operation.
Stationary combustion turbine (stationary gas turbine)	All equipment, including, but not limited to, the turbine, the fuel, air, lubrication and exhaust gas systems, control systems (except emissions control equipment), heat recovery system, and any ancillary components and subcomponents comprising any simple cycle stationary combustion turbine, any regenerative or recuperative cycle stationary combustion turbine, any combined cycle combustion turbine, and any combined heat and power combustion turbine based system. Stationary means that the combustion turbine is not self-

propelled or intended to be propelled while performing its function. It may, however, be mounted on a vehicle for portability.

Stationary RICE

Any internal combustion engine that uses reciprocating motion to convert heat energy into mechanical work. Stationary means that it remains in a single location (i.e., does not move at all) for 12 months or longer or is expected to remain in a single location for 12 months or longer.

Commercial RICE. A RICE used in commercial establishments such as office buildings, hotels, stores, telecommunications facilities, restaurants, financial institutions such as banks, doctor's offices, and sports and performing arts facilities.

Emergency compression ignition or emergency spark ignition RICE. Any stationary RICE that is operated to provide electrical power or mechanical work during an emergency situation. Examples include engines used to produce power for critical networks or equipment (including power supplied to portions of a facility) when electric power from the local utility (or the normal power source, if the facility runs on its own power production) is interrupted, or engines used to pump water in the case of fire or flood, etc. To be considered "emergency," an engine must not operate more than 100 hours per calendar year for non-emergency purposes, including maintenance and testing.

Institutional RICE. A RICE used in institutional establishments such as medical centers, nursing homes, research centers, institutions of higher education, correctional facilities, elementary and secondary schools, libraries, religious establishments, police stations, and fire stations.

Residential RICE. A RICE used in residential establishments such as homes or apartment buildings.

Substantial contact area

An area that is subject to public access on a routine basis or that could result in skin contact.

Substantial modification

Any modification to a facility/building the cost of which exceeds \$1 million, regardless of funding source.

United States

The several States, the District of Columbia, the Commonwealths of Puerto Rico and the Northern Mariana Islands, American Samoa, Guam, Midway and Wake Islands, the US Virgin Islands, any other territory or possession of the United States, and associated navigable waters, contiguous zones, and ocean waters of which the natural resources are under the exclusive management authority of the United States.

**Vapor cleaning
machine**

A batch or in-line solvent cleaning machine that boils liquid solvent which generates solvent vapor that is used as a part of the cleaning or drying cycle.

ACRONYMS

ACM	asbestos containing material (<i>see Definitions for more detail</i>)
°C	degrees Celsius
CAS	Chemical Abstracts Service
CEMS	continuous emission monitoring system
cm	centimeter
cm²	square centimeter
CO	carbon monoxide
CO₂	carbon dioxide
DLA	Defense Logistics Agency
DoDD	DoD Directive
DoDI	DoD Instruction
dscm	dry standard cubic meter
EO	Executive Order
ESP	electrostatic precipitator
°F	degrees Fahrenheit
FGS	Final Governing Standard
ft	foot or feet
ft²	square foot or feet
g/HP-hr	grams per horsepower hour
g/kW-hr	grams per kilowatt hour
GJ/hr	gigajoules per hour
GJ/yr	gigajoules per year
HAP	hazardous air pollution
HC	hydrocarbon

HCFC	hydrochlorofluorocarbon
HFC	hydrofluorocarbon
Hg	mercury
HHV	higher heating value
HIMWI	hospital and infectious medical waste incinerator
HP	horsepower
hr	hour
IPR	industrial process refrigeration
J	joule
kg	kilogram
kg/GJ	kilogram per gigajoules
kW	kilowatt
lb	pound
lb/MMBtu	pound per million British thermal units
lb/MWh	pound per megawatt-hour
LBP	lead-based paint
LEC	lead environmental component
LHV	lower heating value
LPG	liquefied petroleum gas
µg	microgram
µg/ft²	microgram per square foot
µg/m²	microgram per square meter
m²	square meter
mg	milligram
mg/dscm	milligram per dry standard cubic meter
MMBtu/hr	million British thermal units per hour
MSW	municipal solid waste

Mton	metric ton
MW	megawatt
MWC	municipal waste combustion
MWh	megawatt-hour
ng	nanogram
ng/dscm	nanogram per dry standard cubic meter
ng/J	nanograms per joule
NMHC	nonmethane hydrocarbons
NO_x	nitrogen oxide
O₂	oxygen
ODS	ozone-depleting substance
OSD	Office of the Secretary of Defense
OSWI	other solid waste incinerator
PCB	polychlorinated biphenyls (<i>see Definitions for more detail</i>)
PCE	Perchloroethylene
PM	particulate matter
ppm	parts per million
ppmv	parts per million by volume
ppmvd	parts per million by volume, dry basis
RDF	refuse-derived fuel
RICE	reciprocating internal combustion engines
SLB	stroke lean burn
SO₂	sulfur dioxide
SRB	stroke rich burn
TBtu/yr	trillion British thermal units per year
TEQ	toxic equivalency factor

US	United States
USEUCOM	United States European Command
VOC	volatile organic compound

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CHAPTER 4: AIR EMISSIONS

4.1. INTRODUCTION.

This chapter contains standards on the control of air emissions sources. It includes, but is not limited to, control of emissions from boilers, incinerators, dry cleaning machines, solvent cleaning machines, stationary combustion sources, and use of ozone-depleting substances (ODS). See Table 4.1 for the location of additional standards in this manual related to air emission sources.

Table 4.1. Additional Standards Related to Air Emission Sources

For:	See:
Asbestos	Chapter 5
Hazardous materials	Chapter 10
Petroleum, oil, and lubricants	Chapter 11
Underground storage tanks	Chapter 12
Hazardous waste	Chapter 16

4.2. GENERAL.

Installations must ensure compliance with the following standards for air emission sources, as applicable. For sources covered in Tables 4.2, 4.8, and 4.9 through 4.18, units in use as of the date of this publication must be operated and maintained according to manufacturer specifications, but are not required to be retrofitted or replaced in order to meet emission concentration limits.

4.2.1. Maintenance and Repair of Equipment.

All equipment that generates air pollutants must be operated and maintained in accordance with the manufacturer's specifications, including preventive maintenance inspections. Any equipment failing to meet emission limits prescribed in this section must be evaluated along with any affiliated pollution control devices for needed repairs or changes in operating parameters to bring emissions into compliance. Equipment must be repaired or replaced as soon as technically feasible.

4.2.2. Stack Height and Diameter.

Stack height and diameter must be based on industry standards and practices for the specific source and dispersion modeling, as applicable, to ensure that emissions from the stack do not result in excessive concentrations of any air pollutant as a result of atmospheric downwash.

4.2.3. Source Testing.

All emission sources requiring testing or continuous emissions monitoring systems (CEMS) must have sampling and testing facilities that ensure safe and easy access (including platforms and sampling ports, as well as power sources for test equipment) to determine the nature and quality of emissions that are or may be discharged as a result of source operations. All equipment and support facilities used for source testing, CEMS operation, and quality assurance should be compliant with industry standards.

4.2.4. Recordkeeping.

The following recordkeeping requirements apply to all units.

4.2.4.1. Retain records related to compliance with emission limits for 3 years (e.g., continuous monitoring system results, test results, tune-up records, fuel certifications, performance test results).

4.2.4.2. Retain manufacturer specifications, manufacturer-supplied certificates of conformity, manufacturer-supplied emissions test data, maintenance inspection logs, one-time performance test results, and repair records for the life of the unit.

4.2.5. Personnel Qualifications.

Personnel involved in activities associated with the control of air emission sources should be trained consistent with their responsibilities. Personnel must meet the training and qualification standards of Paragraph 4.9.5.1, as applicable.

4.3. BOILERS.

Installations must ensure that boilers meet the standards of this paragraph, as applicable. Standards for boilers specified below are based on several parameters, including heat input capacity, date when construction began, and type of fuel combusted.

4.3.1. Air Emission Limits.

4.3.1.1. The following standards apply to units with a maximum design heat input capacity greater than or equal to 10.56 gigajoules per hour (GJ/hr) [10 million British thermal units per hour (MMBtu/hr)]:

4.3.1.1.1. Boiler units must meet the emission limits for specific sized units shown in Table 4.2.

4.3.1.1.2. For units combusting liquid fossil fuel, compliance with particulate matter (PM) and sulfur dioxide (SO₂) emission limits must be demonstrated by combusting oil containing no more than 0.50 weight percent sulfur demonstrated by fuel certification.

4.3.1.2. Initial demonstration of compliance with the Table 4.2 emission limits can be accomplished using one or more of the following:

4.3.1.2.1. Test data from the boiler manufacturer.

4.3.1.2.2. Test data from the owner/operator.

4.3.1.2.3. Data from a CEMS and/or a continuous opacity monitoring system.

4.3.1.2.4. Data from fuel analysis/certification (where applicable).

4.3.1.3. Subsequent demonstration of compliance:

4.3.1.3.1. Is required if significant changes occur to the boiler (e.g., modification, reconstruction) that may affect emissions or if there is a change in fuel type/quality.

4.3.1.3.2. Must be accomplished every 3 years for these categories of emission limits:

4.3.1.3.2.1. The mercury (Hg) and carbon monoxide (CO) limits applicable to boilers combusting solid fossil fuel.

4.3.1.3.2.2. Those emission limits that only apply to units that began construction or reconstruction after June 4, 2010 (i.e., emission limits with footnote “h” or “l” in Table 4.2).

4.3.2. Work Practice Standards, Emission Reduction Measures, and Management Practices.

4.3.2.1. Tune-up Requirements.

Unless specifically exempted, conduct a boiler tune-up in accordance with manufacturer specifications, but no less frequently than specified in Table 4.2 (every 2 years or every 5 years).

4.3.2.2. Energy Assessment Recommendations.

The purpose of the energy assessment is to identify energy conservation measures that can be implemented to reduce system and facility energy demand, which would reduce fuel use and emissions. Energy assessment recommendations for boilers are detailed in Table 4.3. Unless specifically exempted in Table 4.3, a one-time energy assessment should be performed for all existing boilers with a maximum design heat input capacity greater than or equal to 10.56 GJ/hr [10 MMBtu/hr]. A one-time energy assessment should also be performed for any energy use systems associated with those boilers that equal or exceed specified energy use levels (i.e., equal or exceed a specified percentage of a regulated boiler’s total energy production). As an alternative to performing the one-time energy assessment, facilities can demonstrate that the facility energy program is compatible with International Organization for Standardization 50001.

4.4. INCINERATORS.

There are no DoD-operated incinerators in Türkiye. If a DoD Component anticipates having operational control of an incinerator, contact the LEC for additional criteria. Please refer to Paragraph 1.2.3 for further information.

4.5. PERCHLOROETHYLENE (PCE CAS#127-18-4) DRY CLEANING MACHINES.

Installations must ensure that PCE dry cleaning machines meet the standards of this paragraph, as applicable. The following requirements apply to all dry cleaning machines, except for coin-operated machines.

4.5.1. Emissions from PCE dry cleaning machines installed before September 22, 1993, must be controlled with a refrigerated condenser, unless a carbon adsorber was already installed. The temperature of the refrigerated condenser must be maintained at 7 degrees Celsius (°C) [45 degrees Fahrenheit (°F)] or less.

4.5.2. All PCE dry cleaning systems installed between September 22, 1993 and December 21, 2005 must be of the dry-to-dry design with emissions controlled by a refrigerated condenser. The temperature of the refrigerated condenser must be maintained at 7 °C [45 °F] or less.

4.5.3. All PCE dry cleaning systems installed on or after December 21, 2005 must route the air- PCE gas-vapor stream contained within each dry cleaning machine through a refrigerated condenser and pass the air-PCE gas-vapor stream from inside the dry cleaning machine drum through a non-vented carbon adsorber or equivalent control device immediately before the door of the dry cleaning machine is opened. The carbon adsorber must be desorbed in accordance with manufacturer's instructions. The temperature of the refrigerated condenser must be maintained at 7 °C [45 °F] or less.

4.6. HALOGENATED SOLVENT CLEANING MACHINES.

Installations must ensure that halogenated solvent cleaning machines meet the standards of this paragraph, as applicable. These requirements apply to all solvent cleaning machines that use solvents containing more than 5 percent by weight of the following halogenated solvents: methylene chloride (Chemical Abstracts Service (CAS) No. 75-09-2), PCE (CAS No. 127-18-4), trichloroethylene (CAS No. 79-01-6), 1,1,1-trichloroethane (CAS No. 71-55-6), carbon tetrachloride (CAS No. 56-23-5), chloroform (CAS No. 67-66-3), or any combination of these halogenated solvents.

4.6.1. Cold Solvent Cleaning Machine.

4.6.1.1. When not in use, cover all cold cleaning machines (remote reservoir and immersion tanks). Covers must be free of cracks, holes, and other defects.

4.6.1.2. Maintain a 2.5 centimeter (cm) [1 inch] water layer or a freeboard ratio of at least 0.75 for immersion type cold cleaning machines.

4.6.1.3. Collect and store waste solvent in closed containers.

4.6.1.4. If a flexible hose or flushing device is used, only perform flushing within the freeboard area of the solvent cleaning machine.

4.6.1.5. Drain solvent cleaned parts.

4.6.1.6. Maintain solvent level at or below the fill line.

4.6.1.7. Immediately wipe up spills that occur during solvent transfer. Store used wipe rags in covered containers in accordance with Paragraph 16.8.5 of this manual.

4.6.1.8. When an air- or pump-agitated solvent bath is used, operate the agitator to produce a rolling motion of the solvent but not observable splashing against tank walls or parts being cleaned.

4.6.1.9. When the cover is open, do not expose the cold cleaning machine to drafts.

4.6.2. Vapor Cleaning Machines (Vapor Degreasers).

All vapor cleaning machines (vapor degreasers) must incorporate control designs and meet solvent idling emission limits found in Table 4.5. In addition, these work practices must be observed:

4.6.2.1. Use covers across the cleaning machine opening(s) during idling and down times, or limit the flow of air across the top of the freeboard area. Covers must be free of cracks, holes, and other defects.

4.6.2.2. In an open-top batch vapor cleaning machine, do not occupy more than 50 percent of the solvent/air interface area with parts baskets or the parts being cleaned.

4.6.2.3. Perform spraying operations within the vapor zone or within a section of the solvent cleaning machine that is not directly exposed to the ambient air (i.e., a baffled or enclosed area of the solvent cleaning machine).

4.6.2.4. Orient parts so that the solvent drains from them freely. Tip or rotate parts with cavities or blind holes before removing them from a solvent cleaning machine.

4.6.2.5. Do not remove parts baskets or parts from any solvent cleaning machine until dripping has stopped.

4.6.2.6. During startup of each vapor cleaning machine, turn on the primary condenser before the sump heater.

4.6.2.7. During shutdown of each vapor cleaning machine, turn off the sump heater and allow the solvent vapor layer to collapse before turning off the primary condenser.

4.6.2.8. When solvent is added or drained from any solvent cleaning machine, transfer the solvent using threaded or other leak-proof couplings and locate the end of the pipe in the solvent sump beneath the liquid solvent surface.

4.6.2.9. Collect and store waste solvent, still bottoms, and sump bottoms in closed containers and manage in accordance with Chapter 16 of this manual.

4.6.2.10. Sponges, fabric, wood, and paper products must not be cleaned.

4.7. STATIONARY COMBUSTION TURBINES (STATIONARY GAS TURBINES).

Installations must ensure that stationary combustion turbines meet the standards of this paragraph, as applicable.

4.7.1. Operate and maintain the stationary combustion turbine, air pollution control equipment, and monitoring equipment in a manner consistent with manufacturer specifications and industry standards and practices for minimizing emissions at all times, including during startup, shutdown, and malfunction.

4.7.2. The following requirements apply to all stationary combustion turbines with a heat input at peak load equal to or greater than 10.56 GJ/hr [10 MMBtu/hr], based on the lower heating value (LHV) of the fuel fired that began construction, modification, or reconstruction after October 3, 1977 but before February 18, 2005. Emergency gas turbines, military gas turbines installed for use at military training facilities, and firefighting gas turbines are exempt from NO_x emission limits, as are units with a heat input at peak load less than 105.6 GJ/hr [100 MMBtu/hr] based on the LHV of the fuel fired, that began construction before October 3, 1982.

4.7.2.1. Each unit must comply with the NO_x emission limits in Table 4.6.

4.7.2.2. The maximum sulfur content for any fuel burned in a stationary gas turbine must not exceed 0.8 percent by weight [8,000 ppm by weight].

4.7.3. The following requirements apply to stationary combustion turbines with a heat input at peak load equal to or greater than 10.56 GJ/hr [10 MMBtu/hr], based on the higher heating value (HHV) of the fuel, which began construction, modification, or reconstruction after February 18, 2005. Combustion turbine test cells and stands are exempt. Emergency combustion turbines are exempt from the NO_x emission limits.

4.7.3.1. Each unit must meet the applicable NO_x emission limits in Table 4.8.

4.7.3.2. The total sulfur content for any liquid fuel burned must not exceed 0.4 percent by weight (4,000 ppm by weight). The total sulfur content for natural gas must not exceed 9.1 grams [140 grains] of sulfur per 2.8 kiloliters [100 standard cubic ft].

4.8. STATIONARY RECIPROCATING INTERNAL COMBUSTION ENGINES (RICE).

Installations must ensure that stationary RICE meet the standards of this paragraph, as applicable.

4.8.1. Operation and Maintenance.

4.8.1.1. Operate and maintain RICE and air pollution control equipment according to manufacturer's specifications or in a manner consistent with industry standards and practices for minimizing emissions.

4.8.1.2. Minimize idle time during startup and ensure startup time does not exceed 30 minutes, the point at which engines become subject to applicable emission limits.

4.8.2. Compression Ignition RICE.

4.8.2.1. Each compression ignition RICE must meet the emission limits or work practices identified in Tables 4.9 through 4.14, as appropriate. Engines with a national security exemption are not subject to these requirements but must follow manufacturer specifications for operation and maintenance. Engines used in test cells and test stands are exempt. Existing residential, commercial, or institutional emergency engines that were purchased prior to June 12, 2006 are exempt from the requirements of Table 4.14 (see "*Stationary RICE*" definition).

4.8.2.2. All non-exempt diesel compression ignition RICE must operate solely on fuel having a maximum sulfur content of 50 ppm [0.005 percent by weight].

4.8.2.3. For all model year 2007 and later engines, model year 2006 engines manufactured after April 1, 2006 (July 1, 2006 for fire pump engines), and all engines reconstructed after July 11, 2005, compliance with emission limits must be demonstrated by purchasing a certified engine or conducting testing to show that the engine's emissions meet the standards. For all other engines with emission limits, compliance is demonstrated by purchasing a certified engine, keeping records of engine manufacturer data indicating compliance with the standards, or conducting an initial performance test to demonstrate compliance with the emission standards. For engines with work practice standards, compliance is demonstrated by documenting that the work practices have been accomplished.

4.8.2.4. Emergency engines must be equipped with a non-resettable hour meter, and engine operating hours should be recorded by type of use (e.g., emergency, maintenance and testing, other non-emergency).

4.8.3. Spark Ignition RICE.

4.8.3.1. Spark ignition RICE must meet the emission limits identified in Tables 4.15 through 4.18 as appropriate. Engines with a national security exemption are not subject to these requirements, but must follow manufacturer specifications and industry standards and practices for operation and maintenance. Engines used in test cells and test stands are exempt. Existing residential, commercial, or institutional emergency engines are exempt from the requirements of Table 4.18. Existing engines are those that commenced construction or reconstruction before June 12, 2006 (see “*Stationary RICE*” definition).

4.8.3.2. For engines manufactured after July 1, 2007, compliance with emission limits must be demonstrated by purchasing a certified engine or conducting testing to show that the engine’s emissions meet the standards.

4.9. UNITS CONTAINING ODS AND SUBSTITUTES FOR ODS.

Installations must ensure that units containing ODS meet the standards of this paragraph, as applicable. ODS are listed in Table 4.19 (Class I), Table 4.20 (Class II), and Table 4.21 (Blend). The standards in Paragraph 4.9.2. through 4.9.5. apply to direct atmospheric emissions of ODS from refrigeration and fire suppression equipment. These standards also apply to substitutes for ODS, such as hydrofluorocarbons (HFCs), where indicated.

4.9.1. Substitutes Exempt from Refrigerant Management Requirements.

The following substitutes are exempt from the refrigerant management requirements:

- 4.9.1.1. Carbon dioxide in any application.
- 4.9.1.2. Nitrogen in any application.
- 4.9.1.3. Water in any application.
- 4.9.1.4. Ammonia in commercial or industrial process refrigeration or absorption units.
- 4.9.1.5. Chlorine in industrial process refrigeration (processing of chlorine and chlorine compounds).
- 4.9.1.6. Hydrocarbons in industrial process refrigeration (processing of hydrocarbons).
- 4.9.1.7. Ethane (R-170) in very low temperature refrigeration equipment and equipment for non-mechanical heat transfer.
- 4.9.1.8. Propane (R-290) in retail food refrigerators and freezers (stand-alone units only); household refrigerators, freezers, and combination refrigerators and freezers; self-contained room air conditioners for residential and light commercial air-conditioning and heat pumps;

vending machines; and effective January 3, 2017, self-contained commercial ice machines, very low temperature refrigeration equipment, and water coolers.

4.9.1.9. Isobutane (R-600a) in retail food refrigerators and freezers (stand-alone units only); household refrigerators, freezers, and combination refrigerators and freezers; and vending machines.

4.9.1.10. R-441A in retail food refrigerators and freezers (stand-alone units only); household refrigerators, freezers, and combination refrigerators and freezers; self-contained room air conditioners for residential and light commercial air-conditioning; heat pumps; and vending machines.

4.9.1.11. Methyl bromide for quarantine and pre-shipment applications.

4.9.2. Production and Use of Class I and II ODS.

Production of Class I ODS has been banned. Production of Class II ODS is being phased out and no Class II ODS will be produced after January 1, 2030. All existing commercial systems using Class I and Class II ODS must be phased out at the end of their life cycle. No new commercial systems may be purchased containing these substances. Use of Class I ODS is only permitted for weapons systems and when supplied by the Defense Logistics Agency (DLA) from the DoD stockpile. Use of Class II ODS is permitted only in existing air-conditioning and refrigeration equipment until the end of their life cycle. Maintenance or servicing of products and equipment containing Class I or Class II ODS listed in Tables 4.19 through 4.22 is prohibited, except for HCFC-22. HCFC-22 can be used to maintain or service household refrigeration and cooling equipment until the 1 January 2025. Running an existing system (e.g., using a refrigerator) would not be classified as maintaining or servicing.

4.9.2.1. Allowed Use of ODS. ODS listed in Tables 4.19 through 4.21 can be used as a feedstock, a process agent where emissions are insignificant, and for essential laboratory and analytical uses. Use of any of these ODS other than Hydrochlorofluorocarbons (HCFCs) for laboratory use shall be reported to the HAAZ Commander.

4.9.2.2. Allowed Use of Methyl Bromide. Methyl bromide may be used for quarantine and pre-shipment applications. Methyl bromide may also be used in an emergency where unexpected outbreaks of particular pests or diseases so require. Consult with the HAAZ Commander prior to emergency use.

4.9.2.3. Fluorinated Greenhouse Gases Restrictions. From 1 January 2020, use of virgin Fluorinated Greenhouse Gases with a Global Warming Potential (See Table 4.23) over 2,500 is prohibited in refrigeration units containing a charge size of 40 tonnes of CO₂ equivalent, or more. Use of reclaimed or recycled fluorinated greenhouse gases with a Global Warming Potential over 2,500 may continue until 2030, provided the refrigerant is recovered or recycled from similar equipment.

4.9.3. Labeling.

All containers or products containing a Class I or Class II substance must bear the warning statement, in English and Turkish, shown in Figure 4.1. The label must be clearly legible and conspicuous and not interfere with, detract from, or obscure any labeling information required to be on the equipment or container. Alternative placement of the warning such as on hang tags, invoices, bills of lading, package inserts, or other supplemental printed materials is also acceptable. Containers and products must comply with labeling and other requirements for hazardous materials in Chapter 10 of this manual, as applicable.

Figure 4.1. Class I or Class II Warning Label

WARNING: Contains [or Manufactured with, if applicable] [insert name of substance], a substance which harms public health and environment by destroying ozone in the upper atmosphere.

DiKKAT: Üst atmosferde ozonu yok ederek halk sağlığına ve çevreye zarar veren bir maddeyi [veya varsa, maddenin adını giriniz] içerir.

4.9.4. Refrigerants.

The following criteria apply to direct atmospheric emissions of ODS and Fluorinated Greenhouse Gases from refrigeration equipment.

4.9.4.1. ODS and Fluorinated Greenhouse Gas Refrigerant Recovery and Recycling.

All repairs, including leak repairs or services to appliances, industrial process refrigeration units, air-conditioning units, or motor vehicle air conditioners containing ODS and Fluorinated Greenhouse Gas refrigerants, must be performed using commercially available refrigerant recovery and recycling equipment operated by trained personnel. Refrigerant technicians must be trained in proper recovery and recycling procedures, leak detection, safety, shipping, and disposal in accordance with recognized industry standards and practices or Turkish equivalent. Use of refrigerant recovery and recycling equipment is not required for ammonia, carbon dioxide, and pure hydrocarbon refrigerants.

4.9.4.1.1. Technicians must ensure the proper recovery of ODS refrigerant or Fluorinated Greenhouse Gases from refrigeration, air-conditioning and heat pump equipment, equipment containing solvents, fire protection systems and fire extinguishers, and high-voltage switchgear prior to its disposal and, when appropriate, during its servicing and maintenance.

4.9.4.1.2. ODS refrigerants and Fluorinated Greenhouse Gases contained in other products and equipment not listed in paragraph 4.10.4.2.1. shall, to the extent that it is technically feasible and does not entail disproportionate cost, be recovered to ensure their recycling, reclamation or destruction prior to its disposal and, when appropriate, during its servicing and maintenance.

4.9.4.1.3. When a Fluorinated Greenhouse Gas container used for transport or storage purposes reaches the end of its life, ensure the proper recovery of any residual gases it contains.

4.9.4.2. Refrigerant Venting Prohibition.

Any ODS and Fluorinated Greenhouse Gas refrigerants and their substitutes (such as HFCs) must not be intentionally released in the course of maintaining, servicing, repairing, or disposing of appliances, industrial process refrigeration units, air-conditioning units, or motor vehicle air conditioners. De minimis releases associated with good faith attempts to recycle or recover ODS or substitute refrigerants are not subject to this prohibition. Ammonia, carbon dioxide, and pure hydrocarbon refrigerants are not subject to the venting prohibition.

4.9.4.3. ODS and Fluorinated Greenhouse Gas Refrigerant Leak Monitoring and Repair.

4.9.4.3.1. Equipment containing ODS refrigerant in quantities of 3 kg (6.6 lbs) or more or fluorinated greenhouse gases in quantities of 5 tonnes of CO₂ equivalent or more shall be checked for leaks at least once every 12 months; this shall not apply to equipment with hermetically sealed systems, which are labeled as such and contain less than 6 kg (13.2 lbs) of ODS or 10 tonnes of CO₂ equivalent charge of fluorinated greenhouse gases (see the notes of Table 4.23 to determine tonnes of CO₂ equivalent).

4.9.4.3.2. Equipment containing ODS refrigerant in quantities of 30 kg (66 lbs) or more or fluorinated greenhouse gases in quantities of 50 tonnes of CO₂ equivalent or more shall be checked for leaks at least once every six months (see the notes of Table 4.23 to determine tonnes of CO₂ equivalent).

4.9.4.3.3. Equipment containing ODS refrigerant in quantities of 300 kg (660 lbs) or more or fluorinated greenhouse gases in quantities of 500 tonnes of CO₂ equivalent or more shall be checked for leaks at least once every three months (see the notes of Table 4.23 to determine tonnes of CO₂ equivalent).

4.9.4.3.4. Where a leak detection system is installed on equipment containing fluorinated greenhouse gases, the frequency of the checks required under paragraphs 4.9.4.3.1 to 4.9.4.3.3. shall be halved. The Leak Detection Systems on equipment containing fluorinated greenhouse gases shall be checked at least once every 12 months to ensure their proper functioning.

4.9.4.3.5. All equipment shall be checked for leaks within one month after a leak has been repaired to ensure that the repair has been effective.

4.9.4.4. Verification Testing.

Both an initial verification test (conducted prior to adding refrigerant back into equipment) and a follow-up verification test (conducted after the equipment returns to normal operating conditions) must be conducted to verify leak repairs.

4.9.4.5. Additional Leak Monitoring and Repair for Fluorinated Greenhouse Gas (Table 4.23) Fire Protection Systems.

Installations must monitor fire protection systems containing 3 kg (6.6 lbs) or more of Fluorinated Greenhouse Gases and make repairs to any leaks according to the following criteria:

4.9.4.5.1. Pressure gauges and weight-monitoring devices shall be checked once every 12 months to ensure proper functioning.

4.9.4.5.2. A leak test shall be performed prior to recharging of equipment.

4.9.4.5.3. Newly installed fire protection systems shall be checked for leaks immediately after they have been placed into service.

4.9.4.6. Additional Leak Monitoring and Repair for Fluorinated Greenhouse Gas (Table 4.23) Heating and Cooling Systems.

Leak Monitoring and Repair of working and temporarily out of operation stationary refrigeration, air conditioning and heat pump equipment containing 3 kg (6.6 lbs) or more of Fluorinated Greenhouse Gases, shall meet the following.

4.9.4.6.1. Prior to any repair, a pump-down or recovery shall be carried out, where necessary.

4.9.4.6.2. A leak test with Oxygen-Free Nitrogen (OFN) or another suitable pressure testing and drying gas shall be carried out where necessary, followed by evacuation, recharge and leak-test.

4.9.4.6.3. Before pressure testing, Fluorinated Greenhouse Gases shall be recovered from the appliance, where necessary.

4.9.4.6.4. The cause of any leak shall be identified to the extent possible, to avoid recurrence.

4.9.4.6.5. Newly installed refrigeration, air conditioning and heat pump equipment shall be checked for leaks immediately after they have been placed into service.

4.9.4.7. ODS Refrigerant (Tables 4.19 through 4.21) and Fluorinated Greenhouse Gas (Table 4.23) Record Keeping.

Operators of stationary refrigeration, air conditioning and heat pump equipment including circuitry, and fire protection systems containing 3 kg (6.6 lbs) or more of ODS or 5 tonnes of CO₂ equivalent charge of Fluorinated Greenhouse Gases shall maintain records on the quantity and type of ODS or Fluorinated Greenhouse Gases installed, any quantities added and the quantity recovered during servicing, maintenance and final disposal.

4.9.4.7.1. For all ODS and Fluorinated Greenhouse Gas systems, installations shall maintain relevant information including identification of the company and/or technician performing the service or maintenance and the dates and results of checks carried out to comply with 4.10.4.3.

4.9.4.7.2. For Fluorinated Greenhouse Gas systems containing 5 tonnes or more of CO₂ equivalent charge of Fluorinated Greenhouse Gases, installations shall also maintain the following information in the records:

4.9.4.7.2.1. Information on whether the Fluorinated Greenhouse Gases installed in a system were recovered or recycled, to include the source of these gases.

4.9.4.7.2.2. If a system is being decommissioned, information on the measures taken to recover and dispose of the fluorinated greenhouse gases.

4.9.4.7.2.3. The fluorinated greenhouse gas charge for a fire protection system, refrigeration, air conditioning or heat pump equipment.

4.9.4.7.3. These records shall be retained for at least 5 years and made available to the Turkish Installation Commander upon request.

4.9.5. Fire Suppression Agent (Halon).

Critical uses of halon, as indicated in Table 4.24, are still permitted until the date specified in Table 4.24 for each category. The systems must be decommissioned by the listed end dates. All other uses of halon are banned.

4.9.5.1. Technician Training.

Technicians who test, maintain, service, repair, or dispose of halon-containing equipment must be trained in halon emission reduction within 30 days of hire.

4.9.5.2. Venting Prohibition.

Halon must not be intentionally released into the environment while testing, maintaining, servicing, repairing, or disposing of halon-containing equipment or using such equipment for technician training. This venting prohibition does not apply to the following halon releases:

4.9.5.2.1. De minimis releases associated with good faith attempts to recycle or recover halons (i.e., release of residual halon contained in fully discharged total flooding fire extinguishing systems).

4.9.5.2.2. Emergency releases for the legitimate purpose of fire extinguishing, explosion inertion, or other emergency applications for which the equipment or systems were designed.

4.9.5.2.3. Releases during the testing of fire extinguishing systems, if all of the

following are true:

4.9.5.2.3.1. Systems or equipment employing suitable alternative fire extinguishing agents are not available.

4.9.5.2.3.2. Release of extinguishing agent is essential to demonstrate equipment functionality. environment.

4.9.5.2.3.3. Failure of system or equipment would pose great risk to human safety or the

4.9.5.2.3.4. A simulant agent cannot be used.

4.9.6. New Substances listed in Table 4.22. Maintenance or servicing of products and equipment containing the New Substances listed in Table 4.22 is prohibited other than use as a feedstock or for laboratory and analytical purposes. Running an existing system (e.g., using a refrigerator) would not be classified as maintenance of servicing.

4.10. MOTOR VEHICLES.

Installations must ensure that DoD-owned and -leased motor vehicles:

4.10.1. Use only unleaded gasoline, if available on the local economy, in vehicles that are designed for this fuel.

4.10.2. Use lowest sulfur content diesel available (not to exceed 50 ppm) in diesel-fueled vehicles.

4.11. OTHER AIR EMISSIONS SOURCES.

4.11.1. Facilities Subject to Emission Permissions. All facilities engaged in operations that generate pollutants into the atmosphere must contact the Turkish Installation Commander to determine emission permission requirements. If an emission permission is received, the installation shall adhere to the conditions of the permission. However, if the permission conditions require a less protective standard than the emission standards prescribed, then the FGS shall be the compliance criteria. Facility operations that could be subject to emission permissions include:

4.11.1.1. Paint booths;

4.11.1.2. Fuel storage, dispensing, and transfer operations (unloading and loading materials); and

4.11.1.3. Engine and gas turbine test centers.

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Table 4.2. Emission Limits for Boilers^a

FUEL TYPE	MAXIMUM DESIGN HEAT INPUT CAPACITY										
	10.56 to 105.6 GJ/hr (10 to 100 MMBtu/hr)					Greater than 105.6 GJ/hr (100 MMBtu/hr)					
	PM ^b (kg/GJ) [lb/MMBtu]	SO ₂ (kg/GJ) [lb/MMBtu]	Hg ^c (kg/GJ) [lb/MMBtu]	CO ^d (ppm)	Opacity ^e (%)	PM ^b (kg/GJ) [lb/MMBtu]	SO ₂ (kg/GJ) [lb/MMBtu]	NO _x (kg/GJ) [lb/MMBtu]	Hg ^c (kg/GJ) [lb/MMBtu]	CO ^d (ppm)	Opacity ^e (%)
Gaseous Fuel							0.21 (0.50) ^f	0.09 (0.20)			
Gaseous Coal-Derived Fuel							0.21 (0.50)	0.21 (0.50)			
Liquid Fossil Fuel	0.01 (0.03) ^{g, h}	0.21 (0.50) ^g			20	0.04 (0.10) ⁱ or 0.01 (0.03) ^f	0.21 (0.50)	0.17 (0.40)			20
Solid Fossil Fuel	0.04 (0.10) ^j 0.01 (0.03) ^k or 0.18 (0.42) ^l	0.506 (1.2)	0.000009 (0.000022)	420	20	0.04 (0.10) ⁱ or 0.01 (0.03) ^f	0.506 (1.2)	0.30 (0.70)	0.000009 (0.000022)	420	20
Biomass Fuel	0.13 (0.30) ^j 0.01 (0.03) ^k or 0.03 (0.07) ^l				20 ^m	0.09 (0.20) ⁱ or 0.01 (0.03) ^f					20 ^m
CO = carbon monoxide, Hg = mercury, kg/GJ = kilogram per gigajoules, lb/MMBtu = pound per million British thermal units, NO _x = nitrogen oxide, ppm = parts per million											
^a Unless otherwise specified, emission limits for units with a design capacity in the range of 10.56 to 105.6 GJ/hr (10 to 100 MMBtu/hr) apply to units that began construction, modification, or reconstruction after June 9, 1989, while emission limits for units with a design capacity greater than 105.6 GJ/hr (100 MMBtu/hr) apply to units that began construction, modification, or reconstruction after June 19, 1984. The PM and opacity emission limits apply at all times, except during periods of startup, shutdown, or malfunction. The SO ₂ , NO _x , Hg, and CO emission limits apply at all times, including periods of startup, shutdown, and malfunction.											
^b Boilers combusting the following fuels are not subject to PM standards:											
(1) oil that contains no more than 0.5 weight percent sulfur;											
(2) coke oven gas;											
(3) a mixture of the first two fuels;											
(4) or either of the first two fuels (or a mixture of the first two fuels) in combination with other fuels not subject to a PM standard and not using a post-combustion technology (except a wet scrubber) to reduce SO ₂ or PM emissions.											
^c Compliance with Hg emission limits may be met by using fuel analysis.											
^d CO emission limits are on a dry basis corrected to 3 percent oxygen (O ₂).											

Table 4.2. Emission Limits for Boilers^a, Continued

^e Opacity limits do not apply to boilers less than 31.65 GJ/hr (30 MMBtu/hr).
^f Limit only applies to units that began construction, modification, or reconstruction after February 28, 2005.
^g Limit must be met by combusting oil containing no more than 0.50 weight percent sulfur as demonstrated by fuel certification.
^h Limit only applies to units that began construction or reconstruction after June 4, 2010.
ⁱ Limit applies to units that began construction, modification, or reconstruction after June 19, 1984 but before or on February 28, 2005.
^j Limit applies to units greater than or equal to 31.65 GJ/hr (30 MMBtu/hr) that began construction, modification, or reconstruction after June 9, 1989 but before or on February 28, 2005.
^k Limit applies to units greater than or equal to 31.65 GJ/hr (30 MMBtu/hr) that began construction, modification, or reconstruction after February 28, 2005.
^l Limit applies to units between 10.56 and 31.65 GJ/hr (10 and 30 MMBtu/hr) that began construction or reconstruction after June 4, 2010.
^m Limit only applies to wood fuel (i.e., wood products and wood residue).

Table 4.3. Tune-up Requirements for Boilers

EXEMPT UNITS	
The following types of units are exempt from all tune-up requirements: - Gas-fired boilers^a - Boilers that burn solid or hazardous waste - Hot water heaters^b - Waste heat boilers^c - Temporary boilers^d - Residential boilers - Electric boilers^e - Electric utility steam generating units	
APPLICABILITY	
Biennial Tune-up	Required for the following boilers: - Oil-fired boilers with a heat input capacity greater than 5.28 GJ/hr (5 MMBtu/hr) - Coal-fired boilers with a heat input capacity less than 10.56 GJ/hr (10 MMBtu/hr) - Biomass boilers (all sizes)
5-Year Tune-up	Required for the following boilers: - Oil-fired boilers with a heat input capacity less than or equal to 5.28 GJ/hr (5 MMBtu/hr) - Seasonal boilers^f - Limited-use boilers^g - Boilers with an O₂ trim system^h that maintains an optimum air-to-fuel ratio
DATE FOR INITIAL OR FIRST TUNE-UP	
Biennial Tune-up	As soon as possible, but within 25 months after publication of this manual or within 25 months of initial startup, whichever is later
5-Year Tune-up	As soon as possible, but within 61 months after publication of this manual or within 61 months of initial startup, whichever is later
REQUIRED TUNE-UP FREQUENCY	
Biennial Tune-up	Within 25 months of previous tune-up
5-Year Tune-up	Within 61 months of previous tune-up
TUNE-UP REQUIREMENTS	
1. As applicable, inspect the burner and clean or replace any components of the burner as necessary. For units requiring a biennial tune-up, the burner inspection may be delayed until the next scheduled unit shutdown, not to exceed 36 months from the previous inspection. For units requiring a 5-year tune-up, the burner inspection may be delayed until the next scheduled unit shutdown, but each burner must be inspected at least once every 72 months.	
2. Inspect the flame pattern, as applicable, and adjust the burner as necessary to optimize the flame pattern. The adjustment should be consistent with the manufacturer's specifications, if available.	
3. Inspect the system controlling the air-to-fuel ratio, as applicable, and ensure that it is correctly calibrated and functioning properly. For units requiring a biennial tune-up, the inspection may be delayed until the next scheduled unit shutdown, not to exceed 36 months from the previous inspection. For units requiring a 5-year tune-up, the inspection may be delayed until the next scheduled unit shutdown, but each system controlling the air-to-fuel ratio must be inspected at least once every 72 months.	
4. Optimize total emissions of CO. This optimization should be consistent with the manufacturer's specifications, if available, and with any NO_x requirement to which the unit is subject.	
5. Measure the concentrations in the effluent stream of CO in ppm, by volume, and O₂ in volume percent, before and after the adjustments are made (measurements may be either on a dry or wet basis, as long as it is the same basis before and after the adjustments are made). Measurements may be taken using a portable CO analyzer.	

Table 4.3. Tune-up Requirements for Boilers, Continued

TUNE-UP REQUIREMENTS, continued
6. Maintain a report on site that contains the following information: (i) The concentrations of CO in the effluent stream in ppm, by volume, and O₂ in volume percent, measured at high fire or typical operating load, before and after the tune-up. (ii) A description of any corrective actions taken as a part of the tune-up. (iii) The type and amount of fuel used over the 12 months before the tune-up, but only if the unit was physically and legally capable of using more than one type of fuel during that period. Units sharing a fuel meter may estimate the fuel use by each unit.
7. If the unit is not operating on the required date for a tune-up, the tune-up must be conducted within 30 calendar days of startup.
^a Includes any boiler that burns gaseous fuels not combined with any solid fuels and burns liquid fuel only during periods of gas curtailment, gas supply interruption, startups, or periodic testing on liquid fuel. Periodic testing of liquid fuel must not exceed a combined total of 48 hours during any calendar year. ^b A closed vessel with a capacity of no more than 454 liters (120 gallons) in which water is heated by combustion of fuel and hot water is withdrawn for use external to the vessel. Hot water boilers (i.e., boilers not generating steam) with a heat input capacity of less than 1.69 GJ/hr (1.6 MMBtu/hr) are included in this definition. The 454 liters (120 gallons) capacity threshold to be considered a hot water heater is independent of the 1.69 GJ/hr (1.6 MMBtu/hr) heat input capacity threshold for hot water boilers. Hot water heater also means a tankless unit that provides on-demand hot water. ^c A device that recovers normally unused energy (e.g., hot exhaust gas) and converts it to usable heat. Waste heat boilers are also referred to as heat recovery steam generators. ^d A boiler that is designed to, and is capable of, being carried or moved from one location to another and does not remain at one location for 12 consecutive months or longer. ^e A boiler in which electric heating serves as the source of heat. Electric boilers that burn gaseous or liquid fuel during periods of electrical power curtailment or failure are included in this definition. ^f A boiler that undergoes a shutdown for a period of at least 7 consecutive months (or 210 consecutive days) each 12-month period due to seasonal conditions, except for periodic testing. Periodic testing must not exceed a combined total of 15 days during the 7-month shutdown. This definition only applies to boilers combusting oil or biomass. ^g A boiler that burns any amount of solid, liquid, or gaseous fuels and has an enforceable average “annual capacity factor” of no more than 10 percent. Annual capacity factor is the ratio between the actual heat input to a boiler from the fuels burned during a calendar year and the potential heat input to the boiler had it been operated for 8,760 hours during a year at the maximum steady state design heat input capacity. ^h A system of monitors that is used to maintain excess air at the desired level in a combustion device. A typical system consists of a flue gas O₂ and/or CO monitor that automatically provides a feedback signal to the combustion air controller.

Table 4.4. Energy Assessment for Boilers

EXEMPT UNITS	
The following types of units are exempt from all energy assessment requirements:	
- Gas-fired boilers	- Residential boilers
- Boilers that burn solid or hazardous waste	- Electric boilers
- Hot water heaters	- Electric utility steam generating units
- Waste heat boilers	- Limited-use boilers
- Temporary boilers	
APPLICABILITY	
Recommended for existing boilers ^a greater than or equal to 10.56 GJ/hr (10 MMBtu/hr).	
ENERGY ASSESSMENT RECOMMENDATIONS	
A one-time energy assessment should be performed by a qualified energy assessor. The energy assessment should include all of the affected boiler systems ^b and consist of the following:	
1. A visual inspection of the boiler system.	
2. An evaluation of operating characteristics of the affected boiler systems, specifications of energy use systems, operating and maintenance procedures, and unusual operating constraints.	
3. An inventory of major energy use systems consuming energy from affected boiler(s) and which are under control of the boiler owner or operator.	
4. A review of available architectural and engineering plans, facility operation and maintenance procedures and logs, and fuel usage.	
5. A list of major and cost-effective energy conservation measures that are within the facility's control.	
6. A list of the energy savings potential of the energy conservation measures identified.	
7. A comprehensive report detailing the ways to improve efficiency, the cost of specific improvements, benefits, and the time frame for recouping those investments.	
SCOPE OF ENERGY ASSESSMENT	
Facilities with affected boilers with a combined heat input capacity of < 316,761 gigajoules per year (GJ/yr) (0.3 trillion Btu/year [TBtu/yr])	- Length: 8 on-site technical labor hours maximum, but may be longer at the discretion of the owner or operator of the affected source. - Systems: The boiler system(s) and any on-site energy use system(s) accounting for at least 50 percent of the affected boiler(s) energy (e.g., steam, hot water, process heat, or electricity) production, as applicable.
Facilities with affected boilers with a combined heat input capacity of 316,761 to 1,055,870 GJ/yr (0.3 to 1 TBtu/yr)	- Length: 24 on-site technical labor hours maximum, but may be longer at the discretion of the owner or operator of the affected source. - Systems: The boiler system(s) and any on-site energy use system(s) accounting for at least 33 percent of the affected boiler(s) energy (e.g., steam, hot water, process heat, or electricity) production, as applicable.
Facilities with affected boilers with a combined heat input capacity of > 1,055,870 GJ/yr (1 TBtu/yr)	- Length: Up to 24 on-site technical labor hours in length for the first 1,055,870 GJ/yr (1 TBtu/yr) plus 8 on-site technical labor hours for every additional 1,055,870 GJ/yr (1 TBtu/yr) not to exceed 160 on-site technical hours, but may be longer at the discretion of the owner or operator of the affected source. - Systems: The boiler system(s) and any energy use system(s) accounting for at least 20 percent of the affected boiler(s) energy (e.g., steam, hot water, process heat, or electricity) production, as applicable.
^a Existing boilers began construction or reconstruction on or before June 4, 2010.	
^b The boiler and associated components such as feedwater systems, combustion air systems, fuel systems (including burners), blowdown systems, combustion control systems, steam systems, and condensate return systems, directly connected to and serving the energy use systems.	

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Table 4.5. Vapor Cleaning Machine Control Combinations and Solvent Idling Emission Limits^a

UNIT TYPE	SOLVENT/AIR INTERFACE AREA	CONTROL COMBINATION OPTIONS	SOLVENT IDLING EMISSION LIMITS
Batch Vapor Cleaning Machine (New and Existing)	< 1.21 m ² (13 ft ²)	Working-mode Cover ^b /Freeboard Ratio of 1.0/Superheated Vapor ^c	0.22 kg/hr/m ² (0.045 lb/hr/ft ²)
		Freeboard Refrigeration Device ^d /Superheated Vapor ^c	
		Working-mode Cover ^b /Freeboard Refrigeration Device ^d	
		Reduced Room Draft ^e /Freeboard Ratio of 1.0/Superheated Vapor ^c	
		Freeboard Refrigeration Device ^d /Reduced Room Draft	
		Freeboard Refrigeration Device ^d /Freeboard Ratio of 1.0	
		Freeboard Refrigeration Device ^d /Dwell ^f	
		Reduced Room Draft/Dwell ^g /Freeboard Ratio of 1.0	
		Freeboard Refrigeration Device ^d /Carbon Adsorber ^g	
		Freeboard Ratio of 1.0/Superheated Vapor ^c /Carbon Adsorber ^g	
	> 1.21 m ² (13 ft ²)	Freeboard Refrigeration Device ^d /Freeboard Ratio of 1.0/Superheated Vapor ^c	0.22 kg/hr/m ² (0.045 lb/hr/ft ²)
		Dwell ^f /Freeboard Refrigeration Device ^d /Reduced Room Draft	
		Working-mode Cover ^b /Freeboard Refrigeration Device ^c /Superheated Vapor ^c	
		Freeboard Ratio of 1.0/Reduced Room Draft/Superheated Vapor ^c	
		Freeboard Refrigeration Device ^d /Reduced Room Draft/Superheated Vapor ^c	
		Freeboard Refrigeration Device ^d /Reduced Room Draft/Freeboard Ratio of 1.0	
		Freeboard Refrigeration Device ^d /Superheated Vapor ^c /Carbon Adsorber ^g	
		Superheated Vapor ^c /Freeboard Ratio of 1.0	
Existing In-line Cleaning Machines		Freeboard Refrigeration Device ^d /Freeboard Ratio of 1.0	0.10 kg/hr/m ² (0.021 lb/hr/ft ²)
New In-line Cleaning Machines		Dwell ^g /Freeboard Refrigeration Device ^d	0.10 kg/hr/m ² (0.021 lb/hr/ft ²)
		Dwell ^g /Carbon Adsorber ^g	
		Superheated Vapor ^c /Freeboard Refrigeration Device ^d	
		Freeboard Refrigeration Device ^d /Carbon Adsorber ^g	0.10 kg/hr/m ² (0.021 lb/hr/ft ²)
		Superheated Vapor ^c /Carbon Adsorber ^g	

Table 4.5. Vapor Cleaning Machine Control Combinations and Solvent Idling Emission Limits^a, Continued

m ² = square meter, ft ² = square foot
^a Compliance is shown by employing one of the approved control combinations for a unit or demonstrating that the cleaning machine can achieve and maintain the solvent idling emission limit.
^b Cover opens only for part entrance and removal and completely covers the cleaning machine openings when closed; working-mode cover free of cracks, holes, and other defects.
^c Maintain solvent vapor temperature at the center of the superheated vapor zone greater than 5.6 °C (10 °F) above the solvent's boiling point, and follow manufacturer specified minimum dwell time.
^d Maintain the chilled air blanket temperature at less than 30 percent of the solvent's boiling point, as measured at the center of the air blanket.
^e Limit the movement of air across the top of the freeboard area of the solvent cleaning machine or within the solvent cleaning machine enclosure to less than 15.2 meters per minute (50 feet (ft) per minute), at any time.
^f Determine and use appropriate dwell time for each part type (or parts basket), or determine and use the maximum dwell time using the most complex part type (or parts basket).
^g Limit organic solvent emissions to less than 100 ppm of any halogenated hazardous air pollutant (HAP) compound; do not bypass the carbon adsorber during desorption; and locate the lip exhaust above the solvent cleaning machine cover so that the cover closes below the lip exhaust level.

Table 4.6. NO_x Emission Limits for Stationary Gas Turbines – Non-Emergency Engines that Began Construction, Modification, or Reconstruction after October 3, 1977 but on or before February 18, 2005^{a, b}

GAS TURBINE HEAT INPUT AT PEAK LOAD	Y ^c	NO _x EMISSION CONCENTRATION ^d
≥ 10.56 GJ/hr (10 MMBtu/hr) and < 105.6 GJ/hr (100 MMBtu/hr) ^e	Manufacturer's rated heat rate at manufacturer's rated peak load (kilojoules per watt hour) or actual measured heat rate based on LHV of fuel as measured at actual peak load for the facility.	$0.0075(14.4)/Y + F^f$
>105.6 GJ/hr (100 MMBtu/hr) ^e	Manufacturer's rated heat rate at manufacturer's rated peak load (kilojoules per watt hour) or actual measured heat rate based on LHV of fuel as measured at actual peak load for the facility.	$0.0150(14.4)/Y + F^f$

^a Except as exempted in accordance with Paragraph 4.7.2.

^b To ensure compliance with these limits, for units using water or steam injection to control NO_x emissions, install, calibrate, maintain, and operate a continuous monitoring system to monitor and record the fuel consumption and the ratio of water or steam to fuel being fired in the turbine to ensure the average steam or water to fuel ratio falls within the acceptable ratio needed to demonstrate compliance. As an alternative, install, certify, maintain, operate, and quality-assure a CEMS consisting of NO_x and O₂ monitors or use a carbon dioxide (CO₂) monitor to adjust the measured NO_x concentration to 15 percent O₂. For any turbine that does not use water or steam to control NO_x emissions, a CEMS may be used but is not required.

^c The value of Y must not exceed 14.3 kilojoules (13.6 British thermal units) per watt hour.

^d Allowable NO_x emission concentration (percent by volume at 15 % O₂ and on a dry basis).

^e Based on the LHV of the fuel fired.

^f F = NO_x emission allowance for fuel-bound nitrogen. The use of F is optional but, if used, is defined according to the nitrogen content of the fuel in Table 4.7.

Table 4.7. NO_x Emission Allowance for Fuel-Bound Nitrogen

N (FUEL-BOUND NITROGEN PERCENT BY WEIGHT)	F (NO _x PERCENT BY VOLUME)
$N \leq 0.015$	0
$0.015 < N \leq 0.1$	$0.04(N)$
$0.1 < N \leq 0.25$	$0.004 + 0.0067(N - 0.1)$
$N > 0.25$	0.005

Table 4.8. NO_x Emission Limits for Stationary Gas Turbines that Began Construction, Modification, or Reconstruction after February 18, 2005^{a, b}

COMBUSTION TURBINE TYPE	COMBUSTION TURBINE HEAT INPUT (EXCEPT AS NOTED) AT PEAK LOAD (HHV)	NO _x EMISSION LIMITS
New turbine firing natural gas, electric generating.	≤ 53 GJ/hr (50 MMBtu/hr)	42 ppm at 15 percent O ₂ or 290 ng/J of useful output (2.3 lb/MWh) ^c
New turbine firing natural gas, mechanical drive.	≤ 53 GJ/hr (50 MMBtu/hr)	100 ppm at 15 percent O ₂ or 690 ng/J of useful output (5.5 lb/MWh)
New turbine firing natural gas.	> 53 GJ/hr (50 MMBtu/hr) and 897 GJ/hr (850 MMBtu/hr)	25 ppm at 15 percent O ₂ or 150 ng/J of useful output (1.2 lb/MWh)
New, modified, or reconstructed turbine firing natural gas.	> 897 GJ/hr (850 MMBtu/hr)	15 ppm at 15 percent O ₂ or 54 ng/J of useful output (0.43 lb/MWh)
New turbine firing fuels other than natural gas, electric generating.	≤ 53 GJ/hr (50 MMBtu/hr)	96 ppm at 15 percent O ₂ or 700 ng/J of useful output (5.5 lb/MWh)
New turbine firing fuels other than natural gas, mechanical drive.	≤ 53 GJ/hr (50 MMBtu/hr)	150 ppm at 15 percent O ₂ or 1,100 ng/J of useful output (8.7 lb/MWh)
New turbine firing fuels other than natural gas.	> 53 GJ/hr (50 MMBtu/hr) and 897 GJ/hr (850 MMBtu/hr)	74 ppm at 15 percent O ₂ or 460 ng/J of useful output (3.6 lb/MWh)
New, modified, or reconstructed turbine firing fuels other than natural gas.	> 897 GJ/hr (850 MMBtu/hr)	42 ppm at 15 percent O ₂ or 160 ng/J of useful output (1.3 lb/MWh)
Modified or reconstructed turbine.	≤ 53 GJ/hr (50 MMBtu/hr)	150 ppm at 15 percent O ₂ or 1,100 ng/J of useful output (8.7 lb/MWh)
Modified or reconstructed turbine firing natural gas.	> 53 GJ/hr (50 MMBtu/hr) and 897 GJ/hr (850 MMBtu/hr)	42 ppm at 15 percent O ₂ or 250 ng/J of useful output (2.0 lb/MWh)
Modified or reconstructed turbine firing fuels other than natural gas.	> 53 GJ/hr (50 MMBtu/hr) and 897 GJ/hr (850 MMBtu/hr)	96 ppm at 15 percent O ₂ or 590 ng/J of useful output (4.7 lb/MWh)
Turbines operating at less than 75 percent of peak load and turbines operating at less than 0 °F.	≤ 108 GJ/hr (30 MW) output	150 ppm at 15 percent O ₂ or 1,100 ng/J of useful output (8.7 lb/MWh)

Table 4.8. NO_x Emission Limits for Stationary Gas Turbines that Began Construction, Modification, or Reconstruction after February 18, 2005^{a, b}, Continued

COMBUSTION TURBINE TYPE	COMBUSTION TURBINE HEAT INPUT (EXCEPT AS NOTED) AT PEAK LOAD (HHV)	NO _x EMISSION LIMITS
Turbines operating at less than 75 percent of peak load and turbines operating at less than 0 °F.	> 108 GJ/hr (30 MW) output	96 ppm at 15 percent O ₂ or 590 ng/J of useful output (4.7 lb/MWh)
Heat recovery units operating independent of the combustion turbine.	All sizes	54 ppm at 15 percent O ₂ or 110 ng/J of useful output (0.86 lb/MWh)
ng/J = nanograms per Joule, lb/MWh = pound per megawatt-hour, MW = megawatt ^a Except as exempted in accordance with Paragraph 4.7.3. ^b To ensure compliance with these limits, if using water or steam injection to control NO_x emissions, install, calibrate, maintain, and operate a continuous monitoring system to monitor and record the fuel consumption and the ratio of water or steam to fuel being fired in the turbine to ensure the average steam or water to fuel ratio falls within the acceptable ratio needed to demonstrate compliance. If not using water or steam injection to control NO_x emissions, conduct annual performance tests (no more than 14 calendar months following the previous performance test) or use continuous parameter monitoring to demonstrate continuous compliance. As an alternative for either case, install, calibrate, maintain, and operate a CEMS.		

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Table 4.9. Emergency Compression Ignition RICE Model Years 2007 and After - Emission Limits^a

ENGINE POWER RANGE	ENGINE MODEL YEAR RANGE	EMISSIONS LIMITS g/kW-hr (g/HP-hr)					SMOKE OPACITY (ACCELERATION, LUGGING, PEAK OF LUGGING OR ACCELERATION) ¹
		NMHC	NMHC + NO _x	NO _x	PM	CO	
kW < 8 (HP < 11)	2007		7.5 (5.6)		0.8 (0.6)	8 (6.0)	
	2008 and later				0.4 (0.3)		
8 ≤ kW < 19 (11 ≤ HP < 25)	2007		7.5 (5.6)		0.8 (0.6)	6.6 (4.9)	
	2008 and later				0.4 (0.3)		
19 ≤ kW < 37 (25 ≤ HP < 50)	2007		7.5 (5.6)		0.6 (0.4)	5.5 (4.1)	
	2008 and later				0.3 (0.22)		
37 ≤ kW < 56 (50 ≤ HP < 75)	2007		7.5 (5.6)		0.4 (0.3)	5.0 (3.7)	
	2008 and later		4.7 (3.5)				
56 ≤ kW < 75 (75 ≤ HP < 101)	2007		7.5 (5.6)		0.4 (0.3)	5.0 (3.7)	
	2008 and later		4.7 (3.5)				
75 ≤ kW < 130 (101 ≤ HP < 171)	2007 and later		4.0 (3.0)		0.3 (0.22)	5.0 (3.7)	
		4.0 (3.0)		0.2 (0.15)	3.5 (2.6)		
		4.0 (3.0)		0.2 (0.15)	3.5 (2.6)		
		4.0 (3.0)		0.2 (0.15)	3.5 (2.6)		
		4.0 (3.0)		0.2 (0.15)	3.5 (2.6)		
560 ≤ kW < 900 (751 ≤ HP < 1207)			6.4 (4.8)		0.2 (0.15)	3.5 (2.6)	
900 ≤ kW < 2,237 (1207 ≤ HP < 3,000)			6.4 (4.8)		0.2 (0.15)	3.5 (2.6)	
kW ≥ 2,237 (HP ≥ 3,000)	2007 - 2010	1.3 (1.0)	6.4 (4.8)	9.2 (6.9)	0.54 (0.40)	11.4 (8.5)	
	2011 and later				0.2 (0.15)	3.5 (2.6)	

HP = horsepower, kW = kilowatt, NMHC = nonmethane hydrocarbons, g/HP-hr = grams per horsepower hour, g/kW-hr = grams per kilowatt hour

^a Emissions limits in this table do not apply to fire pump engines – see Table 13.

¹ Exhaust smoke opacity is expressed in percentage for acceleration, lugging, and peak modes (acceleration/lugging/peak).

HP = horsepower, kW = kilowatt, NMHC = nonmethane hydrocarbons, g/HP-hr = grams per horsepower hour, g/kW-hr = grams per kilowatt hour

^a Emissions limits in this table do not apply to fire pump engines – see Table 13.¹ Exhaust smoke opacity is expressed in percentage for acceleration, lugging, and peak modes (acceleration/lugging/peak).

Table 4.10. Non-Emergency Compression Ignition RICE Model Years 2007 and After - Emission Limits

ENGINE POWER RANGE	ENGINE MODEL YEAR RANGE	EMISSIONS LIMITS g/kW-hr (g/HP-hr)					SMOKE OPACITY (ACCELERATION, LUGGING, PEAK OF LUGGING OR ACCELERATION) ¹
		NMHC	NMHC + NO _x	NO _x	PM	CO	
kW < 8 (HP < 11)	2007		7.5 (5.6)		0.8 (0.6)	8.0 (6.0)	20/15/50%
	2008 - 2014				0.4 (0.3)		
	2015 and later				0.4 (0.3)		
8 ≤ kW < 19 (11 ≤ HP < 25)	2007		7.5 (5.6)		0.8 (0.6)	6.6 (4.9)	
	2008 - 2014				0.4 (0.3)		
	2015 and later				0.4 (0.3)		
19 ≤ kW < 37 (25 ≤ HP < 50)	2007		7.5 (5.6)		0.6 (0.4)	5.5 (4.1)	
	2008 - 2012		7.5 (5.6)		0.3 (0.22)		
	2013 - 2014		7.5 (5.6)		0.03 (0.02)		
	2015 and later		4.7 (3.5)		0.03 (0.02)		
37 ≤ kW < 56 (50 ≤ HP < 75)	2007		7.5 (5.6)		0.4 (0.3)	5.0 (3.7)	
	2008 - 2012		4.7 (3.5)		0.3 (0.22)		
	2013 - 2014		4.7 (3.5)		0.03 (0.02)		
	2015 and later		4.7 (3.5)		0.03 (0.02)		
56 ≤ kW < 75 (75 ≤ HP < 101)	2007		7.5 (5.6)		0.4 (0.3)	5.0 (3.7)	
	2008 - 2011		4.7 (3.5)		0.4 (0.3)		
	2012 - 2013	0.19 (0.14)		0.4 (0.3)	0.2 (0.15)		
	2014 and later	0.19 (0.14)		0.4 (0.3)	0.02		
75 ≤ kW < 130 (101 ≤ HP < 171)	2007 - 2011		4.0 (3.0)		0.3 (0.22)	5.0 (3.7)	20/15/50%
	2012 - 2013	0.19 (0.14)		0.4 (0.3)	0.02 (0.015)		
	2014 and later	0.19 (0.14)		0.4 (0.3)	0.02 (0.015)		
130 ≤ kW < 225 (171 ≤ HP < 302)	2007 - 2010		4.0 (3.0)		0.2 (0.15)	3.5 (2.6)	
	2011 - 2013	0.19 (0.14)		0.4 (0.3)	0.02 (0.015)		
	2014 and later	0.19 (0.14)		0.4 (0.3)	0.02 (0.015)		

Table 4.10. Non-Emergency Compression Ignition RICE Model Years 2007 and After - Emission Limits, Continued

ENGINE POWER RANGE	ENGINE MODEL YEAR RANGE	EMISSIONS LIMITS g/kW-hr (g/HP-hr)				SMOKE OPACITY (ACCELERATION, LUGGING, PEAK OF LUGGING OR ACCELERATION) ¹
		NMHC	NMHC + NO _x	NO _x	PM	CO
225 ≤ kW < 450 (302 ≤ HP < 603)	2007 - 2010		4.0 (3.0)		0.2 (0.15)	
	2011 - 2013	0.19 (0.14)		0.40 (0.30)	0.02 (0.015)	3.5 (2.6)
	2014 and later	0.19 (0.14)		0.4 (0.3)	0.02 (0.015)	
450 ≤ kW < 560 (603 ≤ HP < 751)	2007 - 2010		4.0 (3.0)		0.2 (0.15)	
	2011 - 2013	0.19 (0.14)		0.40 (0.30)	0.02 (0.015)	3.5 (2.6)
	2014 and later	0.19 (0.14)		0.4 (0.3)	0.02 (0.015)	
560 ≤ kW < 900 (751 ≤ HP < 1207)	2007 - 2010		6.4 (4.8)		0.2 (0.15)	
	2011 - 2014	0.4 (0.3)		3.5 (2.6)	0.1 (0.075)	3.5 (2.6)
	2015 and later	0.19 (0.14)		0.67 (0.50)	0.03 (0.02)	
900 ≤ kW < 2,237 (1207 ≤ HP < 3,000)	2007 - 2010		6.4 (4.8)		0.2 (0.15)	
	2011 - 2014	0.4 (0.3)		0.67 (0.50)	0.1 (0.075)	3.5 (2.6)
	2015 and later	0.19 (0.14)		0.67 (0.50)	0.03 (0.02)	
2,237 ≤ kW (3,000 ≤ HP)	2007 - 2010	1.3 (1.0)		9.2 (6.9)	0.54 (0.40)	11.4 (8.5)
	2011 - 2014		6.4 (4.8)		0.2 (0.15)	3.5 (2.6)
	2015 and later	0.19 (0.14)		0.67 (0.50)	0.03 (0.02)	3.5 (2.6)
¹ Exhaust smoke opacity is expressed in percentage for acceleration, lugging, and peak modes (acceleration/lugging/peak).						

Table 4.11. Compression Ignition RICE Pre 2007 Model Year and 2007 to 2010 Model Years Rated >2,237 kW (3,000 HP)^{a, b} – Emission Limits

ENGINE POWER RANGE	ENGINE MODEL YEAR RANGE	EMISSION LIMITS g/kW-hr (g/HP-hr)				
		NMHC + NOX	HC	NOx	CO	PM
kW < 8 (HP < 11)	2006 and earlier	10.5 (7.8)			8.0 (6.0)	1.0 (0.75)
8 ≤ kW < 19 (11 ≤ HP < 25)	2006 and earlier	9.5 (7.1)			6.6 (4.9)	0.80 (0.60)
19 ≤ kW < 37 (25 ≤ HP < 50)	2006 and earlier	9.5 (7.1)			5.5 (4.1)	0.80 (0.60)
37 ≤ kW < 56 (50 ≤ HP < 75)	2006 and earlier			9.2 (6.9)		
56 ≤ kW < 75 (75 ≤ HP < 101)	2006 and earlier			9.2 (6.9)		
75 ≤ kW < 130 (101 ≤ HP < 175)	2006 and earlier			9.2 (6.9)		
130 ≤ kW < 225 (175 ≤ HP < 300)	2006 and earlier		1.3 (1.0)	9.2 (6.9)	11.4 (8.5)	0.54 (0.40)
225 ≤ kW < 450 (300 ≤ HP < 600)	2006 and earlier		1.3 (1.0)	9.2 (6.9)	11.4 (8.5)	0.54 (0.40)
450 ≤ kW < 560 (600 ≤ HP < 750)	2006 and earlier		1.3 (1.0)	9.2 (6.9)	11.4 (8.5)	0.54 (0.40)
kW ≥ 560 (HP ≥ 750)	2006 and earlier		1.3 (1.0)	9.2 (6.9)	11.4 (8.5)	0.54 (0.40)
kW ≥ 2,237 (HP ≥ 3,000)	2007 - 2010		1.3 (1.0)	9.2 (6.9)	11.4 (8.5)	0.54 (0.40)

Table 4.11. Compression Ignition RICE Pre 2007 Model Year and 2007 to 2010 Model Years Rated >2,237 kW (3,000 HP)^{a, b} – Emission Limits, Continued

HC = hydrocarbon	
^a The pre-2007 model year RICE subject to these emission limits include model year 2006 RICE manufactured after April 1, 2006 and any pre-2007 RICE reconstructed after July 11, 2005. For this table, “reconstructed” means the replacement of components to such an extent that the fixed capital cost of the new components exceeds 75 percent of the fixed capital cost that would be required to construct a comparable new engine.	
^b Emission limits in this table do not apply to fire pump engines.	

Table 4.12. Non-Emergency Compression Ignition RICE Manufactured On or Before April 1, 2006 – Emission Limits^a

ENGINE POWER RANGE	ENGINE MODEL YEAR RANGE	CO ^b
225 ≤ kW < 373 (300 ≤ HP < 500)	2006 and earlier	49 ppmvd at 15% O ₂ or 70% reduction
kW ≥ 373 (HP ≥ 500)	2006 and earlier	23 ppmvd at 15% O ₂ or 70% reduction
ppmvd = parts per million by volume, dry basis		
^a Pre-2007 model year RICE that are reconstructed after July 11, 2005 are subject to the emission limits in Table 11 instead of Table 12. For this table, “reconstructed” means the replacement of components to such an extent that the fixed capital cost of the new components exceeds 75 percent of the fixed capital cost that would be required to construct a comparable new engine.		
^b Compliance with the CO emission limits typically requires installation of a control device, such as an oxidation catalyst.		

Table 4.13. Fire Pump Compression Ignition Engines Model Years 2007 and After - Emission Limits

ENGINE POWER RANGE	ENGINE MODEL YEAR RANGE	EMISSIONS LIMITS g/kW-hr (g/HP-hr)			SMOKE OPACITY (ACCELERATION, LUGGING, PEAK OF LUGGING OR ACCELERATION) ¹
		NMHC + NO _x	PM	CO	
kW < 8 (HP < 11)	2007 - 2010	10.5 (7.8)	1.0 (0.75)	8.0 (6.0)	20/15/50%
	2011 and later	7.5 (5.6)	0.4 (0.3)		
8 ≤ kW < 19 (11 ≤ HP < 25)	2007 - 2010	9.5 (7.1)	0.8 (0.6)	6.6 (4.9)	
	2011 and later	7.5 (5.6)	0.4 (0.3)		
19 ≤ kW < 37 (25 ≤ HP < 50)	2007 - 2010	9.5 (7.1)	0.8 (0.6)	5.5 (4.1)	
	2011 and later	7.5 (5.6)	0.3 (0.22)		
37 ≤ kW < 56 (50 ≤ HP < 75)	2007 - 2010	10.5 (7.8)	0.8 (0.6)	5.0 (3.7)	
	2011 and later	4.7 (3.5)	0.4 (0.3)		
56 ≤ kW < 75 (75 ≤ HP < 101)	2007 - 2010	10.5 (7.8)	0.8 (0.6)	5.0 (3.7)	
	2011 and later	4.7 (3.5)	0.4 (0.3)		
75 ≤ kW < 130 (101 ≤ HP < 171)	2007 - 2009	10.5 (7.8)	0.8 (0.6)	5.0 (3.7)	
	2010 and later	4.0 (3.0)	0.3 (0.22)		
130 ≤ kW < 225 (171 ≤ HP < 302)	2007 - 2008	10.5 (7.8)	0.54 (0.40)	3.5 (2.6)	
	2009 and later	4.0 (3.0)	0.2 (0.15)		
225 ≤ kW < 450 (302 ≤ HP < 603)	2007 - 2008	10.5 (7.8)	0.54 (0.40)	3.5 (2.6)	
	2009 and later	4.0 (3.0)	0.2 (0.15)		
450 ≤ kW < 560 (603 ≤ HP < 751)	2007 - 2008	10.5 (7.8)	0.54 (0.40)	3.5 (2.6)	
	2009 and later	4.0 (3.0)	0.2 (0.15)		
kW ≥ 560 (HP ≥ 751)	2007	10.5 (7.8)	0.54 (0.40)	3.5 (2.6)	
	2008 and later	6.4 (4.8)	0.2 (0.15)		

Table 4.14. Compression Ignition RICE Purchased Before June 12, 2006 – Work Practice Standards

ENGINE POWER RANGE	WORK PRACTICE STANDARDS Perform annually or at the frequency listed below, whichever comes first.		
	Change Oil and Filter ^a	Inspect Air Cleaner; Replace As Necessary	Inspect All Hoses and Belts; Replace as Necessary
Emergency Engines - All Power Ranges	500 hours	1,000 hours	500 hours
Non-Emergency Engines kW ≤ 225 (HP ≤ 300)	1,000 hours	1,000 hours	500 hours
^a The oil change requirement specified in this table may be extended through the use of an oil analysis program performed at the same frequency specified in the table for changing the oil. At a minimum, the oil analysis program must analyze the following parameters for compression ignition engines: total base number, viscosity, and percent water content. The oil life may be extended if the analysis indicates the oil meets the following specifications: the total base number is not less than 30 percent of the total base number of the oil when new; the viscosity of the oil has not changed by more than 20 percent from the viscosity of the oil when new; and the percent water content (by volume) is not greater than 0.5.			

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Table 4.15. Emergency Spark Ignition RICE Purchased or Reconstructed on or After June 12, 2006 – Emission Limits

FUEL TYPE	ENGINE POWER RANGE	MANUFACTURED DATE ^a	EMISSIONS LIMITS					EMISSIONS LIMITS		
			g/kW-hr (g/HP-hr)					ppmvd at 15% O2		
			HC + NOx	NOx	CO	VOC	NOx	CO	VOC	
All	kW < 19 (HP < 25)	July 1, 2008 to December 31, 2010	13.4 (10.0)		519 (387)					
		On or After January 1, 2011	8.0 (6.0)		610 (455)					
Natural Gas and Liquefied Petroleum Gas (LPG) ^b	19 ≤ kW < 99 (25 ≤ HP < 130)	On or After January 1, 2009	13.4 (10.0)		519 (387)					
	kW ≥ 99 (HP ≥ 130)	On or After January 1, 2009		2.7 (2.0)	5.4 (4.0)	1.3 (1.0)	160	540	86	
Gasoline	19 ≤ kW < 99 (25 < HP < 130)	On or After January 1, 2009	13.4 (10.0)		519 (387)					
	kW ≥ 99 (HP ≥ 130)	On or After January 1, 2009	2.7 (2.0)		4.4 (3.3)					
VOC = volatile organic compound										
^a Reconstructed engines with a manufactured date prior to July 1, 2009 (prior to July 1, 2008 for engines < 19 kW) must meet the standards applicable to engines manufactured on July 1, 2009 (on July 1, 2008 for engines < 19 kW).										
^b Demonstrate compliance in either g/kW-hr or ppmvd at 15 percent O ₂ .										

Table 4.16. Non-Emergency Spark Ignition RICE Purchased or Reconstructed on or After June 12, 2006 – Emission Limits

ENGINE TYPE AND FUEL	ENGINE POWER RANGE	MANUFACTURED ON OR AFTER ^a	EMISSION LIMITS						
			g/kW-h (g/HP-hr)				ppmvd at 15% O2		
			HC + NO _x	NO _x	CO	VOC ^b	NO _x	CO	VOC ^b
All	kW ≤ 19 (HP < 25)	July 1, 2008 to December 31, 2010	13.4 (10.0)		519 (387)				
		On or After January 1, 2011	8.0 (6.0)		610 (455)				
Rich Burn LPG	kW ≥ 19 (HP ≥ 25)	July 1, 2008	2.7 (2.0)		4.4 (3.3.)				
Natural Gas ^{b, c} and Lean Burn LPG ^{b, c} except lean burn 500 ≤ HP < 1,350)	19 ≤ kW < 75 (25 ≤ HP < 100)	July 1, 2008	2.7 (2.0)		4.4 (3.3)				
	75 ≤ kW < 373 (100 ≤ HP < 500)	July 1, 2008		2.7 (2.0)	5.4 (4.0)	1.3 (1.0)	160	540	86
		January 1, 2011		1.3 (1.0)	2.7 (2.0)	0.9 (0.7)	82	270	60
		kW ≥ 373 (HP ≥ 500)	July 1, 2007		2.7 (2.0)	5.4 (4.0)	1.3 (1.0)	160	540
July 1, 2010				1.3 (1.0)	2.7 (2.0)	0.9 (0.7)	82	270	60
Lean Burn Natural Gas ^b and LPG ^b	373 ≤ kW < 1007 (500 ≤ HP < 1,350)	January 1, 2008		2.7 (2.0)	5.4 (4.0)	1.3 (1.0)	160	540	86
		July 1, 2010		1.3 (1.0)	2.7 (2.0)	0.9 (0.7)	82	270	60

Table 4.16. Non-Emergency Spark Ignition RICE Purchased or Reconstructed on or After June 12, 2006 – Emission Limits,
Continued

ENGINE TYPE AND FUEL	ENGINE POWER RANGE	MANUFACTURED ON OR AFTER ^a	EMISSION LIMITS					
			g/kW-h (g/HP-hr)			ppmvd at 15% O ₂		
			HC + NO _x	NO _x	CO	VOC ^b	NO _x	CO
Gasoline ^d	kW ≥ 19 (HP ≥ 25)	July 1, 2008	2.7 (2.0) ^d		4.4 (3.3)	NA		

^a Reconstructed engines with a manufactured date prior to July 1, 2008 (prior to July 1, 2007 for natural gas and lean burn LPG engines > 373 kW or prior to January 1, 2008 for lean burn natural gas and LPG engines in the range of 373 to 1007 kW) must meet the standards applicable to engines manufactured on July 1, 2008 (on July 1, 2007 for natural gas and lean burn LPG engines > 373 kW or on January 1, 2008 for lean burn natural gas and LPG engines in the range of 373 to 1007 kW).

^b Demonstrate compliance in units of g/HP-hr or ppmvd at 15 percent O₂.

^c Excluding emissions of formaldehyde.

^d Can demonstrate compliance by either meeting the numeric limit or $(HC + NO_x) \times CO^{0.784}$ less than or equal to 8.57, where the maximum NO_x is 2.7 g/kW-hr and maximum CO is 20.6 g/kW-hr.

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Table 4.17. Non-Emergency Spark Ignition RICE Manufactured Before July 1, 2007^a – Pollution Control Requirements

ENGINE POWER RANGE	ANNUAL OPERATION TIME	BURN TYPE	POLLUTION CONTROL REQUIRED TO BE INSTALLED
kW ≥ 373 (HP ≥ 500)	> 24 hours per year	4SLB	Install an oxidation catalyst to reduce HAP emissions
		2SLB or 4SRB	
	≤ 24 hours per year	4SRB	Install non-selective catalytic reduction to reduce HAP emissions
		2SLB or 4SLB	
2SLB = 2-stroke lean burn, 4SLB = 4-stroke lean burn, 4SRB = 4-stroke rich burn ^a Manufactured before July 1, 2008 for lean burn engines with a maximum engine power greater than or equal to 373 kW (500 HP) and less than 1,007 kW (1,350 HP).			

Table 4.18. Spark Ignition RICE Manufactured Before June 12, 2006 – Work Practice Standards

ENGINE POWER RANGE	ENGINE IGNITION TYPE	WORK PRACTICE STANDARDS Perform annually or at the frequency listed below, whichever comes first.			
		Change Oil and Filter ^a	Inspect Air Cleaner; Replace As Necessary	Inspect All Hoses and Belts; Replace as Necessary	Inspect Spark Plugs; Replace as Necessary
Emergency Engines - All Power Ranges		500 hours	1,000 hours	500 hours	
Non-Emergency Engines - All Power Ranges	2 SLB	4,320 hours		4,320 hours	4,320 hours
Non-Emergency Engines kW ≤ 373 (HP ≤ 500)	4SLB or 4SRB	1,440 hours		1,440 hours	1,440 hours
Non-Emergency Engines kW > 373 (HP > 500)	4SLB or 4SRB	500 hours		500 hours	1,000 hours
^a The oil change requirement specified in this table may be extended through the use of an oil analysis program, performed at the same frequency specified in the table for changing the oil. At a minimum, the oil analysis program must analyze the following parameters for spark ignition engines: total acid number, viscosity, and percent water content. The oil life may be extended if the analysis indicates the oil meets the following specifications: The total acid number does not increase by more than 3.0 mg of potassium hydroxide per gram from the total acid number of the oil when new; the viscosity of the oil has not changed by more than 20 percent from the viscosity of the oil when new; and the percent water content (by volume) is not greater than 0.5.					

Table 4.19. Class I ODS Chemicals (EU Groups I to VII and IX)

CHEMICAL NAME ^a	SYMBOL	CAS NO.	REF NO.	COMMON NAME
FIRE SUPPRESSANTS				
Bromochlorodifluoromethane	CF ₂ ClBr	353-59-3	Halon 1211	
Bromotrifluoromethane	CF ₃ Br	75-63-8	Halon 1301	
Dibromotetrafluoroethane	C ₂ F ₄ Br ₂	124-73-2	Halon 2402	
Chlorobromomethane	CH ₂ BrCl	74-97-5	Halon 1011	CBM
Bromodifluoromethane	CHBrF ₂	1511-62-2	Halon 1201	FM-100
REFRIGERANTS				
Trichlorofluoromethane	CFC-11	75-69-4	R-11	Freon 11
Dichlorodifluoromethane	CFC-12	75-71-8	R-12	Freon 12
Chlorotrifluoromethane	CFC-13	75-72-9	R-13	Freon 13
Pentachlorofluoroethane	CFC-111	354-58-5	R-111	
Tetrachlorodifluoroethane	CFC-112	76-12-0	R-112	
Dichlorotetrafluoroethane	CFC-114	76-14-2	R-114	
Chloropentafluoroethane	CFC-115	76-15-3	R-115	
Heptachlorofluoropropane	CFC-211	422-78-6		
Hexachlorodifluoropropane	CFC-212	3182-26-1		
Pentachlorotrifluoropropane	CFC-213	2354-06-5		
Tetrachlorotetrafluoropropane	CFC-214	29255-31-0		
Trichloropentafluoropropane	CFC-215	4259-43-2		
Dichlorohexafluoropropane	CFC-216	661-97-2		
Chloroheptafluoropropane	CFC-217	422-86-6		
REFRIGERANT BLENDS				
R-12 (74%) and HFC-152a (26%)			R-500	
R-12 (25%) and R-22 (75%)			R-501	
R-115 (51%) and R-22 (49%)			R-502	
R-13 (59.9%) and HFC-23 (40.1%)			R-503	
OTHERS				
Tetrachloromethane	CCL ₄	56-23-5	solvent	Carbon Tet
1,1,1 Trichloroethane	TCA	71-55-6	solvent	Methyl Chloroform
Trichlorotrifluoroethane	CFC-113	76-13-1	solvent	Freon 113
Bromomethane	MBX	74-83-9	pesticide	Methyl Bromide
^a All isomers of these chemicals are ODS, except isomers of 1,1,1-trichloroethane (also known as methyl chloroform) such as 1,1,2-trichloroethane.				

Table 4.20. Class II ODS Chemicals (EU Group VIII)

CHEMICAL NAME ^a	HCFC	SYMBOL	CAS NO.	REF NO.	COMMON NAME
FIRE SUPPRESSANTS					
Dichlorotrifluoroethane	HCFC-123	C ₂ HF ₃ Cl ₂	306-83-2	R-123	Halotron I
REFRIGERANTS					
Dichlorofluoromethane	HCFC-21	CHFCl ₂	75-43-4	R-21	Freon 21
Monochlorodifluoromethane	HCFC-22	CHF ₂ Cl	75-45-6	R-22	Freon 22, Genetron 22, Forane 22, Refron 22
Monochlorofluoromethane	HCFC-31	CH ₂ FCI	593-70-4	R-31	Genetron 31
Dichlorotrifluoroethane	HCFC-123	C ₂ HF ₃ Cl ₂	306-83-2	R-123	Suva 123, Freon 123, Genetron 123, Halotron I
Monochlorotetrafluoroethane	HCFC-124	C ₂ HF ₄ Cl	2837-89-0	R-124	Suva 124, Freon 124, Genetron 124, FE-241
Trichlorofluoroethane	HCFC-131	C ₂ H ₂ FCI ₃	359-28-4		
Dichlorodifluoroethane	HCFC-132b	C ₂ H ₂ F ₂ Cl ₂	1649-08-7		
Monochlorotrifluoroethane	HCFC-133a	C ₂ H ₂ F ₃ Cl	75-88-7		
Monochlorodifluoroethane	HCFC-142b	C ₂ H ₃ F ₂ Cl	75-68-3	R-142b	Genetron 142b
Hexachlorofluoropropane	HCFC-221	C ₃ HFCl ₆	422-26-4		
Pentachlorodifluoropropane	HCFC-222	C ₃ HF ₂ Cl ₅	422-49-1		
Tetrachlorotrifluoropropane	HCFC-223	C ₃ HF ₃ Cl ₄	422-52-6		
Trichlorotetrafluoropropane	HCFC-224	C ₃ HF ₄ Cl ₃	422-54-8		
Monochlorohexafluoropropane	HCFC-226	C ₃ HF ₆ Cl	431-87-8		
Pentachlorofluoropropane	HCFC-231	C ₃ H ₂ FCI ₅	421-94-3		
Tetrachlorodifluoropropane	HCFC-232	C ₃ H ₂ F ₂ Cl ₄	460-89-9		
Trichlorotrifluoropropane	HCFC-233	C ₃ H ₂ F ₃ Cl ₃	7125-84-0		
Dichlorotetrafluoropropane	HCFC-234	C ₃ H ₂ F ₄ Cl ₂	425-94-5		

Table 4.20. Class II ODS Chemicals (EU Group VIII), Continued

CHEMICAL NAME ^a	HCFC	SYMBOL	CAS NO.	REF NO.	COMMON NAME
Monochloropentafluoropropane	HCFC-235	C ₃ H ₂ F ₅ Cl	460-92-4		
Tetrachlorofluoropropane	HCFC-241	C ₃ H ₃ FCl ₄	666-27-3		
Trichlorodifluoropropane	HCFC-242	C ₃ H ₃ F ₂ Cl ₃	460-63-9		
Dichlorotrifluoropropane	HCFC-243	C ₃ H ₃ F ₃ Cl ₂	460-69-5		
Monochlorotetrafluoropropane	HCFC-244	C ₃ H ₃ F ₄ Cl	134190-50-5		
Trichlorofluoropropane	HCFC-251	C ₃ H ₄ FCl ₃	421-41-0		
Dichlorodifluoropropane	HCFC-252	C ₃ H ₄ F ₂ Cl ₂	819-00-1		
Monochlorotrifluoropropane	HCFC-253	C ₃ H ₄ F ₃ Cl	460-35-5		
Dichlorofluoropropane	HCFC-261	C ₃ H ₅ FCl ₂	420-97-3		
Monochlorodifluoropropane	HCFC-262	C ₃ H ₅ F ₂ Cl	421-02-3		
Monochlorofluoropropane	HCFC-271	C ₃ H ₆ FCl	430-55-7		
HCFC = hydrochlorofluorocarbon ^a All isomers of these chemicals are ODS, except isomers of 1,1,1-trichloroethane (also known as methyl chloroform) such as 1,1,2-trichloroethane.					

Table 4.21. Class II ODS Blend Chemicals (EU Group VIII)

CHEMICAL NAME ^a	SYMBOL	CAS NO.	REF NO.	COMMON NAME
FIRE SUPPRESSANT BLENDS				
R-22 (82%), R-124 (9.5%) and R-123 (4.75%)			NAF S III	
R-123 (55%), R-124 (31%) and R-134a			NAF P III	
REFRIGERANT BLENDS				
R-22 (53%), R-124 (34%) and R-152a			R-401A	MP-39
R-22 (61%), R-124 (28%) and R-152a			R-401B	MP-66
R-22 (33%), R-124 (52%) and R-152a			R-401C	MP-52
R-22 (38%), R-125 and propane			R-402A	HP-80
R-22 (60%), R-125 and propane			R-402B	HP-81
R-22 (75%), octafluoropropane and propane			R-403A	
R-22 (55%), octafluoropropane and propane			R-403B	
R-22 (45%), R-142b (5.5%), R-152a and octafluorocyclobutane			R-405A	G2015
R-22 (55%), R-142b (41%) and isobutene			R-406A	Autofrost

Table 4.21. Class II ODS Blend Chemicals (EU Group VIII), Continued

CHEMICAL NAME ^a	SYMBOL	CAS NO.	REF NO.	COMMON NAME
R-22 (47%), R-143a and R-125			R-408A	
R-22 (60%), R-124 (25%) and R-142b (15%)			R-409A	FX-56
R-22 (65%), R-124 (25%) and R-142b (10%)			R-409B	FX-57
R-22 (87.5%), R-152a and propylene			R-411A	G2018A
R-22 (94%), R-152a and propylene			R-411B	G2018B
R-22 (70%), R-142b (25%) and octafluoropropane			R-412A	
R-22 (51%), R-124 (28.5%), R-142b (16.5%) and isopropane			R-414A	GHG-X4
R-22 (50%), R-124 (39%), R-142b (9.5%) and isopropane			R-414B	Hot Shot
R-22 (82%) and R-152a			R-415A	
R-22 (25%) and R-152a			R-415B	
R-124 (39.5%), R-134a and butane			R-416A	FR-12, FRIG-C
R-22 (96%), R-152a and propane			R-418A	
R-142b (12%) and R-134a			R-420A	
R-22 (44%) and octafluoropropane			R-509	
OTHERS				
Tetrachlorofluoroethane	HCFC-121	354-14-3		lubricant
Trichlorodifluoroethane	HCFC-122	41834-16-6		lubricant
Dichlorofluoroethane	HCFC-141b	1717-00-6		solvent
Dichloropentafluoropropane	HCFC-225ca	422-56-0		solvent
Dichloropentafluoropropane	HCFC-225cb	507-55-1		solvent
^a All isomers of these chemicals are ODS, except isomers of 1,1,1-trichloroethane (also known as methyl chloroform) such as 1,1,2-trichloroethane.				

Table 4.22. New Controlled Substance

CHEMICAL NAME	SYMBOL	CAS NO.	REF NO.	COMMON NAME
Dibromodifluoromethane (Halon-1202)	CB ₂ F ₂	75-61-6	R-408A	Halon-1202

Table 4.23. Fluorinated Greenhouse Gases

Gas Name	GWP ^{1, 2}	Gas Name	GWP ^{1, 2}
Sulfur hexafluoride	22,800		
HFCs			
HFC-23	14,800	HFC-161	12
HFC-32	675	HFC-227ea	3,220
HFC-41	92	HFC-236cb	1,340
HFC-125	3,500	HFC-236ea	1,370
HFC-134	1,100	HFC-236fa	9,810
HFC-134a	1,430	HFC-245ca	693
HFC-143	353	HFC-245fa	1,030
HFC-143a	4,470	HFC-365mcf	794
HFC-152	53	HFC-43-10-mee	1,640
HFC-152a	124		
PFCs			
Perfluoromethane (PFC-14)	7,390	Perfluoropentane (PFC-4-1-12)	9,160
Perfluoroethane (PFC-116)	12,200	Perfluorohexane (PFC-5-1-14)	9,300
Perfluoropropane (PFC-218)	8,830	Perfluorocyclobutane (PFC-c-318)	10,300
Perfluorobutane (PFC-3-1-10)	8,860		

Notes:

1 The Global Warming Potential (GWP), expressed as kg of CO₂ equivalent per kg of fluorinated greenhouse gas, is the climate warming potential of a greenhouse gas. The GWP of a mixture of gases is calculated as a weighted average, derived from the sum of the weight fractions of the individual substances multiplied by their GWP. Example: a 50/50 mixture of HFC-134a and HFC-143a has a GWP of 2,950 [(50% x 1,430) + (50% x 4,470)].

2 GWP is used to calculate an appliance's overall charge of fluorinated greenhouse gas, expressed in kg of CO₂ equivalent, by multiplying the total kg of a fluorinated greenhouse gas in an appliance by its GWP. For example: an appliance containing 5 kg of HFC-134a (GWP of 1,430 per above) has a total charge of 7,150 kg of CO₂ equivalent [5 kg x 1,430 = 7,150 kg of CO₂ equivalent], or 7.15 tonnes of CO₂ equivalent.

Table 4.24. Critical Areas of Use of Halon

CRITICAL USES OF HALONS					
APPLICATION				CUT OFF DATE 1, 2	END DATE 1, 3
CATEGORY	PURPOSE	TYPE OF EXTINGUISHER	HALON		
On Military Ground Vehicles	For the protection of engine compartments	Fixed System	1301, 1211, 2402	2010	2035
	For the protection of crew compartments	Fixed System	1301, 2402	2011	2040
	For the Protection of crew compartments	Portable Extinguisher	1301, 1211	2011	2020
On Military Surface Ships	For the protection of normally occupied machinery spaces	Fixed System	1301, 2402	2010	2040
	For the protection of normally unoccupied engine spaces	Fixed System	1301, 1211, 2402	2010	2035
	For the protection of normally unoccupied electrical compartments	Fixed System	1301, 1211	2010	2030
	For the protection of command centers	Fixed System	1301	2010	2030
	For the protection of fuel pump rooms	Fixed System	1301	2010	2030
	For the protection of flammable liquid storage compartments	Fixed System	1301, 1211, 2402	2010	2030
	For the protection of aircraft in hangars and maintenance areas	Portable Extinguisher	1301, 1211	2010	2016
On Aircraft	For the protection of normally unoccupied cargo compartments	Fixed System	1301, 1211, 2402	2018	2040
	For the protection of cabins and crew compartments	Portable Extinguisher	1211, 2402	2014	2025
	For the protection of engine nacelles and auxiliary power units	Fixed System	1301, 1211, 2402	2014	2040
	For the inerting of fuel tanks	Fixed System	1301, 2402	2011	2040

Table 4.24. Critical Areas of Use of Halon, continued

CRITICAL USES OF HALONS					
APPLICATION				CUT OFF DATE 1, 2	END DATE 1, 3
CATEGORY	PURPOSE	TYPE OF EXTINGUISHER	HALON		
	For the protection of lavatory waste receptacles	Fixed System	1301, 1211, 2402	2011	2020
	For the protection of dry bays	Fixed System	1301, 1211, 2402	2010	2040
In Oil, Gas, and Petrochemical Facilities	For the protection of spaces where flammable liquid or gas could be released	Fixed System	1301, 2402	2010	2020
In Land-based Command and Communications Facilities Essential to National Defense	For the protection of normally occupied spaces	Fixed System	1301, 2402	2010	2025
	For the protection of normally occupied spaces	Portable Extinguisher	1211	2010	2013
	For the protection of normally unoccupied spaces	Fixed System	1301, 2402	2010	2020
At Airports and Airfields	For crash rescue vehicles	Portable Extinguisher	1211	2010	2016
	For the protection of aircraft in hangars and maintenance areas	Portable Extinguisher	1211	2010	2016
Other	or initial extinguishing by fire brigades where essential to personal safety	Fixed System	1211	2010	2013
	For the protection of persons by military and police personnel	Fixed System	1211	2010	2013

Notes:

- 1 By 31 December of listed year.
- 2 Cut-off date shall mean the date after which halons must not be used for fire extinguishers or fire protection systems in new equipment and new facilities. New facilities or equipment are those that have not received procurement or development contract signature, have not received approval authority from local authorities, or have not yet received planning permission from the local authorities.
- 3 End date shall mean the date after which halons shall not be used for the application concerned and by which date the fire extinguishers or fire protection systems containing halons shall be decommissioned.

CHAPTER 5: ASBESTOS

5.1. INTRODUCTION.

This chapter contains standards on the control of threats to human health from asbestos. It covers the identification and abatement of asbestos containing material (ACM) when the asbestos poses a threat and during activities that may disturb asbestos, such as demolition or renovation. Policy requirements for a comprehensive occupational health and safety program are not covered in this chapter. To protect personnel from asbestos exposure, refer to DoDIs 6055.01, “DoD Safety and Occupational Health (SOH) Program,” and 6055.05, “Occupational and Environmental Health”.

5.2. PERSONNEL QUALIFICATIONS.

Installations must ensure that:

5.2.1. The asbestos program manager, custodial staff, maintenance staff, and individuals involved in asbestos management are trained consistent with their responsibilities and DoDIs 6055.01 and 6055.05. At a minimum, training will require the proper safety precautions to be taken when disturbing ACM, including proper use of approved tools and ventilation.

5.2.2. Training includes, as appropriate:

5.2.2.1. Asbestos hazards and worker protection.

5.2.2.2. Notifications.

5.2.2.3. Material identification,

5.2.2.4. Control procedures for removals including, at least, wetting, local exhaust ventilations, negative pressure enclosures, glove-bag procedures, and high-efficiency particulate air filters.

5.2.2.5. Waste disposal work practices; and recordkeeping.

5.3. ASBESTOS CONTROLS.

Installations must:

5.3.1. Appoint an asbestos program manager (APM) to serve as the single point of contact for all asbestos-related activities.

5.3.2. Prepare and implement an asbestos management plan. At a minimum, the plan must include:

5.3.2.1. A list of known and presumed ACM, by location, on the installation.

5.3.2.2. A notification and education program to inform all persons affected (e.g., workers, tenants, building occupants) where potentially friable ACM is located, and how and why to avoid disturbing the ACM.

5.3.2.3. Regular ACM surveillance to note, assess, and document any changes in the ACM's condition.

5.3.2.4. Work control or permit systems to control activities that might disturb ACM.

5.3.2.5. Operations and maintenance work practices to avoid or minimize fiber release during activities affecting ACM.

5.3.2.6. Recordkeeping to document operations and maintenance activities related to asbestos identification management and abatement.

5.3.2.7. Training for the asbestos program manager, custodial staff, maintenance staff, and those involved in asbestos management activities.

5.3.2.8. Procedures to assess and prioritize identified hazards for abatement.

5.3.2.9. Procedures to prevent the use of ACM in new construction.

5.4. ASBESTOS ABATEMENT.

Installations must perform asbestos abatement in accordance with the standards of this paragraph.

5.4.1. Asbestos Determination.

Before demolition or renovation of a facility, determine whether or not the activity will remove or disturb ACM, and record it on the project authorization document (e.g., work order).

5.4.2. Asbestos Assessment.

When removing or disturbing friable ACM, prepare and display a written assessment of the action at the location to ensure affected personnel are aware of the potential hazards and the actions being undertaken. A copy of the assessment must also be maintained on permanent file. The assessment must include

5.4.2.1. Type of operation: demolition or renovation.

5.4.2.2. Description of the facility or affected part of the facility including the size, age, and present and past use of the facility.

5.4.2.3. Procedure, including analytical methods, used to detect the presence of regulated ACM.

5.4.2.4. Estimated amount of:

5.4.2.4.1. Regulated ACM to be removed from the facility.

5.4.2.4.2. Category I and Category II nonfriable ACM in the affected part of the facility that will not be removed before demolition.

5.4.2.5. Location, street address, and building number (if applicable) of the facility being demolished or renovated.

5.4.2.6. Scheduled starting and completion dates of asbestos removal work, or any other activity such as site preparation, that would break up, dislodge, or similarly disturb asbestos material.

5.4.2.7. Scheduled starting and completion dates of demolition or renovation.

5.4.2.8. Description of planned demolition or renovation work and method(s) to be used, including a description of affected facility components.

5.4.2.9. Description of work practices and engineering controls, including asbestos removal and waste-handling emission control procedures.

5.4.2.10. Name and location of the waste disposal site where the asbestos-containing waste material will be deposited.

5.4.2.11. Description of procedures to follow if unexpected regulated ACM is found or Category II nonfriable ACM becomes crumbled, pulverized, or reduced to powder.

5.4.3. Asbestos Removal.

5.4.3.1. Remove friable ACM when it poses a threat to release airborne asbestos fibers and can't be reliably repaired or isolated.

5.4.3.2. Before disturbing or demolishing a facility or part of a facility, remove all regulated ACM in the area to be disturbed.

5.4.3.3. Remove ACM according to the following procedures:

5.4.3.3.1. Adequately wet all regulated ACM exposed during cutting or disjoining operations.

5.4.3.3.2. Carefully lower each unit or section to the floor and to ground level, not dropping, throwing, sliding, or otherwise damaging or disturbing the regulated ACM.

5.4.3.3.3. When ACM is stripped from a facility component while it remains in place in the facility, adequately wet the regulated ACM during the stripping operation.

5.4.3.3.4. Wetting is not required in renovation operations if the following emission control methods are used:

5.4.3.3.4.1. A local exhaust ventilation and collection system designed and operated to capture the particulate asbestos material produced by the stripping and removal of the asbestos materials. The system must exhibit no visible emissions to the outside air.

5.4.3.3.4.2. A glove-bag system designed and operated to contain the particulate asbestos material produced by the stripping of the asbestos materials.

5.4.3.3.4.3. Leak-tight wrapping to contain all regulated ACM before dismantlement.

5.4.3.3.4.4. Other methods equivalent to wetting, when wetting would result in equipment damage or a safety hazard and the methods in Paragraphs 5.4.3.3.4.1. through 5.4.3.3.4.3. can't be used.

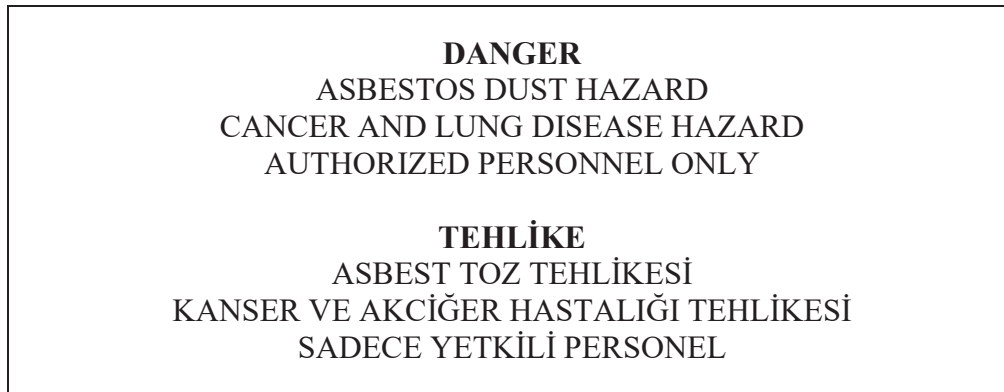
5.4.3.4. After regulated ACM removal from the facility, ensure the ACM is stripped or contained in leak-tight wrapping, except for large facility components as identified in Paragraph 5.4.3.4.2.

5.4.3.4.1. If stripped, either:

5.4.3.4.1.1. Adequately wet the regulated ACM during stripping, or

5.4.3.4.1.2. Use a local exhaust ventilation and collection system designed and operated to capture the particulate asbestos material produced by the stripping. The system must exhibit no visible emissions to the outside air.

5.4.3.4.2. For large facility components such as reactor vessels, large tanks, and steam generators (but not beams), the regulated ACM is not required to be stripped if the component is removed, transported, stored, disposed of, or reused without disturbing or damaging the regulated ACM and the component is encased in leak-tight wrapping. The leak-tight wrapping must be labelled during all loading and unloading operations as well as during storage and displayed in a manner that a person can easily read. Use the language, in English and Turkish, shown in Figure 5.1.

Figure 5.1. Leak-Tight Wrapping Label

5.4.3.4.3. For all ACM, including material that has been removed or stripped:

5.4.3.4.3.1. Adequately wet the material and ensure that it remains wet until collected and contained or treated in preparation for disposal.

5.4.3.4.3.2. Carefully lower the material to the ground and floor, not dropping, throwing, sliding, or otherwise damaging or disturbing the material.

5.4.3.4.3.3. Transport the material to the ground using leak-tight chutes or containers if it has been removed or stripped more than 15.24 meter [50 ft] above ground level and was not removed as units or in sections.

5.4.3.4.4. When the temperature at the point of wetting is below 0 °C (32 °F), the wetting provisions identified in Paragraphs 5.4.3.3.4.1. and 5.4.3.3.4.3. need not be followed.

5.4.3.4.5. If a facility component contains or is coated or covered with ACM, it must be removed as units or in sections, to the maximum extent possible.

5.4.3.4.6. If a facility will be demolished by intentional burning, all regulated ACM - including Category I and Category II nonfriable ACM - must be removed before burning.

5.5. ASBESTOS DISPOSAL.

Installations must dispose of asbestos in accordance with these standards.

5.5.1. When disposing of ACM waste, adequately wet and seal it (including any wastewater containing ACM) in a leak-proof container, and properly dispose of it in an MSW landfill facility in accordance with Chapter 16, “*Hazardous Waste*” of this manual.

5.5.1.1. Label containers in English and Turkish as shown in Figure 5.2. Labeling all ACM shall be in accordance with Figure 5.2 using one of the following methods:

5.5.1.1.1. An adhesive label firmly affixed to the product or its packaging;

5.5.1.1.2. A tie-on label attached to the product or its packaging;

5.5.1.1.3. Direct printing onto the product or its packaging. Where the label is printed directly onto the product, a single color contrasting with the background color may be used.

5.5.1.1.4. In the case of loose ACM, where it is not reasonably practicable to comply with paragraph 5.5.1.1.1., the label shall be printed on a suitable sheet and accompany the item.

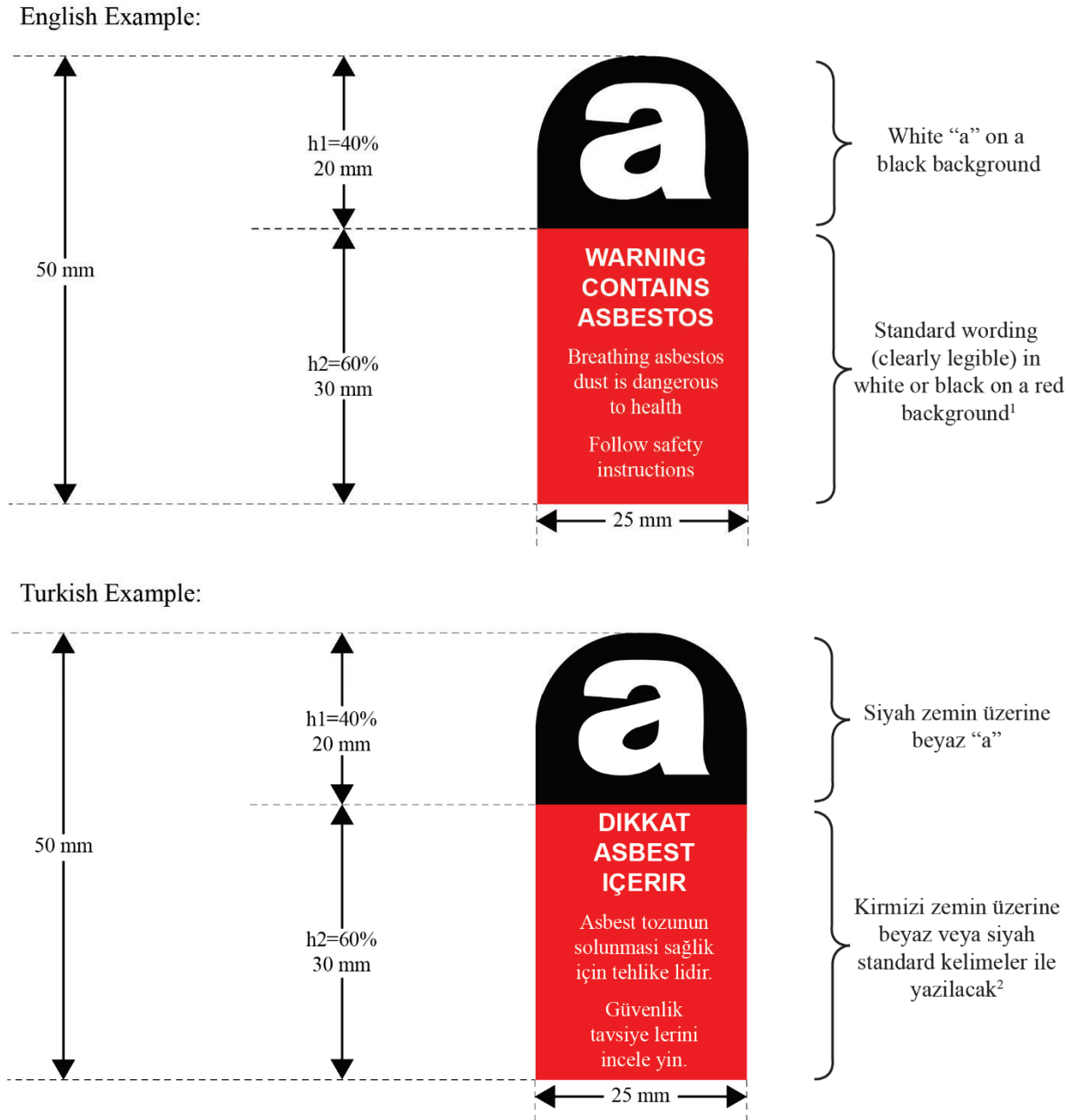
5.6. DoD SCHOOL COMPLIANCE.

Installations must ensure that DoD schools comply with applicable requirements of Section 2643(1) of Title 15, United States Code and implementing regulations in Part 763, Subpart E, of Title 40, Code of Federal Regulations.

5.7. RECORDKEEPING.

Installations must ensure that DoD schools comply with applicable requirements of Section 2643(1) of Title 15, United States Code and implementing regulations in Part 763, Subpart E, of Title 40, Code of Federal Regulations.

Figure 5.2. Label for Asbestos, Asbestos Waste, and ACM (English and Turkish Examples)



Notes: The label must be at least 50 mm high (H) and 25 mm wide; the label shall consist of two parts ($h1=40\%$ H and $h2=60\%$ H)

¹ In the case of any product containing crocidolite, the words “CONTAINS ASBESTOS” shown in the diagram shall be replaced with the words “CONTAINS CROCIDOLITE/BLUE ASBESTOS.”

² In the case of any product containing crocidolite, the Turkish words “ASBEST İÇERİR” shown in the diagram shall be replaced with the words “KROSIDOLOL İÇERİR/MAVİ ASBEST.”

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CHAPTER 6: LEAD BASED PAINT (LBP)

6.1. INTRODUCTION.

This chapter contains standards on the identification, control, or elimination of Lead Based Paint (LBP) hazards in child-occupied facilities and military family housing through interim controls or abatement. To protect personnel from lead exposure, refer to guidance found in DoDI 6055.01, “*DoD Safety and Occupational Health (SOH) Program*” and DoDI 6055.05, “*Occupational and Environmental Health*”.

6.2. PERSONNEL QUALIFICATIONS.

Installations must ensure that all personnel participating in activities that involve LBP, including paint inspection, risk assessment, specification or design, supervision, and abatement, are properly trained.

6.3. USE OF LEAD-CONTAINING PAINT IN CONSUMER PRODUCTS.

6.3.1. Installations must ensure that they do not use consumer products with lead-containing paint. Consumer products include those customarily produced or distributed for sale that are used by consumers in or around a household, in schools, or in recreation. Specific banned hazardous products are:

6.3.1.1. Toys and other articles intended for use by children that are labelled “*lead-containing paint*”.

6.3.1.2. Furniture that is labelled “*lead-containing paint*”.

6.3.2. Installations must ensure LBP is not used for any new construction or renovation project. All materials purchased and used for projects must be evaluated, especially for projects involving family housing and schools.

6.4. LBP HAZARD ABATEMENT PROGRAM.

Installations must develop and implement a multi-disciplinary LBP hazard management program to identify, evaluate, and reduce LBP hazards in child-occupied facilities and military family housing.

6.4.1. Identify and maintain a record of LBP hazards in child-occupied facilities and military family housing using these methods:

6.4.1.1. LBP risk assessment screening. If the screening identifies dust-lead levels greater than 431 $\mu\text{g}/\text{m}^2$ [40 $\mu\text{g}/\text{ft}^2$] for floors or greater than 2,691 $\mu\text{g}/\text{m}^2$ [250 $\mu\text{g}/\text{ft}^2$] for interior window sills, perform an LBP risk assessment.

6.4.1.2. LBP risk assessments.

6.4.1.3. Routine facility inspection for fire and safety.

6.4.1.4. Occupant, facility manager, and worker reports of deteriorated paint.

6.4.1.5. Results of childhood blood lead screening or reports of children identified to have a confirmed concentration of lead in whole blood of 20 g/deciliter for a single test or 15-19 $\mu\text{g}/\text{deciliter}$ in two tests taken at least 3 months apart.

6.4.1.6. LBP re-evaluations.

6.4.1.7. Review of construction, painting, and maintenance histories.

6.4.2. Manage identified LBP hazards through interim controls or abatement.

6.4.3. Disclose the presence of any known LBP or LBP hazards to occupants of child-occupied facilities and military family housing and provide information on LBP hazard reduction.

6.4.4. Before conducting remodeling or renovation projects, inform occupants of military family housing of the hazards associated with these activities and provide information on protecting family members from the hazards of LBP.

6.4.5. Ensure occupant and worker protection measures are taken during all maintenance, repair, and renovation activities that disturb areas known or assumed to have LBP.

6.5. DISPOSAL OF LEAD-CONTAMINATED WASTE.

Installations must dispose of lead-contaminated waste that meets the definition of a hazardous waste in accordance with Chapter 16, “*Hazardous Waste*” of this manual.

CHAPTER 7: POLYCHLORINATED BIPHENYLS (PCBs)**7.1. INTRODUCTION.**

This chapter contains standards on the control and abatement of threats to human health and the environment from the handling, use, storage, and disposal of polychlorinated biphenyls (PCBs). These standards include specific requirements for most uses of PCBs, including, but not limited to, transformers, capacitors, heat transfer systems, hydraulic systems, electromagnets, switches and voltage regulators, circuit breakers, reclosers, fluorescent light ballasts, and cables.

7.2. GENERAL.

Installations must comply with the following standards:

7.2.1. Minimize the use of PCBs and PCB items without degrading mission performance.

7.2.2. Do not purchase or otherwise take control of PCBs or PCB items for use.

7.2.3. Ensure all procurement of transformers or any other equipment containing dielectric or hydraulic fluid includes a manufacturer's certification that the equipment contains no detectable PCBs (< 2 ppm).

7.2.4. Affix permanent labels, in English, to newly procured transformers and equipment stating they are PCB-free (no detectable PCBs).

7.2.5. Maintain a written inventory if PCB items are located on the installation:

7.2.5.1. Include a current list, by type, of all marked PCB items in use and PCB items (whether or not marked) placed into storage for disposal or disposed of during that year.

7.2.5.2. Maintain the inventory for a period of at least 3 years from the disposal of the last item on the list.

7.2.5.3. The inventory shall be made available to the Turkish Installation Commander upon request.

7.2.6. Document all required PCB periodic inspections at the installation. Maintain the inspection records and maintenance history for at least 3 years after disposal.

7.2.7. Prominently mark all PCB large high-voltage capacitors, equipment, items, and transformers that contain PCBs greater than 50 ppm, and containers used to store the preceding items, as well as rooms, vaults, and storage areas containing, storing, or accumulating PCB items and transformers for disposal. Marking must be in English and Turkish and may be painted, affixed using an adhesive label, or accomplished using any other method that meets these standards:

7.2.7.1. Identifies the item as containing PCBs.

7.2.7.2. Identifies the descriptive name, instructions, cautions, or other information applied to PCBs and PCB items.

7.2.7.3. Warns against improper disposal and handling.

7.2.7.4. Provides a phone number in case of spills or if questions arise about disposal.

7.2.7.5. PCB items must also be clearly labelled with an indelible and embossed or engraved sign containing the information set out in Figure 7.1.

7.2.7.6. The labels shall be designed so as to be conveniently readable from a distance of 2 meters (6.6 ft).

Figure 7.1: Label for Substances and Equipment That Contain Used PCBs and PCBs

CAUTION! CONTAINS PCBs  H6 TOXIC PCB Concentration (ppm) 50 - 500 ☐ > 500 ☐ Date of analysis: _____ Unit in charge : _____ Inventory Registration No. : _____	D İ K K A T ! PCB İÇERMEKTEDİR  H6 TOKSİK PCB Derişimi (ppm) 50 - 500 ☐ > 500 ☐ Analiz Tarihi _____ Sorumlu Birim _____ Envanter Kayıt No. _____
--	---

7.2.8. If not already marked, mark PCB large low-voltage capacitors and equipment containing a PCB transformer or PCB large high-voltage capacitor in accordance with Paragraphs 7.2.7.1. through 7.2.7.6.

7.2.9. PCB Restrictions.

7.2.9.1. Only transformers containing < 50 ppm PCB or a total volume of < 0.05 liters (0.013 gallons) PCB (see Paragraph 7.4, “*PCB Transformer Management*”) may be used and maintained until such transformers are removed from service , decontaminated, decommissioned,

recycled and/or disposed according to Paragraph 7.7, “*Disposal*”. Storage prior to disposal shall be in accordance with Paragraph 7.6, “*Storage*”.

7.2.9.2. All other existing PCB items may be used, but not maintained, until such items are removed from service, decontaminated, decommissioned, recycled and/or disposed according to Paragraph 7.7, “*Disposal*”. Storage prior to disposal shall be in accordance with Paragraph 7.6, “*Storage*”.

7.2.9.3. All PCB items with a PCB volume of 5 liters (1.3 US gallons) or more may be held until the end of 31 December 2025 and then must be decontaminated or removed from service and disposed according to Paragraph 7.7, “*Disposal*”. Storage prior to disposal shall be in accordance with Paragraph 7.6, “*Storage*”.

7.3. SPILL PREVENTION AND RESPONSE.

Installations must:

7.3.1. Ensure the installation spill prevention and response plan addresses PCB items, including temporary storage items. Chapter 13 of this manual provides standards for spill prevention and response plans.

7.3.2. Immediately respond to spills of PCB liquids at concentrations of 50 ppm or greater and clean up in accordance with the following:

7.3.2.1. Clean surfaces in substantial contact areas to 10 µg per 100 square centimeters (cm²) [.065 µg per 100 square inches]

7.3.2.2. Clean surfaces in all other contact areas to 100 µg per 100 cm² [.65 µg per 100 square inches].

7.3.2.3. Remove contaminated soil in restricted access areas until the soil tests no higher than 25 ppm PCBs and backfill with clean soil containing < 1 ppm PCBs. For restricted access areas where PCB spills have been cleaned up, annotate installation real property records to note the level of PCBs remaining in the soil, including the extent of sampling, date and type of sampling, and a reference to any reports documenting the site conditions.

7.3.2.4. Remove contaminated soil in unrestricted access areas to a minimum depth of 25 cm [10 inches] or until the soil tests no higher than 10 ppm PCBs, whichever is deeper, and backfill with clean soil containing < 1 ppm PCBs.

7.4. PCB TRANSFORMER MANAGEMENT.

Installations must comply with the following standards:

7.4.1. Consider and treat all transformers as PCB transformers unless there is information to the contrary.

7.4.2. Transformers containing 500 ppm PCBs or greater will immediately be decontaminated to below 500 ppm or taken out of service and disposed. If possible, decontamination shall reduce PCB levels to below 50 ppm. The replacement fluid shall not contain PCBs (e.g., < 50 ppm PCB), and must not compromise the subsequent disposal of the PCBs. Once decontaminated to below 500 ppm PCB, the transformer can be used for the duration of its life. Any decontaminated transformer must be clearly marked with an indelible and embossed or engraved sign containing the information set out in Figure 7.2.

7.4.3. Each item of decontaminated equipment must be clearly marked with an indelible and embossed or engraved sign which must include the following information:

Figure 7.2: Labeling of Decontaminated Transformers

DECONTAMINATED PCB EQUIPMENT The PCB containing fluid inside the device was replaced — with (name of substitute) — on (date) — by (organization / company) Concentration of PCBs in — old fluid ppm — new fluid ppm
Arındırılmış PCB'li Ekipman 1) Cihazda bulunan PCB'li sıvı, — a) isimli sıvıyla, — b) tarihinde, — c) firması/kuruluşu tarafından değiştirilmiştir. 2) PCB derişimi, 1s in — a) Eski sıvıda ppm — b) Yeni sıvıda ppm olarak ölçülmüştür.

7.4.4. Do not use PCB transformers in any application that poses a risk of contamination to food or feed.

7.4.5. Register all PCB transformers with the servicing fire department.

7.4.6. For any PCB transformer, evaluate replacement with a non-PCB transformer as a long-term, cost-saving measure. If replacement with a non-PCB item is not possible or practicable, equip the PCB transformers in use in or near commercial buildings, or located in sidewalk vaults, with electrical protection to minimize transformer failure that would result in the release of PCBs.

7.4.7. Once PCB transformers are removed, they must be disposed. Reuse of PCB transformers is prohibited.

7.4.8. Service PCB transformers as follows:

7.4.8.1. Only service transformers classified as PCB-contaminated electrical equipment with dielectric fluid containing < 50 ppm PCBs. The replacement fluid must entail markedly lesser risks, and shall not compromise the subsequent disposal of the PCBs.

7.4.8.2. Do not perform any servicing of PCB transformers that requires removal of the transformer coil.

7.4.8.3. PCB transformers with damaged internal parts shall not be serviced or repaired, and shall be directly disposed through the servicing DLA Disposition Services in accordance with DoD 4160.21-M or Paragraph 7.7 of this Chapter.

7.4.8.4. Capture and reuse dielectric fluids removed during servicing as dielectric fluid for PCB transformers or dispose of fluids in accordance with Paragraph 7.7. Do not mix dielectric fluid from a PCB transformer with the dielectric fluid from PCB-contaminated electrical equipment.

7.4.8.5. Do not use in any electrical equipment dielectric fluids containing < 500 ppm PCBs that are mixed with fluids containing 500 ppm or greater PCBs, regardless of the resulting PCB concentration. Consider the entire mixture to be > 500 ppm PCBs.

7.4.9. Inspect all in-service PCB transformers for evidence of damage, leaks, or spills at least every 3 months, except for these transformers that must only be inspected every 12 months:

7.4.9.1. PCB transformers with an impervious, undrained secondary containment capacity of 100% of dielectric fluid.

7.4.9.2. PCB transformers tested and found to contain < 60,000 ppm PCBs at least every 12 months.

7.4.10. Manage leaking PCB transformers in a manner that minimizes exposure and contamination. Perform appropriate spill response in accordance with Paragraph 7.3. Capture and dispose of leaking PCB fluids in accordance with Paragraph 7.7.

7.4.10.1. If any PCB transformer is involved in a fire and was subjected to heat or pressure sufficient to result in violent or nonviolent rupture, take measures to contain and control any potential releases of PCBs and incomplete combustion products into water. These measures may include:

7.4.10.1.1. Blocking of all floor drains in the vicinity of the transformer.

7.4.10.1.2. Containing water runoff.

7.4.10.1.3. Controlling and treating (prior to release) any water used in subsequent cleanup operations. Waters used during fire extinguishing and cleaning procedures shall be treated as hazardous waste. Runoff water (i.e., waters used during fire extinguishing and cleaning procedures) shall be controlled and shall be treated as hazardous waste.

7.4.10.2. Leaking PCB transformers must be:

7.4.10.2.1. Repaired or replaced within 48 hours of discovery of a leak, or as soon as possible thereafter.

7.4.10.2.2. Inspected daily until repaired or replaced.

7.5. MANAGEMENT OF OTHER PCB ITEMS.

Installations must:

7.5.1. Service electromagnets, switches, and voltage regulators that may contain PCBs at any concentration as follows:

7.5.1.1. Only service PCB-contaminated electrical equipment with dielectric fluid containing < 500 ppm PCBs.

7.5.1.2. Do not service any electromagnet, switch, or voltage regulator with a PCB concentration of ≥ 500 ppm that requires the removal and rework of the internal components

7.5.1.3. Capture PCBs removed during servicing and either reuse them as dielectric fluid or dispose of them properly in accordance with Paragraph 7.7.

7.5.1.4. Do not mix or add PCBs from electromagnets, switches, and voltage regulators with a PCB concentration of ≥ 500 ppm to dielectric fluid from PCB-contaminated electrical equipment.

7.5.2. Manage capacitors containing PCBs at any concentration by prohibiting:

7.5.2.1. Use and storage for reuse of PCB large high-voltage capacitors and PCB large low-voltage capacitors that pose an exposure risk to food, water, or feed.

7.5.2.2. Use of PCB large high-voltage and PCB large low-voltage capacitors unless the capacitor is used within a restricted-access electrical substation or in a contained and restricted-access indoor installation. The indoor installation must not have public access and must have an adequate roof, walls, and floor to contain any release of PCBs.

7.5.3. Mark any PCB item removed from service with the date it was removed.

7.6. STORAGE

7.6.1. Installations must store PCBs and PCB items awaiting disposal in facilities that have:

7.6.1.1. Roofs and walls that exclude precipitation.

7.6.1.2. A containment berm at least 15.24 cm [6 inches] high, sufficient to contain twice the internal volume of the largest PCB article, or 25% of the total internal volume of all PCB articles or containers stored, whichever is greater.

7.6.1.3. Continuous, smooth, and impervious flooring material that contains no drain valves, floor drains, expansion joints, sewer line, or other opening that would permit liquids to flow from the curbed area.

7.6.1.4. To the maximum extent practicable, been located to minimize the risk of release due to seismic activity, floods, or other natural events. For facilities located where there is a high possibility of such risks, the installation spill prevention and response plan must address the risk.

7.6.2. Installations may temporarily store these items in an area that does not comply with Paragraph 7.6.1. for up to 30 days from the date of removal from service, subject to weekly inspection:

7.6.2.1. Non-leaking PCB items, marked to indicate whether it is a PCB article or PCB equipment.

7.6.2.2. Leaking PCB articles and PCB equipment in a leak-proof PCB container that contains sufficient absorbent material to absorb the fluid contained in the leaking article or equipment.

7.6.2.3. PCB containers in which non-liquid PCBs have been placed.

7.6.2.4. PCB containers in which:

7.6.2.4.1. PCBs at a concentration between 50-499 ppm have been placed.

7.6.2.4.2. The containers are marked to indicate there is <500 ppm PCBs.

7.6.3. Installations must store non-leaking and structurally undamaged large high-voltage PCB capacitors and PCB-contaminated electric equipment that have not been drained of free-flowing dielectric fluid on pallets or raised platforms, next to a storage area meeting the standards of Paragraph 7.6.1. if they are inspected weekly.

7.6.4. Installations must inspect all other PCB storage areas at least monthly.

7.6.5. Installations must ensure containers used for the storage of PCBs are at least as secure as those required for transport for disposal by DLA Disposition Services.

7.7. DISPOSAL.

7.7.1. Disposal through DLA Disposition Services.

Installations must dispose of PCBs through DLA Disposition Services, who will dispose of PCB items in accordance with DoD Manual 4160.21, Volume 4, “*Defense Materiel Disposition: Instructions for Hazardous Property and Other Special Processing Materiel*” and the disposal requirements of this paragraph. Incineration of PCBs and PCB Items shall only be conducted in properly permitted facilities approved to accept the waste. The transportation, treatment and disposal of PCB waste shall be conducted by licensed entities. If DoD intends to operate a treatment and/or disposal facility, the LEC should be contacted.

7.7.2. Disposal Records.

If the installation generates PCB waste, it must maintain an audit trail for the waste at least as stringent as that required under the standards in Chapter 16, “*Hazardous Waste*”.

7.7.3. PCB Disposal in Incinerators.

Any PCB waste at concentrations > 50 ppm (e.g., PCB-contaminated dielectric fluid; PCB-contaminated rags, soil and other debris; PCB-transformers; PCB articles; PCB items; PCB-contaminated electrical equipment; and PCB containers) will be disposed of in a land-based, high temperature incinerator meeting the requirements of Chapter 16, “*Hazardous Waste*” and below. Where PCB fluids, items or articles are disposed of in an incinerator, installations must follow these procedures:

7.7.3.1. Ensure combustion standards maintain the introduced liquids for a 2-second dwell time at 1,200 °C, plus or minus 100 °C (2,200 °F +/- 212 °F), and 3% excess O₂ in the stack gas or maintenance of the introduced liquids for a 1-1/2 second dwell time at 1,600 °C, plus or minus 100 °C (3,050 °F +/- 212 °F) and 2% excess O₂ in the stack gas;

7.7.3.2. Ensure combustion efficiency, measured by the ratio of the concentration of CO₂ to the total concentration of both CO₂ and CO, is maintained at least 99.9%.

7.7.3.3. Measure and record the rate and quantity of PCBs that are fed to the combustion system at regular intervals not greater than 15 minutes.

7.7.3.4. Continuously measure and record the temperatures of the incineration process.

7.7.3.5. Automatically stop the flow of PCBs to the incinerator if temperature standards are not met.

7.7.3.6. Conduct sufficient monitoring to ensure that the first time an incinerator is used for disposal, it operates within the standards identified in Paragraphs 7.7.3.1. through 7.7.3.5.

7.7.3.7. Conduct continuous monitoring of O₂ and CO and periodic monitoring of CO₂ during incineration of PCBs.

7.7.4. PCB Containers.

After draining all free-flowing liquid, installations must dispose of PCB containers used to contain only PCBs at a concentration less than 500 ppm as MSW.

7.7.5. Retrogrades of PCB Items.

Installations must dispose of PCB items through DLA Disposition Services. DLA Disposition Services must return DoD-generated PCB items manufactured in the United States to the United States for delivery to a permitted disposal facility if Turkish or third country disposal is not possible, is prohibited, or would not be managed in an environmentally sound manner. Ensure that all PCB items and equipment are marked in accordance with the standards in Paragraph 7.2.7.

7.8. RECORDKEEPING.

Installations must maintain an inventory and inspection records (including maintenance history) for PCB items for at least 3 years after disposal. Installations must maintain an audit trail for disposal records of PCB items.

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DEFINITIONS

Unless otherwise noted, these terms and their definitions are for the purpose of this volume.

2-Hour Composite Sample	The pollutant parameter values for samples collected and combined over a period of 2 hours.
24-Hour Composite Sample	The arithmetic mean of pollutant parameter values for samples collected and combined over a period of 24 hours.
4-day average	The arithmetic mean of pollutant parameter values for samples collected in a period of 4 consecutive days.
7-day average	The arithmetic mean of pollutant parameter values for samples collected in a period of 7 consecutive days.
30-day average	The arithmetic mean of pollutant parameter values for samples collected in a period of 30 consecutive days.
Action level	The concentration of a substance in water that establishes appropriate treatment for a water system.
Appropriate DoD medical authority	The medical professional designated by the in-theater DoD Component commander to be responsible for resolving medical issues necessary to provide safe drinking water at the DoD Component's installations.
Audit monitoring	Less frequent monitoring performed to determine if the MCLs of the parameters specified in Table 8.13 are within compliance. Audit monitoring frequency is prescribed within Table 8.13.
BMP	Mandatory schedule of activities, prohibition of practices, maintenance procedure, or other management practices to prevent or reduce the pollution of Turkish Waters. BMPs also include mandatory treatment requirements, operating procedures, and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.
BOD₅	The 5-day measure of the dissolved oxygen used by microorganisms in the biochemical oxidation of organic matter. The pollutant parameter is biochemical oxygen demand (i.e., biodegradable organics in terms of oxygen demand).
Bottled water	Water that is intended for human consumption and that is sealed in bottles or other containers with no added ingredients except that it may optionally contain safe and suitable antimicrobial agents, and meets the requirements of Section 165.110 of Title 21, Code of Federal Regulations and applicable DoD sanitation standards.
CBOD₅	The 5-day measure of the pollutant parameter, CBOD, used as an alternative to BOD ₅ . Measures the dissolved oxygen consumed by microorganisms in the oxidation of organic matter in a body of water

	in which the contribution from nitrogenous bacteria has been suppressed.
Cesspool	A drywell that receives untreated sanitary waste and sometimes has an open bottom or perforated sides.
Check monitoring	Regular monitoring performed at set intervals to obtain information on the organoleptic and microbiological quality of the potable water as well as determining the effectiveness of water treatment. Check monitoring is prescribed within Table 8.11.
Carbonaceous oxygen demand (COD)	An indirect measure of the amount of oxygen used by inorganic and organic matter in water. The measure is a laboratory test based on a chemical oxidant and therefore does not necessarily correlate with biochemical oxygen demand (BOD).
Consumer confidence report	An annual water quality report that a CWS is required to provide to its customers.
Cross connection	Any actual or potential connection between the public water supply and a source of contamination or pollution.
CT	The product of residual disinfectant concentration, C, in mg/L determined before or at the first customer and corresponding disinfectant contact time, T, in minutes and a dimensionless baffling factor that accounts for mixing effects. Baffling factors may be estimated, or obtained from Table 8.17, or from tracer surveys. CT values appear in Table 8.18 through Table 8.34.
CWS	See the definition of “PWS.”
Daily discharge	The discharge of a pollutant measured during a calendar day or any 24-hour period that reasonably represents the calendar day for purposes of sampling. For pollutants with limitations expressed in units of mass, the daily discharge is calculated as the total mass of the pollutant discharged over the day. For pollutants with limitations expressed in other units of measurement (e.g., concentration), the daily discharge is calculated as the average measurement of the pollutant over the day.
Diatomaceous earth filtration	A water treatment process of passing water through a precoat of diatomaceous earth deposited onto a support membrane while additional diatomaceous earth is continuously added to the feed water to maintain the permeability of the precoat, resulting in substantial particulate removal from the water.
Direct discharge	Any discharge of pollutants other than an indirect discharge.
Direct filtration	Water treatment, including chemical coagulation, possibly flocculation and filtration, but not sedimentation.
Discharge of a pollutant	Any addition of any pollutant or combination of pollutants to Turkish Waters from any point source.

Disinfectant	Any oxidant, including, but not limited to, chlorine, chlorine dioxide, chloramines, and ozone, intended to kill or inactivate pathogenic microorganisms in water.
Distribution system	A network of pipes leading from a treatment plant to customers.
DoD non-public water system (NPWS)	An NPWS that provides water for human consumption to DoD installations. The maintenance and monitoring are the responsibility of DoD (e.g., a DoD-owned and -operated NPWS, a DoD-owned and contractor-operated NPWS, or a DoD-privatized NPWS).
DoD public water system (PWS)	A PWS that provides water for human consumption to DoD installations. The maintenance and monitoring are the responsibility of DoD (e.g., a DoD-owned and -operated PWS, a DoD-owned and contractor-operated PWS, or a DoD-privatized PWS).
Domestic wastewater treatment system (DWTS)	Any DoD or Turkish facility designed to treat wastewater before its discharge to Turkish Waters and where the majority of such wastewater is made up of domestic sewage.
Dual sample set	A set of two samples collected at the same time and location, with one sample analyzed for TTHM and the other sample analyzed for a group of HAA5. Dual sample sets are collected for the purposes of determining compliance with the TTHM and HAA5 MCLs.
Effluent limitation	Any restriction imposed on quantities, discharge rates, and concentrations of pollutants that are ultimately discharged from point sources into Turkish Waters.
Enduring location	A location is enduring when DoD intends to maintain access and use of that location for the foreseeable future. The following types of sites are considered enduring for US Government purposes: main operating base, forward operating site, and cooperative security location. All three types of locations may be composed of more than one distinct site. Enduring locations are published in the OSD-approved Enduring Location Master List.
Entrainment	Any life stages of fish or shellfish in the intake water flow entering and passing through a cooling water intake structure and into a cooling water system, including the condenser or heat exchanger.
Final Governing Standard (FGS)	A comprehensive set of country-specific substantive environmental provisions; typically, technical limitations on effluent, discharges, etc., or a specific management practice, developed in accordance with DoDI 4715.05.
First draw sample	A 1-liter sample of tap water that has been standing in plumbing at least 6 hours and is collected without flushing the tap.
GWUDI of surface water	Any water below the surface of the ground with significant occurrence of insects or other microorganisms, algae, or large diameter pathogens, such as <i>Giardia lamblia</i> ; or significant and

	relatively rapid shifts in water characteristics, such as turbidity, temperature, conductivity, or pH, which closely correlate to climatological or surface water conditions.
HAA5	The sum of the concentrations in mg/L of the haloacetic acid compounds monochloroacetic acid, dichloroacetic acid, trichloroacetic acid, monobromoacetic acid, and dibromoacetic acid.
Human consumption	The act of drinking, bathing, showering, hand washing, teeth brushing, food preparation, dishwashing, and maintaining oral hygiene.
Illicit discharge	Any discharge to a storm sewer that is not composed entirely of stormwater. Unless identified as a source of contamination, the following discharges are not considered illicit: groundwater, irrigation water, discharges from potable water sources, diverted surface water flows, foundation drains, air conditioning condensation, water from crawl space pumps, individual residential car washing, dechlorinated swimming pool discharges, and street wash water.
Impingement	The entrapment of any life stages of fish and shellfish on the outer part of an intake structure or against a screening device during periods of intake water withdrawal.
Indirect discharge	An introduction of pollutants in process wastewater to a DWTS.
Industrial wastewater treatment system	Any DoD facility other than a DWTS designed to treat process wastewater before its discharge to Turkish Waters.
Industry standards and practices	Applicable or recognized standards and practices relevant to the design, construction, installation, operation and maintenance, inspection, and repair of facilities and equipment.
Installation	An enduring location consisting of a base, camp, post, station, yard, center, or other DoD activity under the operational control of the Secretary of a Military Department or the Secretary of Defense.
Interference	Any addition of any pollutant or combination of pollutant discharges that inhibits or disrupts the DWTS, its treatment processes or operations, or its sludge-handling processes, use, or disposal.
International agreement	A multilateral or bilateral agreement, such as a base rights or access agreement, a status-of-forces agreement, or any other instrument defined as a binding international agreement in accordance with DoDD 5530.3, " <i>International Agreements</i> " (Reference (n)).
Lead-free	Containing a maximum lead content of 0.2% for solder and flux, and a weighted average of not more than 0.25% lead when used with respect to wetted surface material.

Lead service line	A service line made of lead that connects the water main to the building inlet, and any lead pigtail, gooseneck, or other fitting that is connected to such line.
Log	The percentage of microorganisms removed or inactivated by a drinking water treatment process (e.g., a 1.0-log reduction relates to a 90% reduction, a 2.0-log reduction relates to a 99% reduction, a 3.0-log reduction relates to a 99.9% reduction).
LRAA	The average of sample analytical results for samples taken at a particular monitoring location during the previous 4 calendar quarters.
Maximum daily discharge limit	The highest allowable daily discharge based on volume as well as concentration.
Maximum contaminant level (MCL)	The maximum permissible level of a contaminant in water that is delivered to the free-flowing outlet of the ultimate user of a PWS except for turbidity for which the maximum permissible level is measured after filtration. Contaminants added to the water under circumstances controlled by the user, except those resulting from the corrosion of piping and plumbing caused by water quality, are excluded.
Secondary MCL	An MCL used to control contaminants in drinking water that primarily affect the aesthetic qualities relating to the public acceptance of drinking water. At higher concentrations of these contaminants, health implications may exist in addition to aesthetic degradation.
Maximum residual disinfectant level (MRDL)	The level of a disinfectant added for water treatment measured at the consumer's tap, which may not be exceeded without the possibility of adverse health effects.
Non-community water system (NCWS)	See the definition of "PWS."
Non-public water system (NPWS)	A water system that does not meet the definition of a PWS and provides water for human consumption (e.g., a water system consisting of a well and disinfection treatment serving a single building at an infrequently used training range).
Non-transient, non-community water system (NTNCWS)	See the definition of "PWS."
Operational evaluation level (OEL)	A coliform limit that, if exceeded, requires the water system to evaluate its operation, maintenance, design, sampling, and monitoring, as applicable, to identify sanitary defects that must be corrected.

Point-of-entry treatment device	A treatment device applied to the drinking water entering a facility to reduce contaminants in drinking water throughout the facility.
Point-of-use treatment device	A treatment device applied to a tap to reduce contaminants in drinking water at that tap.
Point source	Any discernible, confined, and discrete conveyance, including, but not limited to, any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, or rolling stock. Does not include vessels, aircraft, or any conveyance that merely collects natural surface flows of precipitation.
Pollutant	Includes, but is not limited to: dredged soil; solid waste; incinerator residue; filter backwash; sewage; garbage; sewage sludge; munitions; chemical waste; biological material; radioactive material; heat; wrecked or discarded equipment; rock; sand; cellar dirt; and industrial, municipal, and agricultural waste discharged into water.
Population equivalent (PE)	Organic matter charge that is biochemically oxidizable, which is based on 45 grams per person per day (g/person/day) of BOD ₅ within raw wastewater.
Process wastewater	Any water that, during manufacturing or processing, comes into direct contact with, or results from the production or use of, any raw material, intermediate product, finished product, by-product, or waste product.
Public water system (PWS)	A system for providing piped water to the public for human consumption, if the system has at least 15 service connections or regularly serves a daily average of at least 25 individuals at least 60 days of the year. This includes any collection, treatment, storage, and distribution facilities under control of the operator of these systems, and any collection or pretreatment storage facilities not under such control that are used primarily in connection with these systems. A PWS is either a CWS or an NCWS: CWS: A PWS that has at least 15 service connections used by year-round residents, or that regularly serves at least 25 year-round residents. NCWS: A PWS that is not a CWS. An NCWS is either a TNCWS or an NTNCWS. NTNCWS: A PWS that is not a CWS and that regularly serves at least 25 of the same persons over 6 months per year. Examples include schools, factories, office buildings, and hospitals that have their own water systems. TNCW: A PWS that provides water to at least 25 persons, but not the same 25 persons, at least 6 months per year. Examples include,

	but are not limited to, gas stations, motels, and seasonal campgrounds that have their own water sources.
Regulated facilities	Those facilities with criteria established in Chapter 9, “ <i>Wastewater and Stormwater</i> ”, such as DWTS, industrial wastewater treatment systems, or industrial discharges.
Sanitary survey	An on-site review of the water source, facilities, equipment, operation, and maintenance of a PWS to evaluate the adequacy of these elements for producing and distributing water for human consumption.
Slow sand filtration	Water treatment process where raw water passes through a bed of sand at a low velocity (1.2 feet per hour) resulting in particulate removal by physical and biological mechanisms.
Standards	Substantive elements of US laws and federal regulations applicable to DoD installations, facilities, and actions in the United States or that have extraterritorial application.
Stormwater	Runoff and drainage from wet weather events such as rain, snow, ice, sleet, and hail.
Surface water	In the context of drinking water standards in Chapter 8, “ <i>Drinking Water</i> ”, water that is open to the atmosphere and subject to surface runoff. Seawater is not surface water, provided that seawater intakes for a desalination plant are located such that intakes are not influenced by surface water runoff or point source discharges.
Transient, non-community water system (TNCWS)	See the definition of “PWS.”
Total suspended solids (TSS)	The pollutant parameter total filterable suspended solids.
Total trihalomethanes (TTHM)	The sum of the concentration in mg/L of chloroform, bromoform, dibromochloromethane, and bromodichloromethane.
Total toxic organics (TTO)	The summation of all quantifiable values greater than 0.01 mg/L for the toxic organics in Table 32.
Turkish Waters	Surface water including the territorial seas recognized under customary international law, including: All waters that are currently used, were used in the past, or may be susceptible to use in commerce. Waters that are or could be used for recreation or other purposes. Waters where fish or shellfish are or could be taken and sold.

Waters that are used or could be used for industrial purposes by industries.

Waters including lakes, rivers, streams (including intermittent streams), sloughs, prairie potholes, or natural ponds.

Tributaries of waters identified in this definition.

Exclusions to Turkish Waters are domestic or industrial waste treatment systems, including treatment ponds or lagoons designed to meet the requirements of Chapter 9, “*Wastewater and Stormwater*”. This exclusion applies to only manmade bodies of water that were neither originally Turkish Waters nor resulted from impoundment of Turkish Waters.

**Underground
injection**

A subsurface emplacement through a bored, drilled, driven, or dug well where the depth is greater than the largest surface dimension, whenever the principal function of the well is emplacement of any fluid.

United States

The several States, the District of Columbia, the Commonwealths of Puerto Rico and the Northern Mariana Islands, American Samoa, Guam, Midway and Wake Islands, the US Virgin Islands, any other territory or possession of the United States, and associated navigable waters, contiguous zones, and ocean waters of which the natural resources are under the exclusive management authority of the United States.

**Vulnerability
assessment**

The process the commander uses to determine the susceptibility to attack from the full range of threats to the security of personnel, family members, and facilities, which provides a basis for determining antiterrorism measures that can protect personnel and assets from terrorist attacks.

ACRONYMS

ASD(S)	Assistant Secretary of Defense for Sustainment
BMP	best management practice
BOD₅	biochemical oxygen demand (5-day measure)
°C	degrees Celsius
CBOD₅	carbonaceous biochemical oxygen demand (5-day measure)
CJCS	Chairman of the Joint Chiefs of Staff
COD	Carbonaceous Oxygen Demand
CPE	comprehensive performance evaluation
CT	See definition of “CT”.
CWS	community water system
DDBP	disinfectant/disinfection byproducts
DoDD	DoD directive
DoDI	DoD instruction
DWTS	domestic wastewater treatment system
EO	Executive order
°F	degrees Fahrenheit
FGS	final governing standard
GPD	gallons per day
GWUDI	groundwater under the direct influence
HAA5	haloacetic acids (five)
L	liter
LEC	lead environmental component
LPD	liters per day

LRAA	locational running annual average
LRV	log removal value
MCL	maximum contaminant level
mg/L	milligram per liter
mg•min/L	milligrams x minute per liter
MGD	million gallons per day
mJ/cm²	millijoules per square centimeter
mL	milliliter
mrem/year	millirem per year
MRDL	maximum residual disinfectant level
NCWS	non-community water system
NPWS	non-public water system
NTNCWS	non-transient, non-community water system
NTU	nephelometric turbidity unit
OSD	Office of the Secretary of Defense
OEL	operational evaluation level
oocysts/L	oocysts per liter
pCi/L	picoCuries per liter
PCB	polychlorinated biphenyls
PE	Population Equivalent
PWS	public water system
SOC	synthetic organic chemical
SWPPP	stormwater pollution prevention plan
TNCWS	transient, non-community water system
TOC	total organic carbon
TSS	total suspended solids

TTHM	total trihalomethanes
TTO	total toxic organics
UFC	United Facilities Criteria
USEUCOM	United States European Command
UV	Ultraviolet
VOC	volatile organic chemical

CHAPTER 8: DRINKING WATER

8.1. INTRODUCTION.

This chapter contains standards on the safety of water provided for human consumption. It includes requirements for DoD non-public water systems (NPWSs) and requirements for DoD public water systems (PWSs) that produce water, as well as those that purchase or are provided water from a Turkish PWS.

8.2. GENERAL.

Installation commanders are responsible for ensuring that water provided for human consumption is safe, regardless of whether the water is produced by the installation or obtained from a Turkish PWS. Applicability of specific standards in this section is delineated by the classification of the system(s) providing water on the installation. DoD systems are classified as either NPWSs or PWSs, with PWSs further classified as community water systems (CWSs), non-transient, non-community water systems (NTNCWSs), and transient, non-community water systems (TNCWSs) (see definition of PWS). Samples taken to conform to the standards of this section must be validated by independent testing or validated supplier testing.

8.2.1. NPWSs.

DoD NPWSs must be monitored for coliform bacteria (total coliforms and *E. coli*), at a minimum, and disinfectant residuals periodically (e.g., quarterly, or before and during operation of an infrequently or seasonally used NPWS) in accordance with the appropriate DoD medical authority. DoD NPWSs are not required to meet any of the additional requirements of this section.

8.2.2. PWSs.

DoD PWSs must provide proper monitoring and treatment for all water provided for human consumption in accordance with the requirements of this section. For drinking water that is purchased or otherwise provided from an Turkish treatment plant or other source, Paragraphs 8.2.2.1. through 8.2.2.5. are only applicable within the installation fenceline. Additionally, DoD PWSs must meet the following general standards:

8.2.2.1. Design, Operation, and Maintenance.

8.2.2.1.1. Implement and comply with the design, operation, and maintenance guidelines in accordance with Unified Facilities Criteria (UFC) 3-230-01, UFC 3-230-02, and UFC 3-230-03.

8.2.2.1.2. Maintain a map or drawing of the complete PWS.

8.2.2.1.3. Perform water distribution system operation and maintenance practices:

8.2.2.1.3.1. Maintain a detectable disinfectant residual throughout the water distribution system, except where determined unnecessary by the appropriate DoD medical authority.

8.2.2.1.3.2. Implement proper procedures for repairing and replacing mains, including disinfection and bacteriological testing.

8.2.2.1.3.3. Conduct an annual water main flushing program.

8.2.2.1.3.4. Properly operate and maintain storage tanks and reservoirs, including cleaning and inspection.

8.2.2.1.3.5. Maintain distribution system components, including hydrants and valves.

8.2.2.1.3.6. Maintain a continuous positive pressure of at least 138 kilopascals [20 pounds per square inch] in the water distribution system.

8.2.2.1.4. Establish a cross-connection control and backflow prevention program.

8.2.2.1.5. Use only lead-free pipe, pipe or plumbing fitting or fixture, solder, and flux in the installation or repair of water systems and plumbing systems for drinking water.

8.2.2.2. Documentation and Recordkeeping.

Maintain all corrective actions, monitoring, and analytical records for at least 3 years, except:

8.2.2.2.1. Bacteriological records – 5 years (except source water *Cryptosporidium* and *E. coli*).

8.2.2.2.2. *Cryptosporidium* and *E. coli* source water records – 10 years.

8.2.2.2.3. Chemical records – 10 years.

8.2.2.2.4. Cross-connection and backflow prevention testing and repair records – 10 years.

8.2.2.3. Source Water Protection.

8.2.2.3.1. Protect all groundwater and surface water sources of drinking water from contamination by operations on DoD installations by:

8.2.2.3.1.1. Suitable placement and construction of wells.

8.2.2.3.1.2. Suitable placement of the new intake (heading) to all water treatment facilities.

8.2.2.3.1.3. Proper siting and maintaining septic systems and on-site treatment units.

8.2.2.3.1.4. Storage and handling of solid and liquid wastes is not permitted within fifty meters of wells, springs, or other water supply sources.

8.2.2.3.1.5. Appropriate land use management.

8.2.2.3.1.6. Appropriate stormwater management.

8.2.2.3.1.7. Appropriate wellhead protection program.

8.2.2.3.2. Conduct sanitary surveys of the water system at least every 3 years for surface water systems, as well as groundwater under the influence of surface water, and every 5 years for systems using groundwater, or as warranted. Sanitary surveys consist of an on-inspection of the water source, treatment, distribution system, finished water storage, pumping facilities and controls, monitoring and reporting data, system management and operation, and compliance with operator requirements. Requirements for sanitary surveys state that off-installation surveys will be coordinated with Turkish authorities through the Turkish Installation Commander.

8.2.2.3.3. Direct discharge of wastewater into groundwaters (i.e., injected directly into groundwater bodies) is prohibited. Installations performing indirect underground injection of wastewaters shall contact the Turkish Installation Commander to determine if an authorization is required. If an authorization is required, installations shall seek an authorization through the Turkish Installation Commander and adhere to the provisions of any authorization granted. Manage non-wastewater underground injection on DoD installations to protect underground water supply sources. Installations must not dispose of hazardous waste or wastewater by underground injection (does not preclude the disposal of sanitary wastewater in septic systems and small capacity cesspools that have been sited, constructed, and operated with the approval of appropriate DoD authorities).

8.2.2.3.4. Conduct (and update as necessary) vulnerability assessments which include, but are not limited to, a review of:

8.2.2.3.4.1. Pipes and constructed conveyances; physical barriers; water collection, pretreatment, treatment, storage, and distribution facilities; and electronic, computer, or other automated systems used by the DoD PWS.

8.2.2.3.4.2. Use, storage, or handling of various chemicals.

8.2.2.3.4.3. Operation and maintenance of the water storage, treatment, and distribution systems.

8.2.2.4. Contingency Plan.

Develop and update, as necessary, an emergency contingency plan to ensure the provision of water fit for human consumption despite interruptions from natural disasters and service interruptions. At a minimum, the plan must identify:

8.2.2.4.1. Plans, procedures, and equipment that can be implemented or used in the event of an intentional or unintentional disruption.

8.2.2.4.2. Key personnel.

8.2.2.4.3. Procedures to restore service, including supplemental sampling procedures.

8.2.2.4.4. Procedures to isolate damaged lines.

8.2.2.4.5. Alternative water supplies.

8.2.2.4.6. Installation public notification procedures.

8.2.2.5. Source Water Sampling for DoD PWSs with Turkish PWS Sources.

DoD PWSs that purchase or are provided water from a Turkish PWS, and that are required to perform source water sampling in accordance with Paragraphs 8.7., 8.9., and 8.11., must perform sampling at the point of entry to the installation before any additional treatment by the installation.

8.2.3. Sample Requirements and Points of Compliance.

8.2.3.1. Samples must be representative of the quality of water at the time of the sampling.

8.2.3.2. Unless otherwise specifically mentioned in a table within this chapter, the points of compliance for all parameters shall be the consumer's taps.

8.3. PERSONNEL QUALIFICATIONS.

8.3.1. The appropriate installation point of contact must designate an operator in responsible charge to be the certified operator who makes decisions regarding the daily operational activities of a PWS, water treatment facility, or distribution system, that directly impact the quality or quantity of drinking water.

8.3.2. Operators in responsible charge must:

8.3.2.1. Be appropriately trained according to the level of complexity of the DoD PWS they operate and oversee.

8.3.2.2. Be certified by having successfully completed, and been licensed through, a US State-approved water system operator certification course, a similar Turkish course, or a course that meets industry standards and practices.

8.3.2.3. Maintain current certification for the duration of the appointment.

8.4. COLIFORM BACTERIA REQUIREMENTS.

8.4.1. Monitoring Program.

DoD PWSs must comply with the total coliform-related operational evaluation level (OEL) and E. coli maximum contaminant level (MCL). Each DoD PWS must develop and maintain a written sample siting plan that is representative of water throughout the distribution system. The plan must identify routine and repeat sampling sites and a sample collection schedule. Total coliform samples must be collected in accordance with the written sample siting plan.

8.4.1.1. The total coliform-related OEL is exceeded whenever more than 5% of samples per month for a system examining 40 or more samples a month, or two or more samples per month when a system analyzes less than 40 samples per month, are confirmed positive for total coliforms.

8.4.1.2. The MCL for E. coli is exceeded whenever:

8.4.1.2.1. A routine E. coli positive sample is followed by a repeat total coliform positive sample or a repeat E. coli positive sample.

8.4.1.2.2. A routine total coliform positive sample is followed by any repeat sample that is positive for E. coli.

8.4.1.2.3. Any required repeat samples are not collected following an E. coli positive routine sample.

8.4.1.2.4. Any repeat total coliform positive sample is not tested for E. coli.

8.4.1.3. Whenever the OEL or E. coli MCL is exceeded, complete an assessment to determine if any sanitary defects exist and, if found, take corrective action.

8.4.2. Monitoring Plan and Sampling.

Each DoD PWS must develop and maintain a written monitoring plan and collect routine samples in accordance with the monitoring frequency provided in Table 8.1. Seasonal DoD

PWSs that do not maintain positive pressure throughout the distribution system must develop a startup plan to be completed before providing water at the beginning of the season.

8.4.2.1. Each system must also monitor for *E. coli* and Enterococci per Table 8.2, “*Other Bacteriological Parameters*”. The MCL is based only on the presence or absence of *E. coli* or Enterococci, provided samples meet the criteria of 8.3.1. If a system is out of compliance with Table 8.2 requirements, the appropriate DoD medical authority in coordination with the command responsible for operating the PWS, will determine the need for additional monitoring, corrective action or notification, if deemed appropriate.

8.4.3. Follow-up Sampling and Assessment.

8.4.3.1. A DoD PWS with initial samples testing positive for total coliforms must collect repeat samples as soon as possible, preferably within 24 hours of being notified of the positive result. Repeat sample locations are required at the same tap as the original sample plus an upstream and downstream sample, each within five service connections of the original tap. Monitoring must continue until total coliforms are no longer detected or the system determines the OEL has been exceeded and an assessment is initiated.

8.4.3.2. When any routine or repeat sample tests positive for total coliforms, it must be tested for *E. coli*. *E. coli* testing can be foregone on a total coliform positive sample if *E. coli* is assumed to be present.

8.4.3.3. If a DoD PWS has an indication of coliform contamination (e.g., as a result of an OEL exceedance, *E. coli* MCL violation, performance failure), it must be assessed to determine if any sanitary defects exist. If sanitary defects are found, the system must take corrective action.

8.4.4. Notification.

If a DoD PWS has exceeded the total coliform-related OEL or *E. coli* MCL, the PWS must complete the notification in accordance with Paragraph 8.16. as follows:

8.4.4.1. Total Coliform-Related OEL. Notify the appropriate DoD medical authority within 24 hours of the DoD PWS receiving notification of an exceedance of the OEL. There is no requirement to notify the public of exceedance of the OEL if the OEL was not triggered by an *E. coli* MCL exceedance.

8.4.4.2. *E. coli* MCL. Notify the appropriate DoD medical authority as soon as possible, but no later than the end of the same day the command responsible for operating the DoD PWS is notified of the result. Because an acute risk to public health may exist, the installation public must be notified as soon as possible, but not later than 24 hours after the command responsible for operating the DoD PWS is notified of the test result.

8.5. INORGANIC CHEMICAL REQUIREMENTS.

8.5.1. DoD PWSs must ensure that the water distributed for human consumption does not exceed inorganic chemical MCLs provided in Table 8.3, as applicable based on the system classification.

8.5.2. Systems must be monitored for inorganic chemicals at the frequency provided in Table 8.4. and Table 8.13, “*Audit Monitoring Requirements*”.

8.5.2.1. Sampling Location.

After any application of treatment, a minimum of one sample must be taken from water systems at every entry point to the distribution system or in the distribution system at a point that is representative.

8.5.2.2. Increased Monitoring.

Increased monitoring must be performed quarterly and must begin in the next quarter after receipt of the sample result that triggered increased monitoring. Increased quarterly monitoring requires a minimum of two consecutive quarterly samples for groundwater systems and at least four consecutive quarterly samples for surface water systems. If all results are less than the increased monitoring trigger criteria, then the system may return to baseline monitoring requirements. Additional increased monitoring requirements relating to nitrate and nitrite are specified in Table 8.4.

8.5.3. If a DoD PWS is out of compliance with Table 8.3. MCLs, with the exception of aluminum, boron, bromate, iron and manganese, the installation must complete the notification in accordance with Paragraph 8.16. as soon as possible.

8.5.4. If a DoD PWS is out of compliance with Table 8.3. MCLs for aluminum, boron, bromate, iron and manganese, the appropriate DoD medical authority in coordination with the command responsible for operating the PWS, will determine the need for additional monitoring, corrective action or notification, if deemed appropriate.

8.5.5. If the nitrate, nitrite, or total nitrate and nitrite MCLs are exceeded, it is considered an acute health risk and the installation must complete the notification to:

8.5.5.1. The appropriate DoD medical authority as soon as possible, but in no case later than the end of the same day the command responsible for operating the PWS is notified of the result.

8.5.5.2. The installation public as soon as possible, but not later than 72 hours after the command responsible for operating the DoD PWS is notified of the test result. If the installation is only monitoring annually on the basis of direction from the appropriate DoD medical authority, it must immediately increase monitoring in accordance with Table 8.4 until corrective actions are completed and authorities determine the system is reliable and consistent.

8.6. FLUORIDE REQUIREMENTS.

8.6.1. DoD PWSs adding fluoride (i.e., practicing fluoridation) for dental health should fluoridate to 0.7 mg/L unless fluoridation is prohibited or restricted by Turkish regulations.

8.6.1.1. Where Turkish regulations do not allow fluoridation to a concentration of 0.7 mg/L, fluoridate to the concentration specified by Turkish regulations.

8.6.1.2. Where Turkish regulations specify fluoride concentrations within a range, fluoridate to a concentration within the range that is closest to 0.7 mg/L.

8.6.2. DoD PWSs practicing fluoridation must sample at least daily for operational control of fluoridation, applying the recommended fluoride concentrations at different temperatures in Table 8.5. They must also analyze samples collected in the distribution system in conjunction with bacteriological samples. The command responsible for operating the DoD PWS must consider the presence of populations at risk for dental health effects and ensure fluoride is maintained throughout the distribution system when determining which bacteriological sampling sites will be monitored for fluoride.

8.6.3. DoD PWSs must be monitored for fluoride at the entry point to the distribution system as specified in Table 8.4 to determine compliance with the fluoride MCL.

8.6.4. An installation commander responsible for a DoD CWS must ensure that the fluoride content of drinking water does not exceed the MCL of 1.5 mg/L, as stated in Table 8.3.

8.6.4.1. If any sample exceeds the secondary MCL of 4.0 mg/L for fluoride, the installation will complete the notification in Paragraph 8.16. as soon as possible, but in no case later than 14 days after the violation.

8.6.4.2. If the primary MCL of 1.5 mg/L is exceeded but not the secondary MCL, corrective actions must be taken, but notification per Paragraph 8.16. shall be at the discretion of the appropriate DoD medical authority in coordination with the command responsible for operating the PWS.

8.7. LEAD AND COPPER REQUIREMENTS.

DoD CWSs and NTNCWSs must not exceed action levels (distinguished from the MCL) of 0.01 mg/L of lead or 1.3 mg/L of copper in more than 10% of tap water samples collected during any monitoring period. An action level exceedance triggers other requirements that include water quality parameter monitoring, corrosion control treatment, source water monitoring and treatment, public education, and lead service line replacement.

8.7.1. Affected DoD systems must conduct monitoring in accordance with Table 8.6. DoD installations and facilities must sample or ensure sampling is completed regardless of system ownership. High-risk sampling sites must be targeted by conducting a materials evaluation of the distribution system. Sampling sites must be selected based on a hierarchical approach.

8.7.1.1. For CWS, priority is given to single-family residences that contain copper pipe with lead solder installed after 1982, contain lead pipes, or are served by lead service lines; then, structures, including multi-family residences with the foregoing characteristics; and, finally, residences and structures with copper pipe with lead solder installed before 1983.

8.7.1.2. NTNCWS sampling sites must consist of structures that contain copper pipe with lead solder installed after 1982, contain lead pipes, or are served by lead service lines. First draw samples must be collected from a cold-water kitchen or bathroom tap; nonresidential samples must be taken at an interior tap from which water is typically drawn for consumption.

8.7.2. The installation must provide public notification, including corrective actions that may be taken, concerning the lead content of materials used in distribution or plumbing systems or the corrosivity of water that has caused leaching, which indicates a potential health threat if exposed to leaded water.

8.7.3. Action levels are exceeded based on the 90th percentile level. The 90th percentile level is calculated by multiplying the number of valid samples sorted in ascending order by 0.9 (e.g., 10 samples $\times$ 0.9 = 9; thus, use 9th highest lead and copper test results to compare to action level). If an action level is exceeded, the installation must:

8.7.3.1. Collect additional monitoring of water quality parameters as specified in Table 8.6.

8.7.3.2. Pursue optimal corrosion control treatment.

8.7.3.2.1. If action levels are exceeded after implementation of applicable corrosion control and source water treatment, lead service lines must be replaced if the lead service lines cause the lead action level to be exceeded.

8.7.3.2.2. Discontinue lead service line replacement whenever lead monitoring results do not exceed the action level in tap samples for two consecutive 6-month monitoring periods.

8.7.3.2.3. Return to the standard monitoring schedule identified in Table 8.6.

8.7.4. The installation commander must implement an education program for installation personnel (including United States and Turkish) within 60 days after the end of the monitoring period in which the action level was exceeded and must complete the notification in accordance with Paragraph 8.16. as soon as possible, but in no case later than 14 calendar days after the violation.

8.8. ORGANIC CHEMICAL REQUIREMENTS.

8.8.1. DoD CWSs and NTNCWSs must ensure that synthetic organic chemicals (SOCs) and volatile organic chemicals (VOCs) in water distributed to people do not exceed the MCLs delineated in Table 8.7.

8.8.2. CWSs and NTNCWSs must be monitored for SOC and VOC according to the schedule stated in Table 8.8. Compliance shall be determined in accordance with notes “g” through “i” of Table 8.8.

8.8.2.1. New DoD CWSs or NTNCWSs beginning operation must initially collect four consecutive quarterly samples to determine compliance with established VOC and SOC MCLs. New systems with no detections during the initial sampling event must continue monitoring at the base monitoring frequencies in Table 8.8.

8.8.2.2. CWSs and NTNCWSs must choose sampling location in accordance with the following:

8.8.2.2.1. Groundwater systems must take a minimum of one sample at every entry point that is representative of each well after treatment.

8.8.2.2.2. Surface water systems must take a minimum of one sample at every entry point to the distribution system at a point that is representative of each source after treatment.

8.8.2.3. A CWS or NTNCWS monitoring at the base monitoring frequency or a reduced monitoring frequency that exceeds the trigger for increased monitoring in any one sample must continue or immediately begin quarterly monitoring. Monitoring must continue until the system demonstrates that it is reliably and consistently below the MCLs (i.e., when there is enough confidence that future sampling results will be sufficiently below the MCL to justify reducing the quarterly monitoring frequency). For example, water systems with widely varying analytical results or analytical results that are just below the MCL would not meet this criterion.

8.8.2.3.1. Groundwater systems must have a minimum of two consecutive quarterly samples with no detections or detections below the MCL to demonstrate the system is reliably and consistently below MCLs.

8.8.2.3.2. Surface water systems must have a minimum of four consecutive quarterly samples with no detections or detections below the MCL to demonstrate the system is reliably and consistently below MCLs.

8.8.2.4. A CWS or NTNCWS that detects a VOC or SOC above the MCL must continue or immediately begin quarterly monitoring and continue monitoring for a minimum of 4 consecutive quarters, until a system demonstrates that it is reliably and consistently below the MCL.

8.8.3. If a CWS or NTNCWS is out of compliance, the notification in accordance with Paragraph 8.16. must be completed as soon as possible, but no later than 14 days after the violation. The installation must continue monitoring, as noted in Table 8.8, and must continue until the US installation commander determines the system is back in compliance and all necessary corrective measures have been implemented.

8.9. DISINFECTANT/DISINFECTION BYPRODUCTS (DDBP) REQUIREMENTS.

8.9.1. DDBP Precursor Requirements.

DoD PWSs with surface water and GWUDI as the source water:

8.9.1.1. Using conventional filtration treatment must monitor each treatment plant water source for total organic carbon (TOC) on a monthly basis. Samples must be taken from the source water before treatment and the treated water (i.e., paired samples) not later than the point of combined filter effluent turbidity monitoring. Source water alkalinity must also be monitored at the same time. Systems with average treated water TOC of less than 2.0 mg/L for 2 consecutive years, or less than 1.0 mg/L for 1 year, may reduce TOC and alkalinity to one paired sample per plant per quarter.

8.9.1.2. Not using conventional filtration treatment must monitor only source water TOC before any treatment on a monthly basis. Source water TOC must be monitored quarterly for systems on reduced total trihalomethanes (TTHM) and haloacetic acids (five) (HAA5) monitoring frequencies.

8.9.2. DDBP Requirements for CWSs and NTNCWSs.

DoD CWSs and NTNCWSs that add a disinfectant (i.e., an oxidant, such as chlorine, chlorine dioxide, chloramines, or ozone) to any part of their treatment process, including disinfectant added by a local water supplier, must meet the following requirements.

8.9.2.1. Comply with the following MCLs and maximum residual disinfectant levels (MRDLs):

8.9.2.1.1. TTHM MCL of 0.080 mg/L

8.9.2.1.2. HAA5 MCL of 0.060 mg/L

8.9.2.1.3. Chlorite MCL of 1.0 mg/L

8.9.2.1.4. Bromate MCL of 0.010 mg/L

8.9.2.1.5. Chlorine MRDL of 4.0 mg/L (as Cl₂)

8.9.2.1.6. Chloramines MRDL of 4.0 mg/L (as Cl₂)

8.9.2.2. Noncompliance is determined as:

8.9.2.2.1. For TTHM or HAA5, when any locational running annual average (LRAA), computed quarterly for each sampling location, exceeds the MCL, or if a single sample exceeds 0.10 mg/L for TTHM.

8.9.2.2.2. For chlorite, when the average concentration of any three-sample set (i.e., one monthly sample set from within the distribution system) exceeds the MCL.

8.9.2.2.3. For bromate, when a running yearly average of samples, computed quarterly, exceeds the MCL.

8.9.2.2.4. For chlorine or chloramine, when a running yearly average of monthly averages of all samples, computed quarterly, exceeds the MRDL. Operators may increase residual disinfectant levels of chlorine or chloramines in the distribution system to a level and for a time necessary to protect public health to address specific microbiological contamination problems caused by circumstances such as distribution line breaks, storm runoff events, source water contamination, or cross connections.

8.9.2.2.5. For chlorine dioxide, when:

8.9.2.2.5.1. Any daily sample from the entrance to the distribution system exceeds the MRDL and if one or more of the three samples taken the following day from within the distribution system exceeds the MRDL, or the system fails to take any distribution system samples. The MRDL for chlorine dioxide may be exceeded for short periods to address specific microbiological contamination problems.

8.9.2.2.5.2. Any two consecutive daily samples exceed the MRDL even if none of the distribution samples exceed the MRDL.

8.9.2.2.5.3. Monitoring is not performed at the entrance to the distribution system on the day following an exceedance of the chlorine dioxide MRDL.

8.9.2.3. Routinely monitor TTHM, HAA5, chlorine dioxide, chloramine, chlorine, and ozone in accordance with Table 8.9. Determine sample locations as follows:

8.9.2.3.1. For HAA5, CWSs and NTNCWs must collect the number of samples listed in Table 8.9., and the number of samples per Table 8.13 for TTHM. One of the samples must be taken at a location in the distribution system reflecting the maximum residence time of water in the system. If a maximum residence time sample location is identified on a dead-end line, ensure that the sample location is at or before the last consumer and not at the very end of the dead-end line. One of the samples must be taken at a location closer to the entry point to the distribution system or at a location where disinfectant residuals (e.g., chlorine and chloramines) are regularly detected. If more than two sample locations are required, one of the remaining samples must be collected at a location representative of the average residence time. Any other remaining samples

must be taken at representative locations in the distribution system. Dual sample sets must be collected at each sampling location.

8.9.2.3.2. CWSs and NTNCWSs using chlorine dioxide for disinfection or oxidation must take daily chlorite and chlorine dioxide samples at the entrance to the distribution system. Systems must also collect monthly chlorite samples within the distribution system, with one as close as possible to the first customer, one in a location representative of average residence time, and one as close as possible to the end of the distribution system (reflects maximum residence time within the distribution system).

8.9.2.3.3. CWSs and NTNCWSs using ozone for disinfection or oxidation must take at least one monthly bromate sample at the entrance to the distribution system for each treatment plant in the system using ozone under normal operating conditions.

8.9.2.3.4. CWSs and NTNCWSs using chlorine for disinfection or oxidation must sample for chlorine at the same time and location in the distribution systems as total coliforms.

8.9.2.3.5. CWSs and NTNCWSs using chloramine for disinfection or oxidation must sample for chloramine (as either total chlorine or combined chlorine) at the same time and location in the distribution systems as total coliforms.

8.9.2.4. Increased monitoring is required as follows:

8.9.2.4.1. For TTHM and HAA5, systems monitoring annually or less frequently must increase monitoring frequency to quarterly at all sample locations if a TTHM sample result is greater than 0.080 mg/L or a HAA5 sample result is greater than 0.060 mg/L at any location. Quarterly sampling must continue for 4 consecutive quarters to calculate the LRAA for compliance determination. For systems monitoring annually, if no annual TTHM sample result is greater than 0.080 mg/L or HAA5 sample result is greater than 0.060 mg/L, the sample result for each monitoring location is considered the LRAA for that monitoring location.

8.9.2.4.2. For chlorite, additional monitoring is required when a daily sample exceeds the chlorite MCL. A three-sample set (following the monthly sample set protocol) must be collected the following day. Further distribution system monitoring is not required in that month unless the chlorite concentration at the entrance to the distribution system again exceeds the MCL.

8.9.2.4.3. For chlorine dioxide, if the MRDL is exceeded, three additional samples must be taken the following day as follows:

8.9.2.4.3.1. If chlorine is used to maintain a disinfectant residual in the distribution system and there are one or more disinfection addition points after the entrance to the distribution system (i.e., booster chlorination), the system must collect one sample as close as possible to the first customer, one sample in a location representative of average residence time, and one sample as close as possible to the end of the distribution system (reflects maximum residence time within the distribution system).

8.9.2.4.3.2. If chlorine dioxide or chloramines are used to maintain a disinfectant residual in the distribution system, or if chlorine is used to maintain a disinfectant residual and there are no disinfection addition points after the entrance to the distribution system (i.e., no booster chlorination), systems must take three samples in the distribution system as close as possible to the first customer at intervals of not less than 6 hours.

8.9.2.5. Reduced monitoring is as follows:

8.9.2.5.1. Systems using ozone may reduce bromate monitoring from monthly to once per quarter if the yearly average raw water bromide concentration is less than or equal to 0.0025 mg/L based on monthly measurements for 1 year.

8.9.2.5.2. Systems using chlorine dioxide may reduce chlorite monitoring from monthly to quarterly if, after 1 year, the chlorite concentration in all samples taken in the distribution system is below the MCL and no daily sample exceeds the MCL. Daily samples must still be collected. Monthly sample set monitoring resumes when any one daily sample exceeds the MCL.

8.9.2.5.3. Systems using surface water or GWUDI source water may reduce TTHM and HAA5 monitoring as follows:

8.9.2.5.3.1. Systems serving a population of 499 or less are not eligible for reduced monitoring.

8.9.2.5.3.2. Systems serving a population of 500 or more must meet all of the following conditions to be eligible for reduced monitoring.

8.9.2.5.3.2.1. LRAA for TTHM is no more than 0.040 mg/L

8.9.2.5.3.2.2. Annual average for HAA5 is no more than 0.030 mg/L.

8.9.2.5.3.2.3. At least 1 year of routine monitoring has been completed.

8.9.2.5.3.2.4. LRAA source water TOC level is no more than 4.0 mg/L before treatment.

8.9.2.5.3.3. Systems serving a population of 500 – 9,999 that meets the eligibility requirements in Paragraphs 8.9.2.5.3.2.1. through 8.9.2.5.3.2.4. may reduce monitoring frequency to two sample locations per year. Reduced monitoring of TTHM must be performed per the Audit Monitoring requirements found in Table 8.13. Dual sample sets must be collected at each sampling location. Samples must be collected during the month of warmest water temperature. One sample location must be at the location representative of maximum residence time and one location must be at a location closer to the entry point to the distribution system. Systems remain on the reduced schedule as long as the annual sample result at any location is no more than 0.060 mg/L for TTHM or 0.045 mg/L for HAA5, or if the source water annual

average TOC is greater than 4.0 mg/L. Systems that do not meet these levels must revert to routine monitoring the following quarter.

8.9.2.5.3.4. Systems serving a population of 10,000 – 49,999 that meets the eligibility requirements in Paragraphs 8.9.2.5.3.2.1. through 8.9.2.5.3.2.4. may reduce monitoring frequency to two sample locations per quarter. Reduced monitoring of TTHM must be performed per the Audit Monitoring requirements found in Table 8.13. Dual sample sets must be collected at each sampling location. Samples must be collected during the month of warmest water temperature. One sample location must be at the location representative of maximum residence time and one location must be at a location closer to the entry point to the distribution system. Systems may remain on the reduced schedule as long as the LRAA is no more than 0.040 mg/L for TTHM and 0.030 mg/L for HAA5, or if the source water annual average TOC is greater than 4.0 mg/L. Systems that do not meet these levels must revert to routine monitoring the following quarter.

8.9.2.5.3.5. Systems serving a population of 50,000 or more that meet the eligibility requirements of Paragraphs 8.9.2.5.3.2.1. through 8.9.2.5.3.2.4. may reduce monitoring of HAA5 to four sample locations per quarter. Reduced monitoring of TTHM must be performed per the Audit Monitoring requirements found in Table 8.13. Dual sample sets must be collected at each sampling location. Samples must be collected during the warmest month of water during the sampling period. One sample location must be at the location representative of maximum residence time and one location must be at a location closer to the entry point to the distribution system. Systems may remain on the reduced schedule as long as the LRAA is no more than 0.040 mg/L for TTHM and 0.030 mg/L for HAA5, and the source water annual average TOC is not greater than 4.0 mg/L. Systems that do not meet these levels must revert to routine monitoring the following quarter.

8.9.2.5.4. Systems using groundwater (not under the influence of surface water) source water may reduce TTHM and HAA5 monitoring as follows:

8.9.2.5.4.1. Systems must meet all of the following conditions to be eligible for reduced monitoring.

8.9.2.5.4.1.1. LRAA for TTHM is no more than 0.040 mg/L.

8.9.2.5.4.1.2. LRAA for HAA5 is no more than 0.030 mg/L

8.9.2.5.4.1.3. At least 1 year of routine monitoring has been completed.

8.9.2.5.4.2. Systems serving a population of 10,000 or more that meet the eligibility requirements of Paragraphs 8.9.2.5.4.1.1. through 8.9.2.5.4.1.3. may reduce monitoring of HAA5 to two sample locations per year. Reduced monitoring of TTHM must be performed per the Audit Monitoring requirements found in Table 8.13. Dual sample sets must be collected at each sampling location. Samples must be collected during the month of warmest water temperature. One sample location must be at the location representative of maximum residence time and one location must be at a location closer to the entry point to the distribution

system. Systems may remain on the reduced schedule as long as the annual sample result at any location is no more than 0.060 mg/L for TTHM or 0.045 mg/L for HAA5. Systems that do not meet these levels must revert to routine monitoring the following quarter.

8.9.2.5.4.3. Systems serving a population of 500 – 9,999 that meet the eligibility requirements of Paragraphs 8.9.2.5.4.1.1. through 8.9.2.5.4.1.3. may reduce monitoring of HAA5 to one sampling location per year. Reduced monitoring of TTHM must be performed per the Audit Monitoring requirements found in Table 8.13. A dual sample set must be collected at the location representative of maximum residence time. Samples must be collected during the month of warmest water temperature. Systems may remain on the reduced schedule as long as the annual sample result at the location is no more than 0.060 mg/L for TTHM or 0.045 mg/L for HAA5. Systems that do not meet these levels must revert to routine monitoring the following quarter.

8.9.2.5.4.4. Systems serving a population of 499 or less that meet the eligibility requirements of Paragraphs 8.9.2.5.4.1.1. through 8.9.2.5.4.1.3. may reduce monitoring of HAA5 to two sample locations every 3 years. Reduced monitoring of TTHM must be performed per the Audit Monitoring requirements found in Table 8.13. Dual sample sets must be collected at each sampling location. Samples must be collected during the month of warmest water temperature. One sample location must be at the location representative of maximum residence time and one location must be at a location closer to the entry point to the distribution system. Systems remain on the reduced schedule as long as the annual sample result at any location is no more than 0.060 mg/L for TTHM or 0.045 mg/L for HAA5. Systems that do not meet these levels must revert to routine monitoring the following quarter.

8.9.2.6. If a CWS or NTNCWS is out of compliance as described in Paragraph 8.9.2.2., the installation must perform the notification in accordance with Paragraph 8.16. as soon as possible, but in no case later than 14 calendar days after the violation, and undertake corrective measures.

8.9.3. DDBP Requirement for TNCWSs.

A TNCWS that uses chlorine dioxide as a disinfectant or oxidant must comply with the chlorine dioxide MRDL of 0.8 mg/L and the associated monitoring requirements for chlorine dioxide.

8.10. RADIONUCLIDE REQUIREMENTS.

8.10.1. A DoD CWS must comply with the radionuclide MCLs in Table 8.10 and associated monitoring requirements.

8.10.1.1. Routine Monitoring.

8.10.1.1.1. All CWSs using groundwater, surface water, or both groundwater and surface water must sample at every entry point (i.e., sampling points) to the distribution system that is representative of all sources being used under normal operating conditions.

8.10.1.1.2. For gross alpha activity and radium-226 and radium-228, and uranium, systems must be tested once every 4 years. Testing must be conducted using an annual composite of four consecutive quarterly samples or the average of four samples obtained at quarterly intervals at a representative point in the distribution system.

8.10.1.1.2.1. Gross alpha only may be analyzed if activity is less than or equal to 5 pCi/L. Where radium-228 may be present, radium-226 and/or -228 analyses should be performed when activity is greater than 2 pCi/L.

8.10.1.1.2.2. If the average annual concentration is less than 50% of the MCL, analysis of a single sample may be substituted for the quarterly sampling procedure.

8.10.1.1.2.3. A system with two or more sources having different concentrations of radioactivity must monitor source water in addition to water from a free-flowing tap.

8.10.1.1.2.4. If the installation introduces a new water source, these contaminants must be monitored within the first year after introduction.

8.10.1.1.3. All CWSs must monitor for beta particle and photon radioactivity every 9 years to include tritium and strontium-90. Monitoring consists of four consecutive quarterly samples at each entry point to the distribution system.

8.10.1.1.3.1. If the gross beta particle activity minus the naturally occurring potassium-40 beta particle activity is greater than 50 pCi/L for any sample, that sample must be further analyzed to identify the major radioactive constituents present and the appropriate doses must be calculated and summed to determine compliance with the MCL for beta particle and photon radioactivity.

8.10.1.1.3.2. CWSs may analyze for naturally occurring potassium-40 beta particle activity from the same or equivalent sample used for gross beta particle activity analysis. CWSs are allowed to subtract the potassium-40 beta particle activity value from the total gross beta particle activity value to determine if the resultant value greater than 50 pCi/L.

8.10.1.1.3.3. The potassium-40 beta particle activity must be calculated by multiplying elemental potassium concentrations (in mg/L) by a factor of 0.82.

8.10.1.2. Follow up requirements.

8.10.1.2.1. If the annual average of sample results exceeds the MCL for gross alpha activity, radium-226 and radium-228 (combined), or uranium, the installation must provide the

notification in accordance with Paragraph 8.16. within 14 calendar days. Monitoring must continue until corrective actions are completed and the average annual concentration no longer exceeds the respective MCL. Continued monitoring for gross alpha-related contamination must occur quarterly.

8.10.1.2.2. The beta particle and photon radioactivity MCL is exceeded if the average annual concentration of beta particle and photon radioactivity from man-made radionuclides in drinking water produces an annual dose equivalent to the total body or any internal organ greater than 4 mrem/year. The concentration of man-made radionuclides causing 4 mrem total body or organ dose equivalents must be calculated on the basis of 2 liters per day (LPD) drinking water intake using the 168-hour data list in the National Bureau of Standards Handbook 69. If the beta particle and photon radioactivity MCL is exceeded, the installation must:

8.10.1.2.2.1. Provide the notification in accordance with Paragraph 8.16. within 14 calendar days.

8.10.1.2.2.2. Increase monitoring frequency to monthly as delineated in Paragraph 8.10.1.3.

8.10.1.3. CWSs that exceed the beta particle and photon radioactivity MCL must conduct monthly monitoring beginning the month after the exceedance occurs. CWSs return to routine monitoring (4 consecutive quarters every 9 years) when the rolling average of 3 monthly samples is less than the MCL. Routine monitoring begins in the quarter immediately after the rolling average of 3 monthly samples is less than the MCL.

8.11. SURFACE WATER TREATMENT REQUIREMENTS.

DoD PWSs that use surface water sources or GWUDI must meet the surface water treatment requirements. Only DoD PWSs that use surface water sources or GWUDI, and are in the control of the watershed or treatment plant in accordance with Paragraph 8.2, must meet the surface water treatment requirements.

8.11.1. Unfiltered Systems.

8.11.1.1. Systems that use unfiltered surface water or GWUDI must analyze the raw water for total coliforms or fecal coliforms at least weekly and for turbidity at least daily, and must continue as long as the unfiltered system is in operation.

8.11.1.1.1. If the total coliforms or fecal coliforms exceed 100/100 milliliters (mL) and 20/100 mL, respectively, in excess of 10% of the samples collected in the previous 6 months, appropriate filtration must be applied.

8.11.1.1.2. Appropriate filtration must also be applied if turbidity of the source water immediately before the first or only point of disinfectant application exceeds 5 nephelometric

turbidity units (NTU). If the turbidity exceeds the limit, the installation must provide notification in accordance with Paragraph 8.16. as soon as possible, but no later than 14 calendar days after the violation, and undertake corrective action.

8.11.1.2. Disinfection must achieve at least 99.9% (3.0-log) inactivation of *Giardia lamblia* cysts and 99.99% (4.0-log) inactivation of viruses by meeting applicable CT values, as shown in Table 8.17 through Table 8.34 in Appendix 8 Note that ultraviolet (UV) disinfection converts hypochlorite to chloride. Therefore, log removal for chlorine disinfection residual following UV disinfection is available only if chlorine is added to re-establish a disinfectant residual.

8.11.1.2.1. Disinfection systems must have redundant components to ensure uninterrupted disinfection during operational periods.

8.11.1.2.2. Disinfectant residual must be monitored immediately after disinfection once every 4 hours that the system is in operation. Disinfectant residual measurements in the distribution system must be made at the same times as total coliforms are sampled.

8.11.1.2.3. Disinfectant residual of water entering the distribution system cannot be less than 0.2 mg/L for greater than 4 hours.

8.11.1.2.4. Water in a distribution system with a heterotrophic bacteria concentration less than or equal to 500/mL measured as heterotrophic plate count is considered to have a detectable disinfectant residual for the purpose of determining compliance with the surface water treatment requirements.

8.11.1.2.5. If disinfectant residuals in the distribution system are undetected in more than 5% of monthly samples for 2 consecutive months, appropriate filtration must be implemented if the undetected disinfectant residuals are due to a deficiency in treatment and not due to a deficiency in the distribution system, such as cross-connection contamination.

8.11.1.2.6. Surface water and GWUDI systems that make changes to their disinfection practices (e.g., change in disinfectant or application point) in order to meet the DDBP requirements in Paragraph 8.9 must ensure that protection from microbial pathogens is not compromised.

8.11.1.3. To the extent that DoD PWSs have the ability, systems must maintain a watershed control program that minimizes the potential for contamination by *Giardia lamblia* cysts and viruses in the source water. The water system should demonstrate that it can control all human activities that may have an adverse impact on the microbial quality of the source water. GWUDI systems may use a wellhead protection program to meet the requirements of a watershed control program. At a minimum, a watershed control program must:

8.11.1.3.1. Characterize the watershed hydrology and land ownership.

8.11.1.3.2. Identify watershed characteristics and activities that may have an adverse effect on source water quality.

8.11.1.3.3. Monitor the occurrence of activities that may have an adverse effect on source water quality.

8.11.1.4. Installations must physically cover all finished water reservoirs, holding tanks, and storage water facilities.

8.11.2. Filtered Systems.

8.11.2.1. Filtered water systems must provide a combination of disinfection and filtration that achieves a total of 99.9% (3.0-log) removal and inactivation of *Giardia lamblia* cysts, 99.99% (4.0-log) removal and inactivation of viruses, and 99% (2.0-log) removal of *Cryptosporidium* through filtration.

8.11.2.2. The turbidity of filtered water must be monitored at least once every 4 hours. The turbidity of filtered water for direct and conventional filtration systems must not exceed 0.3 NTU (1 NTU for slow sand and diatomaceous earth filters) in 95% of the analyses in a month, with a maximum of 1 NTU (5 NTU for slow sand and diatomaceous earth filters). If the turbidity exceeds the limit, the installation must provide notification in accordance with Paragraph 8.16. as soon as possible, but no later than 14 calendar days after the violation, and undertake corrective action.

8.11.2.3. Disinfection must provide the remaining log removal of *Giardia lamblia* cysts and viruses not obtained by the filtration technology applied. Proper conventional treatment typically removes 2.5-log *Giardia*/2.0-log viruses/2.0-log *Cryptosporidium*. Proper direct filtration and diatomaceous earth filtration remove 2.0-log *Giardia*/1.0-log viruses/2.0-log *Cryptosporidium*. Slow sand filtration removes typically removes 2.0-log *Giardia*/2.0-log viruses/2.0-log *Cryptosporidium*. Less log removal may be assumed if treatment is not properly applied.

8.11.2.4. Disinfection residual maintenance and monitoring requirements are the same as those for unfiltered systems outlined in Paragraph 8.11.1.2.

8.11.2.5. Surface water and GWUDI systems that make changes to their disinfection practices (e.g., change in disinfectant or application point) in order to meet the DDBP requirements in Paragraph 8.9 must ensure that protection from microbial pathogens is not compromised.

8.11.2.6. Use of alternate filtration technologies such as membrane processes and cartridge or bag filters for treatment of surface water for microbial contaminants must be approved by the appropriate DoD authority.

8.11.2.7. Conventional or direct filtration systems must continuously monitor (every 15 minutes) the individual filter turbidity for each filter used at the system. Systems with two or

fewer filters may monitor combined filter effluent turbidity continuously instead of individual filter turbidity monitoring. If a system exceeds 1.0 NTU in two consecutive measurements for 3 months in a row for the same filter, the installation must conduct an assessment of the filter within 14 calendar days.

8.11.2.7.1. The assessment must include at least the following components: assessment of filter performance, development of a filter profile, identification and prioritization of factors limiting filter performance, assessment of the applicability of corrections, and preparation of a self-assessment report.

8.11.2.7.2. If a system exceeds 2.0 NTU (in two consecutive measurements 15 minutes apart) for 2 months in a row, a comprehensive performance evaluation (CPE) must be conducted within 90 days. The CPE will review and analyze a treatment plant's performance-based capabilities and associated administrative, operation, and maintenance practices. The CPE is conducted to identify factors that may be adversely impacting a plant's capability to achieve compliance and emphasizes approaches that can be implemented without significant capital improvements.

8.11.2.7.3. The CPE must consist, at a minimum, of the following components: assessment of plant performance, evaluation of major unit processes, identification and prioritization of performance limiting factors, assessment of the applicability of comprehensive technical assistance, and preparation of a CPE report.

8.11.2.8. Installations must cover all finished water reservoirs, holding tanks, and storage water facilities.

8.11.3. Enhanced Treatment for Cryptosporidium for Systems that Use Surface Water or GWUDI.

8.11.3.1. Unfiltered Systems.

8.11.3.1.1. Initial Round of Source Water Monitoring.

A system serving at least 10,000 people must sample their source water for Cryptosporidium, E. coli, and turbidity at least monthly for 24 months. Systems serving less than 10,000 people must sample their source water for Cryptosporidium at least twice per month for 12 months or at least monthly for 24 months.

8.11.3.1.1.1. Systems that operate less than 6 months per year and monitor for Cryptosporidium must collect at least six Cryptosporidium samples per year during each of 2 years of monitoring. Samples must be evenly spaced throughout the plant's operation period. Systems must sample their source water only during the time that the plant operates.

8.11.3.1.1.2. A system that begins using a new source of surface water or GWUDI after the system is required to begin the initial round of source water monitoring must monitor the new source. The new system must also comply with determining the mean Cryptosporidium

level, Cryptosporidium inactivation treatment requirements, and the second round of source water monitoring that must start not later than 6 years following the initial determination of the mean Cryptosporidium level.

8.11.3.1.1.3. Unfiltered systems are not required to conduct initial source water monitoring if the system provides a total of at least 3.0-log Cryptosporidium inactivation.

8.11.3.1.2. Determine Mean Cryptosporidium Level.

Following the completion of the initial round of source water monitoring, calculate the arithmetic mean of all the Cryptosporidium sample concentrations reported.

8.11.3.1.2.1. The unfiltered system must report the arithmetic mean for approval to the appropriate DoD medical authority no later than 6 months after the month the system is required to complete the initial round of source water monitoring.

8.11.3.1.2.2. The arithmetic mean Cryptosporidium level must incorporate a summary of the source water monitoring data used for the calculation.

8.11.3.1.3. Cryptosporidium Inactivation Requirements.

Systems with a mean Cryptosporidium level of 0.01 oocysts per liter (oocysts/L) or less must provide at least 2.0-log Cryptosporidium inactivation. Systems with a mean Cryptosporidium level of greater than 0.01 oocysts/L must provide at least 3.0-log Cryptosporidium inactivation.

8.11.3.1.4. Inactivation Treatment Technology Requirements.

Unfiltered systems must use chlorine dioxide, ozone, or UV to meet the Cryptosporidium inactivation requirements. Unfiltered systems must meet the Cryptosporidium inactivation requirements using a minimum of two disinfectants. Each of two disinfectants must separately achieve the total inactivation required for Cryptosporidium, Giardia, or viruses.

8.11.3.1.5. Second Round of Source Water Monitoring.

Initiate the second round of source water monitoring 9 years after the initial round. A system must meet the requirements for monitoring parameters, frequency, and duration as described in Paragraph 8.11.3.1.1. unless the system provides a total of at least 3.0-log Cryptosporidium inactivation, equivalent to meeting the treatment requirements for unfiltered systems with a mean Cryptosporidium concentration greater than 0.01 oocysts/L.

8.11.3.1.5.1. The unfiltered system must report the arithmetic mean for approval to the appropriate DoD medical authority no later than 6 months after the month the system is required to complete the second round of source water monitoring. The arithmetic mean Cryptosporidium level must incorporate a summary of the source water monitoring data used for the calculation.

8.11.3.1.5.2. If the mean Cryptosporidium level for unfiltered systems changes following the second round of source water monitoring, and if the systems must provide a different level of Cryptosporidium treatment as a result of this change, the system must develop a schedule to meet treatment requirements.

8.11.3.2. Filtered Systems.

8.11.3.2.1. Initial Round of Source Water Monitoring.

A system serving at least 10,000 people must sample its source water for Cryptosporidium, E. coli, and turbidity at least monthly for 24 months. A system serving less than 10,000 people must sample its source water for E. coli at least once every 2 weeks for 12 months but may avoid E. coli monitoring if it is required to sample for Cryptosporidium. Systems serving fewer than 10,000 people must sample their source for Cryptosporidium at least twice per month for 12 months or at least monthly for 24 months if they use lake or reservoir sources and the annual mean E. coli concentration is greater than 10 E. coli/100 mL, or use flow stream sources and the annual mean E. coli concentration is greater than 50 E. coli/100 mL. Systems serving fewer than 10,000 people using GWUDI sources must comply with requirements for Cryptosporidium monitoring based on the E. coli level that applies to the nearest surface body. If no surface water body is nearby, the system must comply based on the requirements that apply to systems using lake or reservoir sources.

8.11.3.2.1.1. Systems that operate less than 6 months per year and monitor for Cryptosporidium must collect at least six Cryptosporidium samples per year during each of 2 years of monitoring. Samples must be evenly spaced throughout the plant's operation period. Systems must sample their source water only during the time the plant operates.

8.11.3.2.1.2. A system that begins using a new source of surface water or GWUDI, after the system is required to begin the initial round of source water monitoring, must monitor the new source. The new system must also comply with determining bin classification, Cryptosporidium inactivation treatment requirements, and the second round of source water monitoring which must start not later than 6 years following the initial bin determination.

8.11.3.2.1.3. Filtered systems are not required to conduct initial source water monitoring if the system provides a total of at least 5.5-log Cryptosporidium inactivation.

8.11.3.2.2. Determination of Cryptosporidium Bin Classification.

Following the completion of the initial round of source water monitoring, systems must calculate an initial Cryptosporidium bin concentration for each plant for which monitoring was required. If the monthly Cryptosporidium sampling frequency varies, systems must first compute a monthly average for each month of monitoring. Systems must then use these monthly average concentrations, rather than individual sample concentrations. Use Table 8.14 to determine initial bin classification.

8.11.3.2.2.1. For systems that collected a total of at least 48 samples, the bin concentration is equal to the arithmetic mean of all sample concentrations.

8.11.3.2.2.2. For systems that collected a total of at least 24 samples, but no more than 47 samples, the bin concentration is equal to the highest arithmetic mean of all sample concentrations in any 12 consecutive months during which the *Cryptosporidium* samples were collected.

8.11.3.2.2.3. For systems serving less than 10,000 people that monitor for *Cryptosporidium* for only 1 year (i.e., collect 24 samples in 12 months), the bin concentration is equal to the arithmetic mean of all sample concentrations.

8.11.3.2.2.4. For systems that operate only part of the year and that monitor fewer than 12 months per year, the bin concentration is equal to the highest arithmetic mean of all sample concentrations during any year of *Cryptosporidium* monitoring.

8.11.3.2.3. Inactivation Treatment Technology Requirements.

Systems must provide the level of additional treatment for *Cryptosporidium* inactivation specified in Table 8.15.

8.11.3.2.4. Second Round of Source Water Monitoring.

Initiate a second round of source water monitoring 9 years after the initial round. A system must meet the requirements for monitoring parameters, frequency, and duration as described in Paragraph 8.11.3.2.1. unless the system provides a total of at least 5.5-log of treatment for *Cryptosporidium*, which is equivalent to meeting the treatment requirements of Bin 4.

8.11.3.2.4.1. Filtered systems must recalculate their *Cryptosporidium* bin concentration following completion of the second round of source water monitoring.

8.11.3.2.4.2. If the classification for a filtered system changes following the second round of source water monitoring, the system must give the level of treatment required for *Cryptosporidium*.

8.11.3.2.4.3. Filtered systems may use one or more of the treatment and management options listed in Table 8.16.

8.12. GROUNDWATER TREATMENT REQUIREMENTS.

8.12.1. DoD PWSs that use only groundwater supplies not under the influence of surface water must provide adequate treatment. Systems that fail to meet the requirements for adequate treatment for longer than 24 hours must provide the notification in accordance with Paragraph

8.16. as soon as possible, but in no case later than 14 calendar days after the violation, and undertake corrective action.

8.12.2. Groundwater systems must provide treatment that reliably achieves at least a 4.0-log treatment of viruses (using disinfection, or a combination filtration and disinfection) before or at the first customer for the groundwater source. Groundwater systems are not allowed to discontinue 4.0-log treatment of viruses.

8.12.2.1. Disinfection Treatment.

8.12.2.1.1. Groundwater systems using chlorine for disinfection must achieve 4.0-log inactivation of viruses by meeting applicable CT values as shown in Table 8.24 in Appendix 8

8.12.2.1.2. Groundwater systems using chlorine dioxide for disinfection must achieve 0- log inactivation of viruses by meeting applicable CT values as shown in Table 8.26 in Appendix 4

8.12.2.1.3. Groundwater systems using ozone for disinfection must achieve 4.0-log inactivation of viruses by meeting applicable CT values as shown in Table 8.27 in Appendix 8 Groundwater systems that use ozone must also add a chemical disinfectant (chlorine, chloramines, chlorine dioxide) to maintain a disinfectant residual in accordance with Paragraph 8.2.2.1.3.1.

8.12.2.1.4. Groundwater systems are not allowed to use UV for disinfection as the only treatment provide Groundwater systems may use UV in combination with another disinfectant or in combination with filtration to achieve 4.0-log inactivation of viruses. Groundwater systems that use UV must also add a chemical disinfectant (chlorine, chloramines, chlorine dioxide) to maintain a disinfectant residual in accordance with Paragraph 8.2.2.1.3.1.

8.12.2.1.5. Groundwater systems providing disinfection treatment must meet the following monitoring requirements:

8.12.2.1.5.1. Groundwater systems serving a population of more than 3,300 must continuously monitor the residual disinfectant at the entry point to the distribution system and must record the lowest residual disinfectant concentration each day that the system is in operation. The lowest daily residual disinfectant concentration must be used to determine if 0-log inactivation of viruses is achieve If the system fails to achieve a 4.0-log inactivation of viruses for more than 1 day, the system is in violation of the treatment requirements and must provide public notification in accordance with Paragraph 8.16. as soon as possible, but in no case later than 14 calendar days after the violation, and undertake corrective action.

8.12.2.1.5.2. Groundwater systems serving a population of 3,300 or less must monitor and record the residual disinfectant at the entry point to the distribution system each day that the system is in operation. The recorded residual disinfectant concentration must be used to determine if 4.0-log inactivation of viruses is achieve If the system fails to achieve a 4.0-log inactivation of viruses for more than 1 day, the system is in violation of the treatment

requirements and must provide public notification in accordance with Paragraph 8.16. as soon as possible, but no later than 14 calendar days after the violation, and undertake corrective action.

8.12.2.2. Filtration and Disinfection Treatment.

8.12.2.2.1. Groundwater systems using filtration and disinfection treatment must achieve a total 4.0-log treatment of viruses either through disinfection treatment alone (in accordance with the disinfection treatment requirements in Paragraph 8.12.2.1.) or through a combination of filtration and disinfection treatment in accordance with the following requirements.

8.12.2.2.1.1. Groundwater systems using conventional filtration, direct filtration, diatomaceous earth filtration, or slow sand filtration must meet the turbidity requirements for filtered systems in Paragraph 8.12.2.2.

8.12.2.2.1.2. Groundwater systems using conventional or slow sand filtration that meet the turbidity requirements and provide proper filtration treatment achieve 2.0-log virus removal and must achieve 2.0-log virus inactivation through disinfection for a total 4.0-log treatment of viruses.

8.12.2.2.1.3. Groundwater systems using direct filtration or diatomaceous earth filtration that meet the turbidity requirements and provide proper filtration treatment achieve 1.0-log virus removal and must achieve 3.0-log virus inactivation through disinfection for a total 4.0-log treatment of viruses. Proper filtration treatment is generally considered to be operation and maintenance in accordance with best industry standards and practices (e.g., consistent use of a chemical coagulant). Less log removal may be assumed if treatment is not properly applied.

8.12.2.2.1.4. Groundwater systems must comply with the disinfection treatment and monitoring requirements as delineated under disinfection treatment in Paragraph 8.12.2.1.5.

8.12.2.2.2. Groundwater systems using alternative filtration technology, such as membrane filtration, must demonstrate to the appropriate DoD medical authority that the alternative filtration technology, in combination with disinfection treatment, consistently achieves 4.0-log treatment of viruses.

8.13. FILTER BACKWASH REQUIREMENTS.

To prevent microbes and other contaminants from passing through and into finished drinking water, DoD PWSs must ensure that recycled streams (i.e., recycled filter backwash water, sludge thickener supernatant, and liquids from dewatering processes) are treated by direct and conventional filtration processes. This requirement only applies to DoD PWSs that:

8.13.1. Use surface water or GWUDI and are in control of the treatment plant in accordance with Paragraph 8.2.

8.13.2. Use direct or conventional filtration processes.

8.13.3. Recycle spent filter backwash water, sludge thickener supernatant, or liquids from dewatering processes.

8.14. ALTERNATIVE WATER SUPPLIES.

Installations will, if necessary to protect public health, only use alternative water sources, including point-of-entry and point-of-use treatment devices, bottled water, and bulk water supplies that are approved by the installation commander upon recommendation by the appropriate DoD medical and veterinary authority.

8.14.1. The use of point-of-use treatment devices to comply with microbiological contaminant requirements (e.g., coliform bacteria) and VOC MCLs is prohibited.

8.14.2. Point-of-entry and point-of-use treatment devices used to comply with drinking water quality requirements of this section must be owned, operated, and maintained by the water system.

8.14.3. Monitoring for applicable contaminants covered by this section is required.

8.14.4. Bottled water is water that is sealed in bottles, packages, or other containers by commercial (non-military) interests for human consumption. When purchased as an alternative drinking source, bottled water must originate from a US Army Veterinary Services approved source.

8.15. CONSUMER CONFIDENCE REPORTS.

DoD CWSs must deliver to the population served by the CWS a consumer confidence report (i.e., water quality report) annually by July. The report will provide water quality data collected during the prior calendar year. Delivery can be accomplished through one or more of the following methods: posting to an installation website, publication in an installation newspaper, posting in public places such as community centers in housing areas, and hand or postal delivery. At a minimum, consumer confidence reports must include:

8.15.1. Name, phone number, and e-mail for a water system contact person.

8.15.2. Source(s) of water.

8.15.3. Definitions (e.g., definition of MCL).

8.15.4. Information about contaminants detected.

8.15.5. Information about compliance with drinking water standards in this section.

8.15.6. Additional information, as appropriate, regarding system operations, drinking water quality, and public information.

8.16. NOTIFICATION REQUIREMENTS.

8.16.1. When a DoD PWS is out of compliance as set forth in this section, the appropriate DoD medical authority and installation population must be notified within the time frames identified in Paragraphs 8.4 through 8.12. The notice must provide:

8.16.1.1. A clear and readily understandable explanation of the violation.

8.16.1.2. Any potential adverse health effects; the population at risk.

8.16.1.3. The steps being taken to correct the violation.

8.16.1.4. The necessity for seeking an alternative water supply, if any.

8.16.1.5. Any preventive measures the consumer should take until the violation is corrected.

8.16.2. The appropriate DoD medical authority, in coordination with the Turkish Installation Commander, must coordinate notification of Turkish authorities in cases where Turkish populations are at risk.

Table 8.1. Total Coliform Monitoring Frequency

POPULATION SERVED	NUMBER OF SAMPLES ^a	POPULATION SERVED	NUMBER OF SAMPLES ^a
25 to 1,000 ^b	1	59,001 to 70,000	70
1,001 to 2,500	2	70,001 to 83,000	80
2,501 to 3,300	3	83,001 to 96,000	90
3,301 to 4,100	4	96,001 to 130,000	100
4,101 to 4,900 ^c	5	130,001 to 220,000	120
4,901 to 5,800	6	220,001 to 320,000	150
5,801 to 6,700	7	320,001 to 450,000	180
6,701 to 7,600	8	450,001 to 600,000	210
7,601 to 8,500	9	600,001 to 780,000	240
8,501 to 12,900	10	780,001 to 970,000	270
12,901 to 17,200	15	970,001 to 1,230,000	300
17,201 to 21,500	20	1,230,001 to 1,520,000	330
21,501 to 25,000	25	1,520,001 to 1,850,000	360
25,001 to 33,000	30	1,850,001 to 2,270,000	390
33,001 to 41,000	40	2,270,001 to 3,020,000	420
41,001 to 50,000	50	3,020,001 to 3,960,000	450
50,001 to 59,000	60	3,960,001 or more	480
a Minimum number of routine samples per month. b A non-community water system (NCWS) using groundwater and serving a population of 1,000 or less may monitor once in each calendar quarter during which the system provides water, provided a sanitary survey conducted within the last 5 years shows the system is supplied solely by a protected groundwater source and free of sanitary defects. c Systems that use groundwater, serve a population of less than 4,900, and collect samples from different sites may collect all samples on a single day. All other systems must collect samples at regular intervals throughout the month. d Samples shall be taken to ensure compliance with the parameters at the following locations: • In the case of water supplied from a distribution network, at the point within the premises or facility at which it emerges from taps that are normally used for human consumption; • In the case of water supplied from a tanker, at the point at which it emerges from the tanker; and/or • In the case of water put into bottles or containers intended for sale, at the point at which water is put into the bottles or containers.			

Table 8.2. Other Bacteriological Parameters

CONTAMINANT	MCL	
E.coli ¹	0	Colonies per 100 mL
Enterococci ²	0	Colonies per 100 mL

Notes:

1 - Number of annual samples required per Table 8.12.

2 - Number of annual samples required per Table 8.13.

Table 8.3. Inorganic Chemical MCLs

CONTAMINANT	MCL (mg/L unless otherwise noted)
Aluminum ^g	0.02
Arsenic ^{a,g}	0.010
Antimony ^{a,g}	0.006
Asbestos ^{a,h}	7 million fibers/liter (longer than 10 micrometers)
Barium ^{a,h}	2.0
Beryllium ^{a,h}	0.004
Boron ^g	1.0
Bromate ^{d,g}	0.01
Cadmium ^{a,g}	0.005
Chromium ^{a,g}	0.1
Copper	1.3
Cyanide ^{a,g}	0.2 (as free cyanide)
Fluoride ^{b,g}	1.5
Fluoride (Secondary MCL) ^{c,g}	4.0
Iron ^g	0.2
Lead ^j	0.01
Manganese ^g	0.05
Mercury ^{a,g}	0.001
Nickel ^{a,e}	0.02
Nitrate ^{e,g,j}	10 (as N)
Nitrite ^{e,g,j}	0.5 (as NO ₂)
Total Nitrite and Nitrate ^{e,g}	10 (as N)
Selenium ^{a,g}	0.01
Sodium ^{e,g}	200
Thallium ^{a,h}	0.002
mg/L = milligram per liter a MCLs apply to CWSs and NTNCWSs. b MCL applies only to CWSs. c Fluoride secondary MCL applies to CWSs for notification purposes only. d The value must be as low as possible without compromising the effectiveness of disinfection. e Sodium and nickel levels shall be reported to the DoD medical authority upon receipt of analysis. f MCLs apply to CWSs, NTNCWSs, and TNCWSs. g For these chemicals, the system is out of compliance when an MCL is exceeded. Samples must conform with the criteria of Paragraph 8.3.1 h For systems monitored quarterly or more frequently, a system is out of compliance if the annual running average concentration of an inorganic chemical exceeds the MCL. For systems monitored annually or less frequently, a system is out of compliance if a single sample exceeds the MCL. Samples must conform with the criteria of Paragraph 8.3.1 i The installation must take all necessary measures to reduce, to the maximum extent practicable, the concentration of lead in drinking water. j The value applies to samples taken at the outlet of the water treatment plant, $[\text{nitrate}]/50 + [\text{nitrite}]/3 \leq 1$, where the brackets represent the concentration in mg/L for nitrates and for nitrites, and the limit value of 0.10 mg/L for nitrites.	

Table 8.4. Inorganic Chemical Monitoring Requirements

CONTAMINANT	GROUNDWATER BASELINE REQUIREMENT ^a	SURFACE WATER BASELINE REQUIREMENT	TRIGGER THAT INCREASES MONITORING ^b	REDUCED MONITORING
Aluminum	See Table 8.13.		-	-
Arsenic	See Table 8.13.		>MCL	-
Antimony	See Table 8.13.		>MCL	-
Barium	1 sample/every 3 years	Annual sample	>MCL	-
Beryllium	1 sample/every 3 years	Annual sample	>MCL	-
Boron	See Table 8.13.		-	-
Bromate	See Table 8.13.		-	-
Cadmium	See Table 8.13.		>MCL	-
Chromium	See Table 8.13.		>MCL	-
Copper	See Table 8.13.		-	-
Cyanide	See Table 8.13.		>MCL	-
Fluoride	See Table 8.13.		>MCL	-
Iron	See Table 8.13.		-	-
Manganese	See Table 8.13.		-	-
Mercury	See Table 8.13.		>MCL	-
Nickel	See Table 8.13.		-	-
Selenium	See Table 8.13.		>MCL	-
Thallium	1 sample/every 3 years	Annual sample	>MCL	-
Sodium	See Table 8.13.		-	-
Asbestos ^c	1 sample/every 9 years	1 sample/every 9 years	>MCL	Yes
Total Nitrate/Nitrite	Annual sample	Quarterly	≥50% Nitrite MCL	-
Nitrate ^{d,e}	See Table 8.13.		≥50% MCL	-
Nitrite ^{d,e}	See Table 8.13.		≥50% MCL	-
Corrosivity ^f	Once	Once	-	-

Table 8.4. Inorganic Chemical Monitoring Requirements, Continued

a	Samples for barium, beryllium, thallium, asbestos, total nitrite/nitrate, and corrosivity shall be taken as follows: groundwater systems shall take a minimum of one sample at every entry point to the distribution system which is representative of each well after treatment; surface water systems shall take at least one sample at every entry point to the distribution system after any application of treatment or in the distribution system at a point which is representative of each source after the treatment.
b	Increased quarterly monitoring requires a minimum of 2 samples per quarter for groundwater systems and at least 4 samples per quarter for surface water systems, unless an applicable standard in Table 8.13 requires more at which point Table 8.13 shall be the standard.
c	Necessity for analysis is predicated upon a sanitary survey conducted by the PWS.
d	Any sampling point with an analytical value greater than or equal to 0.5 mg/L as N (50% of the nitrite MCL) must begin sampling for nitrate and nitrite separately. Since nitrite readily converts to nitrate, a system can conclude that if the total nitrate/nitrite value of a sample is less than 50% of the nitrite MCL, then the value of nitrite in the sample would also be below 50% of its MCL.
e	Increased monitoring frequency must be quarterly for at least 1 year following any one sample for nitrate or nitrite in which the concentration is greater than or equal to 50% of the MCL, unless an applicable standard in Table 8.13 requires more at which point Table 8.13 shall be the standard. Groundwater systems may return to baseline monitoring requirements if all sample results are less than the nitrate or nitrite MCLs.
f	PWSs must be analyzed to determine the corrosivity entering the distribution system. Two samples (one mid-winter and one mid-summer) must be collected at the entry point of the distribution system for systems using surface water and groundwater under the direct influence (GWUDI). One sample must be collected for systems using only groundwater. Corrosivity characteristics of the water must include measurements of pH, calcium, hardness, alkalinity, temperature, total dissolved solids, and calculation of the Langelier Saturation Index.

Table 8.5. Recommended Fluoride Concentrations at Different Temperatures

ANNUAL AVERAGE OF MAXIMUM DAILY AIR TEMPERATURES (°F)	CONTROL LIMITS (mg/L)		
	LOWER	OPTIMUM	UPPER
50.0 - 53.7	0.9	1.2	1.5
53.8 - 58.3	0.8	1.1	1.5
58.4 - 63.8	0.8	1.0	1.3
63.9 - 70.6	0.7	0.9	1.2
70.7 - 79.2	0.7	0.8	1.0
79.3 - 90.5	0.6	0.7	0.8

Table 8.6. Monitoring Requirements for Lead and Copper Water Quality Parameters

POPULATION SERVED	NO. OF SITES FOR STANDARD MONITORING ^a	NO. OF SITES FOR REDUCED MONITORING ^b	NO. OF SITES FOR WATER QUALITY PARAMETERS ^c
>100,000	100	50	25
10,001 - 100,000	60	30	10
3,301 - 10,000	40	20	3
501 - 3,300	20	10	2
101 - 500	10	5	1
<100	5	5	1
a Every 6 months for lead and copper. b Annually for lead and copper if action levels are met during each of two consecutive 6-month monitoring periods. Any small- or medium-sized system (serving a population of less than 50,000) that meets the lead and copper action levels during 3 consecutive years may reduce the monitoring for lead and copper from annually to once every 3 years. Annual or triennial sampling must be conducted during the four warmest months of the year. c This monitoring must be conducted by all large systems (serving a population of greater than 50,000). Small- and medium-sized systems must monitor water quality parameters when action levels are exceeded. Samples must be representative of water quality throughout the distribution system and include a sample from the entry to the distribution system. Samples must be taken in duplicate for pH, alkalinity, calcium, conductivity or total dissolved solids, and water temperatures to allow a corrosivity determination (via a Langelier Saturation Index or other appropriate saturation index); additional parameters are orthophosphate when a phosphate inhibitor is used and silica when a silicate inhibitor is used.			

Table 8.7. Organic Chemical MCLs

ORGANIC CHEMICALS	mg/L	DETECTION LIMIT, mg/L
SOCs ^b		
Alachlor	0.0001	0.0002
Atrazine	0.0001	0.0001
Benzo[a]pyrene	0.0001	0.00002
Carbofuran	0.0001	0.0009
Chlordane	0.0003	0.0002
Dalapon	0.0001	0.001
2,4-D	0.00001	0.0001
1,2-Dibromo-3-chloropropane (DBCP)	0.0001	0.00002
Di (2-ethylhexyl) adipate	0.0001	0.0006
Di (2-ethylhexyl) phthalate	0.0001	0.0006
Dinoseb	0.0003	0.0002
Diquat	0.0001	0.0004
Endrin	0.0001	0.00001
Endothall	0.0001	0.009
Ethylene dibromide (EDB)	0.0001	0.00001
Glyphosate	0.0001	0.006
Heptachlor	0.0001	0.00004
Heptachlorepoxyde	0.0001	0.00002
Hexachlorobenzene	0.0001	0.0001
Hexachlorocyclopentadiene	0.00005	0.0001
Lindane	0.0001	0.00002
Methoxychlor	0.0003	0.0001
Oxamyl (Vydate)	0.0002	0.002
PCBs (as decachlorobiphenyls)	0.0001	0.0001
Pentachlorophenol	0.0001	0.00004
Picloram	0.0001	0.0001
Simazine	0.0001	0.00007
2,3,7,8-TCDD (Dioxin)	0.0001	0.000000005
Toxaphene	0.0005	0.001
2,4,5-TP (Silvex)	0.0001	0.0002
Total Pesticides	0.0001	
VOCs		
Benzene	0.001	0.0005
Carbon tetrachloride	0.005	0.0005
o-Dichlorobenzene	0.6	0.0005
cis-1,2-Dichloroethylene	0.07	0.0005
trans-1,2-Dichloroethylene	0.1	0.0005
1,1-Dichloroethylene	0.007	0.0005
1,1,1-Trichloroethane	0.20	0.0005
1,2-Dichloroethane	0.005	0.0005
Dichloromethane	0.005	0.0005
1,1,2-Trichloroethane	0.005	0.0005
1,2,4-Trichloro-benzene	0.07	0.0005
1,2-Dichloropropane	0.005	0.0005
Ethylbenzene	0.7	0.0005

Table 8.7. Organic Chemical MCLs, Continued

ORGANIC CHEMICALS	mg/L	DETECTION LIMIT, mg/L
VOCs		
Monochlorobenzene	0.1	0.0005
para-Dichlorobenzene	0.075	0.0005
Styrene	0.1	0.0005
Tetrachloroethylene	0.005	0.0005
Trichloroethylene	0.005	0.0005
Toluene	1.0	0.0005
Vinyl chloride	0.002	0.0005
Xylene (total)	10	0.0005
OTHER ORGANICS		
Acrylamide	treatment technique 0.05% dosed at 1 part per million ^a	
Epichlorohydrin	treatment technique 0.01% dosed at 20 parts per million ^a	
Total Polycyclic Aromatic Hydrocarbons ^c		
PCB = polychlorinated biphenyl		
a Only applies when adding these polymer flocculants to the treatment process. No sampling is required; the system certifies that dosing is within specified limits.		
b Only those pesticides suspected of being present in the water supply require monitoring.		
c The specific compounds are benzo(b)fluoranthene, benzo(k)fluoranthane, benzo(ghi)perylene, and indeno(1,2,3-cd)pyrene.		

Table 8.8. Organic Chemical Monitoring Requirements

CONTAMINANT	BASE MONITORING FREQUENCY ^a		TRIGGER FOR INCREASED MONITORING ^b	REDUCED MONITORING
	GROUND WATER	SURFACE WATER		
VOCs ^{g, h}	One sample every 3 years	Annual	>0.0005 mg/L	Yes ^{c,d}
PCBs ^h	Four consecutive quarterly samples every 3 years	Four consecutive quarterly samples every 3 years	>Detection limit ^e	Yes ^{d,f}
PESTICIDES ⁱ	See Table 8.13.		>Detection limit ^e	-

a Groundwater systems shall take a minimum of one sample at every entry point which is representative of each well after treatment; surface water systems will take a minimum of one sample at every entry point to the distribution system at a point which is representative of each source after treatment. For CWS, monitoring compliance is to be met within 1 year of the publishing of the FGS; for NTNCW, compliance is to be met within 2 years of the publishing of the FGS.

b Increased monitoring requires a minimum of 2 quarterly samples for groundwater systems, and at least 4 quarterly samples for surface water systems, unless an applicable standard for pesticides; benzene; benzo(a)pyrene; 1,2-dichloroethane; tetrachloroethylene; and trichloroethylene found in Table 8.13 requires more at which point Table 8.13 shall be the standard.

c Systems that have demonstrated they are reliably and consistently below MCLs may reduce monitoring to annually (one sample every year). After 3 years of annual samples with no detections, systems may return to the base monitoring frequency.

d Monitoring frequency may be reduced if warranted based on a sanitary survey of the PWS.

e Detection limits provided in Table 8.7 or as determined by the best available testing methods.

f For systems monitoring at the base monitoring frequency with one round of no detections (e.g., 4 consecutive quarters with no detections) may further reduce monitoring frequency to the following: systems serving a population greater than 3,300 may reduce to two consecutive quarterly samples within 1 year during a period of 3 years; systems serving a population less than 3,300 may reduce to one sample every 3 years.

g Includes all VOCs listed in Table 8.7. For the following five VOCs, monitoring frequency shall be determined from the greater number of samples required here in Table 8.8 or per Table 8.13 for each chemical. Compliance for these chemicals shall be based on a single exceedance, provided the sample meets the conditions of Paragraph 8.3.1:

- benzene;
- benzo(a)pyrene;
- 1,2-dichloroethane;
- tetrachloroethylene; and
- trichloroethylene.

h Compliance for VOCs (except those VOCs mentioned in Note g) and PCBs is based on an annual running average for each sample point for systems monitoring quarterly or more frequently; for systems monitoring annually or less frequently, compliance is based on a single sample, unless the appropriate DoD medical authority requests a confirmation sample. A system is out of compliance if any contaminant exceeds the MCL.

i Compliance is based on a single exceedance, provided the sample meets the conditions of Paragraph 8.3.1.

Table 8.9. DDBP Monitoring Requirements

SOURCE WATER TYPE	POPULATION SERVED BY SYSTEM	ANALYTE AND ROUTINE MONITORING FREQUENCY	NUMBER OF SAMPLING LOCATIONS
Surface water or GWUDI	50,000 or more	TTHM & HAA5 – Quarterly	8
Surface water or GWUDI	10,000 – 49,999	TTHM & HAA5 –Quarterly	4
Surface water or GWUDI	Serving 500 to 9,999	TTHM & HAA5 – Quarterly	2
Surface water or GWUDI	499 or less	TTHM & HAA5 ^a - Yearly	2
Groundwater	10,000 or more	TTHM & HAA5 – Quarterly	4
Groundwater	500 - 9,999	TTHM & HAA5 – Yearly	2
Groundwater	499 or less	TTHM & HAA5 – Yearly	2
WATER SYSTEM CRITERIA		ANALYTE AND ROUTINE MONITORING FREQUENCY	
Water systems using chlorine dioxide		Chlorite - Daily and Monthly	
		Chlorine Dioxide – Daily	
Water systems using ozone		Bromate – Monthly	
Water systems using chlorine		Chlorine - Same time and location as monthly bacteriological samples in accordance with Paragraph 8.4.	
Water systems using chloramines		Chloramines –Same time and location as monthly bacteriological samples in accordance with Paragraph 8.4.	
Water systems using surface water or GWUDI		TOC – Monthly	
a A surface water or GWUDI water system serving a population of 499 or less must sample two locations per year to meet routine monitoring requirements. Samples must be collected during the month of warmest water temperature. Reduced monitoring is not allowed.			

Table 8.10. Radionuclide MCLs

CONTAMINANT	MCL
Gross Alpha ^{a,c}	2.7 pCi/L
Combined Radium-226 and -228	5 pCi/L
Beta Particle and Photon Radioactivity ^b	4 mrem/year
Gross Beta ^c	27 pCi/L
Uranium	30 micrograms per liter
Tritium ^d	2,700 pCi/L
Total Indicative Dose ^{d,e}	0.10 MSV/year
mrem/year = millirem per year, pCi/L = picoCuries per liter a Gross alpha activity includes radium-226, but excludes radon and uranium. b Beta particle and photon activity is also referred to as gross beta activity from manmade radionuclides. c Gross Alpha and Gross Beta subject to Audit Monitoring in Table 8.13. d Tritium and Total Indicative Dose shall be monitored at a frequency determined by the appropriate DoD medical authority, provided the water is below these MCLs. Otherwise, these parameters are subject to Audit Monitoring. e Excluding tritium, potassium-40, radon and radon decay products.	

Table 8.11. Other Indicator Parameters

PARAMETER	MCL	UNIT	NOTES
Ammonium	0.50	mg/L	
Chloride	250	mg/L	Note 1
Color	Acceptable to consumers and no abnormal change		
Conductivity	2500	at 20 ° c: $\mu\text{S}/\text{cm}$	Note 1
pH	≥ 6.5 and ≤ 9.5	pH units	Note 1
Odor	Acceptable to consumers and no abnormal change		
Oxidizability	5	mg/L of O_2	Note 2
Sulfate	250	mg/L	Note 1
Taste	Acceptable to consumers and no abnormal change		
Total Organic Carbon (TOC)	No abnormal change		Note 3
Turbidity	Acceptable to consumers and no abnormal change		Note 4

1 – Water should not be corrosive.

2 – This parameter need not be analyzed if the TOC parameter is analyzed.

3 – See also Table 8.9 for additional TOC monitoring requirements for systems that use conventional filtration treatment.

4 – When using surface water, turbidity shall not exceed 1.0 NTU. See also Paragraph 8.11. for additional Turbidity monitoring requirements.

General – Indicator parameters are subject to either Check Monitoring or Audit Monitoring per Table 8.12 or Table 8.13, respectively.

Table 8.12. Check Monitoring Requirements

CHECK MONITORING ⁵			
PARAMETER	DAILY AVE PRODUCTION	STANDARD MONITORING ¹	REDUCED MONITORING ^{1, 2}
Ammonium Aluminum ³	≤100 m ³	2	1
Color Conductivity E.coli	>100 and ≤1,000 m ³	4	2
Iron Nitrite/Nitrate ⁴ Odor pH	>1,000 m ³ and ≤10,000 m ³	4 + 3 for each increment of 1,000 m ³	At least 50% of standard monitoring
Turbidity Taste	>10,000 m ³	31 + 3 for each increment of 1,000 m ³	At least 50% of standard monitoring

Notes:

1 – The number of monitoring events required annually. Monitoring events shall be spaced out as evenly as possible throughout the year.

2 – Reduced monitoring is only allowed if permitted by the appropriate DoD medical authority and if the following conditions are met:

- Parameter values during previous 2 successive years are stable and well below established MCLs.
- Nothing is likely to deviate or cause deterioration in water quality.

3 – Only required when used in the treatment process. Otherwise use audit monitoring.

4 – Only required when chloramination is used as a disinfectant. Otherwise use audit monitoring.

5 – Compliance is based on a single exceedance, provided the sample meets the conditions of Paragraph 8.3.1

Table 8.13. Audit Monitoring Requirements

AUDIT MONITORING ²			
PARAMETER		DAILY AVE PRODUCTION	AUDIT MONITORING ¹
Acrylamide	Manganese	≤100 m ³	1
Aluminum ⁴	Mercury		
Antimony	Nickel		
Arsenic	Nitrate		
Benzene	Nitrite/Nitrate ³	>100 and ≤1,000 m ³	1
Benzo(a)pyrene	Oxidizability		
Boron	Pesticides and related products	>1,000 m ³ and ≤10,000 m ³	1 + 3 for each increment of 3,300 m ³
Bromate	Polycyclic- Aromatic-Hydrocarbons (PAHs)		
Cadmium	Selenium	>10,000 m ³	3 + 1 for each increment of 10,000 m ³
Chloride	Sodium		
Chromium	Sulphate		
Cyanide	Tetrachloroethylene		
1,2-dichloroethane	Tetrachloromethane		
Enterococci	Total Indicative Dose		
Epihydrochlorin	Total Organic Carbon		
Fluoride	Trichloroethylene		
Gross alpha	Trihalomethanes		
Gross beta	Tritium		
	Vinyl Chloride		

Notes:

1 – The number of monitoring events required annually. Monitoring events shall be spaced out as evenly as possible throughout the year.

2 – Compliance is based on a single exceedance, provided the sample meets the conditions of Paragraph 8.3.1

3 – Use check monitoring when chloramination is used as a disinfectant.

4 – When used in the treatment process, use check monitoring. Otherwise use audit monitoring as stated here.

Table 8.14. Bin Classification for Filtered Systems

BIN CLASSIFICATION	<i>CRYPTOSPORIDIUM</i> BIN CONCENTRATION
Bin 1	< 0.075 oocysts/L
Bin 2	$0.075 \text{ oocysts/L} \leq \textit{Cryptosporidium} < 1.0 \text{ oocysts/L}$
Bin 3	$1.0 \text{ oocysts/L} \leq \textit{Cryptosporidium} < 3.0 \text{ oocysts/L}$
Bin 4	$\textit{Cryptosporidium} \geq 3.0 \text{ oocysts/L}$

Table 8.15. Additional Treatment for *Cryptosporidium* Inactivation

BIN CLASSIFICATION OF SYSTEM	FILTRATION SYSTEMS			
	CONVENTIONAL FILTRATION TREATMENT (INCLUDING SOFTENING)	DIRECT FILTRATION	SLOW SAND OR DIATOMACEOUS EARTH FILTRATION	ALTERNATIVE FILTRATION TECHNOLOGIES
Bin 1	No additional treatment	No additional treatment	No additional treatment	No additional treatment
Bin 2	1.0-log treatment	1.5-log treatment	1.0-log treatment	4.0-log removal and inactivation
Bin 3 ^a	2.0-log treatment	2.5-log treatment	2.0-log treatment	5.0-log removal and inactivation
Bin 4 ^a	2.5-log treatment	3.0-log treatment	2.5-log treatment	5.5-log removal and inactivation

^a Systems classified in Bins 3 and 4 must achieve at least 1.0-log of additional *Cryptosporidium* treatment using either one or a combination of the following: bag filters, bank filtration, cartridge filters, chlorine dioxide, membranes, ozone, or UV.

Table 8.16. Microbial Toolbox

OPTIONS	<i>CRYPTOSPORIDIUM</i> TREATMENT CREDIT AND IMPLEMENTATION CRITERIA
SOURCE PROTECTION AND MANAGEMENT	
Watershed control Program ^a	0.5-log credit for program comprising required elements, annual program status report, and regular watershed survey.
PRE-FILTRATION	
Pre-sedimentation basin with coagulation	0.5-log credit during any month that pre-sedimentation basins achieve a monthly mean reduction of 0.5-log or greater in turbidity or alternative State-approved performance criteria. ^b
Two-stage lime softening	0.5-log credit for two-stage softening where chemical addition and hardness precipitation occur in both stages. All plant flow must pass through both stages. ^c
Bank filtration	0.5-log credit for 25-foot setback; 1.0-log credit for 50-foot setback; aquifer must be unconsolidated sand containing at least 10% fines; average turbidity in wells must be less than 1 NTU. ^d
TREATMENT PERFORMANCE	
Combined filter performance	0.5-log credit for combined filter effluent turbidity less than or equal to 0.15 NTU in at least 95% of measurements each month.
Individual filter performance	0.5-log credit (in addition to 0.5-log combined filter performance credit) if individual filter effluent turbidity is less than or equal to 0.15 NTU in at least 95% of samples each month in each filter and is never greater than 0.3 NTU in two consecutive measurements in any filter.
ADDITIONAL FILTRATION	
Bag or cartridge filters (individual filters)	Up to 2.0-log credit based on the removal efficiency demonstrated during challenge testing ^e with a 1.0-log factor of safety.
Bag or cartridge filters (in series)	Up to 2.5-log credit based on the removal efficiency demonstrated during challenge testing ^e with a 0.5-log factor of safety.
Membrane filtration	Log credit equivalent to removal efficiency demonstrated in challenge testing, direct integrity testing, and continuous indirect integrity monitoring. The required testing applies to other pathogens if membrane removal credits are claimed.
Second stage filtration	0.5-log credit for second separate granular media filtration stage if treatment train includes coagulation before first filter.
Slow sand filters	2.5-log credit as secondary filtration step; 3.0-log credit as a primary filtration process. ^f
INACTIVATION	
Chlorine dioxide	Log credit based on measured CT in relation to Table 8.32.
Ozone	Log credit based on measured CT in relation to Table 8.33
UV	Log credit based on validated UV dose in relation to Table 8.34. ^g

Table 8.16. Microbial Toolbox, Continued

- a Unfiltered systems are not eligible for credit.
- b To be eligible, basins must be operated continuously with coagulant addition and all plant flow must pass through basins.
- c Single-stage softening is credited as equivalent to conventional treatment.
- d Systems using wells followed by filtration when conducting source water monitoring must sample the well to determine bin classification and are not eligible for additional credit.
- e Bag and cartridge filter systems must complete challenge testing in order to receive *Cryptosporidium* treatment credit. The challenge testing must meet the following criteria:
 - i. Test must be performed full-scale, identical to the construction, configuration (i.e., either individual filters or in series) and housing of the original system.
 - ii. Test must be conducted using *Cryptosporidium* or a surrogate that is removed no more efficiently than *Cryptosporidium*. A method capable of discreetly quantifying the specific microorganism or surrogate must be used to determine concentration. Turbidity may not be used.
 - iii. Maximum feed water concentration is based on the detection limit of the microorganism or surrogate and it can be computed using this equation:

$$\text{Maximum Feed Concentration} = (1 \times 10^4) \times (\text{Filter Detection Limit})$$

- iv. Test must be conducted at the maximum design flow rate for the filter as specified by manufacturer.
- v. Removal efficiency of a filter is determined by applying this formula:

$$\text{LRV} = \text{LOG}_{10}(\text{Cf}) - \text{LOG}_{10}(\text{Cp})$$

Where: LRV = Log removal value demonstrated during challenge test.

Cf = Feed concentration measured during challenge test (same units as Cp).

Cp = Filtrate concentration measured during the challenge test (same units as Cf).

If *Cryptosporidium* or surrogate is not detected in the filtrate, then the term Cp must be set equal to the detection limit.

- vi. Each filter tested must be challenged with *Cryptosporidium* or the surrogate during three periods over the filtration cycle: (1) within 2 hours of startup of a new filter; (2) when the pressure drop is between 45 and 55% of the terminal pressure drop; and (3) at the end of the cycle after pressure drop has reached 100% of the terminal pressure drop. The LRV for the filter (LRV_{filter}) must be assigned the value of the minimum LRV observed during the three challenge periods for that filter.
- vii. If fewer than 20 filters are tested, the overall removal efficiency for the filter product line must be set equal to the lowest LRV_{filter} among the filters tested. If 20 or more filters are tested, the overall removal efficiency for the filter product line must be set equal to the 10th percentile of the set of LRV_{filter} values for the various filters tested.
- viii. If a previously tested filter is modified in a manner that could change the removal efficiency of the filter product line, challenge testing to demonstrate the removal efficiency of the modified filter must be conducted and submitted to the appropriate DoD medical authority.
- f No prior chlorination for either option.
- g Reactor validation testing required to establish UV dose and associated operating conditions.

APPENDIX 8A: DRINKING WATER DISINFECTION TABLES

Table 8.17. Estimated Baffling Factors

BAFFLING CONDITION	BAFFLING FACTOR	BAFFLING DESCRIPTION
Partial Bypass	0.0	Tank with common inlet and outlet.
Unbaffled (mixed flow)	0.1	None, agitated basin, very low length to width ratio, high inlet and outlet flow velocities.
Poor	0.3	Single or multiple unbaffled inlets and outlets, no intra-basin baffles.
Average	0.5	Baffled inlet or outlet with some intra-basin baffles.
Superior	0.7	Perforated inlet baffle, serpentine or perforated intra-basin baffles, outlet weir or perforated launders.
Perfect (plug flow)	1.0	Very high length to width ratio (pipeline flow), perforated inlet, outlet, and intra-basin baffles.

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Table 8.18. CT Values for Inactivation of Giardia Cysts by Free Chlorine at 0.5 °C [32.9 °F] or Lower^a

CHLORINE CONCENTRATION (mg/L)	pH ≤ 6						pH = 6.5						pH = 7.0						pH = 7.5					
	LOG INACTIVATIONS						LOG INACTIVATIONS						LOG INACTIVATIONS						LOG INACTIVATIONS					
	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0
≤0.4	23	46	69	91	114	137	27	54	82	109	136	163	33	65	98	130	163	195	40	79	119	158	198	237
0.6	24	47	71	94	118	141	28	56	84	112	140	168	33	67	100	133	167	200	40	80	120	159	199	239
0.8	24	48	73	97	121	145	29	57	86	115	143	172	34	68	103	137	171	205	41	82	123	164	205	246
1	25	49	74	99	123	148	29	59	88	117	147	176	35	70	105	140	175	210	42	84	127	169	211	253
1.2	25	51	76	101	127	152	30	60	90	120	150	180	36	72	108	143	179	215	43	86	130	173	216	259
1.4	26	52	78	103	129	155	31	61	92	123	153	184	37	74	111	147	184	221	44	89	133	177	222	266
1.6	26	52	79	105	131	157	32	63	95	126	158	189	38	75	113	151	188	226	46	91	137	182	228	273
1.8	27	54	81	108	135	162	32	64	97	129	161	193	39	77	116	154	193	231	47	93	140	186	233	279
2	28	55	83	110	138	165	33	66	99	131	164	197	39	79	118	157	197	236	48	95	143	191	238	286
2.2	28	56	85	113	141	169	34	67	101	134	168	201	40	81	121	161	202	242	50	99	149	198	248	297
2.4	29	57	86	115	143	172	34	68	103	137	171	205	41	82	124	165	206	247	50	99	149	199	248	298
2.6	29	58	88	117	146	175	35	70	105	139	174	209	42	84	126	168	210	252	51	101	152	203	253	304
2.8	30	59	89	119	148	178	36	71	107	142	178	213	43	86	129	171	214	257	52	103	155	207	258	310
3	30	60	91	121	151	181	36	72	109	145	181	217	44	87	131	174	218	261	53	105	158	211	263	316

CHLORINE CONCENTRATION (mg/L)	pH ≤ 8						pH = 8.5						pH = 9.0					
	LOG INACTIVATIONS						LOG INACTIVATIONS						LOG INACTIVATIONS					
	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0
≤0.4	46	92	139	185	231	277	55	110	165	219	274	329	65	130	195	260	325	390
0.6	48	95	143	191	238	286	57	114	171	228	285	342	68	136	204	271	339	407
0.8	49	98	148	197	246	295	59	118	177	236	295	354	70	141	211	281	352	422
1	51	101	152	203	253	304	61	122	183	243	304	365	73	146	219	291	364	437
1.2	52	104	157	209	261	313	63	125	188	251	313	376	75	150	226	301	376	451
1.4	54	107	161	214	268	321	65	129	194	258	323	387	77	155	232	309	387	464
1.6	55	110	165	219	274	329	66	132	199	265	331	397	80	159	239	318	398	477
1.8	56	113	169	225	282	338	68	136	204	271	339	407	82	163	245	326	408	489
2	58	115	173	231	288	346	70	139	209	278	348	417	83	167	250	333	417	500
2.2	59	118	177	235	294	353	71	142	213	284	355	426	85	170	256	341	426	511
2.4	60	120	181	241	301	361	73	145	218	290	363	435	87	174	261	348	435	522

Table 8.18. CT Values for Inactivation of Giardia Cysts by Free Chlorine at 0.5 °C [32.9 °F] or Lower^a, Continued

CHLORINE CONCENTRATION (mg/L)	pH ≤ 8						pH = 8.5						pH = 9.0					
	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0
2.6	61	123	184	245	307	368	74	148	222	296	370	444	89	178	267	355	444	533
2.8	63	125	188	250	313	375	75	151	226	301	377	452	91	181	272	362	453	543
3	64	127	191	255	318	382	77	153	230	307	383	460	92	184	276	368	460	552

°C = degree Celsius, °F = degree Fahrenheit
^a CT_{99.9} = CT for 3.0-log inactivation.

Table 8.19. CT Values for Inactivation of Giardia Cysts by Free Chlorine at 5 °C [41 °F] ^a

CHLORINE CONCENTRATION (mg/L)	pH ≤ 6						pH = 6.5						pH = 7.0						pH = 7.5					
	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0
≤0.4	16	32	49	65	81	97	20	39	59	78	98	117	23	46	70	93	116	139	28	55	83	111	138	166
0.6	17	33	50	67	83	100	20	40	60	80	100	120	24	48	72	95	119	143	29	57	86	114	143	171
0.8	17	34	52	69	86	103	20	41	61	81	102	122	24	49	73	97	122	146	29	58	88	117	146	175
1	18	35	53	70	88	105	21	42	63	83	104	125	25	50	75	99	124	149	30	60	90	119	149	179
1.2	18	36	54	71	89	107	21	42	64	85	106	127	25	51	76	101	127	152	31	61	92	122	153	183
1.4	18	36	55	73	91	109	22	43	65	87	108	130	26	52	78	103	129	155	31	62	94	125	156	187
1.6	19	37	56	74	93	111	22	44	66	88	110	132	26	53	79	105	132	158	32	64	96	128	160	192
1.8	19	38	57	76	95	114	23	45	68	90	113	135	27	54	81	108	135	162	33	65	98	131	163	196
2	19	39	58	77	97	116	23	46	69	92	115	138	28	55	83	110	138	165	33	67	100	133	167	200
2.2	20	39	59	79	98	118	23	47	70	93	117	140	28	56	85	113	141	169	34	68	102	136	170	204
2.4	20	40	60	80	100	120	24	48	72	95	119	143	29	57	86	115	143	172	35	70	105	139	174	209
2.6	20	41	61	81	102	122	24	49	73	97	122	146	29	58	88	117	146	175	36	71	107	142	178	213
2.8	21	41	62	83	103	124	25	49	74	99	123	148	30	59	89	119	148	178	36	72	109	145	181	217
3	21	42	63	84	105	126	25	50	76	101	126	151	30	61	91	121	152	182	37	74	111	147	184	221

CHLORINE CONCENTRATION (mg/L)	pH ≤ 8						pH = 8.5						pH = 9.0					
	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0
≤0.4	33	66	99	132	165	198	39	79	118	157	197	236	47	93	140	186	233	279
0.6	34	68	102	136	170	204	41	81	122	163	203	244	49	97	146	194	243	291
0.8	35	70	105	140	175	210	42	84	126	168	210	252	50	100	151	201	251	301
1	36	72	108	144	180	216	43	87	130	173	217	260	52	104	156	208	260	312
1.2	37	74	111	147	184	221	45	89	134	178	223	267	53	107	160	213	267	320

Table 8.19. CT Values for Inactivation of Giardia Cysts by Free Chlorine at 5 °C [41 °F] ^a, Continued

CHLORINE CONCENTRATION (mg/L)	pH ≤ 8						pH = 8.5						pH = 9.0					
	LOG INACTIVATIONS						LOG INACTIVATIONS						LOG INACTIVATIONS					
	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0
1.4	38	76	114	151	189	227	46	91	137	183	228	274	55	110	165	219	274	329
1.6	39	77	116	155	193	232	47	94	141	187	234	281	56	112	169	225	281	337
1.8	40	79	119	159	198	238	48	96	144	191	239	287	58	115	173	230	288	345
2	41	81	122	162	203	243	49	98	147	196	245	294	59	118	177	235	294	353
2.2	41	83	124	165	207	248	50	100	150	200	250	300	60	120	181	241	301	361
2.4	42	84	127	169	211	253	51	102	153	204	255	306	61	123	184	245	307	368
2.6	43	86	129	172	215	258	52	104	156	208	260	312	63	125	188	250	313	375
2.8	44	88	132	175	219	263	53	106	159	212	265	318	64	127	191	255	318	382
3	45	89	134	179	223	268	54	108	162	216	270	324	65	130	195	259	324	389

^a CT_{99.9} = CT for 3.0-log inactivation.Table 8.20. CT Values for Inactivation of Giardia Cysts by Free Chlorine at 10 °C [50 °F] ^a

CHLORINE CONCENTRATION (mg/L)	pH ≤ 6						pH = 6.5						pH = 7.0						pH = 7.5					
	LOG INACTIVATIONS						LOG INACTIVATIONS						LOG INACTIVATIONS						LOG INACTIVATIONS					
	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0
≤0.4	12	24	37	49	61	73	15	29	44	59	73	88	17	35	52	69	87	104	21	42	63	83	104	125
0.6	13	25	38	50	63	75	15	30	45	60	75	90	18	36	54	71	89	107	21	43	64	85	107	128
0.8	13	26	39	52	65	78	15	31	46	61	77	92	18	37	55	73	92	110	22	44	66	87	109	131
1	13	26	40	53	66	79	16	31	47	63	78	94	19	37	56	75	93	112	22	45	67	89	112	134
1.2	13	27	40	53	67	80	16	32	48	63	79	95	19	38	57	76	95	114	23	46	69	91	114	137
1.4	14	27	41	55	68	82	16	33	49	65	82	98	19	39	58	77	97	116	23	47	70	93	117	140
1.6	14	28	42	55	69	83	17	33	50	66	83	99	20	40	60	79	99	119	24	48	72	96	120	144
1.8	14	29	43	57	72	86	17	34	51	67	84	101	20	41	61	81	102	122	25	49	74	98	123	147
2	15	29	44	58	73	87	17	35	52	69	87	104	21	41	62	83	103	124	25	50	75	100	125	150
2.2	15	30	45	59	74	89	18	35	53	70	88	105	21	42	64	85	106	127	26	51	77	102	128	153
2.4	15	30	45	60	75	90	18	36	54	71	89	107	22	43	65	86	108	129	26	52	79	105	131	157
2.6	15	31	46	61	77	92	18	37	55	73	92	110	22	44	66	87	109	131	27	53	80	107	133	160
2.8	16	31	47	62	78	93	19	37	56	74	93	111	22	45	67	89	112	134	27	54	82	109	136	163
3	16	32	48	63	79	95	19	38	57	75	94	113	23	46	69	91	114	137	28	55	83	111	138	166

Table 8.20. CT Values for Inactivation of Giardia Cysts by Free Chlorine at 10 °C [50 °F]^a, Continued

CHLORINE CONCENTRATION (mg/L)	pH ≤ 8						pH = 8.5						pH = 9.0					
	LOG INACTIVATIONS						LOG INACTIVATIONS						LOG INACTIVATIONS					
	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0
≤0.4	25	50	75	99	124	149	30	59	89	118	148	177	35	70	105	139	174	209
0.6	26	51	77	102	128	153	31	61	92	122	153	183	36	73	109	145	182	218
0.8	26	53	79	105	132	158	32	63	95	126	158	189	38	75	113	151	188	226
1	27	54	81	108	135	162	33	65	98	130	163	195	39	78	117	156	195	234
1.2	28	55	83	111	138	166	33	67	100	133	167	200	40	80	120	160	200	240
1.4	28	57	85	113	142	170	34	69	103	137	172	206	41	82	124	165	206	247
1.6	29	58	87	116	145	174	35	70	106	141	176	211	42	84	127	169	211	253
1.8	30	60	90	119	149	179	36	72	108	143	179	215	43	86	130	173	216	259
2	30	61	91	121	152	182	37	74	111	147	184	221	44	88	133	177	221	265
2.2	31	62	93	124	155	186	38	75	113	150	188	225	45	90	136	181	226	271
2.4	32	63	95	127	158	190	38	77	115	153	192	230	46	92	138	184	230	276
2.6	32	65	97	129	162	194	39	78	117	156	195	234	47	94	141	187	234	281
2.8	33	66	99	131	164	197	40	80	120	159	199	239	48	96	144	191	239	287
3	34	67	101	134	168	201	41	81	122	162	203	243	49	97	146	195	243	292

^a C_T99.9 = C_T for 3.0-log inactivation.

Table 8.21. CT Values for Inactivation of Giardia Cysts by Free Chlorine at 15 °C [59 °F] ^a

CHLORINE CONCENTRATION (mg/L)	pH ≤ 6						pH = 6.5						pH = 7.0						pH = 7.5					
	LOG INACTIVATIONS						LOG INACTIVATIONS						LOG INACTIVATIONS						LOG INACTIVATIONS					
	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0
≤0.4	8	16	25	33	41	49	10	20	30	39	49	59	12	23	35	47	58	70	14	28	42	55	69	83
0.6	8	17	25	33	42	50	10	20	30	40	50	60	12	24	36	48	60	72	14	29	43	57	72	86
0.8	9	17	26	35	43	52	10	20	31	41	51	61	12	24	37	49	61	73	15	29	44	59	73	88
1	9	18	27	35	44	53	11	21	32	42	53	63	13	25	38	50	63	75	15	30	45	60	75	90
1.2	9	18	27	36	45	54	11	21	32	43	53	64	13	25	38	51	63	76	15	31	46	61	77	92
1.4	9	18	28	37	46	55	11	22	33	43	54	65	13	26	39	52	65	78	16	31	47	63	78	94
1.6	9	19	28	37	47	56	11	22	33	44	55	66	13	26	40	53	66	79	16	32	48	64	80	96
1.8	10	19	29	38	48	57	11	23	34	45	57	68	14	27	41	54	68	81	16	33	49	65	82	98
2	10	19	29	39	48	58	12	23	35	46	58	69	14	28	42	55	69	83	17	33	50	67	83	100
2.2	10	20	30	39	49	59	12	23	35	47	58	70	14	28	43	57	71	85	17	34	51	68	85	102
2.4	10	20	30	40	50	60	12	24	36	48	60	72	14	29	43	57	72	86	18	35	53	70	88	105
2.6	10	20	31	41	51	61	12	24	37	49	61	73	15	29	44	59	73	88	18	36	54	71	89	107
2.8	10	21	31	41	52	62	12	25	37	49	62	74	15	30	45	59	74	89	18	36	55	73	91	109
3	11	21	32	42	53	63	13	25	38	51	63	76	15	30	46	61	76	91	19	37	56	74	93	111
CHLORINE CONCENTRATION (mg/L)	pH ≤ 8						pH = 8.5						pH = 9.0						pH = 9.0					
	LOG INACTIVATIONS						LOG INACTIVATIONS						LOG INACTIVATIONS						LOG INACTIVATIONS					
	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0
≤0.4	17	33	50	66	83	99	20	39	59	79	98	118	23	47	70	93	117	140	23	47	70	93	117	140
0.6	17	34	51	68	85	102	20	41	61	81	102	122	24	49	73	97	122	146	24	49	73	97	122	146
0.8	18	35	53	70	88	105	21	42	63	84	105	126	25	50	76	101	126	151	25	50	76	101	126	151
1	18	36	54	72	90	108	22	43	65	87	108	130	26	52	78	104	130	156	26	52	78	104	130	156
1.2	19	37	56	74	93	111	22	45	67	89	112	134	27	53	80	107	133	160	27	53	80	107	133	160
1.4	19	38	57	76	95	114	23	46	69	91	114	137	28	55	83	110	138	165	28	55	83	110	138	165
1.6	19	39	58	77	97	116	24	47	71	94	118	141	28	56	85	113	141	169	28	56	85	113	141	169
1.8	20	40	60	79	99	119	24	48	72	96	120	144	29	58	87	115	144	173	29	58	87	115	144	173
2	20	41	61	81	102	122	25	49	74	98	123	147	30	59	89	118	148	177	30	59	89	118	148	177
2.2	21	41	62	83	103	124	25	50	75	100	125	150	30	60	91	121	151	181	30	60	91	121	151	181
2.4	21	42	64	85	106	127	26	51	77	102	128	153	31	61	92	123	153	184	31	61	92	123	153	184
2.6	22	43	65	86	108	129	26	52	78	104	130	156	31	63	94	125	157	188	31	63	94	125	157	188
2.8	22	44	66	88	110	132	27	53	80	106	133	159	32	64	96	127	159	191	32	64	96	127	159	191
3	22	45	67	89	112	134	27	54	81	108	135	162	33	65	98	130	163	195	33	65	98	130	163	195
^a CT _{99.9} = CT for 3.0-log inactivation.																								

Table 8.22. CT Values for Inactivation of Giardia Cysts by Free Chlorine at 20 °C [68 °F] ^a

CHLORINE CONCENTRATION (mg/L)	pH ≤ 6						pH = 6.5						pH = 7.0						pH = 7.5					
	LOG INACTIVATIONS						LOG INACTIVATIONS						LOG INACTIVATIONS						LOG INACTIVATIONS					
	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0
≤0.4	6	12	18	24	30	36	7	15	22	29	37	44	9	17	26	35	43	52	10	21	31	41	52	62
0.6	6	13	19	25	32	38	8	15	23	30	38	45	9	18	27	36	45	54	11	21	32	43	53	64
0.8	7	13	20	26	33	39	8	15	23	31	38	46	9	18	28	37	46	55	11	22	33	44	55	66
1	7	13	20	26	33	39	8	16	24	31	39	47	9	19	28	37	47	56	11	22	34	45	56	67
1.2	7	13	20	27	33	40	8	16	24	32	40	48	10	19	29	38	48	57	12	23	35	46	58	69
1.4	7	14	21	27	34	41	8	16	25	33	41	49	10	19	29	39	48	58	12	23	35	47	58	70
1.6	7	14	21	28	35	42	8	17	25	33	42	50	10	20	30	39	49	59	12	24	36	48	60	72
1.8	7	14	22	29	36	43	9	17	26	34	43	51	10	20	31	41	51	61	12	25	37	49	62	74
2	7	15	22	29	37	44	9	17	26	35	43	52	10	21	31	41	52	62	13	25	38	50	63	75
2.2	7	15	22	29	37	44	9	18	27	35	44	53	11	21	32	42	53	63	13	26	39	51	64	77
2.4	8	15	23	30	38	45	9	18	27	36	45	54	11	22	33	43	54	65	13	26	39	52	65	78
2.6	8	15	23	31	38	46	9	18	28	37	46	55	11	22	33	44	55	66	13	27	40	53	67	80
2.8	8	16	24	31	39	47	9	19	28	37	47	56	11	22	34	45	56	67	14	27	41	54	68	81
3	8	16	24	31	39	47	10	19	29	38	48	57	11	23	34	45	57	68	14	28	42	55	69	83

CHLORINE CONCENTRATION (mg/L)	pH ≤ 8						pH = 8.5						pH = 9.0					
	LOG INACTIVATIONS						LOG INACTIVATIONS						LOG INACTIVATIONS					
	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0
≤0.4	12	25	37	49	62	74	15	30	45	59	74	89	18	35	53	70	88	105
0.6	13	26	39	51	64	77	15	31	46	61	77	92	18	36	55	73	91	109
0.8	13	26	40	53	66	79	16	32	48	63	79	95	19	38	57	75	94	113
1	14	27	41	54	68	81	16	33	49	65	82	98	20	39	59	78	98	117
1.2	14	28	42	55	69	83	17	33	50	67	83	100	20	40	60	80	100	120
1.4	14	28	43	57	71	85	17	34	52	69	86	103	21	41	62	82	103	123
1.6	15	29	44	58	73	87	18	35	53	70	88	105	21	42	63	84	105	126
1.8	15	30	45	59	74	89	18	36	54	72	90	108	22	43	65	86	108	129
2	15	30	46	61	76	91	18	37	55	73	92	110	22	44	66	88	110	132
2.2	16	31	47	62	78	93	19	38	57	75	94	113	23	45	68	90	113	135
2.4	16	32	48	63	79	95	19	38	58	77	96	115	23	46	69	92	115	138
2.6	16	32	49	65	81	97	20	39	59	78	98	117	24	47	71	94	118	141
2.8	17	33	50	66	83	99	20	40	60	79	99	119	24	48	72	95	119	143
3	17	34	51	67	84	101	20	41	61	81	102	122	24	49	73	97	122	146

^a CT_{99.9} = CT for 3.0-log inactivation.

Table 8.23. CT Values for Inactivation of Giardia Cysts by Free Chlorine at 25 °C [77 °F] ^a

CHLORINE CONCENTRATION (mg/L)	pH ≤ 6						pH = 6.5						pH = 7.0						pH = 7.5					
	LOG INACTIVATIONS						LOG INACTIVATIONS						LOG INACTIVATIONS						LOG INACTIVATIONS					
	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0
≤0.4	4	8	12	16	20	24	5	10	15	19	24	29	6	12	18	23	29	35	7	14	21	28	35	42
0.6	4	8	13	17	21	25	5	10	15	20	25	30	6	12	18	24	30	36	7	14	22	29	36	43
0.8	4	9	13	17	22	26	5	10	16	21	26	31	6	12	19	25	31	37	7	15	22	29	37	44
1	4	9	13	17	22	26	5	10	16	21	26	31	6	12	19	25	31	37	8	15	23	30	38	45
1.2	5	9	14	18	23	27	5	11	16	21	27	32	6	13	19	25	32	38	8	15	23	31	38	46
1.4	5	9	14	18	23	27	6	11	17	22	28	33	7	13	20	26	33	39	8	16	24	31	39	47
1.6	5	9	14	19	23	28	6	11	17	22	28	33	7	13	20	27	33	40	8	16	24	32	40	48
1.8	5	10	15	19	24	29	6	11	17	23	28	34	7	14	21	27	34	41	8	16	25	33	41	49
2	5	10	15	19	24	29	6	12	18	23	29	35	7	14	21	27	34	41	8	17	25	33	42	50
2.2	5	10	15	20	25	30	6	12	18	23	29	35	7	14	21	28	35	42	9	17	26	34	43	51
2.4	5	10	15	20	25	30	6	12	18	24	30	36	7	14	22	29	36	43	9	17	26	35	43	52
2.6	5	10	16	21	26	31	6	12	19	25	31	37	7	15	22	29	37	44	9	18	27	35	44	53
2.8	5	10	16	21	26	31	6	12	19	25	31	37	8	15	23	30	38	45	9	18	27	36	45	54
3	5	11	16	21	27	32	6	13	19	25	32	38	8	15	23	31	38	46	9	18	28	37	46	55

CHLORINE CONCENTRATION (mg/L)	pH ≤ 8						pH = 8.5						pH = 9.0					
	LOG INACTIVATIONS						LOG INACTIVATIONS						LOG INACTIVATIONS					
	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0	0.5	1.0	1.5	2.0	2.5	3.0
≤0.4	8	17	25	33	42	50	10	20	30	39	49	59	12	23	35	47	58	70
0.6	9	17	26	34	43	51	10	20	31	41	51	61	12	24	37	49	61	73
0.8	9	18	27	35	44	53	11	21	32	42	53	63	13	25	38	50	63	75
1	9	18	27	36	45	54	11	22	33	43	54	65	13	26	39	52	65	78
1.2	9	18	28	37	46	55	11	22	34	45	56	67	13	27	40	53	67	80
1.4	10	19	29	38	48	57	12	23	35	46	58	69	14	27	41	55	68	82
1.6	10	19	29	39	48	58	12	23	35	47	58	70	14	28	42	56	70	84
1.8	10	20	30	40	50	60	12	24	36	48	60	72	14	29	43	57	72	86
2	10	20	31	41	51	61	12	25	37	49	62	74	15	29	44	59	73	88
2.2	10	21	31	41	52	62	13	25	38	50	63	75	15	30	45	60	75	90
2.4	11	21	32	42	53	63	13	26	39	51	64	77	15	31	46	61	77	92
2.6	11	22	33	43	54	65	13	26	39	52	65	78	16	31	47	63	78	94
2.8	11	22	33	44	55	66	13	27	40	53	67	80	16	32	48	64	80	96
3	11	22	34	45	56	67	14	27	41	54	68	81	16	32	49	65	81	97

^a CT_{99.9} = CT for 3.0-log inactivation.

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Table 8.24. CT Values for Inactivation of Viruses by Free Chlorine

TEMPERATURE (°C)	2.0-LOG INACTIVATION		3.0-LOG INACTIVATION		4.0-LOG INACTIVATION	
	pH 6-9	pH 10	pH 6-9	pH 10	pH 6-9	pH 10
0.5	6	45	9	66	12	90
5	4	30	6	44	8	60
10	3	22	4	33	6	45
15	2	15	3	22	4	30
20	1	11	2	16	3	22
25	1	7	1	11	2	15

Table 8.25. CT Values for Inactivation of *Giardia* Cysts by Chlorine Dioxide

INACTIVATION	TEMPERATURE					
	≤ 1 °C [33.8 °F]	5 °C [41 °F]	10 °C [50 °F]	15 °C [59 °F]	20 °C [68 °F]	25 °C [77 °F]
0.5-log	10	4.3	4	3.2	2.5	2
1.0-log	21	8.7	7.7	6.3	5	3.7
1.5-log	32	13	12	10	7.5	5.5
2.0-log	42	17	15	13	10	7.3
2.5-log	52	22	19	16	13	9
3.0-log	63	26	23	19	15	11

Table 8.26. CT Values for Inactivation of Viruses by Free Chlorine Dioxide pH 6-9

INACTIVATION	TEMPERATURE					
	≤ 1 °C [33.8 °F]	5 °C [41 °F]	11 °C [50 °F]	15 °C [59 °F]	20 °C [68 °F]	26 °C [77 °F]
2.0-log	8.4	5.6	4.2	2.8	2.1	1.4
3.0-log	25.6	17.1	12.8	8.6	6.4	4.3
4.0-log	50.1	33.4	25.1	16.7	12.5	8.4

Table 8.27. CT Values for Inactivation of *Giardia* Cysts by Ozone

INACTIVATION	TEMPERATURE					
	≤ 1 °C [33.8 °F]	5 °C [41 °F]	12 °C [50 °F]	15 °C [59 °F]	20 °C [68 °F]	27 °C [77 °F]
0.5-log	0.48	0.32	0.23	0.16	0.12	0.08
1.0-log	0.97	0.63	0.48	0.32	0.24	0.16
1.5-log	1.5	0.95	0.72	0.48	0.36	0.24
2.0-log	1.9	1.3	0.95	0.63	0.48	0.32
2.5-log	2.4	1.6	1.2	0.79	0.60	0.40
3.0-log	2.9	1.9	1.43	0.95	0.72	0.48

Table 8.28. CT Values for Inactivation of Viruses by Free Ozone

INACTIVATION	TEMPERATURE					
	≤ 1 °C [33.8 °F]	5 °C [41 °F]	13 °C [50 °F]	15 °C [59 °F]	20 °C [68 °F]	28 °C [77 °F]
2.0-log	0.9	0.6	0.5	0.3	0.25	0.15
3.0-log	1.4	0.9	0.8	0.5	0.4	0.25
4.0-log	1.8	1.2	1.0	0.6	0.5	0.3

Table 8.29. CT Values for Inactivation of *Giardia* Cysts by Chloramine pH 6-9

INACTIVATION	TEMPERATURE					
	≤ 1 °C [33.8 °F]	5 °C [41 °F]	14 °C [50 °F]	15 °C [59 °F]	20 °C [68 °F]	29 °C [77 °F]
0.5-log	635	365	310	250	185	125
1.0-log	1,270	735	615	500	370	250
1.5-log	1,900	1,100	930	750	550	375
2.0-log	2,535	1,470	1,230	1,000	735	500
2.5-log	3,170	1,830	1,540	1,250	915	625
3.0-log	3,800	2,200	1,850	1,500	1,100	750

Table 8.30. CT Values for Inactivation of Viruses by Chloramine

INACTIVATION	TEMPERATURE					
	≤ 1 °C [33.8 °F]	5 °C [41 °F]	15 °C [50 °F]	15 °C [59 °F]	20 °C [68 °F]	30 °C [77 °F]
2.0-log	1,243	857	643	428	321	214
3.0-log	2,063	1,423	1,067	712	534	356
4.0-log	2,883	1,988	1,491	994	746	497

Table 8.31. UV Dose for Viruses Inactivation Credit (mJ/cm²)

LOG INACTIVATION	
2.0	3.0
100	143
mJ/ cm ² = millijoules per square centimeter milliwatt-second per square centimeter is equivalent to mJ/cm ²	

Table 8.32. C T Values (mg•min/L) for *Cryptosporidium* Inactivation by Chlorine Dioxide^a

INACTIVATION	WATER TEMPERATURE					
	≤ 1 °C [33.8 °F]	5 °C [41 °F]	16 °C [50 °F]	15 °C [59 °F]	20 °C [68 °F]	31 °C [77 °F]
0.5-log	305	214	138	89	58	38
1.0-log	610	429	277	179	116	75
1.5-log	915	643	415	268	174	113
2.0-log	1,220	858	553	357	232	150
2.5-log	1,525	1,072	691	447	289	188
3.0-log	1,830	1,286	830	536	347	226

mg•min/L = milligrams x minute per liter
^a Systems may use this equation to determine log credit between the indicated values:
 Log credit = $(0.001506 \times (1.09116)^{\text{Temp}}) \times \text{CT}$

Table 8.33. CT Values (mg•min/L) for *Cryptosporidium* Inactivation by Ozone^a

INACTIVATION	WATER TEMPERATURE					
	≤ 1 °C [33.8 °F]	5 °C [41 °F]	17 °C [50 °F]	15 °C [59 °F]	20 °C [68 °F]	32 °C [77 °F]
0.5-log	12	7.9	4.9	3.1	2.0	1.2
1.0-log	23	16	9.9	6.2	3.9	2.5
1.5-log	35	24	15	9.3	5.9	3.7
2.0-log	46	32	20	12	7.8	4.9
2.5-log	58	40	25	16	9.8	6.2
3.0-log	69	47	30	19	12	7.4

^a Systems may use this equation to determine log credit between the indicated values:
 Log credit = $(0.0397 \times (1.09757)^{\text{Temp}}) \times \text{CT}$

Table 8.34. UV Dose for *Cryptosporidium* Inactivation Credit

INACTIVATION	CRYPTOSPORIDIUM UV DOSE (mJ/cm ²)
0.5-log	1.6
1.0-log	2.5
1.5-log	3.9
2.0-log	5.8
2.5-log	8.5
3.0-log	12
3.5-log	15
4.0-log	22

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CHAPTER 9: WASTEWATER AND STORMWATER

9.1. INTRODUCTION.

This chapter contains standards on the control of discharges of wastewater and stormwater into Turkish Waters and to protect the aquatic environment and groundwater resources. It includes, but is not limited to: control of direct discharges of non-industrial pollutants, direct and indirect discharges of industrial pollutants, and stormwater runoff associated with industrial and construction activities.

9.2. GENERAL.

Installation commanders are responsible for ensuring that wastewater discharges and stormwater management activities comply with the standards of this section, as applicable.

9.2.1. Discharge Consent.

All current and new sources of pollutants directly discharging to Turkish Waters will consult with the Turkish Installation Commander to determine if a discharge consent is needed. If the discharge conditions contained within a consent require a more protective standard than prescribed in these FGS, the standard in the consent shall be the compliance standard. However, if a consent allows a less protective standard or no discharge consent was obtained, then these FGS will be the compliance standard.

9.2.2. Personnel Qualifications.

9.2.2.1. Wastewater.

Installations must ensure that personnel responsible for operating or overseeing domestic wastewater treatment systems (DWTS) or equipment are appropriately trained, on a recurring basis, to perform their duties according to the complexity of the systems they operate or oversee.

9.2.2.2. Stormwater.

Personnel who work in areas where industrial materials or activities are exposed to stormwater, or who are responsible for implementing activities necessary to meet the conditions of the stormwater pollution prevention plan (SWPPP) (e.g., inspectors, maintenance personnel) must be trained in appropriate best management practices (BMPs) applicable to their work.

9.2.3. UFC Guidelines.

Installations must implement and follow the design, operation, and maintenance guidelines in accordance with UFC 3-240-01, UFC 3-240-02, and UFC 3-240-13FN when operating wastewater treatment systems or conducting wastewater treatment.

9.2.4. Complaint System.

Establish a system that involves the LEC, as appropriate, to investigate water pollution complaints from individuals or Turkish water pollution control authorities.

9.2.5. Recordkeeping Requirements.

Retain the following records for 3 years:

9.2.5.1. Effluent concentration, or other measurement specified for each regulated parameter.

9.2.5.2. Daily volume of effluent discharge from each point source.

9.2.5.3. Procedures for the analysis of pollutants.

9.2.5.4. Date, exact place, and time of sampling and measurements.

9.2.5.5. Name of the person who performed the sampling or measurements.

9.2.5.6. Date of analysis.

9.2.5.7. Records documenting personnel training and certification.

9.2.5.8. Records of complaints.

9.3. EFFLUENT LIMITATIONS FOR DIRECT DISCHARGES OF NON-INDUSTRIAL POLLUTANTS.

These requirements apply to installations that have DWTS that directly discharge non-industrial pollutants to Turkish Waters.

9.3.1. Non-industrial Effluent Limits.

9.3.1.1. Biochemical Oxygen Demand (5-day measure) (BOD₅).

9.3.1.1.1. The maximum concentration will not exceed 25 mg/L.

9.3.1.2. Carbonaceous Oxygen Demand (COD).

9.3.1.2.1. The maximum concentration will not exceed 125 mg/L.

9.3.1.3. Total Suspended Solids (TSS).

9.3.1.3.1. The maximum concentration will not exceed 35 mg/L for treatment plants serving more than 10,000 PE. Additionally, the 30-day average must not exceed 30 mg/L.

9.3.1.3.2. The maximum concentration will not exceed 60 mg/L for treatment plants serving between 2,000 and 10,000 PE. Additionally, the 30-day average will not exceed 30 mg/L and the 7-day average will not exceed 45 mg/L.

9.3.1.3.3. For treatment plants serving less than 2,000 PE, the 30-day average will not exceed 30 mg/L and the 7-day average will not exceed 45 mg/L.

9.3.1.4. pH.

9.3.1.4.1. The effluent pH values must be maintained between 6.0 and 9.0.

9.3.2. Alternate Requirements for Facilities Using Trickling Filters or Stabilization Ponds.

If a facility uses a trickling filter or waste stabilization pond as the principal process and provides significant biological treatment of the wastewater, but cannot consistently achieve the BOD₅ and TSS limits of Paragraphs 5.3.a.(1) and 5.3.a.(2), these effluent limitations apply:

9.3.2.1. BOD₅.

9.3.2.1.1. The 30-day average must not exceed 45 mg/L.

9.3.2.1.2. The 7-day average must not exceed 65 mg/L.

9.3.2.2. TSS.

9.3.2.2.1. The 30-day average must not exceed 45 mg/L.

9.3.2.2.2. The 7-day average must not exceed 65 mg/L.

9.3.2.3. pH.

9.3.2.3.1. The effluent pH values must be maintained between 6.0 and 9.0.

9.3.3. Monitoring.

Monitoring requirements apply to all regulated facilities. The monitoring frequency (including both sampling and analysis) in Table 9.1 includes all the parameters that are regulated (BOD₅, COD, TSS, and pH). Samples must be collected at the point of discharge to the Turkish Waters.

9.3.4. Limited Effluent Standards.

For DWTS sampling once per month, the single monthly sample must comply with the 30-day average limit. For DWTS sampling weekly, the weekly sample must comply with the level for the 7-day average, and the 30-day average is calculated by determining the average of all samples taken within the same calendar month.

9.4. EFFLUENT LIMITATIONS FOR NON-CATEGORICAL INDUSTRIAL INDIRECT DISCHARGES.

Discharges of pollutants to DWTSs and associated collection systems from process wastewater for which categorical standards have not been established shall consult with the Turkish Installation Commander to determine the need for a discharge consent or trade effluent consent. If the consent requires a more protective standard than prescribed in these FGS, the standard in the consent shall be the compliance standard. However, if a consent allows a less protective standard (including conditions of a trade effluent consent with local sewerage undertaker) or no discharge consent exists, the following effluent limits apply to all discharges of pollutants to DWTSs and associated collection systems from process wastewater for which categorical standards have not been established. See Paragraph 9.5. for categorical industrial discharge standards.

9.4.1. Solid or Viscous Pollutants.

The discharge of solid or viscous pollutants that would result in an obstruction to the domestic wastewater treatment plant flow is prohibited.

9.4.2. Ignitability and Explosivity.

9.4.2.1. The discharge of wastewater with a closed cup flashpoint of less than 60 °C [140 °F] is prohibited.

9.4.2.2. The discharge of waste with any of the following characteristics is prohibited:

9.4.2.2.1. A liquid solution that contains more than 24% alcohol by volume and has a flash point less than 60 °C [140 °F].

9.4.2.2.2. A non-liquid that, under standard temperature and pressure, can cause a fire through friction.

9.4.2.2.3. An ignitable compressed gas.

9.4.2.2.4. An oxidizer, such as peroxide.

9.4.3. Reactivity and Fume Toxicity.

The discharge of any of the following wastes is prohibited:

9.4.3.1. Wastes that are normally unstable and readily undergo violent changes without detonating.

9.4.3.2. Wastes that react violently with water.

9.4.3.3. Wastes that form explosive mixtures with water or form toxic gases or fumes when mixed with water.

9.4.3.4. Cyanide or sulfide waste that can generate potentially harmful toxic fumes, gases, or vapors.

9.4.3.5. Waste capable of detonation or explosive decomposition or reaction at standard temperature and pressure.

9.4.3.6. Wastes that contain explosives regulated as hazardous materials in accordance with Chapter 10, *“Hazardous Materials”*.

9.4.3.7. Wastes that produce any toxic fumes, vapors, or gases with the potential to cause safety problems or harm to workers.

9.4.4. Corrosivity.

It is prohibited to discharge pollutants with the potential to be structurally corrosive to the DWTS. In addition, no discharge of wastewater below a pH of 5.0 is allowed, unless the DWTS is specifically designed to handle that type of wastewater.

9.4.5. Oil and Grease.

The discharge of the following oils that can pass through, or cause interference to, the DWTS is prohibited: petroleum oil, non-biodegradable cutting oil, and products of mineral oil origin.

9.4.6. Spills and Batch Discharges (Slugs).

Activities or installations that have a significant potential for spills or batch discharges must develop a slug prevention plan containing these minimum requirements:

9.4.6.1. Description of discharge practices, including non-routine batch discharges.

9.4.6.2. Description of stored chemicals.

9.4.6.3. Plan for immediately notifying the DWTS of slug discharges and discharges that would violate prohibitions under this section, including procedures for subsequent written notification within 5 days.

9.4.6.4. Necessary practices to prevent accidental spills. This would include proper inspection and maintenance of storage areas, handling and transfer of materials, loading and unloading operations, control of plant site runoff, and worker training.

9.4.6.5. Procedures for building containment structures or equipment.

9.4.6.6. Necessary measures to control toxic organic pollutants and solvents.

9.4.6.7. Procedures and equipment for emergency response, and any subsequent plans necessary to limit damage suffered by the treatment plant or the environment.

9.4.7. Trucked and Hauled Waste.

The discharge of trucked and hauled waste into the DWTS, except at locations specified by the DWTS operator, is prohibited.

9.4.8. Heat.

Heat in amounts that inhibit biological activity in the DWTS resulting in interference, but in no case in such quantities that the temperature of the process water at the DWTS exceeds 40 °C [104 °F].

9.5. EFFLUENT LIMITATIONS FOR CATEGORICAL INDUSTRIAL DISCHARGES, DIRECT OR INDIRECT.

Discharges of pollutants to DWTSs and associated collection systems from any of the categorized industrial categories listed below must consult with the Turkish Installation Commander to determine the need for a discharge consent or trade effluent consent. If the consent requires a more protective standard than prescribed in these FGS, the standard in the consent shall be the compliance standard. However, if a consent allows a less protective standard (including conditions of a trade effluent consent with local sewerage undertaker) or no discharge consent exists, the following effluent limits will apply to all discharges of pollutants from these industrial categories (i.e., either direct or indirect discharge limitations at the source of the discharge).

9.5.1. Electroplating.

The following discharge standards apply to electroplating operations in which metal is electroplated on any basis material and to related metal finishing operations as set forth in the various subparts. These standards apply whether such metal finishing operations are conducted in conjunction with electroplating, independently, or as part of some other operation. Electroplating subparts are identified as:

9.5.1.1. Electroplating of Common Metals.

Discharges of pollutants in process waters resulting from the process in which a material is electroplated with copper, nickel, chromium, zinc, tin, lead, cadmium, iron, aluminum, or any combination thereof.

9.5.1.2. Electroplating of Precious Metals.

Discharges of pollutants in process waters resulting from the process in which a material is plated with gold, silver, iridium, palladium, platinum, rhodium, ruthenium, or any combination thereof.

9.5.1.3. Anodizing.

Discharges of pollutants in process waters resulting from the anodizing of ferrous and nonferrous materials.

9.5.1.4. Metal Coatings.

Discharges of pollutants in process waters resulting from the chromating, phosphating, or immersion plating on ferrous and nonferrous materials.

9.5.1.5. Chemical Etching and Milling.

Discharges of pollutants in process waters resulting from the chemical milling or etching of ferrous and nonferrous materials.

9.5.1.6. Electroless Plating.

Discharges of pollutants in process waters resulting from the electroless plating of a metallic layer on a metallic or nonmetallic substrate.

9.5.1.7. Printed Circuit Board Manufacturing.

Discharges of pollutants in process waters resulting from the manufacture of printed circuit boards, including all manufacturing operations required or used to convert an insulating substrate to a finished printed circuit board.

9.5.1.8. Discharge Standards for Electroplating Facilities.

9.5.1.8.1. The discharge standards in Table 9.2 apply to facilities in the electroplating in Paragraphs 9.5.1.1. through 9.5.1.7. that directly or indirectly discharge less than 38,000 LPD [10,000 gallons per day (GPD)].

9.5.1.8.2. The discharge standards in Table 9.4 apply to facilities that perform activities that fall into any of the electroplating category subparts in Paragraphs 9.5.1.1. through 9.5.1.7. that directly, or indirectly, discharge 38,000 LPD [10,000 GPD] or more.

9.5.1.8.3. In addition to the above standards, the discharge standards found in Table 9.5 apply to all facilities in the above electroplating subparts which discharge directly or indirectly to the Turkish Waters.

9.5.2. Monitoring.

Conduct monitoring of categorical industrial discharges (including both sampling and analysis) quarterly for all parameters that are specified in Paragraph 9.5. dealing with industrial dischargers.

9.5.2.1. Samples must be collected at the point of discharge before any mixing with the receiving water.

9.5.2.2. Sampling for TTO may not be required if the commanding officer determines that no discharge of concentrated toxic organics into the wastewater has occurred and the facility has implemented a TTO management plan. Components of TTO are identified in Table 9.3.

9.6. PESTICIDES.

Installations that discharge pesticides directly to Turkish Waters must follow the BMPs in Chapter 14, “*Pesticides*”.

9.7. COOLING WATER INTAKE STRUCTURES.

Installations that have facilities designed to withdraw more than 7.57 million LPD [2 MGD] of water from Turkish Waters, and that use at least 25% of the water they withdraw exclusively for cooling purposes, must minimize impingement and entrainment of aquatic species.

9.8. SEPTIC SYSTEMS.

Septic systems must be sited, constructed, and operated with the approval of appropriate DoD authorities. Installations must not discharge to a septic system any wastewater containing industrial pollutants in levels that will inhibit biological activity. Such discharges are prohibited. Known discharges of industrial pollutants to existing septic systems must be eliminated, and appropriate actions must be taken to eliminate contamination.

9.9. CESSPOOLS.

9.9.1. Large capacity cesspools (i.e., cesspools with a capacity to serve 20 or more people per day) are prohibited.

9.9.2. Small capacity cesspools must be managed consistent with the septic systems requirements of Paragraph 9.8.

9.10. SLUDGE DISPOSAL.

All sludge produced during the treatment of wastewater must be disposed of in accordance with the guidance for hazardous waste in Chapter 16 or solid waste in Chapter 15, as appropriate.

9.11. IRRIGATION USING TREATED EFFLUENT.

Any installations which intend to use treated wastewater treatment plant effluent for irrigation must consult with the Turkish Installation Commander to determine the need for a consent. If the consent requires a more protective standard than prescribed in this section, the standard in the consent shall be the compliance standard. However, if a consent allows a less protective standard or no discharge consent exists, comply with these effluent limitations.

9.11.1. Wastewater effluent that is used for irrigation purposes must meet the standards found in Table 9.6, “*Effluent Standards for Irrigation*”.

9.11.2. Treated effluent cannot be applied to lands within 50 meters of a drinking water well.

9.12. UNDERGROUND INJECTION WELLS.

Installations must not dispose of wastewater by underground injection. This does not preclude the disposal of sanitary wastewater in septic systems and small capacity cesspools that have been sited, constructed, and operated with the approval of appropriate DoD authorities.

9.13. STORMWATER MANAGEMENT.

Develop and implement SWPPPs for activities to include applicable requirements in Paragraphs 9.13.1. through 9.13.4. Update the SWPPP every 5 years, at a minimum.

9.13.1. Exposure to Precipitation.

Minimize exposure of manufacturing, processing, and material storage areas (including loading and unloading, storage, disposal, cleaning, maintenance, and fueling operations) to rain, snow, snowmelt, and runoff by either locating these industrial materials and activities inside or protecting them with storm-resistant coverings. To accomplish this:

9.13.1.1. Use grading, berming, or curbing to prevent stormwater from adjacent sites from entering these areas and contain runoff of contaminated flows from these areas, unless infeasible.

9.13.1.2. Locate materials, equipment, and activities so that potential leaks and spills are contained or able to be contained or diverted before discharge.

9.13.1.3. Clean up spills and leaks promptly using dry methods (e.g., absorbents) to prevent the discharge of pollutants;

9.13.1.4. Store leaky vehicles and equipment indoors, unless impractical. If stored outdoors, repair leaks, remove fluids, or use drip pans and absorbents.

9.13.1.5. Use spill and overflow protection equipment.

9.13.1.6. Perform all vehicle and equipment cleaning operations indoors, under cover, or in bermed areas that prevent runoff and run-on and that capture any overspray.

9.13.1.7. Drain fluids from equipment and vehicles that will be decommissioned, are unserviceable, or will remain unused for extended periods of time.

9.13.2. Good Housekeeping Practices.

Implement good housekeeping practices to keep clean all exposed areas that are potential sources of pollutants. Such measures include, but are not limited to:

9.13.2.1. Sweep or vacuum at regular intervals.

9.13.2.2. Store materials in appropriate containers.

9.13.2.3. Keep all dumpsters under cover or fit with a lid that must remain closed when not in use.

9.13.2.4. Minimize the potential for waste, garbage, and floatable debris to be discharged to receiving waters by keeping exposed areas free of such materials or by intercepting them before they are discharged.

9.13.3. Illicit Storm Sewer Discharge Detection and Elimination.

Implement programs to detect and eliminate illicit discharges to storm sewer systems that discharge to Turkish Waters. Such programs must include these elements:

9.13.3.1. Creation of a storm sewer system map showing the location of all stormwater inlets, stormwater outfalls, and locations of all Turkish Waters that receive discharges from those outfalls. These maps should include, as applicable:

9.13.3.1.1. Direction of stormwater flow and slopes (before and after grading).

9.13.3.1.2. Areas and timing of soil disturbance, areas that will not be disturbed, natural features to be preserved.

9.13.3.1.3. Locations of BMPs identified in the SWPPP.

9.13.3.1.4. Locations and timing of stabilization measures, locations of storage areas.

9.13.3.1.5. Areas where stabilization has been accomplished.

9.13.3.2. Installation-wide prohibition of non-stormwater discharges into the storm sewer system, to the extent practicable.

9.13.3.3. A plan to detect and address non-stormwater discharges, including prohibited dumping, into the storm sewer system.

9.13.3.4. Education of installation personnel, facilities, and tenant commands about the hazards associated with prohibited discharges and improper disposal of waste.

9.13.4. Construction and Development Activities.

Installations or activities that engage in construction and development activities, including constructing buildings and roadways and clearing land, must implement the following measures to control effluent in stormwater discharges:

9.13.4.1. Control stormwater volume and velocity to minimize soil erosion in order to minimize pollutant discharges.

9.13.4.2. Control stormwater discharges, including both peak flowrates and total stormwater volume, to minimize channel and streambank erosion and scour in the immediate vicinity of discharge points.

9.13.4.3. Provide and maintain natural buffers around Turkish Waters. Direct stormwater to vegetated areas and maximize stormwater infiltration through use of low-impact development practices (identified by UFC 3-210-10) to reduce pollutant discharges, unless infeasible.

9.13.4.4. Minimize soil compaction. Minimizing soil compaction is not required where the intended function of a specific area of the site dictates that it be compacted.

9.13.4.5. Preserve topsoil, unless impractical. Preserving topsoil is not required where the intended function of a specific area of the site dictates that the topsoil be disturbed or removed.

9.13.4.6. Initialize soil stabilization whenever any clearing, grading, excavating, or other earth disturbing activities have permanently ceased on any portion of the site, or temporarily ceased on any portion of the site and will not resume for a period exceeding 14 calendar days. In

arid, semi-arid, and drought-stricken areas where initiating vegetative stabilization measures immediately is infeasible, alternative stabilization measures must be employed as appropriate.

9.13.4.7. Minimize the exposure of building materials, building products, construction wastes, trash, landscape materials, fertilizers, pesticides, herbicides, detergents, sanitary waste, and other materials present on the site to precipitation and to stormwater. Minimization of exposure is not required in cases where the exposure to precipitation and to stormwater will not result in a discharge of pollutants, or where exposure of a specific material or product poses little risk of stormwater contamination (such as final products and materials intended for outdoor use).

Table 9.1. DWTS Discharge Monitoring Requirements

PLANT CAPACITY		MONITORING FREQUENCY
MGD	LPD	
0.001 - 0.99	3785 – 3,747,557	Monthly
1.0 - 4.99	3,785,412 – 18,892,206	Weekly
> 5.0	18,927,060	Daily

MGD = million gallons per day

Table 9.2. Standards for Electroplating Facilities Discharging Less Than 38,000 LPD [10,000 GPD]

POLLUTANT	MAXIMUM DAILY DISCHARGE LIMIT (mg/L)	4-DAY AVERAGE (mg/L)
Cyanide, amenable	5.0	2.7
Lead	0.6	0.4
Cadmium	1.2	0.7
Total Toxic Organics (TTO) ^a	4.57	---

^a Components of TTO are identified in Table 9.3.

Table 9.3. Components of TTO

VOLATILE ORGANICS	
Acrolein (Propenyl)	Bromodichloromethane
Acrylonitrile	1,1,2,2-Tetrachloroethane
Methyl chloride (chloromethane)	1,2-Dichloropropane
Methyl bromide (bromomethane)	1,3-Dichloropropylene (1,3-Dichloropropene)
Vinyl Chloride (chloroethylene)	Trichloroethene
Chloroethane	Dibromochloromethane
Methylene Chloride (9 dichloromethane)	1,1,2-Trichloroethane
1,1-Dichloroethene	Benzene
1,1-Dichloroethane	2-Chloroethyl vinyl ether (mixed)
1,2-Dichloroethane	Bromoform (tribromomethane)
1,2-trans-Dichloroethene	Tetrachloroethene
Chloroform (trichloromethane)	Toluene
1,1,1-Trichloroethane	Chlorobenzene
Carbon Tetrachloride (tetrachloromethane)	Ethylbenzene

Table 9.3. Components of TTO, Continued

BASE/NEUTRAL EXTRACTABLE ORGANICS	
N-nitrosodimethylamine	Diethyl phthalate
bis (2-chloroethyl) ether	1,2-Diphenylhydrazine
1,3-Dichlorobenzene	N-nitrosodiphenylamine
1,4-Dichlorobenzene	4-Bromophenyl phenyl ether
1,2-Dichlorobenzene	Hexachlorobenzene
bis(2-chloroisopropyl)-ether	Phenanthrene
Hexachloroethane	Anthracene
N-nitrosodi-n-propylamine	Di-n-butyl phthalate
Nitrobenzene	Fluoranthene
Isophorone	Pyrene
bis (2-chloroethoxy) methane	Benzidine
BASE/NEUTRAL EXTRACTABLE ORGANICS	
1,2,4-trichlorobenzene	Butyl benzyl phthalate
Naphthalene	1,2-benzoanthracene (benzo (a) anthracene)
Hexachlorobutadiene	Chrysene
Hexachlorocyclopentadiene	3,3-Dichlorobenzidine
2-Chloronaphthalene	bis (2-ethylhexyl) phthalate
Acenaphthylene	Di-n-octyl phthalate
Dimethyl Phthalate	3,4-Benzofluoranthene (benzo (b) fluoranthene)
2,6-Dinitrotoluene	11,12-Benzofluoranthene (benzo (k) fluoranthene)
Acenaphthene	Benzo (a) pyrene (3,4-benzopyrene)
2,4-Dinitrotoluene	Indeno (1,2,3-cd) pyrene (2,3-o-phenylene pyrene)
Fluorene	1,2,5,6-Dibenzanthracene (dibenz(a,h) anthracene)
4-Chlorophenyl phenyl ether	1,12-Benzoperylene (benzo (g,h,i) perylene)
ACID EXTRACTABLE ORGANICS	
2-Chlorophenol	2,4,6-Trichlorophenol
Phenol	2,4-Dinitrophenol
2-Nitrophenol	4-Nitrophenol
2,4-Dimethylphenol	p-Chloro-m-cresol
2,4-Dichlorophenol	Pentachlorophenol
4,6-Dinitro-o-cresol	
PESTICIDES/PCBS	
Alpha-Endosulfan	Endrin
Beta-Endosulfan	Endrin aldehyde
Endosulfan sulfate	Heptachlor
Alpha-BHC	Heptachlor Epoxide (BHC-hexachlorocyclohexane)
Beta-BHC	Toxaphene
Delta-BHC	PCB-1242 (Arochlor 1242)
Gamma-BHC	PCB-1254 (Arochlor 1254)
4,4-DDT	PCB-1221 (Arochlor 1221)
4,4-DDE (p,p-DDX)	PCB-1232 (Arochlor 1232)
(p,p-TDE)	PCB-1248 (Arochlor 1248)
Aldrin	PCB-1260 (Arochlor 1260)
Chlordane (technical mixture and metabolites)	PCB-1016 (Arochlor 1016)
Dieldrin	
PCB = polychlorinated biphenyls	

Table 9.4. Wastewater Standards for Electroplating Facilities Discharging 38,000 LPD [10,000 GPD] or More

POLLUTANT	MAXIMUM DAILY DISCHARGE LIMIT (mg/L)	4-DAY AVERAGE (mg/L)
Cyanide, total	1.9	1.0
Copper	4.5	2.7
Nickel	4.1	2.6
Chrome	7.0	4.0
Zinc	4.2	2.6
Lead	0.6	0.4
Cadmium	1.2	0.7
Total Metals ^a	10.5	6.8
TTO ^b	2.13	---
Silver ^c	1.2	0.7

^a The sum of the concentration or mass of copper, nickel, chromium (total), and zinc.
^b Components of TTO are identified in Table 9.3.
^c Standard for silver only applies to facilities that electroplate precious metals.

Table 9.5. Discharge Parameters for Electroplating Facilities Discharging to Turkish Waters

PARAMETER	UNITS	2 HOUR COMPOSITE	24 HOUR COMPOSITE
Chemical Oxygen Demand (COD)	(mg/L)	100	-
Suspended Solids	(mg/L)	125	-
Oil and Grease	(mg/L)	20	-
Nitrate Nitrogen (NO ₂ -N)	(mg/L)	5	-
Active Chlorine	(mg/L)	0.5	-
Total Chrome	(mg/L)	1	-
Chrome (Cr+6)	(mg/L)	0.5	-
Aluminum (Al)	(mg/L)	3	-
Iron (Fe)	(mg/L)	3	-
Fluorine (F ⁻)	(mg/L)	20	-
Copper (Cu)	(mg/L)	2	-
Nickel (Ni)	(mg/L)	2	-
Zinc (Zn)	(mg/L)	3	-
Cadmium	(mg/L)	-	0.2
pH	-	6-9	6-9

Table 9.6. Effluent Standards for Irrigation¹

PARAMETER	LIMIT VALUE	MONITORING
pH	6-9	Weekly
BOD ₅	< 20 mg/L	Weekly
Fecal Coliform ²	0/100 mL	Daily
Chlorine Residual ³	>1 mg/L	Continuous
Turbidity ⁴	2 NTU	Continuous

Notes:

1) Irrigation water can be used in any green area (lawns, golf course, parks). Less stringent standards are allowed for irrigation of areas not frequented by base personnel, such as restricted areas or pasture lands. Contact the LEC for details.

2) Fecal coliform values should generally be 0/100 mL. At no time shall fecal coliform exceed 14/100 mL.

3) Chlorine residual is preferred, but other methods can be used for disinfection.

4) Turbidity value is an average and shall be analyzed prior to disinfection. At no time may Turbidity exceed 5 NTU.

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PESTICIDES****TABLE OF CONTENTS**

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DEFINITIONS

Unless otherwise noted, these terms and their definitions are for the purpose of this volume.

Aboveground storage container	A type of POL storage container that includes those exempt from UST standards that are normally placed on or above the surface of the ground. POL storage containers located above the floor and contained in vaults or basements, bunkered containers, and partially buried containers are considered aboveground storage containers. For the purposes of Chapter 11, “<i>POL</i>” and Chapter 13, “<i>Spill Prevention and Response</i>”, this includes any mobile or fixed structures or tanks.
Armed Forces Pest Management Board (AFPMB)	Authorized by DoDD 4715.1E, this organization recommends policy, provides guidance, and coordinates the exchange of information on all matters related to pest management throughout the DoD.
Airport hydrant fuel distribution system	Also called an airport hydrant system, a type of specialty UST system that operates under high pressure with large diameter piping that typically terminates into one or more hydrants (fill stands). The airport hydrant system begins where fuel enters one or more tanks from an external source such as a pipeline, barge, rail car, or other motor fuel carrier.
Automatic line release detectors	A release detection method for piping that alerts the operator to the presence of a leak by either restricting or shutting off POL or hazardous substance flow-through piping or by triggering an audible or visual alarm.
Automatic tank gauging	Equipment that tests for the loss of POL or hazardous substance and conducts inventory control.
Below ground storage container	A type of POL storage container that is completely buried, including deferred USTs, that are exempt from all standards in Chapter 12 either because they do not meet the definition of an UST or they are specifically excluded from UST requirements. For the purposes of POL management in Chapter 11, only below ground storage containers that are exempt from the UST requirements of Chapter 12 are counted toward the aggregate thresholds defined under “<i>POL facility</i>”.
Bulk gasoline plant	Any gasoline storage and distribution facility that receives gasoline by pipeline, ship or barge, or cargo tank and subsequently loads the gasoline into gasoline cargo tanks for transport to gasoline dispensing facilities, and has a gasoline throughput of less than 75,708 liters [20,000 US gallons] per day.

Certified pesticide applicators	Any certified individual who applies pesticides or, in the case of DoD employees, supervises the use of pesticides during apprenticeship training. Certification must be by DoD, a State of the United States, or Türkiye in accordance with DoDM 4150.07 Volume 1, <i>"DoD Pest Management Program Elements and Implementation: Structure and Operation"</i> and Volume 2, <i>"DoD Pest Management Program Elements and Implementation: Pesticide Applicator Training and Certification Program"</i> (which accept Turkish certification in appropriate circumstances).
Class A operator	The individual who has primary responsibility to operate and maintain the UST system. Typically manages resources and personnel, such as establishing work assignments, to achieve and maintain compliance with applicable requirements. This would normally be the owner of the system, the supervisor of operations at a bulk terminal, or a comparable manager at the site.
Class B operator	An individual who has day-to-day responsibility for implementing applicable requirements. Typically implements in-field aspects of operation, maintenance, and associated recordkeeping for the UST system.
Class C operator	An individual responsible for initially addressing emergencies presented by a spill or release from an UST system. Typically controls or monitors the dispensing or sale of hazardous substances or POL and generally includes workers who are handling fuel as their primary job.
Containment sump	A liquid-tight container that protects the environment by containing leaks and spills of hazardous substances or POL from piping, dispensers, pumps, and related components in the containment area. Containment sumps may be single walled or secondarily contained and located at the top of the tank (tank top or submersible turbine sump), underneath the dispenser (under-dispenser containment sump), or at other points in the piping run (transition or intermediate sump).
Decontamination wastes	Waste materials generated during the decontamination of equipment and personnel used during spill response including, but not limited to, purging water, rinsing water, plastic containers, rags, and gloves and other personal protective equipment.
Dispenser	Equipment located aboveground that dispenses hazardous substances or POL from an UST system.
Dispenser system	Includes both the dispenser and any equipment necessary to connect the dispenser to an UST system. Equipment includes check valves, shear valves, unburied risers or flexible connectors, and other

	traditional components that are underneath the dispenser and connect the dispenser to the underground piping.
Enduring location	A location is enduring when DoD intends to maintain access and use of that location for the foreseeable future. The following types of sites are considered enduring for US Government purposes: main operating base, forward operating site, and cooperative security location. All three types of locations may be composed of more than one distinct site. Enduring locations are published in the OSD-approved Enduring Location Master List.
Excluded Underground Storage Tank (UST) systems	UST systems that are not subject to the requirements of Chapter 12.
Existing Underground Storage Tank (UST) system	An UST system where installation began on or before April 11, 2016.
Field Constructed Tank (FCT)	A tank constructed in the field such as a tank constructed of concrete that is poured in the field, or a steel or fiberglass tank primarily fabricated in the field.
Final Governing Standard (FGS)	A comprehensive set of country-specific substantive environmental provisions; typically, technical limitations on effluent, discharges, etc., or a specific management practice, developed in accordance with DoDI 4715.05.
Facility Incident Commander (FIC)	(Also known as installation on-scene coordinator). The official, designated by the installation commander, who coordinates and directs DoD control and cleanup efforts at the scene of a POL or hazardous substance spill due to DoD activities on or near the installation.
Facility Response Team (FRT)	(Also known as installation response team). A team performing emergency functions as defined and directed by the FIC.
Gasoline Dispensing Facility (GDF)	Any stationary facility that dispenses gasoline into the fuel tank of a motor vehicle, motor vehicle engine, non-road vehicle, or non-road engine.
General secondary containment	Containment and diversionary structures intended to prevent a most likely discharge into Turkish waters. This can be either active or passive and needs to consider the typical failure mode and most likely discharge quantity.
Groundwater monitoring	Testing or monitoring for POL or hazardous substances on the groundwater.

Hazardous material	Any material that exhibits any of the characteristics of a physical hazard, a health hazard, a simple asphyxiant, combustible dust, or pyrophoric gas, or is Turkish regulated. See Table 10.1.
Hazardous material shipment	Any movement of hazardous materials either from an installation to a final destination off the installation, or from a point of origin off the installation to a final destination on the installation, in which certification of the shipment is involved.
Hazardous material warning label	A label, tag, or marking on a container that provides information about the material and its hazards, usually provided by the manufacturer.
Hazardous substance	Any substance (including hazardous materials as defined in Chapter 10, “ <i>Hazardous Material</i> ” and hazardous waste as defined in Chapter 16, “ <i>Hazardous Waste</i> ”) having the potential to do serious harm to human health or the environment if spilled or released in reportable quantity. A list of these substances and the corresponding reportable quantities is provided in Table 16.2. Hazardous substances do not include: Petroleum, including crude petroleum, oil, and lubricants or any fraction thereof, that is not otherwise specifically listed or designated in Table 16.2. as a hazardous substance. Natural gas, natural gas liquids, liquefied natural gas, or synthetic gas usable for fuel (or mixtures of natural gas and such synthetic gas) that are not otherwise specifically listed or designated as a hazardous substance above.
Hazardous substance underground storage tank (UST) system	An UST system that contains a hazardous substance (not including hazardous waste as defined in Chapter 11) or any mixture of such hazardous substances and POL, and which is not a POL UST system.
Hazardous waste ¹	A waste that may be solid, semi-solid, liquid, or contained gas, and either is listed as a 6-digit waste code and marked with an asterisk in the European Union List of Wastes, but without a specific or general reference to “<i>hazardous substances</i>”, or, is listed as a 6-digit waste code and marked with an asterisk in the European Union List of Wastes with a specific or general reference to “<i>hazardous substances</i>” and presents one or more hazardous properties listed in Table 16.1, “<i>Hazardous</i>

¹ The European Union List of Wastes is available from the Official Journal of the European Union in various formats and languages at <https://eur-lex.europa.eu/eli/dec/2014/955/oj>

Properties”.

	Does not include domestic sewage sludge, household wastes, and medical wastes.
Hazardous waste storage area	Any location on a DoD installation where hazardous waste is collected before shipment for treatment or disposal. A hazardous waste storage area may store more than the equivalent of a 208-liter [55-gallon] drum of hazardous waste, or a 1-liter [1-quart] container of an acute hazardous waste, from each waste stream.
Hazardous Material Information Resource System (HMIRS)	The computer-based information system developed to accumulate, maintain, and disseminate important information on hazardous materials.
Industry standards and practices	Applicable or recognized standards and practices relevant to the design, construction, installation, O&M, inspection, and repair of facilities and equipment. Industry standards and practices can include those established by the following organizations: API, American Society for Testing and Materials, NACE International, Petroleum Equipment Institute, and STI.
Installation	An enduring location consisting of a base, camp, post, station, yard, center, or other DoD activity under the operational control of the Secretary of a Military Department or the Secretary of Defense.
Integrated Pest Management (IPM)	A planned program, incorporating continuous monitoring, education, recordkeeping, and communication, to prevent pests and disease vectors from causing unacceptable damage to operations, people, property, materiel, or the environment. IPM uses targeted, sustainable (effective, economical, environmentally sound) methods, including education, habitat modification, biological control, genetic control, cultural control, mechanical control, physical control, regulatory control and, where necessary, the judicious use of least- hazardous pesticides.
International agreement	A multilateral or bilateral agreement, such as a base rights or access agreement, a status-of-forces agreement, or any other instrument defined as a binding international agreement in accordance with DoDD 5530.3, “ <i>International Agreements</i> ” (Reference (n)).
Interstitial monitoring	Monitoring between the UST system and a secondary barrier immediately around or beneath it.
Inventory control	Tracking of POL or hazardous substances to compare what is in a tank versus what should be in the tank to reconcile the inputs and outputs of POL or hazardous substances with the volume remaining in the tank.

Loading and unloading racks	A fixed structure (e.g., platform, gangway) necessary for loading or unloading a tank truck or tank car. Includes a loading or unloading arm.
Mobile refueler	POL storage container onboard a vehicle or towed by a vehicle, that is designed or used solely to store and transport fuel for transfer into or from an aircraft, motor vehicle, locomotive, vessel, ground service equipment, or other oil storage container.
Monthly throughput	For GDFs, the total volume of gasoline loaded into, or dispensed from, all the gasoline storage tanks located at a single GDF.
New dispenser system	A dispenser system where installation began after April 11, 2016.
New underground storage tank (UST) system	An UST system where installation began after April 11, 2016.
Oil	Oil of any kind or in any form, including, but not limited to, petroleum, fuel POL, lube oils, animal fats, vegetable oil, sludge, POL refuse, and POL mixed with wastes other than dredged spoil.
Oil-filled operational equipment	Equipment that includes an oil storage container (or multiple containers) in which the oil is present solely to support the function of the apparatus or the device. Oil-filled operational equipment is not considered a POL storage container, and does not include oil-filled manufacturing equipment (flow-through process). Examples of oil-filled operational equipment include, but are not limited to, hydraulic systems, lubricating systems (e.g., those for pumps, compressors and other rotating equipment, including pumpjack lubrication systems), gear boxes, machining coolant systems, heat transfer systems, transformers, circuit breakers, electrical switches, and other systems containing oil solely to enable the operation of the device.
Overfill prevention equipment	Devices that either shut off product flow, restrict product flow, or alert the delivery operator with an alarm when the tank is close to being full.
Pest management consultant (PMC)	A DoD pest management professional who provides technical and management guidance on using IPM to prevent and control pests and disease vectors. The Director, AFPMB, approves pest management consultants as certifying officials of pesticide applicators.
Pesticide	Any substance or mixture of substances, including biological control agents that may prevent, destroy, repel, or mitigate pests or that is used as a plant regulator, defoliant, desiccant, disinfectant, or biocide.
Pesticide waste	Materials subject to pesticide disposal restrictions, including: Any pesticide that has been identified by the pest management consultant as cancelled under US or Turkish authority and which

cannot be safely used.

Any pesticide that does not meet specifications, is contaminated, has been improperly mixed, or otherwise unusable, whether concentrated or diluted.

Any material used to clean up a pesticide spill.

Any containers, equipment, or material contaminated with pesticides.

Pests

Arthropods, birds, rodents, nematodes, fungi, bacteria, viruses, algae, snails, marine borers, snakes, weeds, and other organisms (except for human or animal disease-causing organisms) that adversely affect readiness, military operations, or the well-being of personnel and animals; attack or damage real property, supplies, equipment, or vegetation; or are otherwise undesirable.

**Petroleum, Oil,
Lubricants (POL)**

Refined POLs, including, but not limited to, petroleum, fuel, lubricant oils, synthetic oils, mineral oils, animal fats, vegetable oil, sludge, and POL mixed with wastes other than dredged spoil.

Pipeline facility

Includes new and existing pipes, pipeline rights of way, auxiliary equipment (e.g., valves and manifolds), and buildings or other facilities used in the transportation of POL.

**Petroleum, Oil,
Lubricants (POL)
facility**

An installation with:

An aggregate aboveground storage container capacity (excluding below ground storage containers) of 5,000 liters [1,320 US gallons] or greater, counting only containers with a capacity of 208 liters [55 US gallons] or greater; or

An aggregate below ground storage container capacity of 158,987 liters [42,000 US gallons] or greater; or

A pipeline facility.

**Petroleum, Oil,
Lubricants (POL)
storage container**

Containers with capacities greater than or equal to 208 liters [55 US gallons]. They include mobile and fixed containers as well as those located above and below ground. In the context of USTs in Chapter 12, USTs required to meet all of the requirements of Chapter 12 are excluded from the definition of POL storage containers. Motive power containers (vehicle fuel tanks), containers of heating oil used solely at a single-family residence, pesticide application equipment and related mix containers, and milk/milk-product containers are also excluded.

Registered pesticide

A pesticide registered for use within the US and/or Türkiye.

Release detection method	A method, or combinations of methods, for determining whether a release of a hazardous substance or POL has occurred from an UST system into the environment, or a leak has occurred into the interstitial space between an UST system and its secondary barrier or secondary containment. Methods of release detection include automatic line release detectors, automatic tank gauging, groundwater monitoring, interstitial monitoring, and inventory control.
Repair	In the context of USTs in Chapter 12, to restore to proper operating condition a tank, pipe, spill prevention equipment, overfill prevention equipment, corrosion protection equipment, release detection equipment, or other UST system component that has caused a release of product from the UST system or has failed to function properly.
Replace	In the context of USTs in Chapter 12, to replace a tank means to remove and install another tank. To replace piping means to remove 50% or more of piping and install other piping, excluding connectors, connected to a single tank. For tanks with multiple piping runs, this definition applies independently to each piping run.
Safe suction piping	Piping that is designed, constructed, and can be readily determined to meet these standards: below-grade piping that operates at less than atmospheric pressure, is sloped so that the contents of the pipe will drain back into the storage tank if the suction is released, has only one check valve included in each suction line, and the check valve is located directly below and as close as practical to the suction pump.
Safety Data Sheet (SDS)	A form prepared by manufacturers or importers of chemical products to communicate to users the chemical and physical properties and hazardous effects of a particular product. Formerly known as material safety data sheet.
Secondary containment or secondarily contained	In the context of POL standards in Chapter 11 and spill standards in Chapter 13, a system that provides temporary containment of discharged POL in the event of a failure of the primary containment. This is intended to prevent the migration of POL until appropriate actions can be taken. Secondary containment can include impervious dikes, berms, or retaining walls; curbing or drip pans; sumps and collection systems; culverting and gutters; weirs, booms, or other barriers; spill diversion ponds; retention ponds; or sorbent materials. There are two types of secondary containment, general and sized. In the context of UST standards in Chapter 12, a form of release prevention for tanks or piping. A secondary containment system has an inner and outer barrier with an interstitial space that can be monitored for leaks and includes containment sumps when used for interstitial monitoring of piping. Secondary containment must be able to contain hazardous substances or POL leaked from the primary

	containment until they are detected and removed, and prevent releases of the hazardous substances or POL into the environment at any time during the operational life of an UST system.
Significant spill	For hazardous wastes or hazardous substances identified as a result of inclusion in Table 16.2., any quantity in excess of the reportable quantity listed in that table; For POL or liquid or semi-liquid hazardous material, hazardous waste, or hazardous substances in excess of 416 liters [110 gallons]; For other solid hazardous material in excess of 225 kilograms [500 pounds]; or For combinations of POL and liquid, semi-liquid, and solid hazardous materials, hazardous waste, or hazardous substance in excess of 340 kilograms [750 pounds]. If a spill is contained inside an impervious berm, on a nonporous surface, or inside a building and is not volatilized and is cleaned up, the spill is considered a contained release and is not considered a significant spill.
Sized secondary containment	An impervious (permeability less than or equal to 10^{-7} centimeters per second) secondary means of containment capable of holding the entire contents of the POL storage container plus sufficient freeboard.
Specialty underground storage tank (UST) systems	Also referred to as “previously deferred UST systems.” Airport hydrant fuel distribution systems and UST systems with FCT that were previously deferred from UST requirements.
Spill prevention equipment	Containment around the fill pipe that catches small drips or spills that occur when the delivery hose is disconnected from the fill pipe. The containment is typically called a spill bucket, catchment basin, or spill containment manhole. It must be large enough to contain what may spill when the delivery hose is uncoupled from the fill pipe.
Standards	Substantive elements of US laws applicable and federal regulations to DoD installations, facilities, and actions in the United States that have extraterritorial application or are determined necessary to protect human health and the environment on installations outside the United States.
Storage vessel	Any tank, reservoir, or container used for the storage of petroleum, but does not include: Pressure vessels that are designed to operate in excess of 103 kPa [15 psia] gauge without emissions to the atmosphere, except under emergency conditions.

	Subsurface caverns or porous rock reservoirs. Process tanks.
Trace contaminant	For fire-fighting foams in Chapter 10, “ <i>Hazardous Materials</i> ”: concentrations of PFOA or any of its salts equal to or below 0.025 mg/kg (0.0000025% by weight [or 25 ppb]) where they are present in substances, mixtures, or articles. concentrations of the sum of C9-C14 PFCAs and their salts equal to or below 0.025 mg/kg (0.0000025% by weight [or 25 ppb]) where they are present in substances, mixtures, or articles, or 0.260 mg/kg (0.000026% by weight [or 260 ppb] for the sum of C9-C14 PFCA-related substances.
Transfer areas	Also known as loading and unloading areas. Any location, other than a fixed loading and unloading rack, where POL is authorized to be loaded or unloaded to or from a POL storage container.
United States	The several States, the District of Columbia, the Commonwealths of Puerto Rico and the Northern Mariana Islands, American Samoa, Guam, Midway and Wake Islands, the US Virgin Islands, any other territory or possession of the United States, and associated navigable waters, contiguous zones, and ocean waters of which the natural resources are under the exclusive management authority of the United States.
Underground storage tank (UST) system	A tank and connected underground piping that is used to contain POL products or hazardous substances and the volume of which, including the volume of connected pipes, is 10% or more beneath the surface of the ground, but does not include: Tanks containing heating oil used for consumption on the premises where it is stored. These tanks are considered below ground storage tanks; see Chapter 11 for requirements. Septic tanks. Stormwater or wastewater collection systems. Flow-through process tanks. Surface impoundments, pits, ponds, or lagoons. Storage tanks located in an accessible underground area (e.g., basement, vault) if the storage tank is situated on or above the surface of the floor. These tanks meet the definition of an

aboveground storage tank; see Chapter 11 for requirements.

Any pipes connected to a tank that is not considered an UST system.

**Tank or line
tightness testing**

A test that identifies breaches in a tank or line that could result in a release. While different methods exist, all tightness tests must detect leaks from any portion of the tank or line that routinely contains product while accounting for the effects of thermal expansion or contraction of the product, vapor pockets, tank deformation, evaporation or condensation, and the location of the water table.

Turkish Waters

Surface water including the territorial seas recognized under customary international law, including:

All waters that are currently used, were used in the past, or may be susceptible to use in commerce.

Waters that are or could be used for recreation or other purposes.

Waters where fish or shellfish are or could be taken and sold.

Waters that are used or could be used for industrial purposes by industries.

Waters including lakes, rivers, streams (including intermittent streams), sloughs, prairie potholes, or natural ponds.

Tributaries of waters identified in this definition.

Exclusions to Turkish Waters are domestic or industrial waste treatment systems, including treatment ponds or lagoons designed to meet the requirements of Chapter 9, “*Stormwater and Wastewater*”. This exclusion applies to only manmade bodies of water that were neither originally Turkish Waters nor resulted from impoundment of Turkish Waters.

**Vapor balance
system**

A combination of pipes and hoses that creates a closed system between the vapor spaces of an unloading gasoline cargo tank and a receiving storage tank such that vapors displaced from the storage tank are transferred to the gasoline cargo tank being unloaded.

Vapor monitoring

Testing or monitoring for vapors within the soil gas of the excavation zone.

**Wastewater
treatment tank**

A tank that is designed to receive and treat an influent wastewater through physical, chemical, or biological methods.

Worst-case discharge (WCD) The largest foreseeable discharge from the facility, under adverse weather conditions, as determined using the WCD planning volume standards in Appendix 13A as a guide.

ACRONYMS

ACRONYM	MEANING
AFPMB	Armed Forces Pest Management Board
API	American Petroleum Institute
DLAI	Defense Logistics Agency instruction
DoDD	DoD directive
DoDI	DoD instruction
DoDM	DoD manual
DTR	Defense transportation regulation
EO	Executive order
FCT	field-constructed tank
FGS	final governing standard
FIC	facility incident commander
FRT	facility response team
GDF	gasoline dispensing facility
HMIRS	Hazardous Material Information Resource System
IPM	integrated pest management
IPMC	IPM coordinator
kPa	kilopascal
LEC	lead environmental component
MCO	Marine Corps order
NAVSUP PUB	Naval Supply Systems Command publication
O&M	operation and maintenance
OSD	Office of the Secretary of Defense

PFCA	perfluoro carboxylic acid
PFCAs	its salts and C9-C14 PFCA-related substances
PFOA	Perfluorooctanoic acid
PFOAs	its salts and PFOA-related compounds
PMC	pest management consultant
POL	petroleum, oil, and lubricants
Psia	pounds per square inch absolute
SDS	safety data sheet
STI	Steel Tank Institute
TM	technical manual
UFC	unified facilities criteria
USEUCOM	United States European Command
UST	underground storage tank
WCD	worst-case discharge

CHAPTER 10: HAZARDOUS MATERIALS

10.1. INTRODUCTION.

This chapter contains standards on the safe handling and storage of hazardous materials. It addresses some of the hazard communication, safety, and occupational health topics covered more fully in Department of Defense Instruction (DoDI) 6050.05. It does not cover:

10.1.1. Solid, hazardous, and medical waste, which are covered in Chapters 15, 16, and 17.

10.1.2. Storage of petroleum, oil, and lubricants (POL), underground storage tank (UST) systems, and related spill planning and response requirements, which are covered in Chapters 11, 12, and 13.

10.1.3. Transportation of hazardous materials, which is covered in Parts I, II, III, and IV of Defense Transportation Regulation (DTR) 4500.9-R.

10.1.4. Ammunition and explosives, which are covered in Department of Defense (DoD) 6055.09-M.

10.1.5. Radioactive materials, which are covered in DoD 4715.6-R.

10.2. GENERAL.

10.2.1. Materials that exhibit any of the characteristics in Table 10.1 are considered hazardous.

10.2.2. All personnel who use, handle, or store hazardous materials must be trained in accordance with, and comply with, DoDI 6050.05.

10.2.3. DoD installations should reduce the use of hazardous materials where practical through reissuance, resource recovery, recycling, source reduction, sustainable procurement, substitution, or other minimization strategies in accordance with Service guidance on improved hazardous material management processes and techniques.

10.2.4. All hazardous materials excess to the installation must be processed through the Defense Logistics Agency Disposition Services in accordance with the procedures in Volume 4 of DoDM 4160.21-M, “*Defense Materiel Disposition*”. This section is not intended to prohibit the transfer of usable hazardous materials between DoD activities.

10.2.5. Installations will only use hazardous materials authorized for use by the DoD. Table 10.2 lists the chemicals that shall not be used in Türkiye.

10.2.6. Fire-fighting Foam.

10.2.6.1. Perfluorooctanoic acid (PFOA), its salts and PFOA-related compounds (PFOAs) and C9-C14 perfluoro carboxylic acid (PFCA), its salts and C9-C14 PFCA-related substances (C9-C14 PFCAs), shall be allowed in fire-fighting foam for liquid fuel vapor suppression and liquid fuel fire (Class B fires) already installed in systems, including both mobile and fixed systems, until 4 July 2025, subject to specific conditions.

10.2.6.1.1. fire-fighting foam that contains or may contain PFOAs or C9-C14 PFCAs shall not be used for training;

10.2.6.1.2. fire-fighting foam that contains or may contain PFOAs or C9-C14 PFCAs shall not be used for testing unless all releases are contained;

10.2.6.1.3. fire-fighting foam that contains or may contain PFOAs or C9-C14 PFCAs shall only be allowed at sites where all releases can be contained (from 1 January 2023).

10.2.6.2. New systems containing fire-fighting foam for liquid fuel vapor suppression and liquid fuel fire (Class B fires) shall only contain PFOAs or C9-C14 PFCAs as an unintentional trace contaminant.

10.2.6.3. Fire-fighting Foam Stockpiles

Fire-fighting foam stockpiles that contain or may contain PFOAs (> 50kg) or C9-C14 PFCAs:

10.2.6.3.1. shall be managed as a hazardous waste, according to Chapter 16, “*Hazardous Waste*”.

10.2.6.3.2. shall be managed in a safe, efficient and environmentally sound manner, taking all adequate steps to ensure that the stockpile is managed in a manner that will protect human health and the environment.

10.3. STORAGE AND HANDLING.

10.3.1. Installations must store hazardous materials in such a way as to prevent exposure to precipitation, facilitate spill response, and provide appropriate secondary containment. Hazardous material facility requirements are outlined in Unified Facilities Criteria (UFC) 4-440-01 and Defense Logistics Agency Instruction (DLAI) 4145.11, Army Technical Manual (TM) 38-410, Naval Supply Publication (NAVSUP PUB) 573, Air Force Joint Manual (AFJMAN) 23-209, and Marine Corps Order (MCO) 4450.12A, “*Storage and Handling of Hazardous Materials*”.

10.3.2. Each installation must maintain a master listing of all hazardous material storage locations as well as an inventory of all hazardous materials contained therein. See Paragraph 13.2.3.3. for details regarding hazardous substance inventory.

10.3.3. The installation must prevent the unauthorized entry of persons or livestock into hazardous material storage areas.

10.3.4. All hazardous materials on DoD installations must have a hazardous material warning label in accordance with DoDI 6050.05, or comparable Turkish requirements. Hazardous materials must also have safety data sheet (SDS) information either available or in the Hazardous Material Information Resource System (HMIRS) in accordance with DoDI 6050.05 and other DoD Component instructions. Materials containing ozone depleting substances must be labelled in accordance with 4.9.3. These requirements apply throughout the life-cycle of these materials.

10.3.4.1. Manufacturer or supplier-generated labels, when present, shall not be defaced or removed from a container.

10.3.4.2. When generating labels for a container per DoD Instruction 6050.05, the following elements shall be taken directly from the SDS, to the extent this information is present within the SDS. Refer to

10.3.4.3. for a sample label:

10.3.4.3.1. name, address and telephone number of the supplier(s);

10.3.4.3.2. nominal quantity of the substance or mixture in the package, unless this quantity is specified elsewhere on the package;

10.3.4.3.3. product identifiers (e.g., the name of the product, CAS or EC Numbers, etc. Refer to the USEUCOM Chemicals Lists for examples);

10.3.4.3.4. where applicable, hazard pictogram(s) (see Table 10.3 for samples);

10.3.4.3.5. where applicable, signal words (see Table 10.3 for samples);

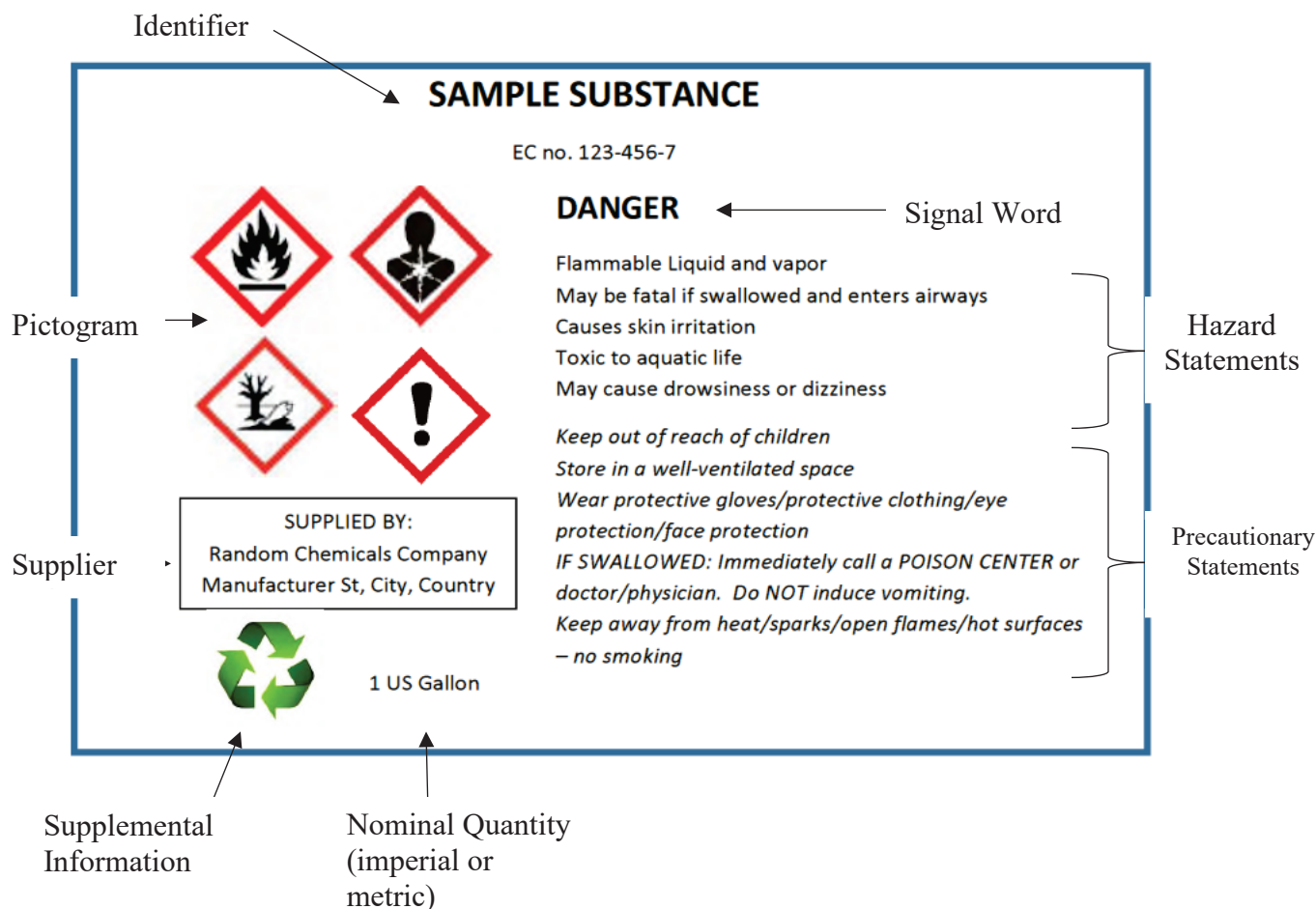
10.3.4.3.6. where applicable, hazard statements (see Table 10.3 for samples);

10.3.4.3.7. where applicable, the appropriate precautionary statements;

10.3.4.3.8. where applicable, a section for supplemental information.

10.3.4.4. The labels shall be sized per Table 10.4.

Figure 10.1. Sample Label Per 10.3.4.2.



10.3.5. Each work center must maintain a file of SDSs for each hazardous material procured, stored, or used at the work center that's accessible to personnel. SDSs that are not contained in the HMIRS and SDSs prepared for locally purchased items must be submitted by the installation for addition into the HMIRS. SDSs must be submitted through HMIRS points of contact as identified at

<http://www.dla.mil/HQ/InformationOperations/Offers/Products/LogisticsApplications/HMIRS.aspx>. Each SDS must be in both English and Turkish and include information on:

10.3.5.1. Identification.

10.3.5.2. Hazard(s) identification.

10.3.5.3. Composition and information on ingredients.

10.3.5.4. First-aid measures.

10.3.5.5. Firefighting measures.

10.3.5.6. Accidental release measures.

10.3.5.7. Handling and storage.

10.3.5.8. Exposure control and personal protection.

10.3.5.9. Physical and chemical properties.

10.3.5.10. Stability and reactivity.

10.3.5.11. Toxicology information.

10.3.5.12. Preparation or last revision.

10.3.5.13. Ecological information (optional).

10.3.5.14. Disposal considerations (optional).

10.3.6. Hazardous material dispensing areas must be properly maintained. Installations must:

10.3.6.1. Ensure drums and containers are not leaking.

10.3.6.2. Provide appropriate secondary containment and place drip pans and absorbent materials under containers, as necessary, to collect drips or spills.

10.3.6.3. Clearly mark container contents.

10.3.6.4. Locate dispensing areas away from catch basins and floor and storm drains.

10.4. PRE-TRANSPORT REQUIREMENTS.

Installations must ensure that before each hazardous material shipment:

10.4.1. The shipment is accompanied by shipping papers that clearly describe the quantity and identity of the material and includes an SDS.

10.4.2. All drivers:

10.4.2.1. Are trained on the hazardous material included in the shipment, including health risks of exposure and the physical hazards of the material, including potential for fire, explosion, and reactivity.

10.4.2.2. Are trained on spill control and emergency notification procedures.

10.4.2.3. Perform a walk-around inspection before and after the hazardous material is loaded.

10.4.3. Hazardous material containers are labeled in accordance with Paragraph 10.3.4.

10.4.4. Road shipments of hazardous materials originating from DoD installations within Türkiye and internationally will adhere to Service Component Policies.

Table 10.1. Typical Characteristics of Hazardous Materials

TYPE OF HAZARD	CHARACTERISTICS
Physical	Explosive, flammable (gases, aerosols, liquids, or solids), oxidizer (liquid, solid or gas), self-reactive, pyrophoric (liquid or solid), self-heating, organic peroxide, corrosive to metal, gas under pressure, or when in contact with water emits flammable gas.
Health	Acute toxicity (any route of exposure), skin corrosion or irritation, serious eye damage or eye irritation, respiratory or skin sensitization, germ cell mutagenicity, carcinogenicity, reproductive toxicity, specific target organ toxicity (single or repeated exposure), or aspiration hazard.
Asphyxiant	Simple asphyxiant that displaces oxygen in the ambient atmosphere, and can thus cause oxygen deprivation in those who are exposed, leading to unconsciousness and death.
Combustible Dust	Solid particles of a substance or mixture suspended in a gas (usually air) that are combustible.
Pyrophoric Gas	A gas that will ignite spontaneously in air at a temperature of 54.4 degrees Celsius [130 degrees Fahrenheit] or below.
Türkiye Regulated	The item or its disposal is regulated by Türkiye because of its hazardous nature.

Table 10.2. Hazardous Materials Banned from Use in Türkiye

Substance	CAS Number	EC Number	Specific Exemption on Intermediate Use or Other Specification
Aldrin	309-00-2	206-215-8	-
Chlordane	57-74-9	200-349-0	-
Dieldrin	60-57-1	200-484-5	-
Endrin	72-20-8	200-775-7	-
Heptachlor	76-44-8	200-962-3	-
Hexachlorobenzene	118-74-1	200-273-9	-
Mirex	2385-85-5	219-196-6	-
Toxaphene	8001-35-2	232-283-3	-
Polychlorinated Biphenyls (PCB)	1336-36-3 and others	215-648-1 and others	Articles already in use. See Chapter 7.
DDT (1,1,1-trichloro-2,2bis(4-chlorophenyl) ethane)	50-29-3	200-024-3	-
Chlordecone	143-50-0	205-601-3	-
Hexabromobiphenyl	36355-01-8	252-994-2	-
HCH, including lindane	608-73-1, 58-89-9	210-168-9, 200-401-2	-
Hexabromocyclododecane, which means: hexabromocyclododecane; 1,2,5,6,9,10-hexabromocyclododecane and its main diastereoisomers: alpha-hexabromocyclododecane; beta-hexabromocyclododecane; and gamma-hexabromocyclododecane	25637-99-4, 3194-55-6, 134237-50-6, 134237-51-7, 134237-52-8	247-148-4, 221-695-9	-
Pentachlorophenol, its salts or esters	87-86-5	201-778-6	-
PFOA, its salts and PFOA-related compounds	335-67-1	206-397-9	Already installed fire-fighting foam systems, including both mobile and fixed systems, until 4 July 2025, subject to specific conditions. New fire-fighting foam systems may only contain substances as an unintentional trace contaminant.
PFCAs, their salts and C9-C14 PFCA-related substances	375-95-1, 335-76-2, 2058-94-8, 307-55-1, 72629-94-8, 376-06-7	206-801-3, 206-400-3, 218-165-4, 206-203-2, 276-745-2, 206-803-4	

Table 10.3. Classes of Hazardous Materials

Hazard Class	Category	Pictogram	Signal Word(s)	Hazard Phrase
Explosive	Unstable		Danger	Unstable Explosive
	Expl. 1.1			Explosive: Mass explosion hazard
	Expl. 1.2		Danger	Explosive: Severe projection hazard
	Expl. 1.3		Danger	Explosive: Fire, blast, or projection hazard
	Expl. 1.4		Warning	Explosive: Fire or projection hazard
	Expl. 1.5	None	Danger	May mass explode
	Expl. 1.6	None	None	None
Desensitised explosive	Des. Expl. 1		Danger	Fire, blast or projection hazard; increased risk of explosion if desensitising agent is reduced
	Des. Expl. 2		Danger	Fire or projection hazard; increased risk of explosion if desensitising agent is reduced
	Des. Expl. 3		Warning	Fire or projection hazard; increased risk of explosion if desensitising agent is reduced
	Des. Expl. 4		Warning	Fire hazard; increased risk of explosion if desensitising agent is reduced
Flammable gas	1A Flam. Gas		Danger	Extremely Flammable Gas
	1A Pyrophoric Gas		Danger	Extremely flammable gas May ignite spontaneously if exposed to air
	1A Chem. Unstable Gas A		Danger	Extremely flammable gas. May react explosively even in the absence of air
	1A Chem. Unstable Gas B		Danger	Extremely flammable gas. May react explosively even in the absence of air at elevated pressure and/or temperature
	1B Flam. Gas		Danger	Flammable gas

Hazard Class	Category	Pictogram	Signal Word(s)	Hazard Phrase
	2 Flam. Gas	None	Warning	Flammable gas
Aerosols	Aerosol 1		Danger	Extremely flammable aerosol Pressurized container: May burst if heated
	Aerosol 2		Warning	Flammable aerosol Pressurized container: May burst if heated
	Aerosol 3	None	Warning	Pressurized container: May burst if heated
Oxidizing Gas	Ox. Gas 1		Danger	May cause or intensify fire; oxidizer
Flammable Liquid	Flam. Liq. 1		Danger	Extremely flammable liquid and vapor
	Flam. Liq. 2		Danger	Highly flammable liquid and vapor
	Flam. Liq. 3		Warning	Flammable liquid and vapor
Flammable Solid	Flam. Sol. 1		Danger	Flammable Solid
	Flam. Sol. 2		Warning	Flammable Solid
Self-reactive substance or mixture	Self-react. A		Danger	Heating may cause explosion

Hazard Class	Category	Pictogram	Signal Word(s)	Hazard Phrase
	Self-react. B		Danger	Heating may cause a fire or explosion
	Self-react. CD		Danger	Heating may cause a fire
	Self-react. EF		Warning	Heating may cause a fire
	Self-react. G	None	None	None
Pyrophoric liquid	Pyr. Liq. 1		Danger	Catches fire spontaneously if exposed to air
Pyrophoric solid	Pyr. Sol. 1		Danger	Catches fire spontaneously if exposed to air
Self-heating substance or mixture	Self-heat. 1		Danger	Self-heating; may catch fire
	Self-heat. 2		Warning	Self-heating in large quantities; may catch fire
Substance or mixture which in contact with water emits flammable gas	Water-react. 1		Danger	In contact with water releases flammable gases which may ignite spontaneously
	Water-react. 2		Danger	In contact with water releases flammable gases
	Water-react. 3		Warning	In contact with water releases flammable gases
Oxidizing Liquid	Ox. Liq. 1		Danger	May cause fire or explosion; strong oxidizer
	Ox. Liq. 2		Danger	May intensify fire; oxidizer

Hazard Class	Category	Pictogram	Signal Word(s)	Hazard Phrase
	Ox. Liq. 3		Warning	May intensify fire; oxidizer
Oxidizing Solid	Ox. Sol. 1		Danger	May cause fire or explosion; strong oxidizer
	Ox. Sol. 2		Danger	May intensify fire; oxidizer
	Ox. Sol. 3		Warning	May intensify fire; oxidizer
Organic Peroxide	Org. Perox. A		Danger	Heating may cause explosion
	Org. Perox. B		Danger	Heating may cause a fire or explosion
	Org. Perox. CD		Danger	Heating may cause a fire
	Org. Perox. EF		Warning	Heating may cause a fire
	Org. Perox. G	None	None	None

Hazard Class	Category	Pictogram	Signal Word(s)	Hazard Phrase
Substance or mixture corrosive to metals	Corrosive to metals		Warning	May be corrosive to metals
Acute Toxicity	Acute Tox. 1		Danger	Fatal if swallowed
	Acute Tox. 2		Danger	Fatal if swallowed
	Acute Tox. 3		Danger	Toxic if swallowed
	Acute Tox. 4		Warning	Harmful if swallowed
Skin corrosion/irritation	Skin Corr. 1A, 1B, 1C		Danger	Causes sever skin burns and eye damage
	Skin Irrit. 2		Warning	Causes skin irritation
Serious eye damage/eye irritation	Eye Dam. 1		Danger	Causes serious eye damage
	Eye Irrit. 2		Warning	Causes serious eye irritation
Respiratory/skin sensitization	Resp. Sens. 1, 1A, 1B		Danger	May cause allergy asthma symptoms or breathing difficulties if inhaled

Hazard Class	Category	Pictogram	Signal Word(s)	Hazard Phrase
	Skin. Sens. 1, 1A, 1B		Warning	May cause allergic skin reaction
Germ cell mutagenicity	Muta. 1A, 1B		Danger	May cause genetic defects
	Muta. 2		Warning	Suspected of causing genetic defects
Carcinogenicity	Carc. 1A, 1B		Danger	May cause cancer
	Carc. 2		Warning	Suspected of causing cancer
Reproductive Toxicity	Repr. 1A, 1B		Danger	May damage fertility or the unborn child
	Repr. 2		Warning	Suspected of damaging fertility or the unborn child
	Lact	None	None	May cause harm to breast-fed children
Specific target organ toxicity — single exposure	STOT SE 1		Danger	Causes damage to organs
	STOT SE 2		Warning	May cause damage to organs
	STOT SE 3		Warning	May cause respiratory irritation Or May cause drowsiness or dizziness
Specific target organ toxicity — repeated exposure	STOT RE 1		Danger	Causes damage to organs
	STOT RE 2		Warning	May cause damage to organs

Hazard Class	Category	Pictogram	Signal Word(s)	Hazard Phrase
Aspiration hazard	Asp. Tox. 1		Danger	May be fatal if swallowed or enters airways
Hazardous to the aquatic environment	Aquatic Acute 1		Warning	Very toxic to aquatic life
	Aquatic Chronic 1		Warning	Very toxic to aquatic life with long lasting effects
	Aquatic Chronic 2		None	Toxic to aquatic life with long lasting effects
	Aquatic Chronic 3	None	None	Harmful to aquatic life with long lasting effects
	Aquatic Chronic 4	None	None	May cause long lasting effects to aquatic life
Hazardous for the ozone layer	Ozone 1		Warning	Harms public health and the environment by destroying ozone in the upper atmosphere
Gases Under Pressure	Compressed Gas		Warning	Contains gas under pressure; may explode if heated
	Liquefied Gas		Warning	Contains gas under pressure; may explode if heated
	Refrigerated Liquefied Gas		Warning	Contains refrigerated gas; may cause cryogenic burns or injury
	Dissolved Gas		Warning	Contains gas under pressure; may explode if heated

Table 10.4. Label Sizes when not Already on Package

Capacity of the Package	Label Dimensions (mm)	Pictogram Dimensions (mm)
Not exceeding 3 liters:	If possible, at least 52×74	Not smaller than 10×10 If possible, at least 16×16
Greater than 3 liters but not exceeding 50 liters:	At least 74×105	At least 23×23
Greater than 50 liters but not exceeding 500 liters:	At least 105×148	At least 32×32
Greater than 500 liters:	At least 148×210	At least 46×46

Label Size Exceptions. DOD-generated labels can deviate from the size standards above for the following circumstances:

- 1) General. Labels on packages need only contain hazard pictograms, the product identifier, and the name and telephone number of the supplier, provided all remaining and required label information from C5.3.7 is available either (a) in fold-out labels; (b) on tie-on tags; or (c) on an outer packaging. This exemption shall only be used when such alternative information is made readily available to end-users.
- 2) Gas Cylinders. Label information can be affixed or attached to the cylinder via an information disk or label. For propane, butane or liquefied petroleum gas, only the pictogram, hazard phrase and precautionary statement of flammability are required.
- 3) Explosives. Refer to Service Instructions.

CHAPTER 11: PETROLEUM, OIL, AND LUBRICANTS (POL)**11.1. INTRODUCTION.**

This chapter contains standards on the prevention and control of pollution resulting from the storage, transport, and distribution of POL.

11.1.1. Standards for UST systems containing POL or hazardous substances are addressed in Chapter 12, “*Underground Storage Tanks*”, except:

11.1.1.1. USTs that are considered storage vessels and covered in Paragraph 11.4.4.

11.1.1.2. Specialty UST systems that also are considered aboveground storage containers or below ground storage containers. Those systems may also be subject to the standards of this section. Installations must evaluate such UST systems to determine applicability of standards and comply with such standards, as practicable.

11.1.2. POL spill prevention and response standards are contained in Chapter 13, “*Spill Prevention and Response Planning*”.

11.2. GENERAL.

Installations that are considered POL facilities must comply with the applicable requirements of this section based on the type and capacity of POL storage and the type of POL transport and distribution activities. All installations, whether considered POL facilities or not, must comply with the spill prevention and response requirements of Chapter 13 and the requirements of Paragraphs 11.6.3. and 11.6.4., as applicable.

11.3. PERSONNEL TRAINING.

At a minimum, all personnel handling POL must be trained annually on:

11.3.1. General facility operations.

11.3.2. Operation and maintenance (O&M) of equipment to prevent accidental discharges.

11.3.3. Spill response procedures.

11.3.4. Contents of the Spill Prevention and Response Plan.

11.4. POL STORAGE CONTAINERS.

11.4.1. Design and Construction.

11.4.1.1. All POL Storage Containers.

POL storage containers must be designed or modernized in accordance with industry standards and practices to prevent unintentional discharges.

11.4.1.1.1. The material and construction of POL storage containers must be compatible with the material stored.

11.4.1.1.2. Design must be in accordance with industry standards and practices.

11.4.1.1.3. Except for mobile refuelers, POL storage containers must have adequate spill and leak prevention options (such as overfill alarms and flow shutoff or restrictor devices).

11.4.1.2. Below Ground and Partially Buried Aboveground Storage Containers.

Completely and partially buried metallic POL containers and piping must be protected from corrosion in accordance with industry standards and practices.

11.4.2. Inspections and Testing.

11.4.2.1. All POL Storage Containers.

11.4.2.1.1. All containers must be inspected and tested and results documented in accordance with industry standards and practices, such as American Petroleum Institute (API), Steel Tank Institute (STI), and UFC.

11.4.2.1.2. All aboveground valves, piping, and equipment associated with POL storage containers must be inspected in accordance with industry standards and practices.

11.4.2.1.3. Except for mobile refuelers and mobile aboveground storage containers, liquid level sensing devices must be tested to ensure proper operation.

11.4.2.2. Buried Piping.

Buried piping associated with POL storage containers must be tested for integrity and leaks at the time of installation, modification, construction, relocation, or replacement.

11.4.2.3. Below Ground Storage Containers.

Below ground storage containers must be tested for leaks regularly and at the time of installation, modification, construction, relocation, or replacement.

11.4.3. Secondary Containment.

11.4.3.1. All POL Storage Containers.

If a professional engineer or Turkish equivalent determines that secondary containment methods are impractical, they may waive these standards while implementing and documenting alternative measures of protection taken to prevent and contain oil discharges.

11.4.3.1.1. POL storage containers must be provided with a sized secondary means of containment (e.g., dike) capable of holding the entire contents of the largest single tank plus sufficient freeboard to allow for precipitation and expansion of product. This does not include mobile refuelers and mobile aboveground storage containers. POL storage containers that are equipped with adequate engineered spill and leak prevention options (such as overfill alarms and flow shutoff or restrictor devices) may provide secondary containment by using a double-wall container.

11.4.3.1.2. POL storage containers (fixed and mobile) must have a general secondary containment analysis to identify and contain likely releases from all parts of the container system. This includes transfer of POL into and out of the container as well as leakage or rupture of all valves and aboveground and underground pipes. Appropriate general secondary containment measures must be identified and put in place.

11.4.3.2. Below Ground Storage Containers.

Completely buried containers not subject to UST standards can alternatively meet the secondary containment standards by using a leak barrier with leak detection equipment and basin.

11.4.3.3. Mobile Refuelers and Mobile Aboveground Storage Containers.

Mobile refuelers and mobile aboveground storage containers must be provided general secondary containment when parked and positioned to prevent discharges into waters of Türkiye.

11.4.3.4. Containment Area Permeability.

Permeability for containment areas may not exceed 10^{-7} centimeters per second.

11.4.3.5. Containment Area Drainage.

Drainage of stormwater from containment areas must be controlled by a valve that is locked closed when not in active use. Collected stormwater must be inspected and documented for petroleum sheen before being drained from containment areas. If a petroleum sheen is present, it must be collected with sorbent materials before drainage or treated using an oil-water separator (subject to criteria found in Chapter 9, “*Wastewater*” if treated on base). Disposal of sorbent material shall be in accordance with Chapter 16, “*Hazardous Waste*” or Chapter 15, “*Solid Waste*” as appropriate.

11.4.4. Additional Requirements for Storage Vessels.

11.4.4.1. Storage vessel designs must comply with the requirements listed in Table 11.1.

11.4.4.2. Storage vessels and emission controls must follow industry standards and practices for proper O&M.

11.4.5. Storage Container Wastes.

11.4.5.1. POL storage container wastes (e.g., sludges, residues, and bottom waters) meeting the definition of hazardous waste (as defined in Chapter 16) must be handled and disposed of in accordance with the requirements of Chapter 16, “*Hazardous Waste*”.

11.4.5.2. If testing confirms that a storage container waste does not exhibit a characteristic and is not hazardous, it must be managed and disposed of in accordance with the solid waste requirements of Chapter 15 or the wastewater requirements of Chapter 9, as appropriate.

11.5. OIL-FILLED OPERATIONAL EQUIPMENT.

General secondary containment must be provided for oil-filled operational equipment. This general secondary containment is not required for facilities that have not had a single discharge from oil-filled operational equipment greater than 3,785 liters [1,000 US gallons] or two discharges greater than 159 liters [42 US gallons] within the past 12 months. If general secondary containment is not provided, the facility must:

11.5.1. Have a written inspection and monitoring program to detect oil-filled equipment failure or discharges.

11.5.2. Have a written commitment of manpower, equipment, and materials required to expeditiously control and remove any quantity of oil discharged.

11.5.3. Include this information in the facility Spill Prevention and Response Plan.

11.6. TRANSPORT AND DISTRIBUTION.

11.6.1. Loading and Unloading Racks and Transfer Areas.

11.6.1.1. Secondary Containment.

11.6.1.1.1. Loading and Unloading Racks. Sized secondary containment must be provided that is designed to handle discharges of at least the maximum capacity of any single compartment of a rail car or tank truck loaded or unloaded at the loading or unloading rack.

11.6.1.1.2. Transfer Areas. General secondary containment, appropriate containment or diversionary structures like dikes, berms, culverts, spill diversion ponds, or equipment such as sorbent materials, weirs, booms, other barriers, must be provided at transfer areas to prevent a discharge of POL.

11.6.1.2. Departing Vehicle Warning Systems and Barriers.

At loading and unloading racks, an interlocked warning light or physical barrier system, warning signs, wheel chocks, or vehicle break interlock system must be provided to prevent vehicles from departing before complete disconnection of flexible or fixed oil transfer lines.

11.6.1.3. Vehicle Inspections.

At both loading and unloading racks and transfer areas, before departure of any tank car or tank truck, the lowermost drain and all outlets of such vehicles must be closely inspected for discharges and, if necessary, tightened, adjusted, or replaced to prevent liquid discharge while in transit.

11.6.2. POL Pipeline Facilities.

All pipeline facilities carrying POL must be inspected, tested, and maintained in accordance with industry standards and practices, including:

11.6.2.1. Each pipeline operator handling POL must prepare and follow a procedural manual for operations, maintenance, and emergencies.

11.6.2.2. Each new pipeline facility, and each facility in which piping has been replaced or relocated, must be tested in accordance with industry standards and practices, without leakage, before being placed in service.

11.6.2.3. All new POL pipeline facilities must be designed and constructed to meet industry standards and practices such as API, STI, or UFC.

11.6.3. Bulk Gasoline Plants.

The following requirements apply to the loading of gasoline into storage tanks with a capacity of 946 liters [250 US gallons] or more, or the loading of gasoline into all cargo tanks. Bulk gasoline plant requirements do not apply to loading of aviation gasoline into storage tanks at airports or the subsequent transfer of aviation gasoline within the airport.

11.6.3.1. Gasoline Handling.

Gasoline must not be handled in a manner that results in vapor release to the atmosphere for an extended period of time. Measures to be taken include, but are not limited to:

11.6.3.1.1. Minimize gasoline spills and clean up spills as expeditiously as practicable.

11.6.3.1.2. Cover all open gasoline containers and all gasoline storage tank fill-pipes with a gasketed seal when not in use.

11.6.3.1.3. Minimize gasoline sent to open waste collection systems that collect and transport gasoline to reclamation and recycling devices, such as oil and water separators.

11.6.3.2. Submerged Filling.

Gasoline must only be loaded into storage tanks and cargo tanks using submerged filling.

11.6.3.3. Inspections.

Monthly leak inspection of all equipment in gasoline service at the facility must be performed. Document each inspection in a log book. Include a list, summary description, or diagram in the log book showing the location of all equipment in gasoline service.

11.6.3.4. Leak Repair.

Initial repair must be performed as soon as possible, but no later than 5 calendar days after the leak is detected. Repair or replacement of leaking equipment must be completed within 15 calendar days after detection, if practicable.

11.6.4. Gasoline Dispensing Facilities (GDFs).

The following requirements apply to the loading of gasoline storage tanks at a GDF, based on monthly throughput of the GDF. If an installation has two or more GDFs at separate locations within the installation, each GDF must be treated separately. GDF requirements do not apply to loading of aviation gasoline into storage tanks at airports or the subsequent transfer of aviation gasoline within the airport. Installations must ensure that each gasoline storage tank located at a GDF and gasoline cargo tank (i.e., tanker truck or railcar) that deliver gasoline to or from a GDF complies with the following requirements:

11.6.4.1. GDF with Monthly Throughput Less Than 37,854 liters [10,000 US gallons]. Gasoline must not be handled in a manner that would result in vapor releases to the atmosphere for extended periods of time. Measures to be taken include, but are not limited to:

11.6.4.1.1. Minimizing gasoline spills and cleaning up spills as expeditiously as practicable.

11.6.4.1.2. Covering all open gasoline containers and all gasoline storage tank fill-pipes with a gasketed seal when not in use.

11.6.4.1.3. Minimizing gasoline sent to open waste collection systems that collect and transport gasoline to reclamation and recycling devices, such as oil/water separators.

11.6.4.2. GDF with Monthly Throughput Greater Than or Equal to 37,854 liters [10,000 US gallons]. Measures to be taken include, but are not limited to:

11.6.4.2.1. Complying with the requirements of Paragraph 11.6.4.1.

11.6.4.2.2. Only loading gasoline into storage tanks using submerged filling.

11.6.4.3. GDF with Monthly Throughput Greater Than or Equal to 378,541 liters [100,000 US gallons]. Measures to be taken include, but are not limited to:

11.6.4.3.1. Complying with the requirements of Paragraphs 11.6.4.1 and 11.6.4.2.

11.6.4.3.2. Installing and operating a vapor balance system on each storage tank at the GDF. At a minimum, each vapor balance system must meet all of these design standards:

11.6.4.3.2.1. All vapor connections and lines on the storage tank must be equipped with closures that seal upon disconnect.

11.6.4.3.2.2. The vapor line from the gasoline storage tank to the gasoline cargo tank must be vapor-tight.

11.6.4.3.2.3. The pressure in the tank truck must not exceed 4.5 kPa [18 inches water] pressure or 1.5 kPa [5.9 inches water] vacuum during product transfer.

11.6.4.3.2.4. The vapor recovery and product adaptors, and the method of connection with the delivery elbow, must prevent the overtightening or loosening of fittings during normal delivery operations.

11.6.4.3.2.5. If a gauge well separate from the fill tube is used, it must be provided with a submerged drop tube.

11.6.4.3.2.6. Liquid fill connections for all systems must be equipped with vapor-tight caps.

11.6.4.3.2.7. Pressure/vacuum vent valves must be installed on the storage tank vent pipes. The pressure specifications for pressure/vacuum vent valves must be a positive pressure setting of 0.6 to 1.5 kPa [2.5 to 6.0 inches of water] and a negative pressure setting of 1.5 to 2.5 kPa [6.0 to 10.0 inches of water].

11.6.4.3.2.8. Storage tanks constructed after November 9, 2006, must be equipped with a dual-point vapor balance system (i.e., a vapor balance system in which the storage tank is equipped with an entry port for a gasoline fill pipe and a separate exit port for a vapor connection).

11.6.4.3.3. Ensuring cargo tanks unloading at a GDF where the storage tanks are equipped with vapor balance systems comply with certain management practices. These practices require meeting all of these conditions before transferring gasoline from the cargo tank to the storage tank:

11.6.4.3.3.1. All hoses in the vapor balance system are properly connected.

11.6.4.3.3.2. The adapters or couplers that attach to the vapor line on the storage tank have closures that seal upon disconnect.

11.6.4.3.3.3. All vapor return hoses, couplers, and adapters used in the gasoline delivery are vapor-tight.

11.6.4.3.3.4. All tank truck vapor return equipment must be compatible in size and form a vapor-tight connection with the vapor balance equipment on the GDF storage tank.

11.6.4.3.3.5. All hatches on the tank truck are closed and securely fastened.

11.6.4.3.3.6. The filling of storage tanks at GDFs is limited to unloading from vapor-tight gasoline cargo tanks.

RECORDKEEPING.

Installations must maintain records associated with POL design and construction, inspections and testing, secondary containment, and other standards of this section. Such recordkeeping may be performed as part of the spill prevention and response standards in Chapter 13.

Table 11.1. Storage Vessels Requirements for Petroleum Liquids

DATES	STORAGE CAPACITY	REQUIREMENT
Construction after March 8, 1974 and before May 19, 1978	Greater than 151,416 liters [40,000 US gallons] but not exceeding 246,052 liters [65,000 US gallons]	If vapor pressure equal to or greater than 10.3 kPa [1.5 psia] but not greater than 76.6 kPa [11.1 psia], the storage vessel must be equipped with: • A floating roof; • A vapor recovery system; or • Their equivalents.
Construction or modification after June 11, 1973 and before May 19, 1978	Greater than 246,052 liters [65,000 US gallons]	If vapor pressure is greater than 76.6 kPa [11.1 psia], the storage vessel must be equipped with a vapor recovery system or its equivalent.
Began construction after May 18, 1978 and before July 23, 1984	Greater than 151,416 liters [40,000 US gallons] ^a	If vapor pressure equal to or greater than 10.3 (kPa) [1.5 psia] but not greater than 76.6 kPa [11.1 psia], the storage vessel must be equipped with: • An external floating roof; • A fixed roof with an internal floating type cover equipped with a continuous closure device between the tank wall and the cover edge; or • A vapor recovery system and a vapor return or disposal system.
Began construction, reconstruction, or modification after July 23, 1984	Greater than or equal to 75,000 liters [19,813 US gallons] but less than 151,000 liters [39,890 US gallons]	If maximum vapor pressure equal to or greater than 27.6 kPa [4.0 psia] but less than 76.6 kPa [11.1 psia], then each storage vessel must be equipped with: • A fixed roof in combination with an internal floating roof; • An external floating roof; or • A closed vent system and control device.
Began construction, reconstruction, or modification after July 23, 1984	Greater than or equal to 75,000 liters [19,813 US gallons]	If maximum vapor pressure equal to or greater than or equal to 76.6 kPa [11.1 psia], then each storage vessel must be equipped with: • A closed vent system and control device, or its equivalent
Began construction, reconstruction, or modification after July 23, 1984	Greater than or equal to 151,000 liters [39,890 US gallons]	If maximum vapor pressure equal to or greater than 5.2 kPa [0.75 psia] but less than 76.6 kPa [11.1 psia], then each storage vessel must be equipped with: • A fixed roof in combination with an internal floating roof; • An external floating roof; or • A closed vent system and control device.
kPa = kilopascal; psia = pounds per square inch absolute		

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CHAPTER 12: UNDERGROUND STORAGE TANKS (USTS)

12.1. INTRODUCTION.

This chapter contains standards on the prevention and control of pollution resulting from POL and hazardous substances stored in UST systems.

12.2. GENERAL.

12.2.1. The standards in this section apply to all UST systems, except for the following excluded UST systems:

12.2.1.1. Any UST system holding hazardous waste. See Chapter 16, “*Hazardous Waste*”.

12.2.1.2. Any wastewater treatment tank that is part of a wastewater treatment facility.

12.2.1.3. Equipment or machinery (operational tanks) that contains hazardous substances or POL for operational purposes such as hydraulic lift tanks and electrical equipment tanks.

12.2.1.4. Any UST system whose capacity is 416 liters [110 US gallons] or less. If greater than or equal to 208 liters [55 US gallons], this is a below ground storage tank subject to the requirements in Chapter 11, “*POL*”.

12.2.1.5. Any UST system that contains de minimis concentration of hazardous substances or POL.

12.2.1.6. Any emergency spill or overflow containment UST system that is expeditiously emptied after use.

12.2.2. Some specialty UST systems may also be considered aboveground storage containers or below ground storage containers and subject to the standards of Chapter 11. Installations must evaluate such UST systems to determine applicability of standards and comply, as practicable.

12.2.3. Owners and operators of UST systems must implement the requirements of this Chapter. Installation commanders and their representatives must oversee implementation and ensure compliance with these requirements, regardless of whether the installation is the owner or operator of the UST system.

12.3. NEW AND EXISTING UST SYSTEMS.

New UST systems include UST systems where installation began after April 11, 2016. Existing UST systems include UST systems where installation began on or before April 11, 2016.

12.4. DESIGN, CONSTRUCTION, AND INSTALLATION.

Owners and operators must ensure that all UST systems are properly designed and installed, protected from corrosion, provided with spill and overfill prevention, and incorporate release detection. Specialty UST systems must meet the requirements of this paragraph as prescribed in Paragraph 12.7., which describes the applicability of the design, construction, and installation requirements of this paragraph. These requirements must be addressed in accordance with manufacturer's specifications and applicable design criteria such as UFC 3-460-01 and UFC 3-460-03 (or similar) and industry standards and practices.

12.4.1. Tank Design, Construction, and Installation.

Tanks must have secondary containment and corrosion protection, and be constructed of, or lined with, a material that is compatible with the substances stored.

12.4.1.1. Secondary Containment for Tanks.

New and replaced POL tanks, as well as existing, new, and replaced hazardous substance tanks, must be secondarily contained and use interstitial monitoring.

12.4.1.2. Corrosion Protection for Tanks.

Any portion of a tank that routinely contains hazardous substances or POL, and is in contact with the ground, must be protected from corrosion in accordance with industry standards and practices. Tanks must be constructed of one of the following:

12.4.1.2.1. A non-corrodible material such as fiberglass-reinforced plastic.

12.4.1.2.2. Steel that is coated and cathodically protected. The corrosion-resistant coating must be a suitable dielectric material. Asphalt does not meet this requirement. Field-installed cathodic protection systems must be designed by a corrosion expert and installed, operated, and maintained in accordance with industry standards and practices. Impressed current systems must be designed to allow determination of current operating status.

12.4.1.2.3. Steel and clad (enclosed or jacketed) with a non-corrodible material that completely isolates the steel from contact with the surrounding soil.

12.4.1.3. Compatibility for Tanks.

Tanks must be constructed of, or lined with, materials that are compatible with the substance stored.

12.4.1.4. Release Detection for Tanks in Existing UST Systems.

12.4.1.4.1. Existing POL tanks must use at least one of the following release detection methods: automatic tank gauging, groundwater monitoring, interstitial monitoring,

statistical inventory reconciliation, or vapor monitoring. Existing POL tanks that meet the requirements of Paragraph 12.4.1 may use tank tightness testing if used in combination with monthly inventory control.

12.4.1.4.2. Existing hazardous substance tanks must, at a minimum, use interstitial monitoring.

12.4.1.5. Release Detection for Tanks in New UST Systems.

New POL and hazardous substance tanks must be monitored for releases using at least interstitial monitoring.

12.4.1.6. Standards for Methods of Release Detection for Tanks.

Tanks must be monitored for releases at least every 30 days or properly closed. Owners and operators must use the release detection method, or combination of methods, specified for new or existing UST systems that:

12.4.1.6.1. Can detect a release from any portion of the tank that routinely contains hazardous substances or POL.

12.4.1.6.2. Is installed and calibrated in accordance with the manufacturer's specifications.

12.4.1.6.3. Is capable of detecting a leak rate or quantity of at least 0.76 liters [0.2 US gallons] per hour or 568 liters [150 US gallons] in 1 month or the rate or quantity for that method as specified in the standards. All must have a probability of detection of 0.95 and a probability of false alarm of 0.05.

12.4.1.6.4. Meets the performance requirements for these specific release detection methods:

12.4.1.6.4.1. Automatic tank gauging must meet industry standards and practices, including those for inventory control and be capable of detecting a 0.76 liter [0.2 US gallon] per hour leak rate from any portion of the tank that routinely contains POL or hazardous substances. Automatic tank gauging is performed with the system operating in either in-tank static mode or a continuous in-tank release detection that allows a leak status to be measured at least every 30 days.

12.4.1.6.4.2. Groundwater monitoring must be consistent with industry standards and practices.

12.4.1.6.4.3. Interstitial monitoring may only be used if the system is designed, constructed, and installed to detect a leak from any portion of the tank that routinely contains product.

12.4.1.6.4.4. Statistical inventory reconciliation must meet industry standards and practices and report a quantitative result with a calculated leak rate. It must be capable of detecting a leak rate of 0.76 liters [0.2 US gallon] per hour or a release of 568 liters [150 US gallons] within 30 days. The threshold must not exceed one-half the minimum detectible leak rate.

12.4.1.6.4.5. Vapor monitoring must be consistent with industry standards and practices. There must be sufficient porosity of the backfill and volatility of the stored substance or tracer compound. Monitoring must assure that known interferences from rain, groundwater, soil moisture, or similar will not allow a release to go undetected for more than 30 days.

12.4.1.6.4.6. Tank tightness testing must be capable of detecting a 0.38 liter [0.1 US gallon] per hour leak rate from any portion of the tank that routinely contains product. Tests must account for the effects of thermal expansion or contraction of the product, vapor pockets, tank deformation, evaporation or condensation, and the location of the water table.

12.4.2. Piping Design, Construction, and Installation.

12.4.2.1. Secondary Containment for Piping.

12.4.2.1.1. For all new and replaced UST systems, all piping must be secondarily contained and use interstitial monitoring, except for suction piping that meets the definition of safe suction piping. Safe suction piping may be single walled.

12.4.2.1.2. For existing hazardous substance UST systems, underground piping must have secondary containment and interstitial monitoring. Existing underground piping that conveys hazardous substances under pressure must have automatic line leak detectors.

12.4.2.1.3. When 50% or more of the piping connected to a single tank is removed and replaced, the entire piping run must be replaced with piping that has secondary containment and interstitial monitoring.

12.4.2.2. Corrosion Protection for Piping.

Piping that routinely contains hazardous substances or POL and is in regular contact with the ground must be properly designed, constructed, and protected from corrosion in accordance with industry standards and practices. Piping must be constructed of:

12.4.2.2.1. A non-corrodible material; or

12.4.2.2.2. Steel that is coated and cathodically protected. The corrosion-resistant coating must be a suitable dielectric material. Asphalt does not meet this requirement. Field-installed cathodic protection systems must be designed by a corrosion expert and be installed, operated, and maintained in accordance with industry standards and practices. Impressed current systems must be designed to allow determination of current operating status.

12.4.2.3. Compatibility for Piping.

Piping must be constructed of, or lined with, materials that are compatible with the substance stored.

12.4.2.4. Release Detection for Piping.

12.4.2.4.1. Release Detection Methods.

Owners and operators must use a release detection method, or combination of methods specified for the particular type of piping, as detailed in Paragraphs 12.4.2.4.2. through 12.4.2.4.5., that:

12.4.2.4.1.1. Can detect a release from any portion of the connected underground piping that routinely contains hazardous substances or POL.

12.4.2.4.1.2. Is installed and calibrated in accordance with the manufacturer's specifications.

12.4.2.4.1.3. Meets the performance requirements for the specific release detection method.

12.4.2.4.1.4. Automatic line release detectors must be capable of detecting leaks of 11.36 liters [3 gallons] per hour at 68.9 kPa [10 pounds per square inch] line pressure within 1 hour.

12.4.2.4.1.4.1. Groundwater monitoring must be consistent with industry standards and practices.

12.4.2.4.1.4.2. Line tightness testing must be capable of detecting a leak rate of 0.38 liters [0.1 gallons] per hour at one and one-half times the operating pressure.

12.4.2.4.1.4.3. Interstitial monitoring may only be used if the system is designed, constructed, and installed to detect a leak from any portion of the piping that routinely contains product.

12.4.2.4.1.4.4. Vapor monitoring must be consistent with industry standards and practices. There must be sufficient porosity of the backfill and volatility of the stored substance or tracer compound. Monitoring must assure that known interferences from rain, groundwater, soil moisture, or similar interferences will not allow a release to go undetected for more than 30 days.

12.4.2.4.1.4.5. Other methods including, but not limited to, electronic pressurized line leak detection may be used if they can detect a 0.76 liter [0.2 US gallon] per hour leak rate with a probability of detection of 0.95 and a probability of false alarm of 0.05.

12.4.2.4.2. Existing Pressurized Piping.

Existing piping that conveys:

12.4.2.4.2.1. Hazardous substances under pressure must use interstitial monitoring and automatic line release detection.

12.4.2.4.2.2. POL under pressure must be equipped with an automatic line release detector and have an annual line tightness test conducted or be monitored monthly.

12.4.2.4.3. New Pressurized Piping.

New and replaced underground pressurized piping for POL and hazardous substance UST systems must be monitored for releases at least every 30 days via interstitial monitoring and be equipped with an automatic line release detector.

12.4.2.4.4. Existing Suction Piping.

Existing underground suction piping for POL and hazardous substance UST systems is not required to have release detection if the piping meets the definition of safe suction. Non-safe suction piping must meet one of these conditions:

12.4.2.4.4.1. Conduct line tightness testing at least every 3 years; or

12.4.2.4.4.2. Use monthly monitoring methods: automatic tank gauging, groundwater monitoring, interstitial monitoring, or vapor monitoring.

12.4.2.4.5. New Suction Piping.

New underground suction piping for POL and hazardous substance UST systems is not required to have release detection if the piping meets the standards for safe suction. If it cannot meet these standards, then it must meet the same requirements as new pressurized piping and be monitored for releases at least every 30 days using interstitial monitoring.

12.4.3. Spill and Overfill Protection Equipment Design, Construction, and Installation.

Except where transfers are made in the amounts of 95 liters [25 gallons] or less, owners and operators must ensure all UST systems have:

12.4.3.1. Spill prevention equipment, such as spill buckets or catchment basins that prevents the release of product into the environment when the transfer hose is detached from the fill pipe.

12.4.3.2. Overfill prevention equipment. Ball float valves can no longer be used as overfill prevention equipment for new UST systems. Overfill prevention equipment must be either:

12.4.3.2.1. An automatic shut-off device set at 95% of tank capacity; or

12.4.3.2.2. A high-level alarm set at 90% of tank capacity that alerts the transfer operator.

12.4.4. Dispenser System Design, Construction, and Installation.

Owners and operators must ensure that each UST system is equipped with under-dispenser containment for new dispenser systems (where installation began after April 11, 2016). A dispenser system is considered new when both the dispenser and the equipment needed to connect the dispenser to the UST system are installed. Under-dispenser containment must be liquid tight on its sides and bottom, and at any penetrations. The containment must allow for visual inspection and access to the components or be periodically monitored for leaks.

12.5. O&M.

Owners and operators must ensure that O&M is performed in accordance with industry standards and practices. These requirements are intended to protect the environment and do not serve as a replacement for comprehensive fuel storage system O&M manuals. Owners and operators must ensure that these requirements are incorporated into the overall O&M manuals.

12.5.1. Spill and Overfill Prevention O&M.

In addition to properly operating and maintaining spill and overfill prevention equipment, owners and operators must operate UST systems in a manner that prevents spills and overfills. Specifically, operators must continuously monitor transfer operations to prevent overfilling and spilling, ensure the available tank volume is greater than the volume of product to be transferred to the tank, and periodically inspect and test spill prevention and overfill equipment during O&M walkthrough inspections.

12.5.1.1. Repairs to Spill and Overfill Prevention Equipment. Within 30 days following repair to spill or overfill prevention equipment, owners and operators must test the repaired equipment in accordance with industry standards and practices to ensure proper operation.

12.5.1.2. Inspection and Testing of Spill Prevention Equipment, Overfill Prevention Equipment, and Containment Sumps. Owners and operators must ensure that walkthrough inspections and tests are conducted that include:

12.5.1.2.1. Inspecting spill prevention equipment at least every 30 days. UST systems receiving deliveries at intervals greater than every 30 days may be checked before each delivery. Inspections must include:

12.5.1.2.1.1. Visually checking for damage.

12.5.1.2.1.2. Removing liquid and debris.

12.5.1.2.1.3. Checking for and removing obstructions in the fill pipe.

12.5.1.2.1.4. Checking the fill cap to ensure it is securely on the fill pipe.

12.5.1.2.1.5. Checking for leaks in interstitial areas of double-walled spill prevention equipment with interstitial monitoring.

12.5.1.2.1.6. Monitoring the integrity of both walls of the double-walled spill prevention equipment by using the vacuum, pressure, or liquid interstitial integrity indicator, if so equipped.

12.5.1.2.2. Inspecting containment sumps annually. Inspections must include:

12.5.1.2.2.1. Visually inspecting for damage.

12.5.1.2.2.2. Checking for leaks to the containment area or releases to the environment.

12.5.1.2.2.3. Removing liquid or debris.

12.5.1.2.2.4. Checking for a leak in the interstitial area for double-walled sumps with interstitial monitoring.

12.5.1.2.3. Using vacuum, pressure, or liquid testing to test spill prevention equipment used for interstitial monitoring of piping at least once every 3 years to ensure the equipment is liquid tight. All single-walled spill prevention equipment and containment sumps as well as double-walled spill prevention equipment and containment sumps not monitored in accordance with Paragraph 12.5.1.2.1.6. require this triennial testing.

12.5.1.2.4. Inspecting overfill prevention equipment at least every 3 years to ensure proper operation and prevention of overfills. At a minimum, the inspection must ensure that overfill prevention equipment is set to the correct level and will activate when the POL or hazardous substance reaches that level.

12.5.1.2.5. Maintaining records for O&M inspections in accordance with the requirements in Paragraph 12.10.

12.5.1.2.6. Maintaining records demonstrating compliance for spill and overfill prevention equipment in accordance with the requirements in Paragraph 12.10.

12.5.2. Corrosion Protection O&M.

Until permanent closure of an UST system, owners and operators must prevent releases due to corrosion by ensuring all of the following are performed:

12.5.2.1. Properly operating and maintaining UST systems (including cathodic protection systems) to continuously provide corrosion protection to the metal components of tanks and piping in contact with the ground.

12.5.2.2. Within 6 months of installation of cathodic protection systems, and at least every 3 years thereafter, inspecting cathodic protection systems for proper operation using qualified cathodic protection experts and in accordance with industry standards and practices.

12.5.2.3. Every 60 days, inspecting UST systems with impressed current cathodic protection systems to validate the equipment is running properly.

12.5.2.4. Within 6 months of repairs to cathodically protected UST systems, testing cathodic protection system in accordance with industry standards and practices to ensure proper operation. Maintain records for cathodic protection tests as described in Paragraph 12.10.

12.5.3. Compatibility O&M.

If the contents of the UST systems are changed, owners and operators must ensure compatibility between the new substance stored and the UST system.

12.5.4. Release Detection System O&M.

Owners and operators must maintain and operate release detection systems in accordance with manufacturer's specifications and industry standards and practices. Operators must:

12.5.4.1. Conduct O&M walkthrough inspections of release detection equipment at least every 30 days to confirm:

12.5.4.1.1. Proper operation and no alarms.

12.5.4.1.2. Hand-held release detection equipment is properly functioning.

12.5.4.1.3. Release detection records are reviewed and current.

12.5.4.2. Conduct testing of release detection systems at least annually to verify proper operation in accordance with manufacturer's specifications and industry standards and practices.

12.5.4.3. Conduct annual line tightness testing or monthly monitoring for existing underground piping that conveys POL under pressure. After tanks and piping have been replaced with double-walled systems by October 2018, only monthly monitoring of the interstitial space is allowed.

12.5.4.4. Maintain records on release detection systems to demonstrate equipment and operational compliance. Detailed recordkeeping requirements for release detection systems are identified in Paragraph 12.10.

12.5.4.5. Report failure of release detection systems and suspected releases in accordance with Service-specific guidance.

12.5.5. Repairs to UST Systems.

Owners and operators must ensure that repairs to UST systems will prevent releases due to structural failure or corrosion as long as the UST system is used to store hazardous substances or POL.

12.5.5.1. UST System Repairs.

12.5.5.1.1. Pipe Sections and Fittings. Metal pipe sections and fittings that have released product as a result of corrosion or other damage must be replaced. Non-corrodible pipes and fittings that are corroded or damaged may be repaired.

12.5.5.1.2. All UST System Repairs. Repairs must be completed in accordance with manufacturer's specifications and industry standards and practices.

12.5.5.2. Testing of Repaired UST Systems.

12.5.5.2.1. Secondary Containment Repairs.

Within 30 days of repairs to secondary containment areas or containment sumps used for interstitial monitoring of piping, a tightness test of the containment area or sump must be conducted.

12.5.5.2.2. Other Repairs.

Within 30 days following the date of repair to tanks or piping components, a tightness test of the UST system must be conducted. This test is not required when:

12.5.5.2.2.1. The repaired tank is internally inspected in accordance with industry standards and practices; or

12.5.5.2.2.2. The repaired portion of the UST system is monitored monthly for releases.

12.5.5.3. Documentation of Repairs.

Records of each repair and testing will be maintained until the UST system is permanently closed.

12.5.6. Inventory.

Installations must maintain an updated UST system inventory for the entire installation that includes the following items for each UST:

12.5.6.1. Location.

12.5.6.2. Installation date.

12.5.6.3. Capacity.

12.5.6.4. Tank and piping attributes, such as material, protection, secondary containment.

12.5.6.5. Piping delivery type (safe suction, pressurized).

12.5.6.6. Spill and overfill protection equipment details.

12.5.6.7. Under-dispenser containment.

12.5.6.8. Substance stored and confirmation of compatibility.

12.5.6.9. Release detection details for tanks and pipes.

12.5.6.10. Removal details.

12.5.6.11. Replacement details.

12.5.6.12. Closure details, including closure date, location, and related information for all historic UST systems on the UST inventory.

12.6. OPERATOR TRAINING.

Installations must ensure that the requirements for operator designation, training, and recordkeeping are met for all UST systems. These requirements apply to all UST systems, including specialty UST systems.

12.6.1. Designation of Class A, B, and C Operators.

Owners and operators must designate:

12.6.1.1. At least one Class A and one Class B operator for each UST system or group of UST systems at a facility; and

12.6.1.2. Each individual who meets the definition of Class C operator at the UST facility as a Class C operator.

12.6.2. Operator Training Content.

Owners and operators must ensure all operators receive the required training, by operator class, as specified in Table 12.1.

12.6.3. Timing of UST System Operator Training.

12.6.3.1. New Class A and B operators must meet requirements within 30 days of assuming duties.

12.6.3.2. New Class C operators must be trained before assuming duties of a Class C operator.

12.6.4. Retraining of UST System Operators.

12.6.4.1. Class A and B operators must take annual refresher training that covers all the required content in Table 12.1.

12.6.4.2. No later than 30 days after a non-compliance issue is identified, Class A and B operators must be retrained. At a minimum, the training must cover the specific area(s) determined to be out of compliance. Annual refresher training can be used to fulfill this requirement if it includes the non-compliance topics.

12.6.5. Documentation.

For as long as operators are designated, UST system owners and operators must maintain records regarding designation and training.

12.7. SPECIALTY UST SYSTEMS.

12.7.1. Specialty UST System Requirements.

Specialty UST systems (i.e., airport hydrant fuel distribution systems and UST systems with field-constructed tanks (FCT)) must meet the standards in this section. Owners and operators must use industry standards and practices for design, installation, O&M, and closure of specialty UST systems. Except for the specific exceptions and alternatives described in this paragraph, specialty UST systems are subject to the same requirements as other UST systems, as described in Paragraphs 12.4., 12.5., 12.6., 12.8., 12.9., and 12.10.

12.7.2. Exceptions and Alternatives for Specialty UST Systems.

12.7.2.1. Pressurized Piping Exceptions.

12.7.2.1.1. Pressurized piping associated with FCTs greater than 189,271 liters [50,000 gallons] and piping associated with airport hydrant systems may use single-walled piping when installing or replacing piping.

12.7.2.1.2. Pressurized piping associated with UST systems with FCTs less than or equal to 189,271 liters [50,000 gallons] and not part of an airport hydrant system must meet the secondary containment requirements for UST systems in Paragraph 12.4.2.1. when installed or replaced.

12.7.2.1.3. Existing piping must comply upon replacement.

12.7.2.2. Additional Corrosion Protection Standards for Specialty UST Systems.

In addition to complying with UST system corrosion protection standards in Paragraphs 12.4.1.2. and 12.4.2.2., owners and operators of specialty UST systems must meet these additional requirements:

12.7.2.2.1. Specialty UST systems must be equipped with cathodic protection as a means of corrosion protection.

12.7.2.2.2. Before adding cathodic protection to specialty UST systems, owners and operators must assess tanks greater than 10 years old to ensure the tank is structurally sound and free of corrosion holes. The assessment must be made by an internal inspection or another industry standard or practice that adequately assesses the tank's structural integrity for soundness and corrosion holes.

12.7.2.3. Additional O&M Requirements for Specialty UST Systems.

Owners and operators of specialty UST systems must meet the UST system O&M requirements in Paragraph 12.5., including walkthrough inspections, reporting, recordkeeping, guidance on repairs, and other standards in Paragraph 12.5. In addition, owners and operators of specialty UST systems must also inspect hydrant pits and vaults at least every 30 days. If confined space entry is required, inspections may be performed no less frequently than annually. The additional inspections must include:

12.7.2.3.1. Hydrant Pits. Visually check for damage, remove liquid or debris, and check for leaks.

12.7.2.3.2. Hydrant Piping Vaults. Check for hydrant piping leaks.

12.7.2.4. Release Detection Requirements for FCTs.

12.7.2.4.1. Owners and operators of FCTs with a capacity less than or equal to 189,271 liters [50,000 gallons] must meet the release detection requirements for UST systems in Paragraph 12.4.1.4.

12.7.2.4.2. Owners and operators of new and existing FCTs with a capacity greater than 189,271 liters [50,000 gallons] and airport hydrant systems must provide release detection through one of the following options:

12.7.2.4.2.1. Meet the release detection requirements for new UST systems in Paragraph 12.4.1.5.

12.7.2.4.2.2. Meet the release detection requirements for existing UST systems in Paragraph 12.4.1.4. with two exceptions. Use of vapor monitoring and groundwater monitoring must be combined with an inventory control method conducted at least every 30 days and capable of detecting a release of less than 0.5% of flow-through; or

12.7.2.4.2.3. Monitor for releases using one or a combination of the following:

12.7.2.4.2.3.1. Conduct an annual tank tightness test that can detect a 1.9 liter [0.5 gallon] per hour leak rate;

12.7.2.4.2.3.2. Use automatic tank gauging at least every 30 days that can detect a leak rate less than or equal to 3.8 liters [1 gallon] per hour. This method must be combined with a tank tightness test that can detect a 0.76 liter [0.2 gallon] per hour leak rate, performed at least every 3 years;

12.7.2.4.2.3.3. Use automatic tank gauging at least every 30 days that can detect a leak rate less than or equal to 7.6 liters [2 gallons] per hour. This method must be combined with a tank tightness test that can detect a 0.76 liter [0.2 gallon] per hour leak rate, performed at least every 2 years;

12.7.2.4.2.3.4. Perform vapor monitoring capable of detecting a 0.38 liter [0.1 gallon] per hour leak rate at least every 2 years; or

12.7.2.4.2.3.5. Perform inventory control at least every 30 days that can detect a leak equal to or less than 0.5% of flow-through. Using this method also requires a tank tightness test (1.89 liter [0.5 gallon] per hour leak rate minimum) every 2 years or vapor monitoring or groundwater monitoring at least every 30 days.

12.7.2.5. Release Detection Requirements for Piping.

12.7.2.5.1. Owners and operators of pressurized piping for new and existing FCTs with a capacity less than or equal to 189,271 liters [50,000 gallons] must meet the UST system release detection requirements in Paragraph 12.4.2.4.

12.7.2.5.2. Owners and operators of underground pressurized piping associated with airport hydrant systems and FCTs greater than 189,271 liters [50,000 gallons] must follow either the requirements in Paragraph 12.4.2.4. (except vapor monitoring and groundwater monitoring, which must be combined with inventory control) or use at least one of the following alternative methods of release detection:

12.7.2.5.2.1. Perform a semiannual or annual line tightness test at or above the piping operating pressure in accordance with Table 12.2. Piping segment volumes greater than or equal to 378,541 liters [100,000 gallons] not capable of meeting the maximum 11.4 liters

[3.0 gallons] per hour leak rate for the semiannual test may be tested at a leak rate up to 22.7 liters [6.0 gallons] per hour according to the schedule in Table 12.3.

12.7.2.5.2.2. Perform vapor monitoring capable of detecting a 0.38 liter 0.1 gallon] per hour leak rate at least every 2 years.

12.7.2.5.2.3. Perform inventory control at least every 30 days that can detect a leak equal to or less than 0.5% of flow-through and perform either a line tightness test at least every 2 years or perform vapor monitoring or groundwater monitoring at least every 30 days.

12.8. RELEASE RESPONSE.

12.8.1. Installations must ensure proper response to suspected and confirmed releases from UST systems.

12.8.2. Owners and operators must:

12.8.2.1. Investigate suspected leaks, including conducting confirmation sampling, as appropriate.

12.8.2.2. Notify appropriate authorities of verified leaks.

12.8.2.3. Ensure that any verified leaking tanks or piping are immediately removed from service.

12.8.2.4. Repair or replace UST systems that are still required.

12.8.2.5. In accordance with Paragraph 12.9., properly close and remove from the ground UST systems that are no longer required. When a leaking UST system is removed, exposed free product and obviously contaminated soil in the immediate vicinity of the tank must be appropriately removed and managed in accordance with the spill response requirements in Chapter 13.

12.8.3. Installations must maintain records of releases and response actions until the installation is permanently closed.

12.9. OUT-OF-SERVICE SYSTEMS AND CLOSURE.

Installations must properly close UST systems using the following standards.

12.9.1. Temporary Closure. When an UST system is temporarily closed, corrosion protection and release detection systems (if the UST system is not empty) must be operated and maintained. If an UST system is temporarily closed for 3 months or greater, the following requirements must be met:

12.9.1.1. Vent lines must be left open and functioning.

12.9.1.2. All other lines, pumps, manways, and ancillary equipment must be secured and capped.

12.9.2. Change in Service. When the product stored in an UST system is changed to a product that is neither a hazardous substance nor a POL, the UST system must be emptied and cleaned by removing all liquid and accumulated sludge.

12.9.3. Permanent Closure. When an UST system has not been used or has been temporarily closed for 1 year, or is determined to no longer be required, all of the product and sludge must be emptied and the UST system removed from the ground. All components must be drained, cleaned, and monitored, as applicable, during the closure process. Under extenuating circumstances, such as large FCTs and where the UST system is located under a building, the UST system can be cleaned and filled with an inert material and closed in place. Examples of acceptable inert material include sand, soil, foam, concrete, and grout. If there is a confirmed or suspected release, installations must undertake the release response activities in Paragraph 12.8.

12.9.4. Disposal of UST System Wastes. Liquids, sludges, and other wastes generated from change of service or closure of UST systems must be characterized in accordance with Paragraph 16.3. to determine if they are hazardous. If a waste exhibits a characteristic of hazardous waste, it must be handled and disposed of in accordance with the requirements of Chapter 16. If testing confirms that a waste does not exhibit a characteristic and is not hazardous, it must be managed and disposed of in accordance with the solid waste requirements of Chapter 15 or the wastewater requirements of Chapter 9, as appropriate.

12.9.5. Closure Records. After permanent UST system closure or change-in-service, the installation must ensure records on the previous tank system, including previous location and closure reports, are maintained for the duration of the installation operations.

12.10. RECORDKEEPING.

Owners and operators must maintain records of UST system design, construction, and installation; O&M; release response; and closure. They must make UST system records available upon request during inspections. Table 12.4. identifies specific UST system recordkeeping requirements.

Table 12.1. UST System Operator Training Requirements

OPERATOR CLASS	MINIMUM TRAINING REQUIREMENTS
Class A	Training must include the purpose, method, and function of: • Spill and overfill prevention. • Release detection. • Corrosion protection. • Emergency response. • Product and equipment compatibility and demonstration. • Temporary and permanent closure. • Related reporting, recordkeeping, testing, and inspections. • Environmental and regulatory consequences of releases. • Training requirements for Class B and C operators. The training program must evaluate Class A operators to determine if these individuals have the knowledge and skills to make informed decisions regarding compliance. The program also will evaluate whether appropriate individuals are fulfilling the operation, maintenance, and recordkeeping requirements for UST systems.
Class B	Training must include the purpose, method, and function of: • O&M. • Spill and overfill prevention. • Release detection and related reporting. • Corrosion protection. • Emergency response. • Product and equipment compatibility and demonstration. • Reporting, recordkeeping, testing, and inspections. • Environmental and regulatory consequences of releases. • Training requirements for Class C operators. The training program must evaluate Class B operators to determine if these individuals have the knowledge and skills to implement applicable UST system regulatory requirements. These requirements apply in the field on the components of typical UST systems or, as applicable, site-specific equipment used at an UST facility.
Class C	Training must include appropriate emergency response actions, including notification procedures, in response to emergencies or alarms caused by spills or releases resulting from UST system operations. The training program must evaluate Class C operators to determine if these individuals have the knowledge and skills to take appropriate action (including notifying appropriate authorities) in response to emergencies or alarms caused by spills or releases from an UST system.

Table 12.2. Specialty UST System Maximum Release Detection Rate per Test Section Volume

PIPING TEST SECTION VOLUME	SEMIANNUAL TEST – LEAK DETECTION RATE NOT TO EXCEED	ANNUAL TEST – LEAK DETECTION RATE NOT TO EXCEED
liters [gallons]	liters [gallons]	per hour
Less than 189,271 [50,000]	3.8 [1.0]	1.9 [0.5]
Greater than or equal to 189,271 [50,000] and less than 283,906 [75,000]	5.7 [1.5]	2.8 [0.75]
Greater than or equal to 283,906 [75,000] and less than 378,541 [100,000]	7.6 [2.0]	3.8 [1.0]
Greater than or equal to 378,541 [100,000]	11.36 [3.0]	5.7 [1.5]

Table 12.3. Specialty UST System Phase-in for Piping Segments Greater Than or Equal to 378,541 Liters [100,000 Gallons] in Volume

TEST	FREQUENCY	LEAK RATE
First Test	As soon as possible but no later than 24 months after publication of this manual.	May use up to 22.7 liters [6.0 gallons] per hour leak rate.
Second Test	Within 36 months after first test.	May use up to 22.7 liters [6.0 gallons] per hour leak rate.
Third Test	Within 12 months after second test.	Must use up to 11.36 liters [3.0 gallons] per hour leak rate.
Subsequent Tests	Semiannual or annual testing (based on the date of the third test) according to maximum leak detection rate per test section volume as specified in Table 12.2.	

Table 12.4. UST System Recordkeeping Requirements

TYPES OF RECORDS		RETENTION PERIOD
UST System Inventory	UST system inventory for the entire installation that includes the items listed in Paragraph 12.5.6.	Life of installation
Spill and Overfill Prevention	Testing and inspection records for spill and overfill prevention equipment and containment sumps used for interstitial monitoring of piping.	3 years
	Documentation showing spill prevention equipment and containment sumps used for interstitial monitoring of piping is double-walled and the integrity of both walls is periodically monitored.	For as long as periodic monitoring is conducted
Corrosion Protection	Records of 60-day inspections for impressed current corrosion protection system.	Three most recent inspections
	Records of cathodic protection tests for corrosion protection system.	Two most recent tests
Release Detection	30-day monitoring results.	1 year
	Tightness test results.	Until the next test
	Records for annual release detection equipment operability tests.	3 years
	Copies of performance claims provided by release detection equipment manufacturers or equipment installers.	Life of system
	Schedules of required calibration and maintenance provided by release detection equipment manufacturers.	5 years after installation
	Records of maintenance, repair, and calibration of on-site release detection equipment.	1 year after servicing is completed
	Records of releases and response actions.	Life of installation
	If using vapor monitoring or groundwater monitoring, records of a site assessment showing that the monitoring system is set up properly.	As long as vapor monitoring or groundwater monitoring is used
Walkthrough Inspections	Records showing performance of periodic walkthrough inspections. Records must include: • A list of the areas checked. • Whether each area was acceptable or needed action. • A description of actions taken to correct an issue. • Delivery records if spill prevention equipment is checked less frequently than every 30 days due to infrequent deliveries.	1 year
Operator Training	Records for each designated Class A, B, and C operator showing they have been trained.	As long as the operator is designated at the facility
Repairs	Records showing that a repaired UST system was properly repaired.	Until the UST system is permanently closed
Closure	Records for permanent closure, including: • Closure reports. • Decommissioning reports. • Sampling records (when applicable).	Life of the installation

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CHAPTER 13: SPILL PREVENTION AND RESPONSE

13.1. INTRODUCTION.

This chapter contains standards for planning, prevention, control, and reporting of spills of POL and hazardous substances. Chapters 10, 11 and 12 provide related standards for hazardous materials, POL, and USTs. Remediation beyond that required for the initial response is conducted in accordance with DoDI 4715.08, “*Remediation of Environmental Contamination Outside the United States*”.

13.2. SPILL PREVENTION AND RESPONSE PLANS.

All DoD installations must prepare, maintain, and implement a spill prevention and response plan that provides for the prevention and control of all POL and hazardous substance spills, and for the reporting of all significant spills. The spill prevention and response plan is referred to as “*the plan*” in this section. The plan must provide measures to prevent and, to the maximum extent practicable, remove a worst-case discharge (WCD) from the facility. Appendix 13A provides guidance for determining the WCD planning volume. The plan should be kept in a location easily accessible to the facility incident commander (FIC) and facility response team (FRT).

13.2.1. Plan Updates.

The plan must be updated at least every 5 years or:

13.2.1.1. Within 6 months of any significant changes to operations.

13.2.1.2. When there have been two significant spills to Turkish waters in any 12-month period.

13.2.1.3. When there has been a spill of 3,785 liters [1,000 US gallons] or greater.

13.2.2. Plan Certification.

The plan must be certified by a registered professional engineer or Turkish equivalent who is familiar with spill prevention and response requirements. The plan must consider industry standards and practices for spill prevention and environmental protection, be prepared in accordance with good engineering practice, and be adequate for the facility. Technical changes (i.e., non-administrative changes) to the plan require recertification.

13.2.3. Prevention Section.

At a minimum, the prevention section of the plan must include:

13.2.3.1. Name, title, responsibilities, duties, and telephone number of the designated FIC and an alternate.

13.2.3.2. General information on the installation including name, type or function, location and address, charts of drainage patterns, designated water protection areas, maps showing locations of facilities described in Paragraph 13.2.3.3., critical water resources, land uses, and possible migration pathways.

13.2.3.3. An inventory that identifies:

13.2.3.3.1. Storage, handling, transfer areas, loading and unloading racks, and areas that have one or more POL storage containers.

13.2.3.3.2. Storage, handling, or transfer areas where POL and hazardous waste or hazardous substances could possibly produce a significant spill. For each listing, using maps as appropriate, a prediction of the direction and rate of flow should be included, as well as the total quantity of POL or hazardous substances that might be spilled as a result of a major failure.

13.2.3.3.3. POL and hazardous substance containers with capacities of 208 liters [55 US gallons] or more at the locations described in Paragraphs 13.2.3.3.1 and 13.2.3.3.2, including the total capacity of each container and the substance stored.

13.2.3.4. Procedures for the periodic integrity testing of storage containers in accordance with Paragraph 11.4.2.1.

13.2.3.5. Procedures for the periodic integrity testing of aboveground valves in accordance with Paragraph 11.4.2.1.2.

13.2.3.6. Procedures for testing buried piping associated with POL storage containers for integrity and leaks in accordance with Paragraph 11.4.2.2.

13.2.3.7. Procedures for performing leak tests for below ground storage containers in accordance with Paragraph 11.4.2.3.

13.2.3.8. A detailed description of the facility's prevention, control, and countermeasures, including sized secondary containment and general secondary containment as required by Paragraph 11.4.3. for diversion and containment of spills, for each site listed in the inventory. Measures should permit, as far as practical, reclamation of spilled substances. Chapters governing hazardous waste (Chapter 16), POL (Chapter 11), USTs (Chapter 12), and polychlorinated biphenyls (Chapter 7) provide specific standards for containment structure requirements.

13.2.3.9. When secondary containment is not feasible for any container listed in the inventory, the plan must include a detailed explanation of measures that will be taken to prevent spills (e.g., pre-booming, integrity testing, frequent inspection) as determined by the licensed or certified technical authority.

13.2.3.10. A description of deficiencies in spill prevention and control measures at each site listed in the inventory, including required corrective measures, procedures to be followed to correct listed deficiencies, and any interim control measures in place. Corrective actions must be implemented within 24 months of the date of the plan preparation or revision.

13.2.3.11. Written procedures for:

13.2.3.11.1. Operations to preclude spills of POLs and hazardous substances.

13.2.3.11.2. Inspections.

13.2.3.11.3. Testing for integrity and leaks.

13.2.3.11.4. Recordkeeping requirements.

13.2.3.12. Site-specific procedures should be maintained at each site on the facility where significant spills could occur.

13.2.3.13. Installations with hazardous waste storage areas or hazardous material storage areas capable of producing a significant spill, or aboveground storage containers with a combined capacity of greater than or equal to 4,997 liters [1,320 gallons], must have a plan that contains:

13.2.3.13.1. A list of all emergency equipment at the facility such as fire extinguishing systems, spill control equipment, communications and alarm systems (internal and external), decontamination equipment, and medical first-aid kit, where this equipment is required. This list must be kept up-to-date. In addition, the plan must include the location and a physical description of each item on the list and a brief outline of its capabilities.

13.2.3.13.2. An evacuation plan for facility personnel where there is a possibility that evacuation would be necessary. This plan must describe signals used to begin evacuation, evacuation routes, and alternate evacuation routes (in cases where the primary routes could be blocked by releases of hazardous waste or fires).

13.2.4. Spill Control Section.

The control section of the plan (which may be considered a contingency plan) must identify resources for cleaning up spills at installations and activities, and provide assistance to other agencies when requested. At a minimum, this section of the plan must contain:

13.2.4.1. Provisions specifying the responsibilities, duties, procedures, and resources to be used to contain and clean up spills.

13.2.4.2. A description of immediate response actions that should be taken when a spill is first discovered.

13.2.4.3. The responsibilities, composition, and training requirements of the FRT.

13.2.4.4. The command structure that will be established to manage a WCD including an organization chart and the responsibilities and composition of the organization.

13.2.4.5. Procedures for FRT alert and response to include provisions for:

13.2.4.5.1. Access to a reliable communications system for timely notification of a POL spill or hazardous substance spill.

13.2.4.5.2. Public affairs involvement.

13.2.4.5.3. A current roster of the persons and alternates who must receive notice of a POL or hazardous substance spill, including a DLA Energy representative, if applicable. The roster must include name, organization mailing address, and current telephone numbers (work, home, mobile). Without compromising security, the plan must include provisions for the notification of the emergency coordinator after normal working hours.

13.2.4.6. A description of arrangements with installation and local police departments, fire departments, hospitals, contractors, and emergency response teams to coordinate emergency services.

13.2.4.7. A telephone number or other means to contact the appropriate emergency service provider (e.g., installation fire department) on a 24-hour basis.

13.2.4.8. A requirement to notify the FIC, installation commander, and local authorities in the event of hazard to human health or environment.

13.2.4.9. Assignment of responsibilities for making the necessary notifications, including notification to the emergency services providers.

13.2.4.10. Surveillance procedures for early detection of POL and hazardous substance spills.

13.2.4.11. A prioritized list of various critical water and natural resources that will be protected in the event of a spill.

13.2.4.12. Other resources addressed in pre-arranged agreements that are available to the installation to respond to a large spill due to DoD activities, if the spill exceeds the response capability of the installation.

13.2.4.13. Spill response methods, including procedures and techniques used to identify, contain, disperse, reclaim, and remove POL and hazardous substances used in bulk quantity on the installation.

13.2.4.14. Procedures for the proper reuse and disposal of recovered substances, decontamination wastes, contaminated POL and absorbent materials, and procedures to be accomplished before resumption of operations.

13.2.4.15. A description of general health, safety, and fire prevention precautions for spill response actions.

13.2.4.16. A public affairs section that describes the procedures, responsibilities, and methods for releasing information in the event of a spill.

13.2.5. Reporting Section.

The reporting section of the plan must address how the required reporting contained in Paragraph 13.4. will be accomplished, including recordkeeping when emergency procedures are invoked.

13.2.6. Training Section.

The training section of the plan must identify and describe how the required training and response drills required in Paragraph 13.5. will be accomplished.

13.3. SPILL RESPONSE.

13.3.1. In the event of a spill, installations must respond immediately to control the source, contain any free product (for spills to water, “free product” means floating POL), and remove and manage the spill. Prompt response should reduce and mitigate substantial threat to human and environmental health and welfare of the Republic of Türkiye from the discharge. Potential casualties include, but are not limited to, fish, shellfish, wildlife, other natural resources, public and private beaches, shorelines, and cultural or historic properties of the Republic of Türkiye.

13.3.2. After the spill has been contained and is under control, any remaining free product and obviously contaminated soil resulting from the spill must be appropriately removed and managed. Installations should perform sampling, if necessary, to confirm obviously contaminated soil has been removed. Any byproducts of the initial spill response that are being disposed of must be characterized in accordance with Paragraph 16.3. to determine if they are hazardous. If a waste exhibits a characteristic of hazardous waste, it must be handled and disposed of in accordance with the requirements of Chapter 16, “*Hazardous Waste*”. If testing confirms that a waste does not exhibit a characteristic and is not hazardous, it must be managed and disposed of in accordance with the solid waste requirements of Chapter 15, “*Solid Waste*” or the wastewater requirements of Chapter 9, “*Stormwater and Wastewater*”, as appropriate.

13.3.3. Any off-installation spill response must be coordinated with appropriate Turkish authorities before taking action outside the installation.

13.3.4. Remediation of environmental contamination that remains after completion of initial spill response actions must be performed in accordance with applicable international agreements and DoDI 4715.08, "*Remediation of Environmental Contamination Outside the United States*".

13.4. REPORTING.

13.4.1. Concurrent with undertaking a spill response, any significant spill must be reported to the FIC immediately.

13.4.2. The FIC must immediately notify the installation commander who will report to the appropriate LEC and In-Theater Component Commander or Defense Agency and submit a follow-up written report when:

13.4.2.1. The spill occurs inside a DoD installation and cannot be contained within any required berm or secondary containment;

13.4.2.2. The spill exceeds 416 liters [110 US gallons] of POLs;

13.4.2.3. A water resource has been polluted; or

13.4.2.4. The FIC has determined that the spill is significant.

13.4.3. When a significant spill occurs inside a DoD installation and cannot be contained within the installation boundaries or threatens the local Turkish drinking water resource, the appropriate In-Theater Component Commander or Defense Agency, LEC, and Turkish authorities (e.g., Turkish Installation Commander) must be notified immediately.

13.4.4. If a significant spill is caused by DoD installation personnel or activities outside of the installation property, the person in charge at the scene must immediately notify the authorities listed in Paragraph 13.2.4.5.3. The FIC will perform further notifications of local emergency personnel, as appropriate, and immediately notify the appropriate In-Theater Component Commander and/or Defense Agency, LEC, and Turkish authorities.

13.5. PERSONNEL TRAINING.

Installations must provide necessary training and accidental release response drills, in accordance with the plan, to ensure the effectiveness of personnel, equipment, and protective measures. Oil-handling personnel must be identified by job title, responsibilities, or job duties, and trained annually as required by Paragraph 11.3.

13.6. RECORDKEEPING.

Installations must maintain records associated with spill prevention and response. Appropriate records include plans, procedures, inspection results, records of spills and response activation, and reports. Recordkeeping must be consistent with the procedures established by the plan (see Paragraph 13.2.3.11).

APPENDIX 13A: DETERMINATION OF WCD PLANNING VOLUME

13A.1. This appendix provides standards to determine:

13A.1.1. On an installation-specific basis, the extent of a WCD.

13A.1.2. The volume of POL or hazardous substance to be used in planning for a WCD. Installations should calculate the WCD volume that applies to the installation's design and the WCD volume that applies to operation, and use the larger of the two as the WCD planning volume.

13A.2. For installations transferring POL to and from vessels with tank capacities of 39,747 liters [10,500 gallons] or more, the WCD planning volume is calculated as follows:

13A.2.1. Where applicable, the loss of the entire capacity of all in-line and break-out tank(s) needed for the continuous operation of the pipelines used for the purposes of handling or transporting POL, in bulk, to or from a vessel regardless of the presence of secondary containment; plus

13A.2.2. The discharge from all piping carrying POL between the marine transfer manifold and the valve or manifold adjacent to the POL storage container. The discharge from each pipe is calculated as shown in Figure 13.1.

Figure 13.1. Pipe Discharge Calculation

Discharge = (the maximum time to discover the release from the pipe in hours + the maximum time to shut down flow from the pipe in hours^a) x (the maximum flow rate expressed in gallons per hour^b + the total line drainage volume expressed in gallons for the pipe between the marine transfer manifold and the valve or manifold adjacent to the POL storage container)

^a Based on historic discharge data or the best estimate in the absence of historic discharge data for the installation.

^b Based on the maximum relief valve setting or maximum system pressure when relief valves are not provided.

13A.3. For installations with POL or hazardous substance storage containers:

13A.3.1. Facilities with a Single Storage Container.

For facilities containing only one aboveground POL or hazardous substance storage container, the WCD planning volume equals the capacity of the POL or hazardous substance storage container. If adequate secondary containment exists for the POL storage container, multiply the capacity of the container by 0.8. Adequate secondary containment is that which is

sufficiently large to contain the capacity of the aboveground POL or hazardous substance storage container, plus sufficient freeboard to allow for precipitation.

13A.3.2. Facilities with Multiple Storage Containers.

13A.3.2.1. Facilities Having No Secondary Containment.

If none of the aboveground storage containers at the facility have adequate secondary containment, the WCD planning volume equals the total aboveground POL and hazardous substance storage capacity at the facility.

13A.3.2.2. Facilities Having Complete Secondary Containment.

If every aboveground storage container at the facility has adequate secondary containment, the WCD planning volume equals the capacity of the largest single aboveground POL or hazardous substance storage container.

13A.3.2.3. Facilities Having Partial Secondary Containment.

If some, but not all aboveground storage containers at the facility have adequate secondary containment, the WCD planning volume equals the sum of:

13A.3.2.1.1. The total capacity of the aboveground POL and hazardous substance storage container that lacks adequate secondary containment; plus

13A.3.2.1.2. The capacity of the largest single aboveground POL or hazardous substance storage container that has adequate secondary containment. Secondary containment is considered adequate when it includes an impervious containment system such as a dike, berm, containment curb, drainage system, or other device that prevents the escape of spilled material into the surrounding soil.

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CHAPTER 14: PESTICIDES

14.1. INTRODUCTION.

This chapter contains standards on the prevention of threats to human health and the environment from the storage and use of pesticides. This chapter does not address the personal use of pesticides by individuals in residences or gardens. It does not cover:

14.1.1. The storage of pesticides as hazardous materials, which is addressed in Chapter 10, “*Hazardous Materials*”, and requirements for spill prevention and response, which are addressed in Chapter 13, “*Spill Prevention and Response*”.

14.1.2. The details of DoD policy implementation, assigned responsibilities, and prescribed standards and procedures that apply outside the United States as part of the DoD Integrated Pest Management (IPM) Program covered in DoDM 4150.07 Volume 1, “*DoD Pest Management Program Elements and Implementation: Structure and Operation*”.

14.2. IPM PLANS.

Installations must prepare, implement, and maintain an IPM plan that includes measures for all installation activities that perform pest control, consistent with the program elements in Section 3 of DoDM 4150.07 Volume 1. This written plan must:

14.2.1. Include IPM procedures to control pests and minimize the use of pesticides.

14.2.2. Include appropriate security procedures to prevent unauthorized access to, or use of, pesticides.

14.2.3. Identify the designated coordinator to oversee all aspects of implementation.

14.2.4. Be implemented using trained personnel and certified pesticide applicators.

14.2.5. Be reviewed, updated, and approved annually by a designated pest management consultant (PMC) and reviewed, revised as necessary, and approved by the installation commander every 5 years.

14.3. IPM COORDINATOR (IPMC).

Each installation must have a designated IPMC to oversee the installation’s pest management program including development, implementation, maintenance, and annual update of the IPM plan. The IPMC must have the educational background, training, technical knowledge, and management skills to implement and oversee the pest management program.

14.4. PEST MANAGEMENT CONTRACTORS.

All pest management contractors must use IPM and comply with certification, licensing, registration, and other requirements in accordance with Section 4.6. of DoDM 4150.07 Volume 1 and this Chapter.

14.5. REQUIREMENTS FOR PESTICIDE APPLICATORS.

Installations must ensure:

14.5.1. All pesticides are applied by pesticide applicators certified for the specific application category in accordance with Section 4.2. of DoDM 4150.07 Volume 1, with the following exceptions:

14.5.1.1. New DoD employees who are not certified may apply pesticides during an apprenticeship period not to exceed 2 years and only under the supervision of a certified pesticide applicator.

14.5.1.2. Arthropod repellents applied to skin and clothing.

14.5.1.3. Pesticides applied as part of an installation's self-help program.

14.5.2. All pesticide applicators are included in a medical surveillance program to monitor the health and safety of persons occupationally exposed to pesticides in accordance with DoDI 6055.05 and DoDM 6055.05.

14.5.3. All pesticide applicators are provided with personal protective equipment appropriate for the work they perform and the types of pesticides to which they may be exposed.

14.6. STORAGE, USE, AND DISPOSAL OF PESTICIDES.

Installations must ensure:

14.6.1. Pesticides are included in the installation spill prevention and response plan. See Chapter 13, "*Spill Prevention and Response*" for spill prevention and response plan requirements.

14.6.2. Pest management facilities, including mixing and storage areas, comply with design requirements of Armed Forces Pest Management Board (AFPMB) "*Technical Guide No. 17: Military Handbook – Design of Pest Management Facilities*".

14.6.3. SDSs and labels for all pesticides are available at the storage facility. Labels must comply with the guidelines in Paragraph 10.3.4. Labels must bear the appropriate use instructions and precautionary message based on the toxicity category of the pesticide. If foreign

nationals will be using the pesticides, the precautionary messages and use instructions must be in English and Turkish.

14.6.4. Pesticide storage areas contain a readily visible current inventory of all items in storage, including items awaiting disposal, and should be regularly inspected and secured to prevent unauthorized access.

14.6.5. Only registered pesticides approved in writing by the appropriate pest management consultant and procured from the Federal Supply System or other approved commercial sources are used. This may be documented as part of the approval of the IPM plan.

14.6.5.1. AFPMB standard pesticides shall be labeled in accordance with Chapter 10, “*Hazardous Materials*”.

14.6.5.2. Registered pesticides will only be used for the process and purpose for which they are intended, as specified on the product labels and documentation. Further, the registered pesticides shall be used sparingly and in a manner that combines physical, biological, chemical, and other measures, as appropriate, to control the target pest.

14.6.6. All pesticides are applied in accordance with the procedures established in Section 5 of DoDM 4150.07 Volume 1 for specific pest management operations and consistent with the label.

14.6.7. The unintended discharge of pesticides to Turkish waters is minimized by implementing the following measures:

14.6.7.1. Use only the amount of pesticide and frequency of pesticide application necessary to control the target pest, using equipment and application procedures appropriate for this task.

14.6.7.2. Maintain pesticide application equipment in proper operating condition by calibrating, cleaning, and repairing such equipment to prevent leaks, spills, or other unintended discharges.

14.6.7.3. Assess weather conditions (e.g., temperature, precipitation, wind speed) in the treatment area to ensure application is consistent with industry standards and practices related to the application of pesticides, and other prudent provisions to reduce or eliminate pesticide discharges to Turkish waters.

14.6.8. Unless otherwise restricted or canceled, pesticides in excess of installation needs are redistributed within the supply system or disposed of in accordance with procedures outlined below:

14.6.8.1. The generator of pesticide wastes must determine whether or not the waste is hazardous in accordance with Chapter 16, “*Hazardous Waste*”.

14.6.8.2. Pesticide waste determined to be hazardous waste must be disposed of in accordance with the standards for hazardous waste disposal in Chapter 16, “*Hazardous Waste*”.

14.6.8.3. Pesticide waste that is determined not to be a hazardous waste must be disposed of in accordance with the label instructions as a solid waste. Empty pesticide containers that have been triple rinsed are not considered hazardous waste, and can be disposed of as normal solid waste. Pesticide containers must be handled in accordance with AFPMB “*Technical Guide No. 21: Pesticide Disposal Guide for Pest Control Shops*”.

14.7. REPORTS AND RECORDKEEPING.

For recordkeeping, Volume 1 of DoDM 4150.07 prescribes DD Form 1532, “*Pest Management Report*” available at <https://www.esd.whs.mil/directives/forms/>. A computer-generated equivalent may be used in its place. Daily records report all in-house, formally contracted and government purchase card- procured pest control activities conducted anywhere on the installation, to include such sites as out-leased land, golf courses, and natural resources. Records must be submitted to the designated pest management consultant at least monthly. Installation commanders must ensure these records are archived after 2 years for permanent retention.

VOLUME V: WASTE

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DEFINITIONS

Unless otherwise noted, these terms and their definitions are for the purpose of this volume.

Acute hazardous waste	Wastes listed in Table 16.2, “ <i>List of Hazardous Wastes and Hazardous Substances</i> ” with a waste number with the “P” designator, or hazardous wastes in Table 16.3 with the Hazard Code “H.”
Bulky waste	Large items of solid waste, such as household appliances, furniture, large auto parts, trees, branches, stumps, and other oversize wastes whose large size precludes or complicates their handling by normal solid waste collection, processing, or disposal methods.
Appropriate DoD medical authority	The medical professional designated by the in-theater Component Commander to be responsible for resolving medical issues at the Component’s installations.
Category A infectious substance	An infectious substance which is transported in a form that, if exposure occurs, is capable of causing permanent disability, or life-threatening or fatal disease, to otherwise healthy humans or animals.
Cathodic protection	A technique to prevent corrosion of a metal surface by making that surface the cathode of an electrochemical cell. For example, a tank system can be cathodically protected through the application of either galvanic anodes or impressed current.
Collection	In the context of solid waste management in Chapter 15, the act of consolidating solid wastes, or materials that have been separated for the purpose of recycling, from various locations.
Commercial solid waste	All types of solid wastes generated by stores, offices, restaurants, warehouses, and other non-manufacturing activities, excluding residential, institutional, and industrial solid wastes.
Construction and demolition debris	The waste building materials, packaging, and rubble resulting from construction, remodeling, repair, and demolition operations on pavements, houses, commercial buildings, and other structures.
Cover material	Material that is used to cover compacted solid wastes in a land disposal site.
Daily cover	Soil that is spread and compacted or synthetic material that is placed on the top and side slopes of compacted solid waste at least at the end of each operating day to control

	vectors, fire, moisture, and erosion and assure an aesthetic appearance. Mature compost or other natural material may be substituted for soil if soil is not reasonably available in the vicinity of the landfill and the substituted material will control vectors, fire, moisture, and erosion and assure an aesthetic appearance.
Disposal	Any of the applicable operations listed in Table 15.1. Proper disposal effectively mitigates hazards to human health and the environment.
Elementary neutralization	A process of neutralizing a hazardous waste that is hazardous only because of the corrosivity characteristic. It must be accomplished in a tank, transport vehicle, or container.
Enduring location	A location is enduring when DoD intends to maintain access and use of that location for the foreseeable future. The following types of sites are considered enduring for US Government purposes: main operating base, forward operating site, and cooperative security location. All three types of locations may be composed of more than one distinct site. Enduring locations are published in the OSD-approved Enduring Location Master List.
Excavation soil	The soil formed as a result of excavation and similar activities carried out during the preparation of the land before construction.
Final Governing Standard (FGS)	A comprehensive set of country-specific substantive environmental provisions; typically, technical limitations on effluent, discharges, etc., or a specific management practice, developed in accordance with DoDI 4715.05.
Final cover	A layer of soil, mature compost, other natural material, or synthetic material with an equivalent minimum permeability that is applied to the landfill after completion of a cell or trench, including a layer of material that will sustain native vegetation, if any.
Food waste	The organic residues generated by the handling, storage, sale, preparation, cooking, and serving of foods, commonly called garbage.
Generation	The act or process of producing waste.
Generator	An installation, or a unit or activity on an installation, whose act or process produces hazardous waste.
Hazardous constituent	A chemical compound listed by name in Table 16.2, that is listed in the USEUCOM Chemicals List (see Chapter 10, “ <i>Hazardous Materials</i> ”), or that possesses the characteristics described in Table 16.1.

Hazardous substance	Any substance (including hazardous materials as defined in Chapter 10, “<i>Hazardous Material</i>” and hazardous waste as defined in Chapter 16, “<i>Hazardous Waste</i>”) having the potential to do serious harm to human health or the environment if spilled or released in reportable quantity (RQ). A list of these substances and the corresponding RQs is provided in Table 16.2. Hazardous substances do not include: Petroleum, including crude petroleum, oil, and lubricants or any fraction thereof, that is not otherwise specifically listed or designated in Table 16.2. as a hazardous substance. Natural gas, natural gas liquids, liquefied natural gas, or synthetic gas usable for fuel (or mixtures of natural gas and such synthetic gas) that are not otherwise specifically listed or designated as a hazardous substance above.
Hazardous waste	A waste that may be solid, semi-solid, liquid, or contained gas, and either is listed as a 6-digit waste code and marked with an asterisk in the European Union List of Wastes (LoW) ², but without a specific or general reference to “<i>hazardous substances</i>”, or, is listed as a 6-digit waste code and marked with an asterisk in the LoW with a specific or general reference to “<i>hazardous substances</i>” and presents one or more hazardous properties listed in Table 16.1, “<i>Hazardous Properties</i>”. Does not include domestic sewage sludge, household wastes, and medical wastes.
Hazardous waste log	A listing of hazardous waste deposited and removed from an HWSA. Information such as the waste type, volume, location, and storage removal dates should be recorded.
Hazardous Waste Accumulation Point (HWAP)	A shop, site, or other work center where hazardous wastes are accumulated until removed to an HWSA or shipped for treatment or disposal.
Hazardous Waste Profile Sheet (HWPS)	A document that identifies and characterizes the waste by providing the user’s knowledge of the waste and lab analysis, and details the physical, chemical, and other descriptive properties or processes that created the hazardous waste. The DLA form 2511 is recommended for this purpose. Forms or form format may be modified after

² The European Union List of Wastes is available from the Official Journal of the European Union in various formats and languages at <https://eur-lex.europa.eu/eli/dec/2014/955/oj>

coordinating with the servicing DLA Disposition Services or alternate disposal agent, but the content shall remain basically the same.

Hazardous Waste Storage Area (HWSA)

Any location on a DoD installation where hazardous waste is collected before shipment for treatment or disposal. An HWSA may store more than the equivalent of a 208-liter [55-gallon] drum of hazardous waste, or a 1-liter [1-quart] container of an acute hazardous waste, from each waste stream.

HWSA manager

A person or agency on the installation assigned the operational responsibility for receiving, storing, inspecting, and general management of the installation's HWSA or HWSA program.

Incompatible waste

A hazardous waste that is unsuitable for: placement in a particular device or facility because it may cause corrosion or decay of containment materials (e.g., container inner liners or tank walls); or commingling with another waste or material under uncontrolled conditions because the commingling might produce heat or pressure, fire or explosion, violent reaction, toxic dusts, mists, fumes, or gases, or flammable fumes or gases.

Industrial solid waste

Solid waste generated by industrial processes and manufacturing that is not characterized as hazardous waste in accordance with Chapter 16, "*Hazardous Waste*".

Infectious agent

Any organism, such as a virus or bacterium, that is capable of being communicated by invasion and multiplication in body tissues and capable of causing disease or adverse health impacts in humans.

Infectious hazardous waste

Mixtures of infectious medical waste and hazardous waste including solid waste, such as fluids from a laboratory.

Infectious medical waste

Solid waste produced by medical facilities that is specially managed because it has the potential for causing disease in humans or animals, or may pose a risk to both individuals or community health if not managed properly, and that includes the following classes:

Microbiology waste, including cultures and stocks of etiologic agents that, due to their species, type, virulence, or concentration, are known to cause disease in humans.

Pathology waste, including tissues and organs, amputated limbs or other body parts, fetuses, placentas, and similar tissues from surgery, delivery, or autopsy procedures. Waste contaminated with an infectious agent, including carcasses, body parts, blood, and bedding are also included. Non-contaminated carcasses of animals that died from natural causes or vehicular impact are not considered pathology waste and are disposed of as solid waste in accordance with Chapter 15, "*Solid Waste*" where local regulations permit.

Blood and blood products (including serum, plasma, and other blood components), items contaminated with liquid or semi-liquid blood or blood products and items saturated or dripping with blood or blood products, and items caked with blood or blood products that are capable of releasing these materials during handling.

Potentially infectious materials, including fluids such as semen, vaginal secretions, cerebrospinal fluid, pericardial fluid, pleural fluid, peritoneal fluid, amniotic fluid, saliva in dental procedures, any body fluid that is visibly contaminated with blood, and all body fluids in situations where it is difficult or impossible to differentiate between body fluids.

Sharps, including hypodermic needles, syringes, biopsy needles, and other types of needles used to obtain tissue or fluid specimens, needles used to deliver intravenous solutions, scalpel blades, Pasteur pipettes, specimen slides, cover slips, glass petri plates, and broken glass potentially contaminated with infectious waste.

Infectious waste from isolation rooms, but only including those items that were contaminated or likely to have been contaminated with infectious agents or pathogens, including bodily excretions and discarded materials contaminated with blood.

Any material that has come into contact with infected animals or their excreta, and waste materials from veterinary services.

Installation

An enduring location consisting of a base, camp, post, station, yard, center, or other DoD activity under the operational control of the Secretary of a Military Department or the Secretary of Defense.

Institutional solid waste

Solid waste generated by educational, health care, correctional, and other institutional facilities.

International agreement

A multilateral or bilateral agreement, such as a base rights or access agreement, a status-of-forces agreement, or any other instrument defined as a binding international agreement in accordance with DoDD 5530.3, "*International Agreements*" (Reference (n)).

Land application unit

An area where wastes are applied onto or incorporated into the soil surface, excluding manure spreading operations, for agricultural purposes or for treatment or disposal.

Land disposal

Placement in or on the land including, but not limited to, land treatment, facilities, surface impoundments, underground injection wells, salt dome formations, salt bed formations, and underground mines or caves.

Lower explosive limit	The lowest percentage by volume of a mixture of explosive gases in air that will propagate a flame at 25 °C [77 °F] and atmospheric pressure.
Medical facility	Medical, dental, research and development, and veterinary facilities that generate waste in the diagnosis, treatment, or immunization of human beings or animals or in the production or testing of biological subjects.
Municipal solid waste (MSW)	Institutional, residential, commercial, and industrial solid waste generated within a community, not including yard waste. See Chapter 15, “ <i>Solid Waste</i> ”.
Municipal solid waste landfill (MSWLF) unit	A discrete area of land or an excavation, on or off an installation, that receives institutional, commercial, residential, or industrial solid waste, and is not a land application unit, surface impoundment, injection well, or waste pile. Employs an engineered method of disposing of solid waste that minimizes environmental hazards by spreading the solid waste in thin layers, compacting the solid waste to the smallest practical volume, and applying and compacting cover materials daily.
Noninfectious medical waste	Solid waste created that does not require special management because it has been determined to be incapable of causing disease in humans or animals, or that has been treated to render it noninfectious. This waste should be disposed of as solid waste in accordance with Chapter 15, “ <i>Solid Waste</i> ” if local regulations permit.
Open burning	Burning of solid wastes in the open, not in a commercially manufactured incinerator or other equipment specifically designed and manufactured for the burning of solid waste.
Open dump	A land disposal site where solid wastes are disposed of in a manner that does not protect the environment, is susceptible to open burning, and is exposed to the elements, vectors, and scavengers. Includes sites that do not meet the design and operational requirements of Paragraph 15.6.
Packaging waste	Any material manufactured for the purpose of accepting, protecting, handling, delivering, or presenting goods, ranging from raw materials to processed product and passed on to the distributor or end user.
Recovery	Any of the applicable operations listed in Table 15.2.
Residential solid waste	The wastes generated by normal household activities, including, but not limited to, food wastes, rubbish, ashes, and bulky wastes.
Rubbish	A general term for solid waste, excluding food wastes and ashes, taken from residences, commercial establishments, and institutions.
Scavenging	The uncontrolled and unauthorized removal of materials at any point in the solid waste management system.

Sludge	The accumulated semi-liquid suspension of settled solids deposited from wastewaters or other fluids in tanks or basins. It does not include solids or dissolved material in domestic sewage or other significant pollutants in water resources, such as silt, dissolved or suspended solids in industrial wastewater effluent, dissolved materials in irrigation return flows, or other common water pollutants.
Solid waste	Garbage, refuse, sludge, and other discarded materials, including solid, semi-solid, liquid, and contained gaseous materials resulting from institutional, industrial, residential, and commercial operations and from community activities. It does not include solids or dissolved material in domestic sewage or other significant pollutants in water resources, such as silt, dissolved or suspended solids in industrial wastewater effluent, dissolved materials in irrigation returnflows, or other common water pollutants.
Solvent-contaminated wipe	A woven or non-woven shop towel, rag, pad, or swab made of wood pulp, fabric, cotton, polyester blends, or other material that, after use or after cleaning up a spill, either: Contains one or more of the F001 through F005 solvents listed in Table 16.3 or the corresponding P- or U-listed solvents found in in Table 16.2; Exhibits one or more characteristics of hazardous waste (<i>ignitability</i>, <i>corrosivity</i>, <i>reactivity</i>, or <i>toxicity</i>) when that characteristic results from a solvent listed in Table 16.2 or Table 16.3; or Exhibits only the hazardous waste characteristic of ignitability due to the presence of one or more solvents that are not listed in Table 16.2 or Table 16.3.
Standards	Substantive elements of US laws and federal regulations applicable to DoD installations, facilities, and actions in the United States or that have extraterritorial application.
Storage	The interim containment of waste after generation and before collection for ultimate recovery or disposal.
Storage site	In the context of medical waste management in Chapter 17, an interim(e.g., soiled utility room) or final location where infectious medical waste is stored before treatment or disposal. This does not include point-of-use collection sites.
Treatment	In the context of hazardous waste management in Chapter 16, “ <i>Hazardous Waste</i> ”, any method, technique, or process, excluding elementary neutralization, designed to change the physical, chemical, or biological characteristics or composition of any

hazardous waste that would render such waste nonhazardous, or less hazardous; safer to transport, store, or dispose of; or amenable for recovery, amenable for storage, or reduced in volume.

In the context of medical waste management in Chapter 17, “*Medical Waste*”, any method, technique, or process designed to change the physical, chemical, or biological character or composition of any infectious hazardous or infectious medical waste so as to render such waste noninfectious; safer to transport, store, or dispose of; or amenable for recovery, amenable for storage, or reduced in volume. Treatment methods for infectious medical waste must eliminate infectious agents so that they no longer pose a hazard to persons who may be exposed. Examples of typical treatment processes include:

Chemical Disinfection. The elimination or reduction of infectious agents on inanimate objects by applying or immersing in chemicals. Disinfection may not kill bacterial spores.

Chemical Sterilization. The complete destruction or elimination of all microbial life using chemicals.

Cremation. Reducing a corpse or parts of a corpse to its basic elements by burning in a licensed crematorium.

Incineration. High temperature combustion of wastes in which toxins are destroyed. Medical waste incinerators must meet the requirements specified within Chapter 4, “*Air Emissions*” for design and operation.

Steam Sterilization. The complete destruction or elimination of all microbial life using steam.

**Turkish waste
transport form**

A Turkish waste manifest used during the transport of hazardous wastes from the DoD Hazardous Waste Generator to the disposal site. This form contains detailed information describing the waste; identifying waste generators, carriers, and disposal sites; recovery or treatment methods used; and provides signature certifications of all parties involved. A sample is provided in Table 15.5.

**Unique identification
number**

A number assigned to generators of hazardous waste to identify the generator and used to assist in tracking the waste from point of generation to ultimate disposal. The number is typically the DoD Activity Address Code (DoDAAC), the Unit Identification Code (UIC), or the Waste Code depending on whether the HW movement is by DOD or Contract means, or a unique identifier (provided by the Turkish Installation Commander) required for local Turkish hazardous waste shipments and manifests. The method for

determining the unique identification number is usually specified by the LEC.

United States

The several States, the District of Columbia, the Commonwealths of Puerto Rico and the Northern Mariana Islands, American Samoa, Guam, Midway and Wake Islands, the US Virgin Islands, any other territory or possession of the United States, and associated navigable waters, contiguous zones, and ocean waters of which the natural resources are under the exclusive management authority of the United States.

Used oil

Any oil or other waste petroleum, oil, or lubricant product that has been refined from crude oil or is synthetic oil and, as a result of being used, is contaminated by physical or chemical impurities or is off-specification and cannot be used as intended. Although used oil may exhibit the characteristics of reactivity, toxicity, ignitability, or corrosivity, it is still considered used oil unless it has been mixed with hazardous waste. Used oil mixed with hazardous waste is a hazardous waste and is managed as such.

Used oil fuel

Used oil that is burned for energy recovery is termed “*used oil fuel*”. Used oil fuel includes any fuel produced from used oil by processing, blending, or other treatment.

Vector

A carrier that is capable of transmitting a pathogen from one organism to another.

Yard waste

Grass and shrubbery clippings, tree limbs, leaves, and similar organic materials commonly generated in residential yard maintenance (also known as green waste).

ACRONYMS

°C	degrees Celsius
CAS	Chemical Abstracts Service
CFR	Code of Federal Regulations
cm	centimeter
DLA	Defense Logistics Agency
DoDD	DoD directive
DoDI	DoD instructions
DoDM	DoD manual
DWTP	domestic wastewater treatment plant
EO	Executive order
EPA	Environmental Protection Agency
°F	degrees Fahrenheit
FGS	final governing solution
HW No.	hazardous waste number
HWAP	hazardous waste accumulation point
HWPS	hazardous waste profile sheet
HWSA	hazardous waste storage area
kg	kilogram

L	liter
LEC	lead environmental component
LoW	European Union List of Wastes
mg	milligram
MSW	municipal solid waste
MSWLF	municipal solid waste landfill
OSD	Office of the Secretary of Defense
PCB	polychlorinated biphenyl
RQ	reportable quantity
UDMH	1, 1-dimethylhydrazine
USEUCOM	United States European Command

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CHAPTER 15: SOLID WASTE

15.1. INTRODUCTION.

This chapter contains standards on solid wastes so they are collected, transported, stored, and recycled or disposed of in a manner protective of human health and the environment. These integrated waste management standards:

15.1.1. Apply to institutional, residential, commercial, and industrial solid waste generated at the installation.

15.1.2. Address general solid waste not otherwise classified or specially managed. Standards for hazardous and medical waste are provided in Chapters 16, “*Hazardous Waste*” and 17, “*Medical Waste*”. Standards for disposal of asbestos and polychlorinated biphenyls (PCBs) are provided in Chapters 5, “*Asbestos*” and 7, “*PCBs*”.

15.2. GENERAL.

15.2.1. Installations will develop and implement a solid waste management strategy to reduce solid waste disposal. This Strategy will be consistent with the waste management hierarchy (waste minimization at source, reuse, recycling, recovery, treatment and/or disposal).

15.2.1. DoD solid wastes must be collected, stored, and recycled in a manner that is protective of human health and the environment and consistent with Paragraphs 15.3., 15.4., and 15.5.

15.2.2. DoD solid wastes must be treated or disposed of at facilities that meet the requirements for landfills in Paragraph 15.6., incinerators in Paragraph 15.7., or sludge land application in Paragraph 15.8., or within a licensed Turkish facility, as appropriate.

15.2.3. The disposal of solid waste in landfills that do not meet the standards of Paragraph 15.6. constitutes open dumping and is prohibited.

15.2.4. Installations should coordinate with the Turkish Installation Commander to determine if registration of waste disposal operations is required. If required, the installation shall provide the Turkish Installation Commander with the required and requested information.

15.2.5. Except as provided in Paragraph 15.6.3.5, open burning of solid waste is prohibited.

15.2.6. Personnel performing solid waste management activities should be trained in accordance with assigned responsibilities.

15.2.7. Off-base transportation of solid waste shall be conducted by entities authorized/ licensed by Turkish authorities. If installations treat, recover or dispose of solid waste on-site, a

description of those operations will be provided to the Turkish Installation Commander, who will determine whether an authorization for such operations is required.

15.2.8. Solid Waste Classification and Recordkeeping.

15.2.8.1. Installations shall classify all solid wastes prepared for off-site transport, treatment, or disposal according to the European Union List of Wastes (See Chapter 16, “*Hazardous Waste*”).

15.2.8.2. Installations shall keep records containing the following information for at least 5 years for each appropriate European Union Waste Code, and provide information on such records to the Turkish Installation Commander upon request:

15.2.8.2.1. Quantity of waste.

15.2.8.2.2. Source of the waste.

15.2.8.2.3. Facility where waste was sent.

15.2.8.2.4. Mode of transport.

15.2.8.2.5. Treatment method, if any.

15.2.9. Installations must maintain records associated with the design, operation, and maintenance of solid waste management facilities, as appropriate.

15.3. COLLECTION.

Installations must:

15.3.1. Ensure all vehicles used for the collection and transportation of solid waste are enclosed or have adequate provisions so there is no spillage when vehicles are in transit.

15.3.2. Collect solid waste frequently enough to inhibit the propagation or attraction of vectors and pests. At a minimum, collect solid waste containing food waste weekly. In some climates, it may be necessary to collect waste more often to inhibit the propagation or attraction of vectors and pests.

15.4. STORAGE.

Installations must:

15.4.1. At a minimum, store bulky wastes by removing all doors from large household appliances and covering the items. Such practices are necessary to reduce the attractive nuisance

(i.e., hazard to children) and the accumulation of solid waste and water in and around the bulky items. Refer to Chapter 4, “*Air Emissions*” for solid waste management requirements associated with municipal waste combustor units.

15.4.1.1. Screen bulky wastes for the presence of ozone-depleting substances in accordance with Chapter 4, “*Air Emissions*” or hazardous constituents in accordance with Chapter 16, “*Hazardous Waste*”.

15.4.1.2. Segregate and dispose of readily detachable or removable hazardous waste in accordance with Chapter 16, “*Hazardous Waste*”, or asbestos and PCBs in accordance with Chapter 5, “*Asbestos*” and Chapter 7, “*PCBs*”.

15.4.2. Design all buildings or other facilities that are constructed, modified, or leased after the effective date of this manual to:

15.4.2.1. Provide adequate storage to accommodate the anticipated volume of solid waste and recyclables.

15.4.2.2. Ensure storage areas are easily cleaned and maintained and allow for safe, efficient collection.

15.4.3. Securely store solid waste that contains food waste in containers that:

15.4.3.1. Are leak-proof, waterproof, and vermin-proof, including sides, seams, and bottoms.

15.4.3.2. Are durable enough to withstand anticipated use and environmental conditions without rusting, cracking, or deforming in a manner that impairs serviceability.

15.4.3.3. Have functional lids.

15.4.4. Store containers on a firm, level, well-drained surface that is large enough to accommodate all of the containers and is maintained in a clean, spillage-free condition.

15.5. RECYCLING.

Recycling programs will be instituted on DoD installations that provide facilities for separate collection (e.g., source segregation) of packaging wastes, electronic waste, paper and cardboard, glass, metal, scrap vehicles, biodegradable and other wastes, if economically feasible and reasonably practicable. Installations must:

15.5.1. Store all solid wastes or materials that have been separated for recycling so they:

15.5.1.1. Do not create a fire, health, or safety hazard.

15.5.1.2. Do not provide food or harborage for vectors and pests.

15.5.1.3. Are contained or bundled to avoid spillage.

15.5.2. If implementing a qualified recycling program, institute it in accordance with DoDI 4715.23, “*Integrated Recycling and Solid Waste Management*”.

15.6. LANDFILLS.

Installations must comply with these standards for the expansion and construction of new landfill units and the operation of existing and new landfills. Landfills failing to satisfy these standards constitute open dumps, which are prohibited. Landfills on DoD installations must meet all of the requirements of this paragraph. Installations disposing of solid waste at Turkish landfills must ensure the landfills comply with the requirements of Paragraph 15.6.3. If the landfill complies with the standards of this paragraph, sewage sludge may be disposed of in a municipal solid waste landfill (MSWLF). Installations must:

15.6.1. Not initiate new landfill units or expand existing waste landfill units without consulting with the LEC and the Turkish Installation Commander who has responsibility for the area where the landfill would be located. New construction or expansion is only permissible after the installation commander provides sufficient justification to the responsible LEC or Turkish Installation Commander that no suitable alternative exists.

15.6.2. Design and operate new DoD MSWLF units that incorporate these factors:

15.6.2.1. Consider all Turkish and local design criteria. Contact the LEC for further information regarding these criteria.

15.6.2.2. Location restrictions regarding civilian populations, airport safety (e.g., bird hazards), floodplains, wetlands, aquifers, seismic zones, residential and agricultural areas, natural protected areas, and unstable areas.

15.6.2.3. Prevent rainwater, surface water and/or groundwater from entering the landfill or leachate collection system.

15.6.2.4. Procedures for excluding hazardous waste.

15.6.2.5. Cover material standards (e.g., daily cover), disease vector control, explosive gas control, air quality standards (e.g., no open burning, odor and dust control), access requirements, liquids restrictions, and recordkeeping requirements.

15.6.2.6. An inspection program.

15.6.2.7. A liner and leachate collection system designed and installed consistent with Unified Facilities Criteria 3-240-10A and in consideration of the location to collect and treat

contaminated leachate and prevent groundwater contamination that would adversely affect human health.

15.6.2.7.1. Liners must consist of a minimum 30-mils [0.762-millimeter] flexible membrane liner and at least a 0.6-meter [2-foot] layer of compacted soil with a hydraulic conductivity of no more than 1×10^{-7} centimeters (cm) per second [3.94×10^{-8} inches per second]. Liner components consisting of high-density polyethylene must be at least 60-mils [1.524-millimeter] thick.

15.6.2.7.2. Leachate collection systems must be designed and constructed to maintain less than 30-cm [11.8-inch] depth of leachate over the liner.

15.6.2.8. A groundwater monitoring system unless the installation operating the landfill, after consultation with the LEC, determines that there is no reasonable potential for migration of hazardous constituents from the MSWLF to the uppermost aquifer during the active life of the facility and the post-closure care period.

15.6.2.9. A written closure plan that is kept as part of the installation's permanent records, with a minimum period of 5 years post-closure period. The plan must include, at a minimum:

15.6.2.9.1. Monitoring and maintenance activities required to ensure the integrity of the final cover.

15.6.2.9.2. Planned uses of the site during the post-closure period.

15.6.2.9.3. Plans for continuing (during the post-closure period) leachate collection, groundwater monitoring, and methane monitoring.

15.6.2.9.4. A survey plot showing the exact site location.

15.6.3. When operating MSWLF units:

15.6.3.1. Use standard landfilling techniques of spreading and compacting solid wastes and placing daily cover over disposed solid waste at the end of each operating day to control disease vectors, fires, odors, blowing litter, and scavenging.

15.6.3.2. Establish standards for unacceptable wastes based on site-specific factors, such as hydrology, chemical and biological characteristics of the waste, available alternative disposal methods, environmental and health effects, and the safety of personnel.

15.6.3.3. The following waste is not acceptable in MSWLF.

15.6.3.3.1. Liquid waste or paste with low viscosity;

15.6.3.3.2. Waste which, within the criteria of the European Union List of Wastes, is explosive, corrosive, oxidizing, highly flammable; or

15.6.3.3.3. Hazardous medical waste.

15.6.3.3.4. End-of-life tires, end-of-life tires includes:

15.6.3.3.4.1. Whole tires, with the exception of those tires used as engineering material, bicycle tires, and tires with an outside diameter exceeding 1400 mm (55 inches).

15.6.3.3.4.2. Shredded tires.

15.6.3.3.5. Any waste for which any of the following are unknown:

15.6.3.3.5.1. The composition and properties;

15.6.3.3.5.2. Leaching potential; or the

15.6.3.3.5.3. Potential long-term changes in characteristics of the waste (ignitability, corrosivity, reactivity, or toxicity).

15.6.3.4. Implement a program to detect and prevent the disposal of hazardous wastes, infectious medical wastes, PCBs, and wastes determined unsuitable for the specific MSWLF unit.

15.6.3.5. Investigate options for composting municipal solid waste (MSW) as an alternative to landfilling or treatment before landfilling.

15.6.3.6. Prohibit open burning, except for infrequent burning of agricultural wastes, silvicultural wastes, land-clearing debris, diseased trees, or debris from emergency cleanup operations.

15.6.3.7. Develop procedures to divert recyclables, yard waste, and construction and demolition debris from MSWLF units to the maximum extent possible (e.g., composting, recycling).

15.6.3.7.1. Recovery of composted material (for example, as final cover for landfills) shall be a priority.

15.6.3.7.2. Collect and separate excavation soil and construction and demolition debris at the source.

15.6.3.7.3. Recyclable construction and demolition debris and excavation soil shall be collected separately, treated, and reused (e.g., as construction material) whenever technically and economically feasible.

15.6.3.8. Operate the MSWLF unit in a manner to protect the health and safety of personnel associated with the operation.

15.6.3.9. Maintain conditions that are unfavorable for the harboring, feeding, and breeding of disease vectors.

15.6.3.10. Ensure that methane gas generated by the MSWLF unit does not exceed 25 percent of the lower explosive limit for methane in structures on or near the MSWLF. Collect, process, and use the methane gas generated in order to minimize the adverse effects or deterioration of the environment and risk to human health. If the captured gas cannot be used, it must be flared.

15.6.3.11. Operate in an aesthetically acceptable manner.

15.6.3.12. Operate in a manner to protect aquifers.

15.6.3.13. Control public access to landfill facilities to prevent illegal dumping of waste and scavenging.

15.6.3.14. If possible, prohibit the disposal of bulk or noncontainerized liquids.

15.6.3.15. Maintain records of MSWLF operations specified in Paragraphs 15.6.3.1. through 15.6.3.13.

15.6.4. During closure and post-closure:

15.6.4.1. Install a final cover system that is designed to minimize infiltration and erosion.

15.6.4.2. Ensure the infiltration layer is composed of a minimum of 50 cm [20 inches] of earthen material, geotextiles, or a combination of the two, with a permeability:

15.6.4.2.1. Less than or equal to the permeability of any bottom liner system or natural subsoil present, or

15.6.4.2.2. No greater than 5×10^{-5} cm per second [1.97×10^{-5} inch per second], whichever is less.

15.6.4.3. Ensure the final layer consists of a minimum of 50 cm [20 inches] of earthen material that is capable of sustaining native plant growth.

15.6.4.4. If possible, revegetate the final cap with native plants that are compatible with the landfill design, including the liner.

15.7. INCINERATION.

15.7.1. Installations operating incinerators must meet the air quality requirements in Chapter 4, “*Air Emissions*”.

15.7.2. Installations operating MSW incinerators processing, or designed to process, more than 50 tons per day aggregate must also:

15.7.2.1. Establish standards for acceptable and unacceptable wastes based on facility capability, chemical and biological characteristics of the waste, environmental and health effects, and personnel safety.

15.7.2.2. Treat all waters discharged from the facility to meet the more protective of applicable water quality standards. See Chapter 9 for wastewater and stormwater standards.

15.7.2.3. Maintain conditions that are unfavorable for the harboring, feeding, and breeding of disease vectors.

15.7.2.4. Operate in an aesthetically acceptable manner (e.g., perform routine housekeeping and regularly remove waste that cannot be processed by the facility).

15.7.2.5. Characterize and dispose of residue and other solid waste resulting from incineration in an environmentally acceptable manner. See Chapter 16, “*Hazardous Waste*” for waste characterization and hazardous waste management standards.

15.7.3. Sewage sludge may be incinerated in an MSW incinerator if the incinerator accepts sewage sludge and has appropriate storage for the sludge while it awaits processing.

15.8. LAND APPLICATION OF SEWAGE SLUDGE.

Installations must comply with the following requirements for land application of sewage sludge.

15.8.1. Landfilling, incineration, and land application are acceptable methods of disposal of sewage sludge. Sewage sludge that is landfilled or incinerated must meet the requirements in Paragraph 15.6. or 15.7, respectively.

15.8.2. Sewage sludge that has been properly treated and processed becomes biosolids, and can be applied to the land for beneficial reuse to either condition the soil or fertilize crops or other vegetation grown in the soil. Biosolids must meet pollutant limits, pathogen reduction requirements, and vector attraction reduction requirements before land application.

15.9. ALTERNATIVE TECHNOLOGIES.

Alternative technologies and methods of treatment and disposal of solid waste must be protective of human health and the environment and meet the requirements of this volume, as appropriate.

Table 15.1. Waste Disposal Operations

D 1	Deposit into or onto land (e.g., landfill, etc.)
D 2	Land treatment (e.g., biodegradation of liquid or sludgy discards in soils, etc.)
D 3	Deep injection (e.g., injection of pumpable discards into wells, salt domes or naturally occurring repositories, etc.)
D 4	Surface impoundment (e.g., placement of liquid or sludgy discards into pits, ponds or lagoons, etc.)
D 5	Specially engineered landfill (e.g., placement into lined discrete cells, which are capped and isolated from one another and the environment, etc.)
D 6	Release into a water body except seas/oceans
D 7	Release into seas/oceans including sea-bed insertion
D 8	Biological treatment not specified elsewhere in this table that results in final compounds or mixtures that are discarded by means of any of the operations numbered D 1 to D 12
D 9	Physico-chemical treatment not specified elsewhere in this table that results in final compounds or mixtures that are discarded by means of any of the operations numbered D 1 to D 12 (e.g., evaporation, drying, calcination, etc.)
D 10	Incineration on land
D 11	Incineration at sea
D 12	Permanent storage (e.g., emplacement of containers in a mine, etc.)
D 13	Blending or mixing prior to submission to any of the operations numbered D 1 to D 12
D 14	Repackaging prior to submission to any of the operations numbered D 1 to D 13
D 15	Storage pending any of the operations numbered D 1, D 2, D 5, D 8 through D 10, and D 12 to D 14 (excluding temporary storage, pending collection, on the site where it is produced)

Table 15.2. Waste Recovery Operations

R 1	Use principally as a fuel or other means to generate energy
R 2	Solvent reclamation/regeneration
R 3	Recycling/reclamation of organic substances that are not used as solvents (including composting and other biological transformation processes)
R 4	Recycling/reclamation of metals and metal compounds
R 5	Recycling/reclamation of other inorganic materials
R 6	Regeneration of acids and bases
R 7	Recovery of components used for pollution abatement
R 8	Recovery of components from catalysts
R 9	Oil re-refining or other reuses of oil
R 10	Land treatment resulting in benefit to agriculture or ecological improvement
R 11	Use of wastes obtained from any of the operations numbered R 1 to R 10
R 12	Exchange of wastes for submission to any of the operations numbered R 1 to R 11
R 13	Storage of wastes pending any of the operations numbered R 1 to R 12 (excluding temporary storage, pending collection, on the site where it is produced)

CHAPTER 16: HAZARDOUS WASTE

16.1. INTRODUCTION.

This chapter contains standards on all hazardous waste generated so it is identified, characterized, stored, transported, treated, and recycled or disposed of in a manner protective of human health and the environment. The management of hazardous waste will be consistent with the waste management hierarchy (waste minimization at source, reuse, recycling, recovery, treatment and/or disposal). It covers wastes that exhibit one or more characteristics of hazardous waste (ignitability, corrosivity, reactivity, or toxicity) or which are listed hazardous wastes. It does not cover:

16.1.1. Ammunition and explosives, which are covered in Defense Explosives Safety Regulation 6055.09.

16.1.2. Radioactive materials, which are covered in DoDI 4715.27.

16.2. PERSONNEL QUALIFICATIONS.

Installations must ensure that personnel and their supervisors who are assigned duties involving actual or potential exposure to hazardous waste successfully complete an appropriate training program before assuming those duties. Personnel assigned to such duties must work under direct supervision until they have completed appropriate training.

16.2.1. Refresher Training.

All personnel performing hazardous waste duties must successfully complete annual refresher hazardous waste training.

16.2.2. Training Contents and Requirements.

The training program must:

16.2.2.1. Include sufficient information to enable personnel to perform their assigned duties and fully comply with pertinent hazardous waste requirements.

16.2.2.2. Be conducted by qualified personnel who have completed a training program in the subject, have comparable academic credentials, or possess relevant experience.

16.2.2.3. Be designed to ensure that facility personnel are able to respond effectively to emergencies by familiarizing them with emergency procedures, emergency equipment, and emergency systems.

16.2.2.4. Address the following areas, in particular for personnel whose duties include hazardous waste handling and management:

16.2.2.4.1. Emergency procedures (response to fire, explosion, and spills; use of communications and alarm systems; body and equipment decontamination).

16.2.2.4.2. Drum and container handling and storage (including waste compatibility and segregation requirements); safe use of hazardous waste equipment; proper sampling procedures.

16.2.2.4.3. Employee protection, including personal protective equipment, safety and health hazards, hazard communication, and worker exposure.

16.2.2.4.4. Recordkeeping, security, inspections, spill prevention and response plans, storage requirements, and transportation requirements.

16.2.2.4.5. All DoD personnel with hazardous waste transportation responsibilities under DoD Component Policies in place shall be trained to meet those responsibilities. This also applies to national transportation within Türkiye.

16.2.3. Documentation of Training.

Installations must document all hazardous waste training for each individual assigned duties involving actual or potential exposure to hazardous waste. Updated training records must be kept by the responsible facility manager or installation office and retained for at least 3 years after termination of duty of these personnel.

16.3. HAZARDOUS WASTE DETERMINATION AND CHARACTERIZATION.

Generators must:

16.3.1. Identify and characterize the solid wastes generated at their site using their knowledge of the materials and processes that generated the waste, or through laboratory analysis of the waste.

16.3.2. Identify inherent hazardous characteristics associated with a solid waste in terms of physical properties (e.g., solid, liquid, contained gases), chemical properties (e.g., chemical constituents, technical or chemical name), or other descriptive properties (e.g., ignitable, corrosive, reactive, toxic). The properties defining the characteristics should be measurable by standardized and available testing protocols. A hazardous waste or any mixture of a solid waste and a hazardous waste that is listed solely because it exhibits one or more characteristics of ignitability, corrosivity, or reactivity, is not a hazardous waste if the waste no longer exhibits any characteristic of hazardous waste. See Table 16.1. and Table 16.2. for characteristics of hazardous wastes and lists of hazardous wastes.

16.3.3. Prepare and maintain a Hazardous Waste Profile Sheet (HWPS) to identify each hazardous waste stream. The HWPS must be updated by the generator, as necessary, to reflect any new waste streams or process modifications that change the character of the hazardous waste being generated.

16.3.4. Use a unique (generator specific) identification number for all recordkeeping, reports, and manifests for hazardous waste.

16.4. HAZARDOUS WASTE ACCUMULATION POINTS (HWAPs).

Installations must ensure that HWAPs comply with the following standards.

16.4.1. An HWAP must be at or near the point of generation and under the control of the operator.

16.4.2. Each HWAP must be designed and operated to provide appropriate segregation for different waste streams, including those that are chemically incompatible. Each HWAP must have warning signs appropriate for the waste being accumulated at that site. Each HWAP container must be labelled as hazardous waste or with an indication of the hazards of the contents (e.g., hazardous waste characteristic, hazard statement, chemical hazard label).

16.4.3. An HWAP may accumulate no more than the equivalent of a 208-liter [55-gallon] drum of hazardous waste, or a 1-liter [1-quart] container of acute hazardous waste, from each waste stream, at or near the point of generation. When these limits have been reached, the generator has 5 working days to move the hazardous waste to a hazardous waste storage area (HWSA) or ship it off-site for treatment or disposal. Wastes designated to be recycled or used for energy recovery (e.g., used oil or antifreeze), in accordance with the installation's hazardous waste management program, are exempt from the 208-liter [55-gallon] and 1-liter [1-quart] volume accumulation limits, but must be transported off-site to a final destination facility within 6 months of first accumulation start date.

16.4.4. Installations must have procedures in place to deal with unknown wastes.

16.4.5. All standards for use and management of containers in Paragraph 16.6. apply to HWAPs with the exception of weekly inspections in Paragraph 16.6.2.5.

16.4.6. The recordkeeping requirements for turn-in documents, manifests, and waste analysis and characterization records in Paragraphs 16.11.3.1., 16.11.3.4., and 16.11.3.5. apply to HWAPs.

16.5. HAZARDOUS WASTE STORAGE AREAS (HWSAs).

Installations that maintain an HWSA shall contact the Turkish Installation Commander to determine if an authorization is required. Installations must ensure that HWSAs comply with the following standards.

16.5.1. Location Standards.

To the maximum extent possible, all HWSAs must be located to minimize the risk of release due to seismic activity, floods, or other natural events. For facilities located where they may face such risks, the installation spill prevention and response plan must address the risk.

16.5.2. Design and Operation of HWSAs.

HWSAs must be designed, constructed, maintained, and operated to minimize the possibility of fire, explosion, or any unplanned release of hazardous waste or hazardous waste constituents to air, soil, groundwater or surface water that could threaten human health or the environment. Hazardous waste must not be stored longer than 1 year in an HWSA. Installations generating more than 1,000 kg [2,204 pounds] per month of hazardous waste, or 1 kg [2.2 pounds] per month of acute hazardous waste, should remove waste within 90 days.

16.5.3. Waste Analysis and Verification.

16.5.3.1. Waste Analysis Plan.

The HWSA manager, in conjunction with the generator(s) served, will develop a plan to determine how and when wastes are to be analyzed. The waste analysis plan will include procedures for characterization and verification testing. The plan must include parameters for testing and the rationale for choosing them, frequency of analysis, test methods, and sampling methods.

16.5.3.2. Waste Analysis Records.

The HWSA must have, and keep on file, an HWPS for each waste stream that is stored at that HWSA.

16.5.3.3. Waste Verification.

Generating activities will provide identification of incoming waste on the HWPS to the HWSA manager. Before accepting the waste, the HWSA manager will:

16.5.3.3.1. Inspect the waste to ensure it matches the description provided.

16.5.3.3.2. Ensure that no waste is accepted for storage unless an HWPS is provided, or is available and properly referenced.

16.5.3.3.3. Request a new HWPS from the generator if there is reason to believe that the process generating the waste has changed.

16.5.3.3.4. Analyze waste shipments in accordance with the waste analysis plan to determine whether it matches the waste description on the accompanying manifest or other documentation.

16.5.3.3.5. Reject wastes that do not match the accompanying waste descriptions unless the generator provides an accurate description.

16.5.3.4. Waste Identification.

HWSA managers should have an appropriate plan in place for the acceptance or identification of unknown waste.

16.5.4. Security.

16.5.4.1. General.

The installation must prevent the accidental entry, and minimize the possibility for unauthorized entry, of persons or livestock onto the HWSA grounds.

16.5.4.2. Security System Design.

An acceptable security system for an HWSA consists of either:

16.5.4.2.1. A 24-hour surveillance system (e.g., television monitoring or surveillance by guards or other designated personnel) that continuously monitors and controls entry into the HWSA; or

16.5.4.2.2. An artificial or natural barrier (e.g., a fence in good repair or a fence combined with a cliff) that completely surrounds the HWSA, combined with a means to control entrance at all times (e.g., an attendant, television monitors, locked gate, or controlled roadway access).

16.5.4.3. Required Signs.

A sign with the legend “*Danger: Unauthorized Personnel Keep Out*” (“*Tehlike: Yetkisiz Personel Giremez*”) must be posted at each entrance to the HWSA, and at other locations, in sufficient numbers to be seen from any approach to the HWSA. The legend must be written in English and Turkish, and must be legible from a distance of at least 7.62 meters [25 feet]. Existing signs with a legend other than “*Danger: Unauthorized Personnel Keep Out*”, may be used if the legend on the sign indicates that only authorized personnel are allowed to enter the HWSA, and that entry can be dangerous.

16.5.5. Required Aisle Space.

Aisle space must allow for unobstructed movement of personnel, fire protection equipment, spill control equipment, and decontamination equipment to any area of facility operation during an emergency. Containers must not obstruct an exit.

16.5.6. Required Equipment.

16.5.6.1. All HWSAs must be equipped with the following:

16.5.6.1.1. An internal communications or alarm system capable of providing immediate emergency instruction (voice or signal) to HWSA personnel.

16.5.6.1.2. A device, such as an intrinsically safe telephone (immediately available at the scene of operations), a hand-held two-way radio, or mobile telephone capable of summoning emergency assistance from installation security, fire departments, or emergency response teams.

16.5.6.1.3. Portable fire extinguishers, fire control equipment appropriate to the material in storage (including special extinguishing equipment, as needed, such as that using foam, inert gas, or dry chemicals), spill control equipment, and decontamination equipment.

16.5.6.1.4. Water at adequate volume and pressure to supply water hose streams, foam-producing equipment, automatic sprinklers, or water spray systems.

16.5.6.1.5. Readily available personal protective equipment appropriate to the materials stored, and eyewash and shower facilities.

16.5.6.1.6. Communications alarm systems, fire protection equipment, spill control equipment, and decontamination equipment, where required, must be maintained to ensure its proper operation in time of emergency.

16.5.7. Access to Communications or Alarm System.

16.5.7.1. Whenever hazardous waste is being poured, mixed, or otherwise handled, all personnel involved in the operation must have immediate access to an internal alarm or emergency communication device, either directly or through visual or voice contact with another person.

16.5.7.2. If there is only one person on duty at the HWSA premises, that person must have immediate access to a device, such as a telephone (immediately available at the scene of operation) or a hand-held two-way radio, capable of summoning external emergency assistance.

16.5.8. General Inspection Requirements.

16.5.8.1. General.

Installations must inspect the HWSAs for malfunctions and deterioration, operator errors, and discharges that may be causing, or may lead to, a release of hazardous waste constituents to the environment or threat to human health.

16.5.8.2. Types of Equipment Covered.

Inspections must include all equipment and areas that are involved in the storage and handling of hazardous waste and are important to preventing, detecting, or responding to environmental or human health hazards. This includes all containers and areas with containers, tank systems and associated piping, and all monitoring equipment, safety and emergency equipment, security devices, and operating and structural equipment (such as dikes and sump pumps).

16.5.8.3. Inspection Schedule.

Inspections must be conducted according to a written schedule that is kept at the HWSA. The schedule must identify the types of problems (e.g., malfunctions or deterioration) that are to be looked for during the inspection (e.g., inoperative sump pump, leaking fitting, or eroding dike).

16.5.8.4. Frequency of Inspections.

Minimum frequencies for inspecting containers and container storage areas are found in Paragraph 16.6.2.5. Minimum frequencies for inspecting tank systems are found in Paragraph 16.7.4.2. For equipment not covered by those sections, inspection frequency should be based on the rate of possible deterioration of the equipment and probability of an environmental or human health incident if the deterioration or malfunction or any operator error goes undetected between inspections. Areas subject to spills, such as loading and unloading areas, must be inspected daily when in use.

16.5.8.5. Remedy of Problems Revealed by Inspection.

If an inspection reveals any deterioration or malfunction of equipment or structures, the installation must remedy that deficiency in a timely manner to prevent an environmental or human health hazard. Where a hazard is imminent or has already occurred, action must be taken immediately.

16.5.8.6. Maintenance of Inspection Records.

The installation must record inspections in an inspection log or summary and keep the records for at least 3 years from the date of inspection. At a minimum, these records must include the date and time of inspection, the name of the inspector, a notation of the observations made, and the date and nature of any repairs or other remedial actions.

16.5.9. Storage Practices.

16.5.9.1. Incompatible Wastes.

Ignitable, reactive, or incompatible wastes must be stored so that they do not threaten human health or the environment. Dangers resulting from improper storage of incompatible wastes include generation of extreme heat, fire, explosion, and generation of toxic gases.

16.5.9.2. Ignitable or Reactive Wastes.

The HWSA manager must take precautions to prevent accidental ignition or reaction of ignitable or reactive waste.

16.5.9.2.1. This waste must be separated and protected from sources of ignition or reaction including, but not limited to, open flames, smoking, cutting and welding, hot surfaces, frictional heat, sparks (static, electrical, or mechanical), spontaneous ignition (e.g., from heat-producing chemical reactions), and radiant heat.

16.5.9.2.2. While ignitable or reactive waste is being handled, the HWSA personnel must confine smoking and open flame to specially designated locations. “*No Smoking*” signs, or signs with the appropriate “*No Smoking*” icon, must be conspicuously placed wherever there is a hazard from ignitable or reactive waste. In areas where access by non-English speaking persons is expected, the “*No Smoking*” (“*Sigara İçilmez*”) legend must be written in English and Turkish.

16.5.9.2.3. Water reactive waste cannot be stored in the same area as flammable and combustible liquid.

16.5.10. Closure and Closure Plans.

16.5.10.1. Closure Plan.

Installations must prepare closure plans for all new and existing HWSAs. Closure plans for a new HWSA must be developed before the HWSA is opened. The closure plan will be implemented concurrent with the decision to close the HWSA. The closure plan must include estimates of the storage capacity of the hazardous waste, steps to be taken to remove or decontaminate all waste residues, and an estimate of the expected date for closure.

16.5.10.2. Closure.

When the decision is made to close an HWSA, the closure plan must be implemented. Closure should be done:

16.5.10.2.1. In a manner that eliminates or minimizes the need for future maintenance or the potential for future releases of hazardous waste.

16.5.10.2.2. According to the closure plan, including removal of all hazardous waste and hazardous waste residues from the containment system, including remaining containers, liners, and bases.

16.6. USE AND MANAGEMENT OF CONTAINERS.

Installations must ensure that hazardous waste containers comply with the following standards.

16.6.1. Container Handling and Storage.

The packaging of hazardous waste for national and international transportation by road or by sea shall comply with DoD Component Policies. Additionally, to protect human health and the environment, the following guidelines will apply when handling and storing hazardous waste containers.

16.6.1.1. Containers holding hazardous waste must be in good condition, free from severe rusting, bulging, or structural defects.

16.6.1.2. Containers used to store hazardous waste, including overpack containers, must be compatible with the materials stored.

16.6.2. Management of Containers.

16.6.2.1. Containers holding hazardous waste must always be closed during storage, except when it is necessary to add or remove waste.

16.6.2.2. Containers holding hazardous waste must not be opened, handled, or stored in a manner that may rupture the container or cause it to leak.

16.6.2.3. Containers of flammable liquids must be grounded when transferring flammable liquids from one container to the other.

16.6.2.4. Containers holding hazardous waste must be marked with a hazardous waste marking.

16.6.2.5. HWSAs where containers are stored must be inspected weekly for leaking and deteriorating containers as well as deterioration of the containment system caused by corrosion or other factors. Secondary containment systems must be inspected for defects and emptied of accumulated releases or retained stormwater.

16.6.3. Secondary Containment Systems.

HWAPs and HWSAs with containers must have a secondary containment system that meets the following standards:

16.6.3.1. Must be sufficiently impervious to contain leaks, spills, and accumulated precipitation until the collected material is detected and removed.

16.6.3.2. Must have sufficient capacity to contain 10% of the volume of stored containers or the volume of the largest container, whichever is greater.

16.6.3.3. HWAPs and HWSAs with containers holding only wastes that do not contain free liquids do not need to have a containment system as described in Paragraphs 16.6.3.1. and 16.6.3.2. provided:

16.6.3.3.1. The area is sloped or is otherwise designed and operated to drain and remove liquid resulting from precipitation; or

16.6.3.3.2. The containers are elevated or are otherwise protected from contact with accumulated liquid.

16.6.3.4. Spilled or leaked waste and accumulated precipitation must be removed from the sump or collection area in as timely a manner as is necessary to prevent overflow of the collection system. Stormwater captured in secondary containment areas should be inspected or tested before release. The inspection or testing must be reasonably capable of detecting contamination by the hazardous waste in the containers. Contaminated water must be treated as hazardous waste until determined otherwise.

16.6.4. Incompatible Wastes.

16.6.4.1. Incompatible wastes and materials must not be placed in the same container.

16.6.4.2. Hazardous waste must not be placed in an unwashed container that previously held an incompatible waste or material.

16.6.4.3. A storage container holding hazardous waste that is incompatible with any waste or other materials stored nearby in other containers, piles, open tanks, or surface impoundments, must be separated from the other materials or protected from them by means of a dike, berm, wall, or other device.

16.6.5. Ignitable or Reactive Waste.

Areas that store containers holding ignitable or reactive waste must be located at least 15 meters [50 feet] inside the installation's boundary.

16.6.6. Residues of Hazardous Waste in Containers.

All containers must be emptied of hazardous waste residues before they are disposed. Hazardous waste residues must be managed as hazardous waste. Empty containers may be disposed of as normal solid waste. A container is considered empty when all wastes have been

removed that can be removed through normal practices (e.g., pouring or pumping) and for containers holding:

16.6.6.1. Hazardous waste, where all waste has been removed with no more than 2.5 cm [1 inch] of residue remains or, if the container is less than or equal to 450 liters [119 gallons], no more than 3% by weight of total capacity of the container remains, or, if the container is greater than 450 liters [119 gallons], no more than 0.3% by weight of the total capacity if the container remains.

16.6.6.2. Acute hazardous waste, where the container or inner liner has been triple rinsed using a solvent capable of removing acute hazardous waste or has been cleaned by another method that has been shown in scientific literature, or by tests conducted by the generator, to achieve equivalent removal. A container with a liner is empty when the liner has been removed if the liner has prevented contact of the container with the acute hazardous waste.

16.6.6.3. Compressed gas hazardous waste, when the pressure in the container approaches atmospheric. Compressed gas cylinders should be managed in accordance with DLA Instruction 4145.25.

16.7. TANK SYSTEMS.

Installations must ensure that all tanks (including underground storage tanks) used to treat or store hazardous waste comply with the following standards. See Chapter 12, “USTs” for standards dealing with underground storage tanks containing petroleum, oil, and lubricants and hazardous substances. Tank systems that are used to store or treat hazardous waste that contain no free liquids and are situated inside a building with an impermeable floor are exempted from the secondary containment requirements in Paragraph 16.7.3. Tank systems, including sumps that serve as part of a secondary containment system to collect or contain releases of hazardous waste, are exempt from the requirements in Paragraph 16.7.3.

16.7.1. Assessment of Existing Tank System Integrity.

For each existing tank system that does not have secondary containment meeting the requirements of Paragraph 16.7.3., installations must determine annually whether the tank system is leaking or is fit for use. Installations must obtain, and keep on file at the HWSA, a written assessment of tank system integrity reviewed and certified by a competent authority.

16.7.2. Design and Installation of New Tank Systems or System Components.

Managers of HWSAs installing new tank systems or system components must obtain a written assessment, reviewed and certified by a registered professional engineer or Turkish equivalent, attesting that the tank system has sufficient structural integrity and is acceptable for storing and treating hazardous waste. The assessment must show that the foundation, structural support, seams, connections, and pressure controls (if applicable) are adequately designed and

that the tank system has sufficient structural strength, compatibility with the waste(s) to be stored or treated, and corrosion protection to ensure that it will not collapse, rupture, or fail.

16.7.3. Containment and Detection of Releases.

To prevent the release of hazardous waste or hazardous constituents from tank systems to the environment, installations must:

16.7.3.1. Provide secondary containment that includes a liner (external to the tank), a vault, a double-walled tank, or an equivalent device for all new and existing tank systems or components storing hazardous waste.

16.7.3.2. Design, install, and operate secondary containment to prevent any migration of wastes or accumulated liquid out of the system to the soil, groundwater, or surface water at any time during the use of the tank system.

16.7.3.3. Construct secondary containment of, or line it with, materials that are compatible with the wastes(s) to be placed in the tank system and have sufficient strength and thickness to prevent failure due to pressure gradients (including static head and external hydrological forces), physical contact with the waste to which it is exposed, climatic conditions, and the stress of daily operation (including stresses from nearby vehicular traffic).

16.7.3.4. Place the secondary containment on a foundation or base capable of providing support to the system, resistance to pressure gradients above and below the system, and capable of preventing failure due to settlement, compressions, or uplift.

16.7.3.5. Provide a leak-detection system that is designed and operated to detect the failure of either the primary or secondary containment structure or the presence of any release of hazardous waste or accumulated liquid in the secondary containment system within 24 hours, or at the earliest practicable time.

16.7.3.6. Slope or otherwise design or operate the secondary containment system to drain and remove liquids resulting from leaks, spills, or precipitation. Spilled or leaked waste and accumulated precipitation must be removed from the secondary containment system within 24 hours, or in as timely a manner as possible, to prevent harm to human health and the environment.

16.7.4. Operation and Inspection.

16.7.4.1. Hazardous wastes or treatment reagents must not be placed in a tank system if they could cause the tank, its ancillary equipment, or the containment system to rupture, leak, corrode, or otherwise fail.

16.7.4.2. The installation must inspect and log at least once each operating day:

16.7.4.2.1. The aboveground portions of the tank system, if any, to detect corrosion or releases of waste.

16.7.4.2.2. Data gathered from monitoring and leak detection equipment (e.g., pressure or temperature gauges, monitoring wells) to ensure that the tank system is being operated according to its design.

16.7.4.2.3. The construction materials and the area immediately surrounding the externally accessible portion of the tank system, including the secondary containment system (e.g., dikes) to detect erosion or signs of releases of hazardous waste (e.g., wet spots, dead vegetation).

16.7.4.3. The installation must inspect cathodic protection systems to ensure that they are functioning properly. The proper operation of the cathodic protection system must be confirmed within 6 months after initial installation and annually thereafter. All sources of impressed current must be inspected or tested, as appropriate, or at least every other month. The installation manager must document the inspections in the operating record of the HWSA.

16.7.5. Response to Leaks or Spills.

A tank system or secondary containment system from which there has been a leak or spill, or that is unfit for use, must be removed from service and immediately repaired or closed. Spills must be addressed in accordance with Chapter 13, “*Spill Prevention and Response*”. Installations must immediately:

16.7.5.1. Stop the flow of hazardous waste into the tank system or secondary containment system and inspect the system to determine the cause of the release.

16.7.5.2. Conduct an inspection of the release and based on that inspection:

16.7.5.2.1. Prevent further migration of the leak or spill to soil or surface water.

16.7.5.2.2. Remove and properly dispose of any contaminated soil or surface water.

16.7.5.2.3. Remove free product to the maximum extent possible.

16.7.5.2.4. Continue monitoring and mitigating for any additional fire and safety hazards posed by vapors or free products in subsurface structures.

16.7.5.3. Make required notifications and reports. Upon request, furnish a report to the Turkish Installation Commander containing the date, location and cause of the incident, the type and quantity of waste spilled, and the corrective actions implemented.

16.7.6. Closure.

At closure of a tank system, the installation must remove or decontaminate hazardous waste residues, contaminated containment system components (liners, etc.), contaminated soil to the extent practicable, and structures and equipment.

16.8. MANAGEMENT OF USED OIL, BATTERIES, ANTIFREEZE, AND WIPES.

Installations must ensure that used oil, batteries, antifreeze, and wipes are managed and disposed of in accordance with the following standards.

16.8.1. Management of Used Oils.

16.8.1.1. Used Oil Collection. Mixing of different categories of used oils (e.g., hydraulic oil, motor oil) or mixing of any used oil with other types of wastes (e.g., antifreeze, and diesel) is prohibited. Used oils shall be collected in containers/tanks and locations meeting the requirements for hazardous waste per this chapter.

16.8.1.2. Used Oil Characterization. Used oils shall be characterized per Section 16.3. At a minimum, characterization shall include laboratory analysis of the following chemical parameters: arsenic, cadmium, chromium, lead, halogens, and polychlorinated biphenyls. The characterization must be updated, as necessary, to reflect any modifications that change the character of the used oil.

16.8.1.3. Used Oil Transportation. Used oil shipments off-installation shall be treated as hazardous waste shipments per Section 16.9.3.1. regardless of whether the oil is shipped for disposal or energy recovery. In addition, Installations must ensure energy recovery facilities and used oil disposal facilities accepting DoD used oils, and commercial carriers transporting DoD used oils on Turkish public roads are authorized to do so by Turkish authorities.

16.8.1.4. Special Handling of Oil Filters. Vehicle oil filters shall be completely drained and disposed as hazardous waste per this chapter.

16.8.1.5. Additional Used Oil Recordkeeping. Manifests, HWPS, and any laboratory analyses for used oil shipments must be maintained for 5 years. Upon request, installations shall furnish records and/or report used oil transport and disposal statistics to the Turkish Installation Commander.

16.8.2. Used Oil Burned for Energy Recovery.

Installations burning used oils for energy recovery shall contact the Turkish Installation Commander to determine whether an authorization is required, and adhere to any provisions that may accompany such an authorization. Used oil fuel may be burned only in the following authorized facilities approved through the Turkish Installation Commander (See Chapter 1 of these FGS):

16.8.2.1. Industrial furnaces.

16.8.2.2. Boilers that are identified as:

16.8.2.2.1. Industrial boilers located on the site of a facility engaged in a manufacturing process where substances are transformed into new products, including the component parts of products, by mechanical or chemical processes.

16.8.2.2.2. Utility boilers used to produce electric power, steam, heated or cooled air, or other gases or fluids.

16.8.2.2.3. Used oil-fired space heaters, provided that:

16.8.2.2.3.1. The heater burns only used oil that the installation generates.

16.8.2.2.3.2. The heater is designed to have a maximum capacity of not more than 527.5 kilojoules [0.5 million British thermal unit per hour].

16.8.2.2.3.3. The combustion gases from the heater are properly vented to the ambient air.

16.8.3. Prohibitions on Dust Suppression or Road Treatment.

16.8.3.1. Installations must not use used oil, hazardous waste, or used oil contaminated with any hazardous waste for dust suppression or road treatment.

16.8.4. Disposal and Management of Batteries.

Installations should recycle all batteries when possible. Batteries that are not recycled may be managed as solid waste if determined not to be hazardous in accordance with Paragraph 16.3.

16.8.4.1. Lead-acid batteries that are to be recycled will be managed as hazardous material. Lead-acid batteries that are not recycled will be managed as HW.

16.8.4.2. Collection and storage of lead-acid batteries shall be on impervious ground (e.g., concrete), stacked no more than 5 batteries high. Any leaking lead-acid batteries shall be collected separately from non-leaking batteries. Collected batteries shall be kept no longer than 90 days.

16.8.4.3. Suppliers of portable, non-industrial batteries (e.g., Services, DeCA, AAFES) shall establish a collection point(s) for end users to return waste batteries, and segregate collected waste batteries for proper recycling and/or disposal. DoD-owned batteries shall be managed in accordance with applicable DoD Service Instructions.

16.8.4.4. Whether recycled or disposed, batteries shall only be transferred to a facility/entity properly licensed by Turkish authorities for the handling, recycling and/or disposal of batteries.

16.8.5. Disposal of Antifreeze.

Installations should recycle all antifreeze when possible. Antifreeze that is not recycled may be managed as solid waste if determined not to be hazardous in accordance with Paragraph 16.3.

16.8.6. Management of Used Wipes.

Used wipes must be characterized in accordance with Paragraph 16.3. and managed accordingly. Solvent-contaminated wipes may be managed as follows:

16.8.6.1. Solvent-contaminated wipes that are sent for cleaning at an industrial laundry or dry cleaner and reused are not hazardous waste when all free liquid has been removed and they are stored in closed, non-leaking containers labeled as “reusable wipes.” The solvent-contaminated wipes may be accumulated for up to 180 days from the start date of accumulation for each container before being sent for cleaning.

16.8.6.2. Disposable solvent-contaminated wipes (except those containing trichloroethylene) are not hazardous waste when all free liquid has been removed and they are stored in closed, non-leaking containers labeled as “disposable wipes.” The solvent-contaminated wipes may be accumulated for up to 180 days from the start date of accumulation for each container before being sent for disposal.

16.8.6.3. The conditions in Paragraphs 16.8.6.1. and 16.8.6.2. only apply to the solvent-contaminated wipes themselves. Any free liquid removed from the solvent-contaminated wipes or from the container holding the wipes must still be managed according to applicable requirements of this section.

16.9. HAZARDOUS WASTE DISPOSAL.

Installations must ensure that hazardous waste is disposed of in accordance with the following standards.

16.9.1. Disposal Through DLA Disposition Services.

All DoD hazardous waste must be disposed of through the DLA Disposition Services, except as follows:

16.9.1.1. A decision not to use DLA Disposition Services for hazardous waste disposal may be made in accordance with Volume 4 of DoDM 4160.21, “*Installation Support*” to best accomplish the installation mission.

16.9.1.2. A decision must have the concurrence of the DoD Component chain of command to ensure that, if waste is disposed of in Türkiye, the standards of Paragraph 16.9.2.

have been met and installation contracts and disposal standards are at least as protective as those used by the DLA Disposition Services.

16.9.1.3. Decisions must be documented in accordance with DoD Component guidelines.

16.9.2. Disposal Location.

DoD Components must ensure that hazardous waste generated by DoD operations and considered hazardous under either US law or applicable Turkish standards is not disposed of in Türkiye unless the disposal complies with these FGS and is in accordance with any applicable international agreements. If there is no international agreement that grants disposal authority, DoD Components must obtain explicit or implicit concurrence from the appropriate Turkish authorities. The US will not have continuing responsibility for the hazardous waste after it has been disposed of in accordance with this manual or applicable international agreements. To the maximum extent practicable, DoD Components will dispose of hazardous waste so as to not retain any future liability for the waste or contractually retain any markings or other indication of ownership of the waste.

16.9.2.1. When the requirements of Paragraph 16.9.2. cannot be met, DoD Components will dispose of hazardous waste in the US or in another foreign nation where the applicable conditions are met. Transshipment of hazardous wastes to a country other than the US for disposal must be approved by, at a minimum, the Deputy Under Secretary of Defense for Installations and Environment [DUSD(I&E)]. If hazardous wastes are exported, the Turkish Installation Commander shall be notified of hazardous waste movement outside of the country.

16.9.2.2. All shipments of waste to a destination outside of Türkiye must be preceded by written notification to the proper Turkish authorities via the Turkish Installation Commander, according to DoD Component Policies and international agreements on the transshipments of wastes.

16.9.2.3. The determination of whether particular DoD-generated hazardous waste may be disposed of in Türkiye will be made by the LEC, in coordination with the Turkish Installation Commander, the Director, DLA, other relevant DoD Component heads, and the chief of the US diplomatic mission, in accordance with Paragraph 16.9.3.5.

16.9.3. Disposal Procedures.

16.9.3.1. Pre-Transport.

National and international transportation of hazardous waste via commercial transportation on Turkish public roads and highways shall be conducted in accordance with DoD and Service Component policies. Requirements may include placarding, marking, containerization, and labeling.

16.9.3.2. Transportation.

Transport of hazardous waste via military vehicle on Turkish public roads and highways shall be conducted in accordance with DoD and Service Component policies.

16.9.3.3. Manifesting.

All hazardous waste leaving the installation must be accompanied by a manifest (e.g., a Turkish Waste Transport Form) to ensure a complete audit trail from point of origin to ultimate disposal. Shipments using commercial waste haulers must be accompanied by Turkish waste transport forms. DoD-controlled shipments may use a Turkish Waste Transport Form or a DoD form, such as a DD Form 1348-1A, “Issue Release/Receipt Document”, or DD Form 1348-2, “Issue Release/Receipt Document with Address Label”, available at <https://www.esd.whs.mil/Directives/forms/>. This manifest must include:

16.9.3.3.1. Generator’s name, address, fax, and telephone number.

16.9.3.3.2. Generator’s unique identification number.

16.9.3.3.3. Transporter’s name, address, and telephone number.

16.9.3.3.4. Transporters license number and vehicle plate number.

16.9.3.3.5. Destination name, address, telephone number, and waste management license number.

16.9.3.3.6. Description of waste, including:

16.9.3.3.6.1. Waste designation.

16.9.3.3.6.2. 6-digit Hazardous Waste Code.

16.9.3.3.6.3. Physical form (liquid, sludge, solid).

16.9.3.3.6.4. Container type, material and number.

16.9.3.3.7. Total quantity of waste.

16.9.3.3.8. Date of shipment.

16.9.3.3.9. Date of receipt.

16.9.3.4. Audit Trail.

Generators must maintain an audit trail of hazardous waste from the point of generation to disposal.

16.9.3.4.1. Generators using DLA Disposition Services will maintain a record from the initial DLA Disposition Services receipt of the waste, including receipt in place, at which time the DLA Disposition Services assumes responsibility of the waste. DLA must provide a copy of the manifest (or other documentation) at the time of final disposal. A generator that uses the hazardous waste management or disposal program of a DoD Component with a different unique identification number must maintain documentation from the receiving component. The receiving component assumes responsibility for subsequent storage, transfer, and disposal of the waste.

16.9.3.4.2. If DLA does not provide disposal services at a particular installation, generators desiring to dispose of their hazardous waste outside the DLA Disposition Services system must provide an audit trail from point of generation to ultimate disposal.

16.9.3.4.3. Rejected Hazardous Waste Deliveries. If a hazardous waste shipment is not accepted at a disposal facility, the installation will ensure the transporter is directed to another disposal site, or arrange for hazardous waste shipment to be returned to the installation until an appropriate disposal site is identified.

16.9.3.5. Disposal in Türkiye.

16.9.3.5.1. In addition to meeting the requirements in Paragraph 5.c. of Enclosure 3 of DoDI 4715.05 to determine whether hazardous waste may be disposed of in Türkiye, the LEC must also consider whether the means of treatment and containment technologies employed in the Turkish program, as enacted and enforced, effectively mitigate the hazards of such waste to human health and the environment. They must consider whether the Turkish program includes:

16.9.3.5.1.1. An effective system for tracking the movement of hazardous waste to its ultimate destination.

16.9.3.5.1.2. An effective system for granting authorization or permission to those engaged in the collection, transportation, storage, treatment, and disposal of hazardous waste.

16.9.3.5.1.3. Appropriate standards and limitations on the methods that may be used to treat and dispose of hazardous waste.

16.9.3.5.1.4. Standards designed to minimize the possibility of fire, explosion, or any unplanned release or migration of hazardous waste or its constituents to air, soil, surface, or groundwater.

16.9.3.5.2. The LEC must also be satisfied, either through reliance on the Turkish regulatory system or provisions in the disposal contracts, that:

16.9.3.5.2.1. Persons and facilities in the waste management process have demonstrated the appropriate level of training and reliability.

16.9.3.5.2.2. Effective inspections, monitoring, and recordkeeping have taken place.

16.9.3.5.2.3. Turkish facilities that store, treat, or dispose of DoD-generated waste have been evaluated and approved by Türkiye as being in compliance with their regulatory requirements. This evaluation and approval requires each facility to possess a valid authorization/license issued by the Competent Turkish Authority for the hazardous waste that will be handled.

16.9.3.6. Recycling and Reuse.

Hazardous waste must be recycled or reused to the maximum extent practical. Installations must safely store hazardous waste that is intended for recycling or reuse to minimize risks to health and the environment.

16.9.3.7. Land Disposal.

Installations must not dispose of hazardous waste in land disposal facilities on the installation. DLA Disposition Services may dispose of hazardous waste in land disposal facilities licensed per paragraph 16.9.3.5.2.3. and that have, as a minimum:

16.9.3.7.1. Location restrictions regarding floodplains, wetlands, aquifers, seismic zones, and other unstable areas.

16.9.3.7.2. A liner that is designed, constructed, and installed to prevent any migration of wastes out of the landfill to the adjacent subsurface soil or groundwater or surface water. The liner system must include:

16.9.3.7.2.1. A top liner designed and constructed of materials (e.g., a geomembrane) to prevent the migration of hazardous constituents into such liner.

16.9.3.7.2.2. A composite bottom liner consisting of at least two components. The upper component must be designed and constructed of materials (e.g., a geomembrane) to prevent the migration of hazardous constituents into this component. The lower component must be designed and constructed of materials to minimize the migration of hazardous constituents if a breach in the upper component were to occur. The lower component must be constructed of at least 91 cm [3 feet] of compacted soil material with a hydraulic conductivity of no more than 1×10^{-7} cm per second [3.94×10^{-8} inches per second].

16.9.3.7.3. A leachate collection and removal system immediately above the liner that is designed, constructed, maintained, and operated to collect and remove leachate from the landfill. The design and operating conditions must ensure that the leachate depth over the liner does not exceed 30 cm [1 foot].

16.9.3.7.4. The leachate collection and removal system between the liners, and immediately above the bottom composite liner in the case of multiple leachate collection and removal systems, is also a leak detection system. This leak detection system must be capable of detecting, collecting, and removing leaks of hazardous constituents at the earliest practicable time through all areas of the top liner likely to be exposed to waste or leachate. The requirements

for a leak detection system in this paragraph are satisfied by installation of a system that is, at a minimum:

16.9.3.7.4.1. Constructed with a bottom slope of 1 percent or more.

16.9.3.7.4.2. Constructed of granular drainage materials with a hydraulic conductivity of 1×10^{-2} cm per second [3.94×10^{-3} inches per second] or more and a thickness of 30.5 cm [12 inches] or more; or constructed of synthetic or geonet drainage materials with a transmissivity of 3×10^{-5} square meter per second [3.2×10^{-4} square feet per second] or more.

16.9.3.7.4.3. Constructed of materials that are chemically resistant to the waste managed in the landfill and the leachate expected to be generated, and of sufficient strength and thickness to prevent collapse under the pressures exerted by overlying wastes, waste cover materials, and equipment used at the landfill.

16.9.3.7.4.4. Designed and operated to minimize clogging.

16.9.3.7.4.5. Constructed with sumps and liquid removal methods (e.g., pumps) of sufficient size to collect and remove liquids from the sump and prevent liquids from backing up into the drainage layer.

16.9.3.7.5. A groundwater monitoring program capable of determining the facility's impact on the quality of water in the aquifers underlying the facility.

16.9.3.8. Underground Injection Wells.

Installations must not dispose of hazardous waste by underground injection.

16.9.4. Incinerators.

This paragraph applies to incinerators that incinerate hazardous waste as well as boilers and industrial furnaces that burn hazardous waste for any recycling purposes.

16.9.4.1. Incinerators used to dispose of hazardous waste must be licensed or permitted by a component Turkish authority through the Turkish Installation Commander. This license, permit, or approval must comply with the standards listed in Paragraph 16.9.4.2.

16.9.4.2. A license, or permit for incineration of hazardous waste requires the incinerator is designed including appropriate equipment as well as operated according to management practices. Required management practices include proper combustion temperature, waste feed rate, combustion gas velocity, and other relevant specifications to effectively destroy hazardous constituents and control harmful emissions. A permitting, licensing, or approval scheme that would require an incinerator to achieve the standards set forth in either Paragraphs 16.9.4.2.1. or 16.9.4.2.2. is acceptable.

16.9.4.2.1. The incinerator achieves a destruction and removal efficiency of 99.99 percent for the organic hazardous constituents that represent the greatest degree of difficulty of incineration in each waste or mixture of waste. The incinerator must minimize carbon monoxide in stack exhaust gas, minimize emission of particulate matter, and emit no more than 1.8 kg [4 pounds] of hydrogen chloride per hour.

16.9.4.2.2. The incinerator has demonstrated, as a condition for obtaining a license, the ability to effectively destroy the organic hazardous constituents that represent the greatest degree of difficulty of incineration in each waste or mixture of waste to be burned. For example, this standard may be met by requiring the incinerator to conduct a trial burn, submit a waste feed analysis, and provide a detailed engineering description of the facility. The competent Turkish authority uses the provided information to conclude that the incinerator will effectively destroy the principal organic hazardous constituents of each waste to be burned.

16.9.5. Treatment.

Treatment technologies may be used to reduce the volume or hazardous characteristics of wastes. Wastes categorized as hazardous on the basis of Table 16.1. that, after treatment as described herein, no longer exhibit any hazardous characteristic, may be disposed of as solid waste. Treatment residues of wastes categorized as hazardous on the basis of Table 16.2., Table 16.3., or Table 16.4. will continue to be managed as hazardous waste under the standards of this manual, including those for disposal. HW shall not be mixed or diluted with other materials or wastes directly, except for approved treatment technologies described in these FGS. The treatment technologies listed in Paragraphs 16.9.5.1. through 16.9.5.5. are provided as baseline treatment and disposal technologies for use in determining suitability of Turkish disposal alternatives. These technologies should not be implemented without consultation with the LEC and the Turkish Installation Commander if there is no LEC.

16.9.5.1. Organics.

16.9.5.1.1. Incinerations.

Incineration in accordance with the requirements of Paragraph 16.9.4.1.

16.9.5.1.2. Fuel Substitution.

Fuel substitution where the units are operated such that destruction of hazardous constituents is at least as efficient as, and hazardous emissions are no greater than those produced by, incineration.

16.9.5.1.3. Biodegradation.

Wastes are degraded by microbial action. Such units will be operated under aerobic or anaerobic conditions so that the concentrations of a representative compound or indicator parameter (e.g., total organic carbon) have been substantially reduced in concentration. The level

to which biodegradation must occur and the process time vary depending on the hazardous waste being biodegraded.

16.9.5.1.4. Recovery.

Wastes are treated to recover organic compounds. This will be done using, but not limited to, one or more of the following technologies: distillation; thin film evaporation; steam stripping; carbon adsorption; critical fluid extraction; liquid extraction; precipitation and crystallization, or phase separation techniques, such as decantation, filtration, and centrifugation when used in conjunction with one of the above techniques.

16.9.5.1.5. Chemical Degradation.

The wastes are chemically degraded in such a manner to destroy hazardous constituents and control harmful emissions.

16.9.5.2. Heavy Metals.

16.9.5.2.1. Stabilization or Fixation.

Wastes are treated in such a way that soluble heavy metals are fixed by oxidation or reduction, or by some other means that renders the metals immobile in a land disposal environment.

16.9.5.2.2. Recovery.

Wastes are treated to recover the metal fraction by thermal processing, precipitation, exchange, carbon absorption, or other techniques that yield nonhazardous levels of heavy metals in the residuals.

16.9.5.3. Reactives.

Any treatment that changes the chemical or physical composition of a material so it no longer exhibits the characteristic for reactivity defined in Paragraph 16A.1.3.

16.9.5.4. Corrosives.

Corrosive wastes as defined in Paragraph 16A.1.2. will be neutralized to a pH value between 6.0 and 9.0. Other acceptable treatments include recovery, incineration, chemical or electrolytic oxidation, chemical reduction, or stabilization.

16.9.5.5. Batteries.

Mercury, nickel-cadmium, lithium, and lead-acid batteries will be processed in accordance with Paragraphs 16.9.5.2.1. or 16.9.5.2.2. to stabilize, fix, or recover heavy metals, as

appropriate, and in accordance with Paragraph 16.9.5.4. to neutralize any corrosives before disposal.

16.9.6. Treatment at the Point of Generation.

DoD generators of hazardous waste may only perform elementary neutralization at the point of generation. No other treatment of hazardous waste is authorized.

16.10. SPILL PREVENTION AND RESPONSE PLAN.

16.10.1. Each installation must have a spill prevention and response plan, including a contingency plan, that describes planning and actions to be taken to contain and clean up spills and releases of hazardous waste in accordance with Chapter 13, “*Spill Prevention and Response*”.

16.10.2. The installation spill prevention and response plan must address each HWSA and HWAP. Each HWSA must maintain a current copy of the plan. Each HWAP must, at a minimum, maintain portions of the plan that are pertinent to its facilities and operations.

16.11. RECORDKEEPING REQUIREMENTS.

Installations must ensure that the following records are maintained.

16.11.1. HWSAs.

Maintain all of the records identified in Paragraphs 16.11.3.1 through 16.11.3.5.

16.11.2. HWAPs.

Maintain the records identified in Paragraphs 16.11.3.1., 16.11.3.4., and 16.11.3.5.

16.11.3. Records.

16.11.3.1. Turn-in Documents.

Turn-in documents (e.g., DD 1348-1A) or manifests must be maintained for 5 years.

16.11.3.2. Hazardous Waste Log.

A hard copy or electronic hazardous waste log will be maintained at the HWSA to record all hazardous waste handled. The hazardous waste log will be available to emergency personnel in the event of a fire or spill. Logs will be maintained until closure of the installation and should consist of:

16.11.3.2.1. Name and address of generator.

16.11.3.2.2. Description and hazard class of the hazardous waste.

16.11.3.2.3. Number and types of containers.

16.11.3.2.4. Quantity of hazardous waste.

16.11.3.2.5. Date stored.

16.11.3.2.6. Storage location.

16.11.3.2.7. Disposition data, including dates received, sealed, and transported, and transporter used.

16.11.3.3. Inspection Logs.

Records of inspections should be maintained for a period of 3 years.

16.11.3.4. Manifests.

Manifests of incoming and outgoing hazardous wastes will be retained for a period of 5 years.

16.11.3.5. Waste Analysis and Characterization Records.

HWAPs and other waste analysis and characterization records must be retained until 3 years after closure of the HWSA.

16.12. CONTRACTOR LICENSING VERIFICATION.

If transportation, treatment and/or disposal of hazardous waste is carried out by contract, DoD personnel shall ensure those contractors are properly licensed. Installations will ensure that all commercial carriers transporting DoD wastes on Turkish public roads are authorized to do so by Turkish authorities.

Table 16.1. Hazardous Properties

Hazardous Properties Descriptions	Hazard Class and Category Code(s)	Hazard Code(s)
HP 1 “Explosive:” Waste which is capable by chemical reaction of producing gas at such a temperature and pressure and at such a speed as to cause damage to the surroundings. Pyrotechnic waste, explosive organic peroxide waste and explosive self-reactive waste is included. If the presence of a substance or laboratory testing indicates that the waste is explosive, it shall be classified as hazardous by HP 1.	Unst. Expl.	H200
	Expl. 1.1	H201
	Expl. 1.2	H202
	Expl. 1.3	H203
	Expl. 1.4	H204
	Self-react. A Org. Perox. A	H240
	Self-react. B Org. Perox. B	H241
HP 2 “Oxidizing:” Waste which may, generally by providing oxygen, cause or contribute to the combustion of other materials. If the presence of a substance or laboratory testing indicates that the waste is oxidizing, it shall be classified as hazardous by HP 2.	Ox. Gas 1	H270
	Ox. Liq. 1	H271
	Ox. Sol. 1	
	Ox. Liq. 2, Ox. Liq 3	H272
	Ox. Sol 2, Ox. Sol 3	
HP 3 “Flammable:” - flammable liquid waste: liquid waste having a flash point below 60 °C or waste gas oil, diesel and light heating oils having a flash point > 55 °C and ≤ 75 °C; - flammable pyrophoric liquid and solid waste: solid or liquid waste which, even in small quantities, is liable to ignite within five minutes after coming into contact with air; - flammable solid waste: solid waste which is readily combustible or may cause or contribute to fire through friction; - flammable gaseous waste: gaseous waste which is flammable in air at 20 °C and a standard pressure of 101.3 kPa; - water reactive waste: waste which, in contact with water, emits flammable gases in dangerous quantities; - other flammable waste: flammable aerosols, flammable self-heating waste, flammable organic peroxides and flammable self-reactive waste. If the presence of a substance or laboratory testing indicates that the waste is flammable, it shall be classified as hazardous by HP 3.	Flam. Gas 1	H220
	Flam. Gas 2	H221
	Aerosol 1	H222
	Aerosol 2	H223
	Flam. Liq. 1	H224
	Flam. Liq. 2	H225
	Flam. Liq. 3	H226
	Flam. Sol 1	H228
	Flam. Sol 2	
	Self-react. CD	H242
	Self-rect. EF	
	Org. Perox. CD	
	Org. Perox. EF	
	Pyr. Liq. 1	H250
	Pyr. Sol. 1	
	Self-heat. 1	H251
	Self-heat. 2	H252
	Water-react. 1	H260
	Water-react. 2	H261

Hazardous Properties Descriptions	Hazard Class and Category Code(s)	Hazard Code(s)
HP 4 “Irritant - skin irritation and eye damage:” Waste which on application can cause skin irritation or damage to the eye. When a waste contains one or more substances in concentrations above the cut-off value, that are classified by one of the following hazard class and category codes and hazard statement codes and one or more of the following concentration limits is exceeded or equaled, the waste shall be classified as hazardous by HP 4. The cut-off value for consideration in an assessment for Skin corr. 1A (H314), Skin irrit. 2 (H315), Eye dam. 1 (H318) and Eye irrit. 2 (H319) is 1 %. If the sum of the concentrations of all substances classified as Skin corr. 1A (H314) exceeds or equals 1 %, the waste shall be classified as hazardous according to HP 4. If the sum of the concentrations of all substances classified as H318 exceeds or equals 10 %, the waste shall be classified as hazardous according to HP 4. If the sum of the concentrations of all substances classified H315 and H319 exceeds or equals 20%, the waste shall be classified as hazardous according to HP 4. Note that wastes containing substances classified as H314 (Skin corr. 1A, 1B or 1C) in amounts greater than or equal to 5 % will be classified as hazardous by HP 8. HP 4 will not apply if the waste is classified as HP 8.	Skin corr. 1A (H314), Skin irrit. 2 (H315), Eye dam. 1 (H318) and Eye irrit. 2 (H319) per conditions in column to the left	H314, H315, H318, H319
HP 5 “Specific Target Organ Toxicity (STOT)/Aspiration Toxicity:” Waste which can cause specific target organ toxicity either from a single or repeated exposure, or which cause acute toxic effects following aspiration. When a waste contains one or more substances classified by one or more of the following hazard class and category codes and hazard statement codes shown in Table 4, and one or more of the concentration limits in Table 4 is exceeded or equaled, the waste shall be classified as hazardous according to HP 5. When substances classified as STOT are present in a waste, an individual substance has to be present at or above the concentration limit for the waste to be classified as hazardous by HP 5. When a waste contains one or more substances classified as Asp. Tox. 1 and the sum of those substances exceeds or equals the concentration limit, the waste shall be classified as hazardous by HP 5 only where the overall kinematic viscosity (at 40 °C) does not exceed 20.5 mm²/s.	STOT SE 1; concentration limit 1% SE = single exposure	H370
	STOT SE 2; concentration limit 10%	H371
	STOT SE 3; concentration limit 20%	H335
	STOT RE 1; concentration limit 1% RE = repeated exposure	H372
	STOT RE 2; concentration limit 10%	H373
	Asp. Tox. 1; concentration limit 10% ASP. = aspiration	H304
HP 6 “Acute Toxicity:” Waste which can cause acute toxic effects following oral or dermal administration, or inhalation exposure. If the sum of the concentrations of all substances contained in a waste, classified with an acute toxic hazard class and category code and	Acute Tox. 1. (Oral), concentration limit 0.1%	H300
	Acute Tox. 2 (Oral), concentration limit 0.25%	H300

Hazardous Properties Descriptions	Hazard Class and Category Code(s)	Hazard Code(s)
hazard statement code, exceeds or equals the threshold given, the waste shall be classified as hazardous by HP 6. When more than one substance classified as acute toxic is present in a waste, the sum of the concentrations is required only for substances within the same hazard category. The following cut-off values shall apply for consideration in an assessment: - For Acute Tox. 1, 2 or 3 (H300, H310, H330, H301, H311, H331): 0.1 %; - For Acute Tox. 4 (H302, H312, H332): 1 %.	Acute Tox. 3 (Oral), concentration limit 5%	H301
	Acute Tox. 4 (Oral), concentration limit 25%	H302
	Acute Tox. 1 (Dermal), concentration limit 0.25%	H310
	Acute Tox. 2 (Dermal), concentration limit 2.5%	H310
	Acute Tox. 3 (Dermal), concentration limit 15%	H311
	Acute Tox. 4 (Dermal), concentration limit 55%	H312
	Acute Tox. 1 (Inhal.), concentration limit 0.1%	H330
	Acute Tox. 2 (Inhal.), concentration limit 0.5%	H330
	Acute Tox. 3 (Inhal.), concentration limit 3.5%	H331
	Acute Tox. 4 (Inhal.), concentration limit 22.5%	H332
HP 7 “Carcinogenic:” Waste which induces cancer or increases its incidence. When a waste contains a substance classified by one of the following hazard class and category codes and hazard statement codes and exceeds or equals one of the following concentration limits shown in column 3, the waste shall be classified as hazardous by HP 7. When more than one substance classified as carcinogenic is present in a waste, an individual substance has to be present at or above the concentration limit for the waste to be classified as hazardous by HP 7.	Carc. 1A, concentration limit 0.1%	H350
	Carc. 1B, concentration limit 0.1%	
	Carc. 2, Suspected human carcinogens Concentration limit 1%	H351
HP 8 “Corrosive:” Waste which on application can cause skin corrosion. When a waste contains one or more substances classified as Skin corr. 1A, 1B or 1C (H314) and the sum of their concentrations exceeds or equals 5 %, the waste shall be classified as hazardous by HP 8. The cut-off value for consideration in an assessment for Skin corr. 1A, 1B, 1C (H314) is 1.0 %.	See HP4	
HP 9 “Infectious:” Waste containing viable micro-organisms or their toxins which are known or reliably believed to cause disease in man or other living organisms.		

Hazardous Properties Descriptions	Hazard Class and Category Code(s)	Hazard Code(s)
HP 10 “Toxic for reproduction:” Waste which has adverse effects on sexual function and fertility in adult males and females, as well as developmental toxicity in the offspring. When a waste contains a substance classified by one of the following hazard class and category codes and hazard statement codes and exceeds or equals one of the following concentration limits shown in column 3, the waste shall be classified hazardous according to HP 10. When more than one substance classified as toxic for reproduction is present in a waste, an individual substance has to be present at or above the concentration limit for the waste to be classified as hazardous by HP 10.	Repr. 1A; concentration limit 0.3%	H360
	Repr. 1B; concentration limit 0.3%	
	Repr. 2; Concentration limit 3.0%	H361
HP 11 “Mutagenic:” Waste which may cause a mutation, that is a permanent change in the amount or structure of the genetic material in a cell. When a waste contains a substance classified by one of the following hazard class and category codes and hazard statement codes and exceeds or equals one of the following concentration limits shown in column 3, the waste shall be classified as hazardous according to HP 11. When more than one substance classified as mutagenic is present in a waste, an individual substance has to be present at or above the concentration limit for the waste to be classified as hazardous by HP 11.	Muta. 1A, concentration limit 0.1%	H340
	Muta. 1B, concentration limit 0.1%	
	Muta. 2, concentration limit 1.0%	H341
HP 12 “Release of an acute toxic gas:” Waste which releases acute toxic gases (Acute Tox. 1, 2 or 3) in contact with water or an acid. When a waste contains a substance assigned to one of the following supplemental hazards EUH029, EUH031 and EUH032, it shall be classified as hazardous by HP 12 according to test methods or guidelines.		EUH029, EUH031, EUH032
HP 13 “Sensitizing:” Waste which contains one or more substances known to cause sensitizing effects to the skin or the respiratory organs. When a waste contains a substance classified as sensitizing and is assigned to one of the hazard statement codes H317 or H334 and one individual substance equals or exceeds the concentration limit of 10 %, the waste shall be classified as hazardous by HP 13.		H317, H334
HP 14 “Ecotoxic:” Waste which presents or may present immediate or delayed risks for one or more sectors of the environment. (See Chapter 5 of these FGS)	Toxic acute 1 Chronic 1 Chronic 2 Chronic 3 Chronic 4 Ozone Depleting	H400 H410 H411 H412 H413 H420
HP 15 “Waste capable of exhibiting a hazardous property listed above not directly displayed by the original waste”. When a waste contains one or more substances assigned to one of the	May explode in fire	H205
	Explosive when dry	EUH001

Hazardous Properties Descriptions	Hazard Class and Category Code(s)	Hazard Code(s)
hazard statements or supplemental hazards shown to the right, the waste shall be classified as hazardous by HP 15, unless the waste is in such a form that it will not under any circumstance exhibit explosive or potentially explosive properties.	May from explosive peroxides	EUH019
	Risk of explosion if heated under confinement	EUH044

Table 16.2. List of Hazardous Wastes and Hazardous Substances

HAZARDOUS WASTES AND HAZARDOUS SUBSTANCES	CAS NO.	HW NO.	REPORTABLE QUANTITY (RQ)	
			(Pounds)	(kg)
Acenaphthene	83-32-9		100	45.4
Acenaphthylene	208-96-8		5,000	2,270
Acetaldehyde	75-07-0	U001	1,000	454
Acetaldehyde, trichloro-	75-87-6	U034	5,000	2,270
Acetamide	60-35-5		100	45.4
Acetic acid	64-19-7		5,000	2,270
Acetic acid, (2,4-dichlorophenoxy)-	94-75-7	U240	100	45.4
Acetic acid ethenyl ester	108-05-4		5,000	2,270
Acetic anhydride	108-24-7		5,000	2,270
Acetone	67-64-1	U002	5,000	2,270
Acetone cyanohydrin	75-86-5	P069	10	4.5
Acetonitrile	75-05-8	U003	5,000	2,270
Acetophenone	98-86-2	U004	5,000	2,270
2-Acetylaminofluorene	53-96-3	U005	1	0.454
Acetyl bromide	506-96-7		5,000	2,270
Acetyl chloride	75-36-5	U006	5,000	2,270
1-Acetyl-2-thiourea	591-08-2	P002	1,000	454
Acrolein	107-02-8	P003	1	0.454
Acrylamide	79-06-1	U007	5,000	2,270
Acrylic acid	79-10-7	U008	5,000	2,270
Acrylonitrile	107-13-1	U009	100	45.4
Adipic acid	124-04-9		5,000	2,270
Aldicarb	116-06-3	P070	1	0.454
Aldicarb sulfone	1646-88-4	P203	100	45.4
Aldrin	309-00-2	P004	1	0.454
Allyl alcohol	107-18-6	P005	100	45.4
Allyl chloride	107-05-1		1,000	454
Aluminum phosphide	20859-73-8	P006	100	45.4
Aluminum sulfate	10043-01-3		5,000	2,270
4-Aminobiphenyl	92-67-1		1	0.454
5-(Aminomethyl)-3-isoxazolol	2763-96-4	P007	1,000	454
4-Aminopyridine	504-24-5	P008	1,000	454
Amitrole	61-82-5	U011	10	4.5
Ammonia	7664-41-7		100	45.4
Ammonia (anhydrous)	7664-41-7		100	45.4
Ammonia (concentration of 20% or greater)	7664-41-7		see ammonium hydroxide	
Ammonium acetate	631-61-8		5,000	2,270
Ammonium benzoate	1863-63-4		5,000	2,270
Ammonium bicarbonate	1066-33-7		5,000	2,270
Ammonium bichromate	7789-09-5		10	4.5
Ammonium bifluoride	1341-49-7		100	45.4

Table 16.2. List of Hazardous Wastes and Hazardous Substances, Continued

HAZARDOUS WASTES AND HAZARDOUS SUBSTANCES	CAS NO.	HW NO.	REPORTABLE QUANTITY (RQ)	
			(Pounds)	(kg)
Ammonium bisulfite	10192-30-0		5,000	2,270
Ammonium carbamate	1111-78-0		5,000	2,270
Ammonium carbonate	506-87-6		5,000	2,270
Ammonium chloride	12125-02-9		5,000	2,270
Ammonium chromate	7788-98-9		10	4.5
Ammonium citrate, dibasic	3012-65-5		5,000	2,270
Ammonium fluoborate	13826-83-0		5,000	2,270
Ammonium fluoride	12125-01-8		100	45.4
Ammonium hydroxide	1336-21-6		1,000	454
Ammonium oxalate	5972-73-6		5,000	2,270
Ammonium oxalate	6009-70-7		5,000	2,270
Ammonium oxalate	14258-49-2		5,000	2,270
Ammonium picrate	131-74-8	P009	10	4.5
Ammonium silicofluoride	16919-19-0		1,000	454
Ammonium sulfamate	7773-06-0		5,000	2,270
Ammonium sulfide	12135-76-1		100	45.4
Ammonium sulfite	10196-04-0		5,000	2,270
Ammonium tartrate	3164-29-2		5,000	2,270
Ammonium tartrate	14307-43-8		5,000	2,270
Ammonium thiocyanate	1762-95-4		5,000	2,270
Ammonium vanadate	7803-55-6	P119	1,000	454
Amyl acetate	628-63-7		5,000	2,270
iso-Amyl acetate	123-92-2		5,000	2,270
sec-Amyl acetate	626-38-0		5,000	2,270
tert-Amyl acetate	625-16-1		5,000	2,270
Aniline	62-53-3	U012	5,000	2,270
o-Anisidine	90-04-0		100	45.4
Anthracene	120-12-7		5,000	2,270
Antimony ^b	7440-36-0		5,000	2,270
Antimony Compounds			&	&
Antimony pentachloride	7647-18-9		1,000	454
Antimony potassium tartrate	28300-74-5		100	45.4
Antimony tribromide	7789-61-9		1,000	454
Antimony trichloride	10025-91-9		1,000	454
Antimony trifluoride	7783-56-4		1,000	454
Antimony trioxide	1309-64-4		1,000	454
ANTU	86-88-4	P072	100	45.4
Aroclor 1016	12674-11-2		1	0.454
Aroclor 1221	11104-28-2		1	0.454
Aroclor 1232	11141-16-5		1	0.454
Aroclor 1242	53469-21-9		1	0.454
Aroclor 1248	12672-29-6		1	0.454
Aroclor 1254	11097-69-1		1	0.454
Aroclor 1260	11096-82-5		1	0.454
Arsenic ^b	7440-38-2		1	0.454
Arsenic acid	7778-39-4	P010	1	0.454
Arsenic Compounds			&	&
Arsenic disulfide	1303-32-8		1	0.454
Arsenic pentoxide	1303-28-2	P011	1	0.454

Table 16.2. List of Hazardous Wastes and Hazardous Substances, Continued

HAZARDOUS WASTES AND HAZARDOUS SUBSTANCES	CAS NO.	HW NO.	REPORTABLE QUANTITY (RQ)	
			(Pounds)	(kg)
Arsenic trioxide	1327-53-3	P012	1	0.454
Arsenic trisulfide	1303-33-9		1	0.454
Arsenous oxide	1327-53-3	P012	1	0.454
Arsenous trichloride	7784-34-1		1	0.454
Asbestos (friable)	1332-21-4		1	0.454
Auramine	492-80-8	U014	100	45.4
Azaserine	115-02-6	U015	1	0.454
Azinphos-methyl	86-50-0		1	0.454
Aziridine	151-56-4	P054	1	0.454
Aziridine, 2-methyl	75-55-8	P067	1	0.454
Barban	101-27-9	U280	10	4.5
Barium cyanide	542-62-1	P013	10	4.5
Bendiocarb	22781-23-3	U278	100	45.4
Bendiocarb phenol	22961-82-6	U364	1000	454
Benezeneamine, 2,6-dinitro-N,N-dipropyl-4-(trifluoromethyl)-	1582-09-8		10	4.5
Benomyl	17804-35-2	U271	10	4.5
Benz[c]acridine	225-51-4	U016	100	45.4
Benzal chloride	98-87-3	U017	5,000	2,270
Benzamide, 3,5-dichloro-N-(1,1-dimethyl-2-propynyl)	23950-58-5	U192	5,000	2,270
Benz[a]anthracene	56-55-3	U018	10	4.5
Benzene	71-43-2	U019	10	4.5
Benzeneacetic acid, 4-chloro-.alpha.-(4-chlorophenyl)-.alpha.-hydroxy-, ethyl ester	510-15-6	U038	10	4.5
Benzene, 2,4-diisocyanato-1-methyl-	584-84-9		100	45.4
Benzene, 1,3-diisocyanato-2-methyl-	91-08-7		100	45.4
Benzene, 1,3-diisocyanatomethyl-	26471-62-5	U223	100	45.4
Benzene, m-dimethyl-	108-38-3	U239	1,000	454
Benzene, o-dimethyl-	95-47-6	U239	1,000	454
Benzene, p-dimethyl-	106-42-3	U239	100	45.4
Benzeneethanamine, alpha,alpha-dimethyl-	122-09-8	P046	5,000	2,270
Benzenemethanol, 4-chloro-.alpha.-4-chlorophenyl)-.alpha.-(trichloromethyl)-	115-32-2		10	4.5
Benzenesulfonyl chloride	98-09-9	U020	100	45.4
Benzenethiol	108-98-5	P014	100	45.4
Benzene, 1,1'-(2,2,2-trichloroethylidene)bis [4-methoxy-	72-43-5	U247	1	0.454
Benzidine	92-87-5	U021	1	0.454
Benzo[b]fluoranthene	205-99-2		1	0.454
Benzo(k)fluoranthene	207-08-9		5,000	2,270
Benzoic acid	65-85-0		5,000	2,270
Benzoic acid, 3-amino-2,5-dichloro-	133-90-4		100	45.4
Benzoic trichloride	98-07-7	U023	10	4.5
Benzonitrile	100-47-0		5,000	2,270
Benzo(rst)pentaphene	189-55-9	U064	10	4.5
Benzo[g,h,i]perylene	191-24-2		5,000	2,270
Benzo(a)phenanthrene	218-01-9	U050	100	45.4
Benzo[a]pyrene	50-32-8	U022	1	0.454
p-Benzoquinone	106-51-4	U197	10	4.5
Benzotrichloride	98-07-7	U023	10	4.5

Table 16.2. List of Hazardous Wastes and Hazardous Substances, Continued

HAZARDOUS WASTES AND HAZARDOUS SUBSTANCES	CAS NO.	HW NO.	REPORTABLE QUANTITY (RQ)	
			(Pounds)	(kg)
Benzoyl chloride	98-88-4		1,000	454
Benzyl chloride	100-44-7	P028	100	45.4
Beryllium ^b	7440-41-7	P015	10	4.5
Beryllium chloride	7787-47-5		1	0.454
Beryllium Compounds			&	&
Beryllium fluoride	7787-49-7		1	0.454
Beryllium nitrate	7787-55-5		1	0.454
Beryllium nitrate	13597-99-4		1	0.454
alpha-BHC	319-84-6		10	4.5
beta-BHC	319-85-7		1	0.454
delta-BHC	319-86-8		1	0.454
2,2'-Bioxirane	1464-53-5	U085	10	4.5
Biphenyl	92-52-4		100	45.4
Bis(2-chloroethoxy) methane	111-91-1	U024	1,000	454
Bis(2-chloroethyl) ether	111-44-4	U025	10	4.5
Bis(chloromethyl) ether	542-88-1	P016	10	4.5
Bis(2-chloro-1-methylethyl)ether	108-60-1	U027	1,000	454
Bis(2-ethylhexyl)phthalate	117-81-7	U028	100	45.4
Bromoacetone	598-31-2	P017	1,000	454
Bromoform	75-25-2	U225	100	45.4
Bromomethane	74-83-9	U029	1,000	454
4-Bromophenyl phenyl ether	101-55-3	U030	100	45.4
Brucine	357-57-3	P018	100	45.4
1,3-Butadiene	106-99-0		10	4.5
1,3-Butadiene, 2-methyl-	78-79-5		100	45.4
2-Butenal	4170-30-3	U053	100	45.4
2-Butenal, (e)-	123-73-9	U053	100	45.4
2-Butene, 1,4-dichloro-	764-41-0	U074	1	0.454
2,4-D butoxyethyl ester	1929-73-3		100	45.4
Butyl acetate	123-86-4		5,000	2,270
iso-Butyl acetate	110-19-0		5,000	2,270
sec-Butyl acetate	105-46-4		5,000	2,270
tert-Butyl acetate	540-88-5		5,000	2,270
n-Butyl alcohol	71-36-3	U031	5,000	2,270
Butylamine	109-73-9		1,000	454
iso-Butylamine	78-81-9		1,000	454
sec-Butylamine	513-49-5		1,000	454
sec-Butylamine	13952-84-6		1,000	454
tert-Butylamine	75-64-9		1,000	454
Butyl benzyl phthalate	85-68-7		100	45.4
1,2-Butylene oxide	106-88-7		100	45.4
n-Butyl phthalate	84-74-2	U069	10	4.5
Butyric acid	107-92-6		5,000	2,270
iso-Butyric acid	79-31-2		5,000	2,270
Cacodylic acid	75-60-5	U136	1	0.454
Cadmium ^b	7440-43-9		10	4.5
Cadmium acetate	543-90-8		10	4.5
Cadmium bromide	7789-42-6		10	4.5
Cadmium chloride	10108-64-2		10	4.5

Table 16.2. List of Hazardous Wastes and Hazardous Substances, Continued

HAZARDOUS WASTES AND HAZARDOUS SUBSTANCES	CAS NO.	HW NO.	REPORTABLE QUANTITY (RQ)	
			(Pounds)	(kg)
Cadmium Compounds			&	&
Calcium arsenate	7778-44-1		1	0.454
Calcium arsenite	52740-16-6		1	0.454
Calcium carbide	75-20-7		10	4.5
Calcium chromate	13765-19-0	U032	10	4.5
Calcium cyanamide	156-62-7		1,000	454
Calcium cyanide	592-01-8	P021	10	4.5
Calcium dodecylbenzenesulfonate	26264-06-2		1,000	454
Calcium hypochlorite	7778-54-3		10	4.5
Camphchlor	8001-35-2	P123	1	0.454
Camphene, octachloro-	8001-35-2	P123	1	0.454
Captan	133-06-2		10	4.5
Carbamic acid, ethyl ester	51-79-6	U238	100	45.4
Carbamic acid, methyl-, O-(((2,4-dimethyl-1,3-dithiolan-2-yl)methylene)amino)-	26419-73-8	P185	100	45.4
Carbamothioic acid, bis(1-methylethyl)-S-(2,3-dichloro-2-propenyl)ester	2303-16-4	U062	100	45.4
Carbamothioic acid, dipropyl-, S-(phenylmethyl) ester	52888-80-9	U387	5000	2,270
Carbaryl	63-25-2	U279	100	45.4
Carbendazim	10605-21-7	U372	10	4.5
Carbofuran	1563-66-2	P127	10	4.5
Carbofuran phenol	1563-38-8	U367	10	4.5
Carbon disulfide	75-15-0	P022	100	45.4
Carbonic difluoride	353-50-4	U033	1,000	454
Carbonic dichloride	75-44-5	P095	10	4.5
Carbonochloridic acid, methylester	79-22-1	U156	1,000	454
Carbon oxide sulfide (COS)	463-58-1		100	45.4
Carbon tetrachloride	56-23-5	U211	10	4.5
Carbonyl sulfide	463-58-1		100	45.4
Carbosulfan	55285-14-8	P189	1000	454
Catechol	120-80-9		100	45.4
CFC-11	75-69-4	U121	5,000	2,270
CFC-12	75-71-8	U075	5,000	2,270
Chloramben	133-90-4		100	45.4
Chlorambucil	305-03-3	U035	10	4.5
Chlordane	57-74-9	U036	1	0.454
Chlordane (Technical Mixture and Metabolites)			&	&
Chlorinated Benzenes			&	&
Chlorinated Ethanes			&	&
Chlorinated Naphthalene			&	&
Chlorinated Phenols			&	&
Chlorine	7782-50-5		10	4.5
Chlornaphazine	494-03-1	U026	100	45.4
Chloroacetaldehyde	107-20-0	P023	1,000	454
Chloroacetic acid	79-11-8		100	45.4
2-Chloroacetophenone	532-27-4		100	45.4
Chloroalkyl Ethers			&	&
p-Chloroaniline	106-47-8	P024	1,000	454
Chlorobenzene	108-90-7	U037	100	45.4

Table 16.2. List of Hazardous Wastes and Hazardous Substances, Continued

HAZARDOUS WASTES AND HAZARDOUS SUBSTANCES	CAS NO.	HW NO.	REPORTABLE QUANTITY (RQ)	
			(Pounds)	(kg)
Chlorobenzilate	510-15-6	U038	10	4.5
p-Chloro-m-cresol	59-50-7	U039	5,000	2,270
2,4-D chlorocrotyl ester	2971-38-2		100	45.4
Chlorodibromomethane	124-48-1		100	45.4
Chloroethane	75-00-3		100	45.4
2-Chloroethyl vinyl ether	110-75-8	U042	1,000	454
Chloroform	67-66-3	U044	10	4.5
Chloromethane	74-87-3	U045	100	45.4
Chloromethyl ether	542-88-1	P016	10	4.5
Chloromethyl methyl ether	107-30-2	U046	10	4.5
2-Chloronaphthalene	91-58-7	U047	5,000	2,270
2-Chlorophenol	95-57-8	U048	100	45.4
Chlorophenols			&	&
4-Chlorophenyl phenyl ether	7005-72-3		5,000	2,270
Chloroprene	126-99-8		100	45.4
3-Chloropropionitrile	542-76-7	P027	1,000	454
Chlorosulfonic acid	7790-94-5		1,000	454
4-Chloro-o-toluidine, hydrochloride	3165-93-3	U049	100	45.4
Chlorpyrifos	2921-88-2		1	0.454
Chromic acetate	1066-30-4		1,000	454
Chromic acid	7738-94-5		10	4.5
Chromic acid	11115-74-5		10	4.5
Chromic sulfate	10101-53-8		1,000	454
Chromium ^b	7440-47-3		5,000	2,270
Chromium Compounds			&	&
Chromous chloride	10049-05-5		1,000	454
Chrysene	218-01-9	U050	100	45.4
C.I. Solvent Yellow 34	492-80-8	U014	100	45.4
Cobalt Compounds			&	&
Cobaltous bromide	7789-43-7		1,000	454
Cobaltous formate	544-18-3		1,000	454
Cobaltous sulfamate	14017-41-5		1,000	454
Coke Oven Emissions			1	0.454
Copper ^b	7440-50-8		5,000	2,270
Copper Compounds			&	&
Copper cyanide	544-92-3	P029	10	4.5
Coumaphos	56-72-4		10	4.5
Creosote		U051	1	0.454
m-Cresol	108-39-4	U052	100	45.4
o-Cresol	95-48-7	U052	100	45.4
p-Cresol	106-44-5	U052	100	45.4
Cresol (mixed isomers)	1319-77-3	U052	100	45.4
Crotonaldehyde	4170-30-3	U053	100	45.4
Crotonaldehyde, (E)-	123-73-9	U053	100	45.4
Cumene	98-82-8	U055	5,000	2,270
Cumene hydroperoxide	80-15-9	U096	10	4.5
Cupric acetate	142-71-2		100	45.4
Cupric acetoarsenite	12002-03-8		1	0.454
Cupric chloride	7447-39-4		10	4.5

Table 16.2. List of Hazardous Wastes and Hazardous Substances, Continued

HAZARDOUS WASTES AND HAZARDOUS SUBSTANCES	CAS NO.	HW NO.	REPORTABLE QUANTITY (RQ)	
			(Pounds)	(kg)
Cupric nitrate	3251-23-8		100	45.4
Cupric oxalate	5893-66-3		100	45.4
Cupric sulfate	7758-98-7		10	4.5
Cupric sulfate, ammoniated	10380-29-7		100	45.4
Cupric tartrate	815-82-7		100	45.4
Cyanide Compounds			&	&
Cyanides (soluble salts and complexes), not otherwise specified		P030	10	4.5
Cyanogen	460-19-5	P031	100	45.4
Cyanogen bromide	506-68-3	U246	1,000	454
Cyanogen chloride	506-77-4	P033	10	4.5
Cyclohexane	110-82-7	U056	1,000	454
Cyclohexane, 1,2,3,4,5,6-hexachloro-,(1.alpha.,2.alpha.,3.beta.,4.alpha.,5.alpha.,6.beta.)-	58-89-9	U129	1	0.454
Cyclohexanone	108-94-1	U057	5,000	2,270
2-Cyclohexyl-4,6-dinitrophenol	131-89-5	P034	100	45.4
Cyclophosphamide	50-18-0	U058	10	4.5
2,4-D	94-75-7	U240	100	45.4
2,4-D Acid	94-75-7	U240	100	45.4
2,4-D butyl ester	94-80-4		100	45.4
2,4-D Esters	94-11-1		100	45.4
2,4-D Esters	94-79-1		100	45.4
2,4-D Esters	94-80-4		100	45.4
2,4-D Esters	1320-18-9		100	45.4
2,4-D Esters	1928-38-7		100	45.4
2,4-D Esters	1928-61-6		100	45.4
2,4-D Esters	1929-73-3		100	45.4
2,4-D Esters	2971-38-2		100	45.4
2,4-D Esters	25168-26-7		100	45.4
2,4-D Esters	53467-11-1		100	45.4
2,4-D isopropyl ester	94-11-1		100	45.4
2,4-D propylene glycol butyl ether ester	1320-18-9		100	45.4
2,4-D, salts and esters	94-75-7	U240	100	45.4
Daunomycin	20830-81-3	U059	10	4.5
DBCP	96-12-8	U066	1	0.454
DDD	72-54-8	U060	1	0.454
DDE	72-55-9		1	0.454
DDE	3547-04-4		5,000	2,270
DDT	50-29-3	U061	1	0.454
DDT and Metabolites			&	&
DEHP	117-81-7	U028	100	45.4
Diallate	2303-16-4	U062	100	45.4
Diaminotoluene	496-72-0	U221	10	4.5
Diaminotoluene	823-40-5	U221	10	4.5
2,4-Diaminotoluene	95-80-7		10	4.5
Diaminotoluene (mixed isomers)	25376-45-8	U221	10	4.5
Diazinon	333-41-5		1	0.454
Diazomethane	334-88-3		100	45.4
Dibenz[a,h]anthracene	53-70-3	U063	1	0.454

Table 16.2. List of Hazardous Wastes and Hazardous Substances, Continued

HAZARDOUS WASTES AND HAZARDOUS SUBSTANCES	CAS NO.	HW NO.	REPORTABLE QUANTITY (RQ)	
			(Pounds)	(kg)
Dibenzofuran	132-64-9		100	45.4
Dibenz[a,i]pyrene	189-55-9	U064	10	4.5
1,2-Dibromo-3-chloropropane	96-12-8	U066	1	0.454
1,2-Dibromoethane	106-93-4	U067	1	0.454
Dibutyl phthalate	84-74-2	U069	10	4.5
Dicamba	1918-00-9		1,000	454
Dichlobenil	1194-65-6		100	45.4
Dichlone	117-80-6		1	0.454
o-Dichlorobenzene	95-50-1	U070	100	45.4
Dichlorobenzene	25321-22-6		100	45.4
1,2-Dichlorobenzene	95-50-1	U070	100	45.4
1,3-Dichlorobenzene	541-73-1	U071	100	45.4
1,4-Dichlorobenzene	106-46-7	U072	100	45.4
Dichlorobenzene (mixed isomers)	25321-22-6		100	45.4
Dichlorobenzidine			&	&
3,3'-Dichlorobenzidine	91-94-1	U073	1	0.454
Dichlorobromomethane	75-27-4		5,000	2,270
1,4-Dichloro-2-butene	764-41-0	U074	1	0.454
Dichlorodifluoromethane	75-71-8	U075	5,000	2,270
1,1-Dichloroethane	75-34-3	U076	1,000	454
1,2-Dichloroethane	107-06-2	U077	100	45.4
1,1-Dichloroethylene	75-35-4	U078	100	45.4
1,2-Dichloroethylene	156-60-5	U079	1,000	454
Dichloroethyl ether	111-44-4	U025	10	4.5
Dichloroisopropyl ether	108-60-1	U027	1,000	454
Dichloromethane	75-09-2	U080	1,000	454
3,6-Dichloro-2-methoxybenzoic acid	1918-00-9		1,000	454
Dichloromethyl ether	542-88-1	P016	10	4.5
2,6-Dichlorophenol	87-65-0	U082	100	45.4
2,4-Dichlorophenol	120-83-2	U081	100	45.4
Dichlorophenylarsine	696-28-6	P036	1	0.454
Dichloropropane	26638-19-7		1,000	454
Dichloropropane - Dichloropropene (mixture)	8003-19-8		100	45.4
1,1-Dichloropropane	78-99-9		1,000	454
1,2-Dichloropropane	78-87-5	U083	1,000	454
1,3-Dichloropropane	142-28-9		1000	454
Dichloropropene	26952-23-8		100	45.4
1,3-Dichloropropene	542-75-6	U084	100	45.4
2,3-Dichloropropene	78-88-6		100	45.4
2,2-Dichloropropionic acid	75-99-0		5,000	2,270
1,3-Dichloropropylene	542-75-6	U084	100	45.4
Dichlorvos	62-73-7		10	4.5
Dicofol	115-32-2		10	4.5
Dieldrin	60-57-1	P037	1	0.454
Diepoxybutane	1464-53-5	U085	10	4.5
Diethanolamine	111-42-2		100	45.4
Diethylamine	109-89-7		100	45.4
N,N-Diethylaniline	91-66-7		1,000	454
Diethylarsine	692-42-2	P038	1	0.454

Table 16.2. List of Hazardous Wastes and Hazardous Substances, Continued

HAZARDOUS WASTES AND HAZARDOUS SUBSTANCES	CAS NO.	HW NO.	REPORTABLE QUANTITY (RQ)	
			(Pounds)	(kg)
Di(2-ethylhexyl) phthalate	117-81-7	U028	100	45.4
O,O-Diethyl S-methyl dithiophosphate	3288-58-2	U087	5,000	2,270
Diethyl-p-nitrophenyl phosphate	311-45-5	P041	100	45.4
Diethyl phthalate	84-66-2	U088	1,000	454
O,O-Diethyl O-pyrazinyl phosphorothioate	297-97-2	P040	100	45.4
Diethylstilbestrol	56-53-1	U089	1	0.454
Diethyl sulfate	64-67-5		10	4.5
Dihydrosafrole	94-58-6	U090	10	4.5
Diisopropylfluorophosphate	55-91-4	P043	100	45.4
1,4:5,8-Dimethanonaphthalene, 1,2,3,4,10,10-hexachloro- 1,4,4a,5,8,8a-hexahydro-(1.alpha.,4.alpha.,4a.beta., 5.alpha.,8.alpha.,8a.beta.)-	309-00-2	P004	1	0.454
Dimethoate	60-51-5	P044	10	4.5
3,3'-Dimethoxybenzidine	119-90-4	U091	100	45.4
Dimethylamine	124-40-3	U092	1,000	454
4-Dimethylaminoazobenzene	60-11-7	U093	10	4.5
Dimethylaminoazobenzene	60-11-7	U093	10	4.5
N,N-Dimethylaniline	121-69-7		100	45.4
7,12-Dimethylbenz[a]anthracene	57-97-6	U094	1	0.454
3,3'-Dimethylbenzidine	119-93-7	U095	10	4.5
2,2-Dimethyl-1,3-benzodioxol-4-ol methylcarbamate	22781-23-3	U278	100	45.4
Dimethylcarbamyl chloride	79-44-7	U097	1	0.454
Dimethylformamide	68-12-2		100	45.4
N,N-Dimethylformamide	68-12-2		100	45.4
1,1-Dimethyl hydrazine	57-14-7	U098	10	4.5
Dimethylhydrazine	57-14-7	U098	10	4.5
2,4-Dimethylphenol	105-67-9	U101	100	45.4
Dimethyl phthalate	131-11-3	U102	5,000	2,270
Dimethyl sulfate	77-78-1	U103	100	45.4
Dimetilan	644-64-4	P191	1	0.454
Dinitrobenzene (mixed isomers)	25154-54-5		100	45.4
m-Dinitrobenzene	99-65-0		100	45.4
o-Dinitrobenzene	528-29-0		100	45.4
p-Dinitrobenzene	100-25-4		100	45.4
Dinitrobutyl phenol	88-85-7	P020	1,000	454
4,6-Dinitro-o-cresol	534-52-1	P047	10	4.5
Dinitrocresol	534-52-1	P047	10	4.5
4,6-Dinitro-o-cresol and salts	534-52-1	P047	10	4.5
Dinitrophenol	25550-58-7		10	4.5
2,4-Dinitrophenol	51-28-5	P048	10	4.5
2,5-Dinitrophenol	329-71-5		10	4.5
2,6-Dinitrophenol	573-56-8		10	4.5
Dinitrotoluene (mixed isomers)	25321-14-6		10	4.5
2,4-Dinitrotoluene	121-14-2	U105	10	4.5
2,6-Dinitrotoluene	606-20-2	U106	100	45.4
3,4-Dinitrotoluene	610-39-9		10	4.5
Dinoseb	88-85-7	P020	1,000	454
Di-n-octyl phthalate	117-84-0	U107	5,000	2,270
n-Dioctylphthalate	117-84-0	U107	5,000	2,270

Table 16.2. List of Hazardous Wastes and Hazardous Substances, Continued

HAZARDOUS WASTES AND HAZARDOUS SUBSTANCES	CAS NO.	HW NO.	REPORTABLE QUANTITY (RQ)	
			(Pounds)	(kg)
1,4-Dioxane	123-91-1	U108	100	45.4
1,2-Diphenylhydrazine	122-66-7	U109	10	4.5
Diphenylhydrazine			&	&
Diphosphoramidate, octamethyl-	152-16-9	P085	100	45.4
Dipropylamine	142-84-7	U110	5,000	2,270
Di-n-propylnitrosamine	621-64-7	U111	10	4.5
Diquat	85-00-7		1,000	454
Diquat	2764-72-9		1,000	454
Disulfoton	298-04-4	P039	1	0.454
Dithiobiuret	541-53-7	P049	100	45.4
2,4-Dithiobiuret	541-53-7	P049	100	45.4
Diuron	330-54-1		100	45.4
Dodecylbenzenesulfonic acid	27176-87-0		1,000	454
Endosulfan	115-29-7	P050	1	0.454
alpha – Endosulfan	959-98-8		1	0.454
beta – Endosulfan	33213-65-9		1	0.454
Endosulfan and Metabolites			&	&
Endosulfan sulfate	1031-07-8		1	0.454
Endothall	145-73-3	P088	1,000	454
Endrin	72-20-8	P051	1	0.454
Endrin aldehyde	7421-93-4		1	0.454
Endrin and Metabolites			&	&
Epichlorohydrin	106-89-8	U041	100	45.4
Epinephrine	51-43-4	P042	1,000	454
Ethanamine	75-04-7		100	45.4
Ethane, chloro-	75-00-3		100	45.4
1,2-Ethanediamine	107-15-3		5,000	2,270
Ethanedinitrile	460-19-5	P031	100	45.4
Ethane, 1,1'-oxybis-	60-29-7	U117	100	45.4
Ethane, 1,1,1,2-tetrachloro-	630-20-6	U208	100	45.4
Ethanimidothioic acid, 2-(dimethylamino)-N-hydroxy-2-oxo-, methyl ester	30558-43-1	U394	5000	2,270
Ethanimidothioic acid, N-[[methylamino]carbonyl]	16752-77-5	P066	100	45.4
Ethanol, 2-ethoxy-	110-80-5	U359	1,000	454
Ethanol, 2,2'-oxybis-, dicarbamate	5952-26-1	U395	5000	2,270
Ethene, chloro-	75-01-4	U043	1	0.454
Ethene, 1,1-dichloro-	75-35-4	U078	100	45.4
Ethion	563-12-2		10	4.5
2-Ethoxyethanol	110-80-5	U359	1,000	454
Ethyl acetate	141-78-6	U112	5,000	2,270
Ethyl acrylate	140-88-5	U113	1,000	454
Ethylbenzene	100-41-4		1,000	454
Ethyl carbamate	51-79-6	U238	100	45.4
Ethyl chloride	75-00-3		100	45.4
Ethyl cyanide	107-12-0	P101	10	4.5
Ethylenebisdithiocarbamic acid, salts & esters	111-54-6	U114	5,000	2,270
Ethylenediamine	107-15-3		5,000	2,270
Ethylenediamine-tetraacetic acid (EDTA)	60-00-4		5,000	2,270
Ethylene dibromide	106-93-4	U067	1	0.454

Table 16.2. List of Hazardous Wastes and Hazardous Substances, Continued

HAZARDOUS WASTES AND HAZARDOUS SUBSTANCES	CAS NO.	HW NO.	REPORTABLE QUANTITY (RQ)	
			(Pounds)	(kg)
Ethylene dichloride	107-06-2	U077	100	45.4
Ethylene glycol	107-21-1		5,000	2,270
Ethyleneimine	151-56-4	P054	1	0.454
Ethylene oxide	75-21-8	U115	10	4.5
Ethylene thiourea	96-45-7	U116	10	4.5
Ethyl ether	60-29-7	U117	100	45.4
Ethylidene Dichloride	75-34-3	U076	1,000	454
Ethyl methacrylate	97-63-2	U118	1,000	454
Ethyl methanesulfonate	62-50-0	U119	1	0.454
Famphur	52-85-7	P097	1,000	454
Ferric ammonium citrate	1185-57-5		1,000	454
Ferric ammonium oxalate	2944-67-4		1,000	454
Ferric ammonium oxalate	55488-87-4		1,000	454
Ferric chloride	7705-08-0		1,000	454
Ferric fluoride	7783-50-8		100	45.4
Ferric nitrate	10421-48-4		1,000	454
Ferric sulfate	10028-22-5		1,000	454
Ferrous ammonium sulfate	10045-89-3		1,000	454
Ferrous chloride	7758-94-3		100	45.4
Ferrous sulfate	7720-78-7		1,000	454
Ferrous sulfate	7782-63-0		1,000	454
Fine mineral fibers			&	&
Fluoranthene	206-44-0	U120	100	45.4
Fluorene	86-73-7		5,000	2,270
Fluorine	7782-41-4	P056	10	4.5
Fluoroacetamide	640-19-7	P057	100	45.4
Fluoroacetic acid, sodium salt	62-74-8	P058	10	4.5
Formaldehyde	50-00-0	U122	100	45.4
Formaldehyde (solution)	50-00-0	U122	100	45.4
Formetanate hydrochloride	23422-53-9	P198	100	45.4
Formic acid	64-18-6	U123	5,000	2,270
Formparanate	17702-57-7	P197	100	45.4
Fumaric acid	110-17-8		5,000	2,270
Furan	110-00-9	U124	100	45.4
Furan, tetrahydro-	109-99-9	U213	1,000	454
Furfural	98-01-1	U125	5,000	2,270
Glycidylaldehyde	765-34-4	U126	10	4.5
Glycol Ethers			&	&
Guanidine, N-methyl-N'-nitro-N-nitroso-	70-25-7	U163	10	4.5
Guthion	86-50-0		1	0.454
Haloethers			&	&
Halomethanes			&	&
Heptachlor	76-44-8	P059	1	0.454
Heptachlor and Metabolites			&	&
Heptachlor epoxide	1024-57-3		1	0.454
1,4,5,6,7,8,8-Heptachloro-3a,4,7,7a-tetrahydro-4,7-methano-1H-indene	76-44-8	P059	1	0.454
Hexachlorobenzene	118-74-1	U127	10	4.5
Hexachloro-1,3-butadiene	87-68-3	U128	1	0.454

Table 16.2. List of Hazardous Wastes and Hazardous Substances, Continued

HAZARDOUS WASTES AND HAZARDOUS SUBSTANCES	CAS NO.	HW NO.	REPORTABLE QUANTITY (RQ)	
			(Pounds)	(kg)
Hexachlorobutadiene	87-68-3	U128	1	0.454
Hexachlorocyclohexane (all isomers)	608-73-1		&	&
alpha-Hexachlorocyclohexane	319-84-6		10	4.5
Hexachlorocyclohexane (gamma isomer)	58-89-9	U129	1	0.454
Hexachlorocyclopentadiene	77-47-4	U130	10	4.5
Hexachloroethane	67-72-1	U131	100	45.4
Hexachlorophene	70-30-4	U132	100	45.4
Hexachloropropene	1888-71-7	U243	1,000	454
Hexaethyl tetraphosphate	757-58-4	P062	100	45.4
Hexamethylene-1,6-diisocyanate	822-06-0		100	45.4
Hexamethylphosphoramide	680-31-9		1	0.454
Hexane	110-54-3		5,000	2,270
n-Hexane	110-54-3		5,000	2,270
Hydrazine	302-01-2	U133	1	0.454
Hydrazine, 1,2-diethyl-	1615-80-1	U086	10	4.5
Hydrazine, 1,1-dimethyl-	57-14-7	U098	10	4.5
Hydrazine, 1,2-dimethyl-	540-73-8	U099	1	0.454
Hydrazine, 1,2-diphenyl-	122-66-7	U109	10	4.5
Hydrazine, methyl-	60-34-4	P068	10	4.5
Hydrazobenzene	122-66-7	U109	10	4.5
Hydrochloric acid	7647-01-0		5,000	2,270
Hydrochloric acid (concentration of 37% or greater)	7647-01-0		5,000	2,270
Hydrochloric acid (aerosol forms only)	7647-01-0		5,000	2,270
Hydrocyanic acid	74-90-8	P063	10	4.5
Hydrofluoric acid	7664-39-3	U134	100	45.4
Hydrofluoric acid (concentration of 50% or greater)	7664-39-3	U134	100	45.4
Hydrogen chloride (anhydrous)	7647-01-0		5,000	2,270
Hydrogen chloride (gas only)	7647-01-0		5,000	2,270
Hydrogen cyanide	74-90-8	P063	10	4.5
Hydrogen fluoride	7664-39-3	U134	100	45.4
Hydrogen fluoride (anhydrous)	7664-39-3	U134	100	45.4
Hydrogen sulfide	7783-06-4	U135	100	45.4
Hydroperoxide, 1-methyl-1-phenylethyl-	80-15-9	U096	10	4.5
Hydroquinone	123-31-9		100	45.4
Indeno(1,2,3-cd)pyrene	193-39-5	U137	100	45.4
Isobutyl alcohol	78-83-1	U140	5,000	2,270
Isodrin	465-73-6	P060	1	0.454
Isofluorophate	55-91-4	P043	100	45.4
1H-Isoindole-1,3(2H)-dione, 3a,4,7,7a-tetrahydro-2- [(trichloromethyl)thio]-	133-06-2		10	4.5
Isophorone	78-59-1		5,000	2,270
Isoprene	78-79-5		100	45.4
Isopropanolamine dodecylbenzene sulfonate	42504-46-1		1,000	454
Isopropylmethylpyrazolyl dimethylcarbamate	119-38-0	P192	100	45.4
Isosafrole	120-58-1	U141	100	45.4
Kepone	143-50-0	U142	1	0.454
Lasiocarpine	303-34-4	U143	10	4.5
Lead ^b	7439-92-1		10	4.5
Lead acetate	301-04-2	U144	10	4.5

Table 16.2. List of Hazardous Wastes and Hazardous Substances, Continued

HAZARDOUS WASTES AND HAZARDOUS SUBSTANCES	CAS NO.	HW NO.	REPORTABLE QUANTITY (RQ)	
			(Pounds)	(kg)
Lead arsenate	7645-25-2		1	0.454
Lead arsenate	7784-40-9		1	0.454
Lead arsenate	10102-48-4		1	0.454
Lead chloride	7758-95-4		10	4.5
Lead compounds			&	&
Lead fluoborate	13814-96-5		10	4.5
Lead fluoride	7783-46-2		10	4.5
Lead iodide	10101-63-0		10	4.5
Lead nitrate	10099-74-8		10	4.5
Lead phosphate	7446-27-7	U145	10	4.5
Lead stearate	1072-35-1		10	4.5
Lead stearate	7428-48-0		10	4.5
Lead stearate	52652-59-2		10	4.5
Lead stearate	56189-09-4		10	4.5
Lead subacetate	1335-32-6	U146	10	4.5
Lead sulfate	7446-14-2		10	4.5
Lead sulfate	15739-80-7		10	4.5
Lead sulfide	1314-87-0		10	4.5
Lead thiocyanate	592-87-0		10	4.5
Lindane	58-89-9	U129	1	0.454
Lithium chromate	14307-35-8		10	4.5
Malathion	121-75-5		100	45.4
Maleic acid	110-16-7		5,000	2,270
Maleic anhydride	108-31-6	U147	5,000	2,270
Maleic hydrazide	123-33-1	U148	5,000	2,270
Malononitrile	109-77-3	U149	1,000	454
Manganese, bis(dimethylcarbamo-dithioato-S,S')-	15339-36-3	P196	10	4.5
Manganese Compounds			&	&
MBOCA	101-14-4	U158	10	4.5
MDI	101-68-8		5,000	2,270
Melphalan	148-82-3	U150	1	0.454
Mercaptodimethur	2032-65-7	P199	10	4.5
Mercuric cyanide	592-04-1		1	0.454
Mercuric nitrate	10045-94-0		10	4.5
Mercuric sulfate	7783-35-9		10	4.5
Mercuric thiocyanate	592-85-8		10	4.5
Mercurous nitrate	7782-86-7		10	4.5
Mercurous nitrate	10415-75-5		10	4.5
Mercury	7439-97-6	U151	1	0.454
Mercury Compounds			&	&
Mercury fulminate	628-86-4	P065	10	4.5
Methacrylonitrile	126-98-7	U152	1,000	454
Methanamine	74-89-5		100	45.4
Methanamine, N,N-dimethyl-	75-50-3		100	45.4
Methanamine, N-methyl-	124-40-3	U092	1,000	454
Methanamine, N-methyl-N-nitroso-	62-75-9	P082	10	4.5
Methane, chloro-	74-87-3	U045	100	45.4
Methane, chloromethoxy-	107-30-2	U046	10	4.5
Methane, isocyanato-	624-83-9	P064	10	4.5

Table 16.2. List of Hazardous Wastes and Hazardous Substances, Continued

HAZARDOUS WASTES AND HAZARDOUS SUBSTANCES	CAS NO.	HW NO.	REPORTABLE QUANTITY (RQ)	
			(Pounds)	(kg)
Methane, oxybis[chloro-	542-88-1	P016	10	4.5
Methanesulfenyl chloride, trichloro-	594-42-3		100	45.4
Methane, tetranitro-	509-14-8	P112	10	4.5
Methanethiol	74-93-1	U153	100	45.4
Methane, trichloro-	67-66-3	U044	10	4.5
4,7-Methanoindan, 1,2,3,4,5,6,7,8,8-octachloro- 2,3,3a,4,7,7a-hexahydro-	57-74-9	U036	1	0.454
Methanol	67-56-1	U154	5,000	2,270
Methapyrilene	91-80-5	U155	5,000	2,270
Methiocarb	2032-65-7	P199	10	4.5
Methomyl	16752-77-5	P066	100	45.4
Methoxychlor	72-43-5	U247	1	0.454
Methyl bromide	74-83-9	U029	1,000	454
Methyl chloride	74-87-3	U045	100	45.4
Methyl chlorocarbonate	79-22-1	U156	1,000	454
Methyl chloroform	71-55-6	U226	1,000	454
Methyl chloroformate	79-22-1	U156	1,000	454
3-Methylcholanthrene	56-49-5	U157	10	4.5
4,4'-Methylenebis(2-chloroaniline)	101-14-4	U158	10	4.5
Methylenebis(phenylisocyanate)	101-68-8		5,000	2,270
Methylene bromide	74-95-3	U068	1,000	454
Methylene chloride	75-09-2	U080	1,000	454
4,4'-Methylenedianiline	101-77-9		10	4.5
Methyl ethyl ketone	78-93-3	U159	5,000	2,270
Methyl ethyl ketone peroxide	1338-23-4	U160	10	4.5
Methyl hydrazine	60-34-4	P068	10	4.5
Methyl iodide	74-88-4	U138	100	45.4
Methyl isobutyl ketone	108-10-1	U161	5,000	2,270
Methyl isocyanate	624-83-9	P064	10	4.5
2-Methyl lactonitrile	75-86-5	P069	10	4.5
Methyl mercaptan	74-93-1	U153	100	45.4
Methyl methacrylate	80-62-6	U162	1,000	454
Methyl parathion	298-00-0	P071	100	45.4
2-Methylpyridine	109-06-8	U191	5,000	2,270
Methyl tert-butyl ether	1634-04-4		1,000	454
Methylthiouracil	56-04-2	U164	10	4.5
Metolcarb	1129-41-5	P190	1000	454
Mevinphos	7786-34-7		10	4.5
Mexacarbate	315-18-4	P128	1,000	454
Mitomycin C	50-07-7	U010	10	4.5
Monoethylamine	75-04-7		100	45.4
Monomethylamine	74-89-5		100	45.4
Muscimol	2763-96-4	P007	1,000	454
Naled	300-76-5		10	4.5
Naphthalene	91-20-3	U165	100	45.4
1-Naphthalenol, methylcarbamate	63-25-2	U279	100	45.4
Naphthenic acid	1338-24-5		100	45.4
1,4-Naphthoquinone	130-15-4	U166	5,000	2,270
alpha-Naphthylamine	134-32-7	U167	100	45.4

Table 16.2. List of Hazardous Wastes and Hazardous Substances, Continued

HAZARDOUS WASTES AND HAZARDOUS SUBSTANCES	CAS NO.	HW NO.	REPORTABLE QUANTITY (RQ)	
			(Pounds)	(kg)
beta-Naphthylamine	91-59-8	U168	10	4.5
Nickel ^b	7440-02-0		100	45.4
Nickel ammonium sulfate	15699-18-0		100	45.4
Nickel carbonyl	13463-39-3	P073	10	4.5
Nickel chloride	7718-54-9		100	45.4
Nickel chloride	37211-05-5		100	45.4
Nickel Compounds			&	&
Nickel cyanide	557-19-7	P074	10	4.5
Nickel hydroxide	12054-48-7		10	4.5
Nickel nitrate	14216-75-2		100	45.4
Nickel sulfate	7786-81-4		100	45.4
Nicotine	54-11-5	P075	100	45.4
Nicotine and salts	54-11-5	P075	100	45.4
Nicotine sulfate	65-30-5		100	45.4
Nitric acid	7697-37-2		1,000	454
Nitric acid (conc 80% or greater)	7697-37-2		1,000	454
Nitric oxide	10102-43-9	P076	10 @	4.5 @
p-Nitroaniline	100-01-6	P077	5,000	2,270
Nitrobenzene	98-95-3	U169	1,000	454
4-Nitrobiphenyl	92-93-3		10	4.5
Nitrogen dioxide	10102-44-0	P078	10 @	4.5 @
Nitrogen dioxide	10544-72-6		10 @	4.5 @
Nitrogen oxide (NO)	10102-43-9	P076	10 @	4.5 @
Nitroglycerin	55-63-0	P081	10	4.5
Nitrophenol (mixed isomers)	25154-55-6		100	45.4
2-Nitrophenol	88-75-5		100	45.4
4-Nitrophenol	100-02-7	U170	100	45.4
m-Nitrophenol	554-84-7		100	45.4
p-Nitrophenol	100-02-7	U170	100	45.4
Nitrophenols			&	&
2-Nitropropane	79-46-9	U171	10	4.5
Nitrosamines			&	&
N-Nitrosodi-n-butylamine	924-16-3	U172	10	4.5
N-Nitrosodiethanolamine	1116-54-7	U173	1	0.454
N-Nitrosodiethylamine	55-18-5	U174	1	0.454
N-Nitrosodimethylamine	62-75-9	P082	10	4.5
Nitrosodimethylamine	62-75-9	P082	10	4.5
N-Nitrosodiphenylamine	86-30-6		100	45.4
N-Nitrosodi-n-propylamine	621-64-7	U111	10	4.5
N-Nitroso-N-ethylurea	759-73-9	U176	1	0.454
N-Nitroso-N-methylurea	684-93-5	U177	1	0.454
N-Nitroso-N-methylurethane	615-53-2	U178	1	0.454
N-Nitrosomethylvinylamine	4549-40-0	P084	10	4.5
N-Nitrosomorpholine	59-89-2		1	0.454
N-Nitrosopiperidine	100-75-4	U179	10	4.5
N-Nitrosopyrrolidine	930-55-2	U180	1	0.454
Nitrotoluene	1321-12-6		1,000	454
m-Nitrotoluene	99-08-1		1,000	454
o-Nitrotoluene	88-72-2		1,000	454

Table 16.2. List of Hazardous Wastes and Hazardous Substances, Continued

HAZARDOUS WASTES AND HAZARDOUS SUBSTANCES	CAS NO.	HW NO.	REPORTABLE QUANTITY (RQ)	
			(Pounds)	(kg)
p-Nitrotoluene	99-99-0		1,000	454
5-Nitro-o-toluidine	99-55-8	U181	100	45.4
Oleum (fuming sulfuric acid)	8014-95-7		1,000	454
Organorhodium Complex (PMN-82-147)				
Osmium oxide OsO ₄ (T-4)-	20816-12-0	P087	1,000	454
Osmium tetroxide	20816-12-0	P087	1,000	454
Oxamyl	23135-22-0	P194	100	45.4
Oxirane	75-21-8	U115	10	4.5
Oxirane, (chloromethyl)-	106-89-8	U041	100	45.4
Oxirane, methyl-	75-56-9		100	45.4
Paraformaldehyde	30525-89-4		1,000	454
Paraldehyde	123-63-7	U182	1,000	454
Parathion	56-38-2	P089	10	4.5
Parathion-methyl	298-00-0	P071	100	45.4
Paris green	12002-03-8		1	0.454
PCBs	1336-36-3		1	0.454
PCNB	82-68-8	U185	100	45.4
PCP	87-86-5		10	4.5
Pentachlorobenzene	608-93-5	U183	10	4.5
Pentachloroethane	76-01-7	U184	10	4.5
Pentachloronitrobenzene	82-68-8	U185	100	45.4
Pentachlorophenol	87-86-5		10	4.5
1,3-Pentadiene	504-60-9	U186	100	45.4
Perchloroethylene	127-18-4	U210	100	45.4
Perchloromethyl mercaptan	594-42-3		100	45.4
Phenacetin	62-44-2	U187	100	45.4
Phenanthrene	85-01-8		5,000	2,270
Phenol	108-95-2	U188	1,000	454
Phenol, 2-(1-methylethoxy)-, methylcarbamate	114-26-1	U411	100	45.4
Phenol, 3-(1-methylethyl)-, methylcarbamate	64-00-6	P202	10	4.5
Phenyl dichloroarsine	696-28-6	P036	1	0.454
p-Phenylenediamine	106-50-3		5,000	2,270
Phenylmercuric acetate	62-38-4	P092	100	45.4
Phenylmercury acetate	62-38-4	P092	100	45.4
Phenylthiourea	103-85-5	P093	100	45.4
Phorate	298-02-2	P094	10	4.5
Phosgene	75-44-5	P095	10	4.5
Phosphine	7803-51-2	P096	100	45.4
Phosphonic acid, (2,2,2-trichloro-1-hydroxyethyl)-, dimethyl ester	52-68-6		100	45.4
Phosphoric acid	7664-38-2		5,000	2,270
Phosphoric acid, 2-dichloroethenyl dimethyl ester	62-73-7		10	4.5
Phosphorothioic acid, O,O-diethyl-O-(4-nitrophenyl) ester	56-38-2	P089	10	4.5
Phosphorous trichloride	7719-12-2		1,000	454
Phosphorus (yellow or white)	7723-14-0		1	0.454
Phosphorus	7723-14-0		1	0.454
Phosphorus oxychloride	10025-87-3		1,000	454
Phosphorus trichloride	7719-12-2		1,000	454

Table 16.2. List of Hazardous Wastes and Hazardous Substances, Continued

HAZARDOUS WASTES AND HAZARDOUS SUBSTANCES	CAS NO.	HW NO.	REPORTABLE QUANTITY (RQ)	
			(Pounds)	(kg)
Phosphoryl chloride	10025-87-3		1,000	454
Phthalate Esters			&	&
Phthalic anhydride	85-44-9	U190	5,000	2,270
Physostigmine	57-47-6	P204	100	45.4
Physostigmine, salicylate (1:1)	57-64-7	P188	100	45.4
2-Picoline	109-06-8	U191	5,000	2,270
PCBs	1336-36-3		1	0.454
Polycyclic organic matter			&	&
Polynuclear Aromatic Hydrocarbons			&	&
Potassium arsenate	7784-41-0		1	0.454
Potassium arsenite	10124-50-2		1	0.454
Potassium bichromate	7778-50-9		10	4.5
Potassium chromate	7789-00-6		10	4.5
Potassium cyanide	151-50-8	P098	10	4.5
Potassium hydroxide	1310-58-3		1,000	454
Potassium permanganate	7722-64-7		100	45.4
Potassium silver cyanide	506-61-6	P099	1	0.454
Promecarb	2631-37-0	P201	1000	454
Pronamide	23950-58-5	U192	5,000	2,270
Propane 1,2-dichloro-	78-87-5	U083	1,000	454
Propanenitrile	107-12-0	P101	10	4.5
Propane sultone	1120-71-4	U193	10	4.5
1,3-Propane sultone	1120-71-4	U193	10	4.5
Propargite	2312-35-8		10	4.5
Propargyl alcohol	107-19-7	P102	1,000	454
2-Propenal	107-02-8	P003	1	0.454
2-Propenenitrile	107-13-1	U009	100	45.4
2-Propenenitrile, 2-methyl-	126-98-7	U152	1,000	454
2-Propen-1-ol	107-18-6	P005	100	45.4
Propham	122-42-9	U373	1000	454
beta-Propiolactone	57-57-8		10	4.5
Propionaldehyde	123-38-6		1,000	454
Propionic acid	79-09-4		5,000	2,270
Propionic anhydride	123-62-6		5,000	2,270
Propionitrile	107-12-0	P101	10	4.5
Propionitrile, 3-chloro-	542-76-7	P027	1,000	454
Propoxur	114-26-1	U411	100	45.4
n-Propylamine	107-10-8	U194	5,000	2,270
Propyleneimine	75-55-8	P067	1	0.454
Propylene oxide	75-56-9		100	45.4
Pyrene	129-00-0		5,000	2,270
Pyrethrins	121-21-1		1	0.454
Pyrethrins	121-29-9		1	0.454
Pyrethrins	8003-34-7		1	0.454
Pyridine	110-86-1	U196	1,000	454
Pyridine, 4-amino-	504-24-5	P008	1,000	454
Pyridine, 3-(1-methyl-2-pyrrolidiny)-(S)-	54-11-5	P075	100	45.4
Quinoline	91-22-5		5,000	2,270
Quinone	106-51-4	U197	10	4.5

Table 16.2. List of Hazardous Wastes and Hazardous Substances, Continued

HAZARDOUS WASTES AND HAZARDOUS SUBSTANCES	CAS NO.	HW NO.	REPORTABLE QUANTITY (RQ)	
			(Pounds)	(kg)
Quintozene	82-68-8	U185	100	45.4
Reserpine	50-55-5	U200	5,000	2,270
Resorcinol	108-46-3	U201	5,000	2,270
Saccharin (manufacturing)	81-07-2	U202	100	45.4
Saccharin and salts	81-07-2	U202	100	45.4
Safrole	94-59-7	U203	100	45.4
Selenious acid	7783-00-8	U204	10	4.5
Selenious acid, dithallium(1+) salt	12039-52-0	P114	1,000	454
Selenium ^b	7782-49-2		100	45.4
Selenium Compounds			&	&
Selenium dioxide	7446-08-4		10	4.5
Selenium sulfide	7488-56-4	U205	10	4.5
Selenourea	630-10-4	P103	1,000	454
Silver ^b	7440-22-4		1,000	454
Silver Compounds			&	&
Silver cyanide	506-64-9	P104	1	0.454
Silver nitrate	7761-88-8		1	0.454
Silvex (2,4,5-TP)	93-72-1		100	45.4
Sodium	7440-23-5		10	4.5
Sodium arsenate	7631-89-2		1	0.454
Sodium arsenite	7784-46-5		1	0.454
Sodium azide (Na(N ₃))	26628-22-8	P105	1,000	454
Sodium bichromate	10588-01-9		10	4.5
Sodium bifluoride	1333-83-1		100	45.4
Sodium bisulfite	7631-90-5		5,000	2,270
Sodium chromate	7775-11-3		10	4.5
Sodium cyanide (Na(CN))	143-33-9	P106	10	4.5
Sodium dodecylbenzenesulfonate	25155-30-0		1,000	454
Sodium fluoride	7681-49-4		1,000	454
Sodium fluoroacetate	62-74-8	P058	10	4.5
Sodium hydrosulfide	16721-80-5		5,000	2,270
Sodium hydroxide	1310-73-2		1,000	454
Sodium hypochlorite	7681-52-9		100	45.4
Sodium hypochlorite	10022-70-5		100	45.4
Sodium methylate	124-41-4		1,000	454
Sodium nitrite	7632-00-0		100	45.4
Sodium phosphate, dibasic	7558-79-4		5,000	2,270
Sodium phosphate, dibasic	10039-32-4		5,000	2,270
Sodium phosphate, dibasic	10140-65-5		5,000	2,270
Sodium phosphate, tribasic	7601-54-9		5000	2,270
Sodium phosphate, tribasic	10101-89-0		5,000	2,270
Sodium phosphate, tribasic	10361-89-4		5,000	2,270
Sodium selenite	7782-82-3		100	45.4
Sodium selenite	10102-18-8		100	45.4
Streptozotocin	18883-66-4	U206	1	0.454
Strontium chromate	7789-06-2		10	4.5
Strychnine	57-24-9	P108	10	4.5
Strychnine and salts	57-24-9	P108	10	4.5
Strychnine, sulfate	60-41-3		10	4.5

Table 16.2. List of Hazardous Wastes and Hazardous Substances, Continued

HAZARDOUS WASTES AND HAZARDOUS SUBSTANCES	CAS NO.	HW NO.	REPORTABLE QUANTITY (RQ)	
			(Pounds)	(kg)
Styrene	100-42-5		1,000	454
Styrene oxide	96-09-3		100	45.4
Sulfotep	3689-24-5	P109	100	45.4
Sulfuric acid (aerosol forms only)	7664-93-9		1,000	454
Sulfuric acid	7664-93-9		1,000	454
Sulfuric acid (fuming)	8014-95-7		1,000	454
Sulfuric acid, mixture with sulfur trioxide	8014-95-7		1,000	454
Sulfur monochloride	12771-08-3		1,000	454
Sulfur monochloride	10025-67-9		1,000	454
Sulfur phosphide	1314-80-3	U189	100	45.4
2,4,5-T acid	93-76-5		1,000	454
2,4,5-T amines	1319-72-8		5,000	2,270
2,4,5-T amines	2008-46-0		5,000	2,270
2,4,5-T amines	3813-14-7		5,000	2,270
2,4,5-T amines	6369-96-6		5,000	2,270
2,4,5-T amines	6369-97-7		5,000	2,270
2,4,5-T esters	93-79-8		1,000	454
2,4,5-T esters	1928-47-8		1,000	454
2,4,5-T esters	2545-59-7		1,000	454
2,4,5-T esters	25168-15-4		1,000	454
2,4,5-T esters	61792-07-2		1,000	454
2,4,5-T salts	13560-99-1		1,000	454
TEPP	107-49-3	P111	10	4.5
1,2,4,5-Tetrachlorobenzene	95-94-3	U207	5,000	2,270
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	1746-01-6		1	0.454
1,1,2,2-Tetrachloroethane	79-34-5	U209	100	45.4
1,1,1,2-Tetrachloroethane	630-20-6	U208	100	45.4
Tetrachloroethylene	127-18-4	U210	100	45.4
2,3,4,6-Tetrachlorophenol	58-90-2		10	4.5
Tetraethyldithiopyrophosphate	3689-24-5	P109	100	45.4
Tetraethyl lead	78-00-2	P110	10	4.5
Tetraethyl pyrophosphate	107-49-3	P111	10	4.5
Tetranitromethane	509-14-8	P112	10	4.5
Thallic oxide	1314-32-5	P113	100	45.4
Thallium ^b	7440-28-0		1,000	454
Thallium(I) acetate	563-68-8	U214	100	45.4
Thallium(I) carbonate	6533-73-9	U215	100	45.4
Thallium chloride TlCl	7791-12-0	U216	100	45.4
Thallium Compounds			&	&
Thallium(I) nitrate	10102-45-1	U217	100	45.4
Thallium(I) sulfate	7446-18-6	P115	100	45.4
Thallium sulfate	10031-59-1		100	45.4
Thallos carbonate	6533-73-9	U215	100	45.4
Thallos chloride	7791-12-0	U216	100	45.4
Thallos sulfate	7446-18-6	P115	100	45.4
Thioacetamide	62-55-5	U218	10	4.5
Thiodicarb	59669-26-0	U410	100	45.4
Thiofanox	39196-18-4	P045	100	45.4
Thiomethanol	74-93-1	U153	100	45.4

Table 16.2. List of Hazardous Wastes and Hazardous Substances, Continued

HAZARDOUS WASTES AND HAZARDOUS SUBSTANCES	CAS NO.	HW NO.	REPORTABLE QUANTITY (RQ)	
			(Pounds)	(kg)
Thionazin	297-97-2	P040	100	45.4
Thiophanate-methyl	23564-05-8	U409	10	4.5
Thiophenol	108-98-5	P014	100	45.4
Thiosemicarbazide	79-19-6	P116	100	45.4
Thiourea	62-56-6	U219	10	4.5
Thiourea, (2-chlorophenyl)-	5344-82-1	P026	100	45.4
Thiourea, 1-naphthalenyl-	86-88-4	P072	100	45.4
Thiram	137-26-8	U244	10	4.5
Titanium chloride (TiCl ₄) (T-4)-	7550-45-0		1,000	454
Titanium tetrachloride	7550-45-0		1,000	454
o-Tolidine	119-93-7	U095	10	4.5
Toluene	108-88-3	U220	1,000	454
Toluenediamine	25376-45-8	U221	10	4.5
Toluene-2,4-diisocyanate	584-84-9		100	45.4
Toluene-2,6-diisocyanate	91-08-7		100	45.4
Toluenediisocyanate (mixed isomers)	26471-62-5	U223	100	45.4
Toluene diisocyanate (unspecified isomer)	26471-62-5	U223	100	45.4
o-Toluidine	95-53-4	U328	100	45.4
p-Toluidine	106-49-0	U353	100	45.4
o-Toluidine hydrochloride	636-21-5	U222	100	45.4
Toxaphene	8001-35-2	P123	1	0.454
2,4,5-TP esters	32534-95-5		100	45.4
Triallate	2303-17-5	U389	100	45.4
Tribromomethane	75-25-2	U225	100	45.4
Trichlorfon	52-68-6		100	45.4
1,2,4-Trichlorobenzene	120-82-1		100	45.4
1,1,1-Trichloroethane	71-55-6	U226	1,000	454
1,1,2-Trichloroethane	79-00-5	U227	100	45.4
Trichloroethylene	79-01-6	U228	100	45.4
Trichlorofluoromethane	75-69-4	U121	5,000	2,270
Trichloromethanesulfonyl chloride	594-42-3		100	45.4
Trichloromonofluoromethane	75-69-4	U121	5,000	2,270
Trichlorophenol	25167-82-2		10	4.5
2,3,4-Trichlorophenol	15950-66-0		10	4.5
2,3,5-Trichlorophenol	933-78-8		10	4.5
2,3,6-Trichlorophenol	933-75-5		10	4.5
2,4,5-Trichlorophenol	95-95-4		10	4.5
2,4,6-Trichlorophenol	88-06-2		10	4.5
3,4,5-Trichlorophenol	609-19-8		10	4.5
Triethanolamine dodecylbenzene sulfonate	27323-41-7		1,000	454
Triethylamine	121-44-8	U404	5,000	2,270
Trifluralin	1582-09-8		10	4.5
Trimethylamine	75-50-3		100	45.4
2,2,4-Trimethylpentane	540-84-1		1,000	454
1,3,5-Trinitrobenzene	99-35-4	U234	10	4.5
Tris(2,3-dibromopropyl) phosphate	126-72-7	U235	10	4.5
Trypan blue	72-57-1	U236	10	4.5
Uracil mustard	66-75-1	U237	10	4.5
Uranyl acetate	541-09-3		100	45.4

Table 16.2. List of Hazardous Wastes and Hazardous Substances, Continued

HAZARDOUS WASTES AND HAZARDOUS SUBSTANCES	CAS NO.	HW NO.	REPORTABLE QUANTITY (RQ)	
			(Pounds)	(kg)
Uranyl nitrate	10102-06-4		100	45.4
Uranyl nitrate	36478-76-9		100	45.4
Urethane	51-79-6	U238	100	45.4
Vanadium pentoxide	1314-62-1	P120	1,000	454
Vanadyl sulfate	27774-13-6		1,000	454
Vinyl acetate	108-05-4		5,000	2,270
Vinyl acetate monomer	108-05-4		5,000	2,270
Vinyl bromide	593-60-2		100	45.4
Vinyl chloride	75-01-4	U043	1	0.454
Vinylidene chloride	75-35-4	U078	100	45.4
Warfarin	81-81-2	P001	100	45.4
Warfarin and salts, concentration > 0.3%	81-81-2	P001	100	45.4
Warfarin sodium	129-06-6		100	45.4
m-Xylene	108-38-3	U239	1,000	454
o-Xylene	95-47-6	U239	1,000	454
p-Xylene	106-42-3	U239	100	45.4
Xylene (mixed isomers)	1330-20-7	U239	100	45.4
Xylenol	1300-71-6		1,000	454
Zinc (fume or dust)	7440-66-6		1,000	454
Zinc ^b	7440-66-6		1,000	454
Zinc acetate	557-34-6		1,000	454
Zinc ammonium chloride	14639-97-5		1,000	454
Zinc ammonium chloride	14639-98-6		1,000	454
Zinc ammonium chloride	52628-25-8		1,000	454
Zinc borate	1332-07-6		1,000	454
Zinc bromide	7699-45-8		1,000	454
Zinc carbonate	3486-35-9		1,000	454
Zinc chloride	7646-85-7		1,000	454
Zinc Compounds			&	&
Zinc cyanide	557-21-1	P121	10	4.5
Zinc fluoride	7783-49-5		1,000	454
Zinc formate	557-41-5		1,000	454
Zinc hydrosulfite	7779-86-4		1,000	454
Zinc nitrate	7779-88-6		1,000	454
Zinc phenolsulfonate	127-82-2		5,000	2,270
Zinc phosphide	1314-84-7	P122	100	45.4
Zinc phosphide (concentration ≤ 10%)	1314-84-7	U249	100	45.4
Zinc phosphide (concentration > 10%)	1314-84-7	P122	100	45.4
Zinc silicofluoride	16871-71-9		5,000	2,270
Zinc sulfate	7733-02-0		1,000	454
Ziram	137-30-4	P205	10	4.5
Zirconium nitrate	13746-89-9		5,000	2,270
Zirconium potassium fluoride	16923-95-8		1,000	454
Zirconium sulfate	14644-61-2		5,000	2,270
Zirconium tetrachloride	10026-11-6		5,000	2,270
UNLISTED CHARACTERISTIC HAZARDOUS WASTES				
Unlisted hazardous wastes characteristic of ignitability		D001	100	45.4
Unlisted hazardous wastes characteristic of corrosivity		D002	100	45.4
Unlisted hazardous wastes characteristic of reactivity		D003	100	45.4

Table 16.2. List of Hazardous Wastes and Hazardous Substances, Continued

HAZARDOUS WASTES AND HAZARDOUS SUBSTANCES	CAS NO.	HW NO.	REPORTABLE QUANTITY (RQ)	
			(Pounds)	(kg)
UNLISTED HAZARDOUS WASTES CHARACTERISTIC OF TOXICITY				
Arsenic		D004	1	0.454
Barium		D005	1,000	454
Cadmium		D006	10	4.54
Chromium		D007	10	4.54
Lead		D008	10	4.54
Mercury		D009	1	0.454
Selenium		D010	10	4.54
Silver		D011	1	0.454
Endrin		D012	1	0.454
Lindane		D013	1	0.454
Methoxychlor		D014	1	0.454
Toxaphene		D015	1	0.454
2,4-D		D016	100	45.4
2,4,5-TP		D017	100	45.4
Benzene		D018	10	4.54
Carbon tetrachloride		D019	10	4.54
Chlordane		D020	1	0.454
Chlorobenzene		D021	100	45.4
Chloroform		D022	10	4.54
o-Cresol		D023	100	45.4
m-Cresol		D024	100	45.4
p-Cresol		D025	100	45.4
Cresol		D026	100	45.4
1,4-Dichlorobenzene		D027	100	45.4
1,2-Dichloroethane		D028	100	45.4
1,1-Dichloroethylene		D029	100	45.4
2,4-Dinitrotoluene		D030	10	4.54
Heptachlor (and epoxide)		D031	1	0.454
Hexachlorobenzene		D032	10	4.54
Hexachlorobutadiene		D033	1	0.454
Hexachloroethane		D034	100	45.4
Methyl ethyl ketone		D035	5,000	2270
Nitrobenzene		D036	1,000	454
Pentachlorophenol		D037	10	4.54
Pyridine		D038	1,000	454
Tetrachloroethylene		D039	100	45.4
Trichloroethylene		D040	100	45.4
2,4,5-Trichlorophenol		D041	10	4.54
2,4,6-Trichlorophenol		D042	10	4.54
Vinyl chloride		D043	1	0.454
NONSPECIFIC SOURCE HAZARDOUS WASTES ^c				
Spent halogenated solvents used in degreasing:		F001	10	4.54
(a) Tetrachloroethylene	127184	U210	100	45.4
(b) Trichloroethylene	79016	U228	100	45.4
(c) Methylene chloride	75092	U080	1,000	454
(d) 1,1,1-Trichloroethane	71556	U226	1,000	454
(e) Carbon tetrachloride	56235	U211	10	4.54
(f) Chlorinated fluorocarbons			5,000	2270

Table 16.2. List of Hazardous Wastes and Hazardous Substances, Continued

HAZARDOUS WASTES AND HAZARDOUS SUBSTANCES	CAS NO.	HW NO.	REPORTABLE QUANTITY (RQ)	
			(Pounds)	(kg)
Spent halogenated solvents:		F002	10	4.54
(a) Tetrachloroethylene	127184	U210	100	45.4
(b) Methylene chloride	75092	U080	1,000	454
(c) Trichloroethylene	79016	U228	100	45.4
(d) 1,1,1-Trichloroethane	71556	U226	1,000	454
(e) Chlorobenzene	108907	U037	100	45.4
(f) 1,1,2-Trichloro-1,2,2-trifluoroethane	76131		5,000	2270
(g) o-Dichlorobenzene	95501	U070	100	45.4
(h) Trichlorofluoromethane	75694	U121	5,000	2270
(i) 1,1,2-Trichloroethane	79005	U227	100	45.4
Spent non-halogenated solvents and still bottoms from recovery:		F003	100	45.4
(a) Xylene	1330207	U239	1,000	454
(b) Acetone	67641	U002	5,000	2270
(c) Ethyl acetate	141786	U112	5,000	2270
(d) Ethylbenzene	100414		1,000	454
(e) Ethyl ether	60297	U117	100	45.4
(f) Methyl isobutyl ketone	108101	U161	5,000	2270
(g) n-Butyl alcohol	71363	U031	5,000	2270
(h) Cyclohexanone	108941	U031	5,000	2270
(i) Methanol	67561	U154	5,000	2270
Spent non-halogenated solvents and still bottoms from recovery:		F004	100	45.4
(a) Cresols/cresylic acid	1319773	U052	100	45.4
(b) Nitrobenzene	98953	U169	1,000	454
Spent non-halogenated solvents and still bottoms from recovery:		F005	100	45.4
(a) Toluene	108883	U220	1,000	454
(b) Methyl ethyl ketone	78933	U159	5,000	2270
(c) Carbon disulfide	75150	P022	100	45.4
(d) Isobutanol	78831	U140	5,000	2270
(e) Pyridine	110861	U196	1,000	454
Wastewater treatment sludges from electroplating operations (with some exceptions)		F006	10	4.54
Spent cyanide plating bath solutions from electroplating		F007	10	4.54
Plating bath residues from electroplating where cyanides are used		F008	10	4.54
Spent stripping/cleaning bath solutions from electroplating where cyanides are used		F009	10	4.54
Quenching bath residues from metal heat treating where cyanides are used		F010	10	4.54
Spent cyanide solution from salt bath pot cleaning from metal heat treating		F011	10	4.54
Quenching wastewater sludges from metal heat treating where cyanides are used		F012	10	4.54
Wastewater treatment sludges from chemical conversion aluminum coating		F019	10	4.54
Wastes from production or use of tri/tetrachlorophenol or derivative intermediates		F020	1	0.454

Table 16.2. List of Hazardous Wastes and Hazardous Substances, Continued

HAZARDOUS WASTES AND HAZARDOUS SUBSTANCES	CAS NO.	HW NO.	REPORTABLE QUANTITY (RQ)	
			(Pounds)	(kg)
Wastes from production or use of pentachlorophenol or intermediates for derivatives		F021	1	0.454
Wastes from use of tetra/penta/hexachlorobenzenes under alkaline conditions		F022	1	0.454
Wastes from material production on equipment previously used for tri/tetrachlorophenol		F023	1	0.454
Wastes from production of chlorinated aliphatic hydrocarbons (C1-C5)		F024	1	0.454
Lights ends, filters from production of chlorinated aliphatic hydrocarbons (C1-C5)		F025	1	0.454
Waste from equipment previously used to production tetra/penta/hexachlorobenzenes		F026	1	0.454
Discarded formulations containing tri/tetra/pentachlorophenols or derivatives		F027	1	0.454
Residues from incineration of soil contaminated with F020, F021, F022, F023, F026, F027		F028	1	0.454
Wastewaters, process residuals from wood preserving using chlorophenolic solutions.		F032	1	0.454
Wastewaters, process residuals from wood preserving using creosote formulations		F034	1	0.454
Wastewaters, process residuals from wood preserving using arsenic or chromium		F035	1	0.454
Petroleum refinery primary oil/water/solids separation sludge		F037	1	0.454
Petroleum refinery secondary (emulsified) oil/water/solids separation sludge		F038	1	0.454
Multisource leachate		F039	1	0.454
SOURCE-SPECIFIC HAZARDOUS WASTES				
Wastewater treatment sludge from creosote/pentachlorophenol wood preserving		K001	1	0.454
Wastewater treatment sludge from production of chrome yellow and orange pigments		K002	10	4.54
Wastewater treatment sludge from production of molybdate orange pigments		K003	10	4.54
Wastewater treatment sludge from production of zinc yellow pigments		K004	10	4.54
Wastewater treatment sludge from production of chrome green pigments		K005	10	4.54
Wastewater treatment sludge from production of chrome oxide green pigments		K006	10	4.54
Wastewater treatment sludge from production of iron blue pigments		K007	10	4.54
Oven residue from production of chrome oxide green pigments		K008	10	4.54
Distillation bottoms from production of acetaldehyde from ethylene		K009	10	4.54
Distillation side cuts from production of acetaldehyde from ethylene		K010	10	4.54

Table 16.2. List of Hazardous Wastes and Hazardous Substances, Continued

HAZARDOUS WASTES AND HAZARDOUS SUBSTANCES	CAS NO.	HW NO.	REPORTABLE QUANTITY (RQ)	
			(Pounds)	(kg)
Bottom stream from wastewater stripper in acrylonitrile production		K011	10	4.54
Bottom stream from acetonitrile column in acrylonitrile production		K013	10	4.54
Bottoms from acetonitrile purification column in acrylonitrile production		K014	5,000	2270
Still bottoms from the distillation of benzyl chloride		K015	10	4.54
Heavy ends or distillation residues from production of carbon tetrachloride		K016	1	0.454
Heavy ends from the purification column in epichlorohydrin production		K017	10	4.54
Heavy ends from the fractionation column in ethyl chloride production		K018	1	0.454
Heavy ends from the distillation of ethylene dichloride during its production		K019	1	0.454
Heavy ends from the distillation of vinyl chloride during production of the monomer		K020	1	0.454
Aqueous spent antimony catalyst waste from fluoromethanes production		K021	10	4.54
Distillation bottom tars from production of phenol/acetone from cumene		K022	1	0.454
Distillation light ends from production of phthalic anhydride from naphthalene		K023	5,000	2270
Distillation bottoms from production of phthalic anhydride from naphthalene		K024	5,000	2270
Distillation bottoms from production of nitrobenzene by nitration of benzene		K025	10	4.54
Stripping still tails from the production of methyl ethyl pyridines		K026	1,000	454
Centrifuge/distillation residues from toluene diisocyanate production		K027	10	4.54
Spent catalyst from hydrochlorinator reactor in production of 1,1,1-trichloroethane		K028	1	0.454
Waste from product steam stripper in production of 1,1,1-trichloroethane		K029	1	0.454
Column bottoms/heavy ends from production of trichloroethylene and perchloroethylene		K030	1	0.454
By-product salts generated in the production of monosodium methanearsonate and cacodylic acid		K031	1	0.454
Wastewater treatment sludge from the production of chlordane		K032	10	4.54
Wastewater/scrubwater from chlorination of cyclopentadiene in chlordane production		K033	10	4.54
Filter solids from filtration of hexachlorocyclopentadiene in chlordane production		K034	10	4.54
Wastewater treatment sludges from the production of creosote		K035	1	0.454

Table 16.2. List of Hazardous Wastes and Hazardous Substances, Continued

HAZARDOUS WASTES AND HAZARDOUS SUBSTANCES	CAS NO.	HW NO.	REPORTABLE QUANTITY (RQ)	
			(Pounds)	(kg)
Still bottoms from toluene reclamation distillation in disulfoton production		K036	1	0.454
Wastewater treatment sludges from the production of disulfoton		K037	1	0.454
Wastewater from the washing and stripping of phorate production		K038	10	4.54
Filter cake from filtration of diethylphosphorodithioic acid in phorate production		K039	10	4.54
Wastewater treatment sludge from the production of phorate		K040	10	4.54
Wastewater treatment sludge from the production of toxaphene		K041	1	0.454
Heavy ends/residues from distillation of tetrachlorobenzene in 2,4,5-T production		K042	10	4.54
2,6-Dichlorophenol waste from the production of 2,4-D		K043	10	4.54
Wastewater treatment sludge from manufacturing and processing of explosives		K044	10	4.54
Spent carbon from treatment of wastewater containing explosives		K045	10	4.54
Wastewater sludge from manufacturing, formulating, loading of lead-based initiating compound		K046	10	4.54
Pink/red water from trinitrotoluene operations		K047	10	4.54
Dissolved air flotation float from the petroleum refining industry		K048	10	4.54
Slop oil emulsion solids from the petroleum refining industry		K049	10	4.54
Heat exchanger bundle cleaning sludge from petroleum refining industry		K050	10	4.54
API separator sludge from the petroleum refining industry		K051	10	4.54
Tank bottoms (leaded) from the petroleum refining industry		K052	10	4.54
Ammonia still lime sludge from coking operations		K060	1	0.454
Emission control dust/sludge from primary production of steel in electric furnaces		K061	10	4.54
Spent pickle liquor generated by steel finishing (SIC codes 331 and 332)		K062	10	4.54
Acid plant blowdown slurry/sludge from blowdown slurry from primary copper production		K064	10	4.54
Surface impoundment solids at primary lead smelting facilities		K065	10	4.54
Sludge from treatment of wastewater/acid plant blowdown from primary zinc production		K066	10	4.54
Emission control dust/sludge from secondary lead smelting		K069	10	4.54
Brine purification muds from mercury cell process in chlorine production		K071	1	0.454
Chlorinated hydrocarbon waste from diaphragm cell process in chlorine production		K073	10	4.54

Table 16.2. List of Hazardous Wastes and Hazardous Substances, Continued

HAZARDOUS WASTES AND HAZARDOUS SUBSTANCES	CAS NO.	HW NO.	REPORTABLE QUANTITY (RQ)	
			(Pounds)	(kg)
Distillation bottoms from aniline extraction		K083	100	45.4
Wastewater sludges from production of veterinary pharmaceuticals from arsenic compounds		K084	1	0.454
Distillation or fractionation column bottoms in production of chlorobenzenes		K085	10	4.54
Wastes/sludges from production of inks from chromium and lead-containing substances		K086	10	4.54
Decanter tank tar sludge from coking operations		K087	100	45.4
Spent potliners from primary aluminum reduction		K088	10	4.54
Emission control dust/sludge from ferrochromiumsilicon production		K090	10	4.54
Emission control dust/sludge from ferrochromium production		K091	10	4.54
Distillation light ends from production of phthalic anhydride by ortho-xylene		K093	5,000	2270
Distillation bottoms in production of phthalic anhydride by ortho-xylene		K094	5,000	2270
Distillation bottoms in production of 1,1,1-trichloroethane		K095	100	45.4
Heavy ends from distillation column in production of 1,1,1-trichloroethane		K096	100	45.4
Vacuum stripper discharge from the chlordane chlorinator in production of chlordane		K097	1	0.454
Untreated process wastewater from the production of toxaphene		K098	1	0.454
Untreated wastewater from the production of 2,4-D		K099	10	4.54
Waste leaching solution from emission control dust/sludge in secondary lead smelting		K100	10	4.54
Distillation tar residue from aniline in production of veterinary pharmaceuticals from arsenic compd.		K101	1	0.454
Residue from activated carbon in production of veterinary pharmaceuticals from arsenic compounds		K102	1	0.454
Process residues from aniline extraction from the production of aniline		K103	100	45.4
Combined wastewater streams generated from production of nitrobenzene/aniline		K104	10	4.54
Aqueous stream from washing in production of chlorobenzenes		K105	10	4.54
Wastewater treatment sludge from mercury cell process in chlorine production		K106	1	0.454
Column bottoms from separation in production of 1,1-dimethylhydrazine (UDMH) from carboxylic acid hydrazides		K107	10	4.54
Condensed column overheads and vent gas from production of UDMH from -COOH hydrazides		K108	10	4.54
Spent filter cartridges from purification of UDMH production from carboxylic acid hydrazides		K109	10	4.54
Condensed column overheads from separation in UDMH production from -COOH hydrazides		K110	10	4.54

Table 16.2. List of Hazardous Wastes and Hazardous Substances, Continued

HAZARDOUS WASTES AND HAZARDOUS SUBSTANCES	CAS NO.	HW NO.	REPORTABLE QUANTITY (RQ)	
			(Pounds)	(kg)
Product washwaters from production of dinitrotoluene via nitration of toluene		K111	10	4.54
Reaction by-product water from drying in toluenediamine production from dinitrotoluene		K112	10	4.54
Condensed liquid light ends from purification of toluenediamine during its production		K113	10	4.54
Vicinals from purification of toluenediamine during its production from dinitrotoluene		K114	10	4.54
Heavy ends from toluenediamine purification during production from dinitrotoluene		K115	10	4.54
Organic condensate from solvent recovery system in production of toluene diisocyanate		K116	10	4.54
Wastewater from vent gas scrubber in ethylene bromide production by ethene bromination		K117	1	0.454
Spent absorbent solids in purification of ethylene dibromide in its production		K118	1	0.454
Process wastewater from the production of ethylenebisdithiocarbamic acid and salts		K123	10	4.54
Reactor vent scrubber water from production of ethylenebisdithiocarbamic acid and salts		K124	10	4.54
Filtration/other solids from production of ethylenebisdithiocarbamic acid and salts		K125	10	4.54
Dust/sweepings from the production of ethylenebisdithiocarbamic acid and salts		K126	10	4.54
Wastewater and spent sulfuric acid from the production of methyl bromide		K131	100	45.4
Spent absorbent and wastewater solids from the production of methyl bromide		K132	1,000	454
Still bottoms from ethylene dibromide purification in production by ethene bromination		K136	1	0.454
Process residues from coal tar recovery in coking		K141	1	0.454
Tar storage tank residues from coke production from coal or recovery of coke by-prods.		K142	1	0.454
Process residues from recovery of light oil in coking		K143	1	0.454
Wastewater residues from light oil refining in coking		K144	1	0.454
Residues from naphthalene collection and recovery from coke by-products		K145	1	0.454
Tar storage tank residues from coal tar refining in coking		K147	1	0.454
Residues from coal tar distillation, including still bottoms, in coking		K148	1	0.454
Distillation bottoms from the production of chlorinated toluenes/benzoyl chlorides		K149	10	4.54
Organic residuals from chlorine gas and hydrogen chloride recovery from chlorinated toluene production		K150	10	4.54
Wastewater treatment sludge from production of chlorotoluenes/benzoyl chlorides		K151	10	4.54
Organic waste from production of carbamates and carbamoyl oximes		K156	10	4.54

Table 16.2. List of Hazardous Wastes and Hazardous Substances, Continued

HAZARDOUS WASTES AND HAZARDOUS SUBSTANCES	CAS NO.	HW NO.	REPORTABLE QUANTITY (RQ)	
			(Pounds)	(kg)
Wastewaters from production of carbamates and carbamoyl oximes (not sludges)		K157	10	4.54
Bag house dusts & filter/separation solids from prod of carbamates, carb oximes		K158	10	4.54
Organics from treatment of thiocarbamate waste		K159	10	4.54
Purified solids/bag house dust/sweepings from prod of dithiocarbamate acids/salts		K161	1	0.454
Crude oil storage tank sediment from refining operations		K169	10	4.54
Clarified slurry oil tank sediment of in-line filter/separation solids		K170	1	0.454
Spent hydrotreating catalyst		K171	1	0.454
Spent hydrorefining catalyst		K172	1	0.454
Wastewater treatment sludges from the production of ethylene dichloride or vinyl chloride monomer, (including sludges that result from commingled ethylene dichloride or vinyl chloride monomer wastewater and other wastewater), unless the sludges meet certain disposal conditions. See Section 261.32 of Title 40, CFR		K174	1	0.454
Wastewater treatment sludges from the production vinyl chloride monomer using mercuric chloride catalyst in an acetylene-based process. See Section 261.32 of Title 40, CFR		K175	1	0.454
Baghouse filters from the production of antimony oxide, including filters from the production of intermediates (e.g., antimony metal or crude antimony oxide)		K176	1	0.454
Slag from the production of antimony oxide that is speculatively accumulated or disposed, including slag from the production of intermediates (e.g., antimony metal or crude antimony oxide)		K177	5,000	2270
Non-wastewaters generated from the production of certain dyes, pigments, and Food, Drug & Cosmetics colorants, exceeding constituent mass loading levels, subject to disposal exceptions in Section 261.32 of Title 40, CFR		K181	1	0.454
& = Indicates that no RQ is assigned to this generic or broad class, although the class is a hazardous substance. @ = Releases in amounts less than 453.5 kg [1,000 pounds] per 24 hours of nitrogen oxide or nitrogen dioxide to the air that are the result of combustion and combustion related activities are exempt from the notification requirements. ^a RQ (See Chapter 13, “Spill Prevention and Response”) ^b For metals, no reporting of releases of the solid form is required if the mean diameter of the pieces of the solid metal released is greater than 100 micrometers [0.004 inches]. The RQs shown apply to smaller particles. ^c Detailed descriptions of nonspecific source hazardous wastes are contained in Table 16.3.				

Table 16.3. Listed Hazardous Wastes from Nonspecific Sources

HW NO.	HAZARDOUS WASTES	HAZARD CODE ^a
F001	The following spent halogenated solvents used in degreasing: Tetrachloroethylene, trichloroethylene, methylene chloride, 1,1,1-trichloroethane, carbon tetrachloride, and chlorinated fluorocarbons; all spent solvent mixtures/blends used in degreasing containing, before use, a total of 10% or more (by volume) of one or more of the above halogenated solvents or those solvents listed in F002, F004, and F005; and still bottoms from the recovery of these spent solvents and spent solvent mixtures.	(T)
F002	The following spent halogenated solvents: tetrachloroethylene, methylene chloride, trichloroethylene, 1,1,1-trichloroethane, chlorobenzene, 1,1,2-trichloro-1,2,2-trifluoroethane, ortho-dichlorobenzene, trichlorofluoromethane, and 1,1,2-trichloroethane; all spent solvent mixtures/blends containing, before use, a total of 10% or more (by volume) of one or more of the above halogenated solvents or those listed in F001, F004, or F005; and still bottoms from the recovery of these spent solvents and spent solvent mixtures.	(T)
F004	The following spent non-halogenated solvents: cresols and cresylic acid, and nitrobenzene; all spent solvent mixtures/blends containing, before use, a total of 10% or more (by volume) of one or more of the above non-halogenated solvents or those solvents listed in F001, F002, and F005; and still bottoms from the recovery of these spent solvents and spent solvent mixtures.	(T)
F005	The following spent non-halogenated solvents: toluene, methyl ethyl ketone, carbon disulfide, isobutanol, pyridine, benzene, 2-ethoxyethanol, and 2-nitropropane; all spent solvent mixtures/blends containing, before use, a total of 10% or more (by volume) of one or more of the above non-halogenated solvents or those solvents listed in F001, F002, or F004; and still bottoms from the recovery of these spent solvents and spent solvent mixtures.	(I,T)
F006	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.	(T)
F007	Spent cyanide plating bath solutions from electroplating operations.	(R,T)
F008	Plating bath residues from the bottom of plating baths from electroplating operations where cyanides are used in the process.	(R,T)
F009	Spent stripping and cleaning bath solutions from electroplating operations where cyanides are used in the process.	(R,T)
F010	Quenching bath residues from oil baths from metal heat treating operations where cyanides are used in the process.	(R,T)
F011	Spent cyanide solutions from salt bath pot cleaning from metal heat treating operations.	(R,T)
F012	Quenching wastewater treatment sludges from metal heat treating operations where cyanides are used in the process.	(T)
F019	Wastewater treatment sludges from the chemical conversion coating of aluminum, except from zirconium phosphating in aluminum can washing when such phosphating is an exclusion conversion coating process.	(T)
F020	Wastes (except wastewater and spent carbon from hydrogen chloride purification) from the production or manufacturing use (as a reactant, chemical intermediate, or component in a formulating process) of tri- or tetrachlorophenol, or of intermediates used to produce their pesticide derivatives (this listing does not include wastes from the production of hexachlorophene from highly purified 2,4,5- trichlorophenol).	(H)
F021	Wastes (except wastewater and spent carbon from hydrogen chloride purification) from the production or manufacturing use (as a reactant, chemical intermediate, or component in a formulating process) of pentachlorophenol, or of intermediates used to produce its derivatives.	(H)
F022	Wastes (except wastewater and spent carbon from hydrogen chloride purification) from the manufacturing use (as a reactant, chemical intermediate, or component in a formulating process) of tetra-, penta-, or hexachlorobenzenes under alkaline conditions.	(H)

HW NO.	HAZARDOUS WASTES	HAZARD CODE ^a
F023	Wastes (except wastewater and spent carbon from hydrogen chloride purification) from the production of materials on equipment previously used for the production or manufacturing use (as a reactant, chemical intermediate, or component in a formulating process) of tri- and tetrachlorophenols (this listing does not include wastes from equipment used only for the production or use of hexachlorophene from highly purified 2,4,5- trichlorophenol).	(H)
F025	Condensed light ends, spent filters and filter aids, and spent desiccant wastes from the production of certain chlorinated aliphatic hydrocarbons by free radical catalyzed processes. These chlorinated aliphatic hydrocarbons are those having carbon chain lengths ranging from one to five, with varying amounts and positions of chlorine substitution.	(T)
F026	Wastes (except wastewater and spent carbon from hydrogen chloride purification) from the production of materials on equipment previously used for the manufacturing use (as a reactant, chemical intermediate, or component in a formulating process) of tetra-, penta-, or hexachlorobenzene under alkaline conditions.	(H)
F027	Discarded unused formulations containing tri-, tetra-, or pentachlorophenol or discarded unused formulations containing compounds derived from these chlorophenols (this listing does not include formulations containing hexachlorophene synthesized from prepurified 2,4,5-trichlorophenol as the sole component).	(H)
F028	Residues resulting from the incineration or thermal treatment of soil contaminated with HW No.'s F020, F021, F022, F023, F026, and F027.	(T)
F032	Wastewater (except that which has not come into contact with process contaminants), process residuals, preservative drippage, and spent formulations from wood preserving processes generated at plants that currently use or have previously used chlorophenolic formulations (except potentially cross- contaminated wastes that are otherwise currently regulated as hazardous wastes (i.e., F034 or F035), and where the generator has cleaned or replaced all process equipment that may have come into contact with chlorophenolic formulations or constituents thereof, and does not resume or initiate use of chlorophenolic formulations). This listing does not include K001 bottom sediment sludge from the treatment of wastewater from wood preserving processes that use creosote or pentachlorophenol.	(T)
F034	Wastewaters (except those that have not come into contact with process contaminants), process residuals, preservative drippage, and spent formulations from wood preserving processes generated at plants that use creosote formulations. This listing does not include K001 bottom sediment sludge from the treatment of wastewater from wood preserving processes that use creosote and/or pentachlorophenol.	(T)
F035	Wastewater (except those that have not come into contact with process contaminants), process residuals, preservative drippage, and spent formulations from wood preserving processes generated at plants that use inorganic preservatives containing arsenic or chromium. This listing does not include K001 bottom sediment sludge from the treatment of wastewater from wood preserving processes that use creosote or pentachlorophenol.	(T)
F037	Petroleum refinery primary oil/water/solids separation sludge: Any sludge generated from the gravitational separation of oil/water/solids during the storage or treatment of process wastewater and oily cooling wastewater from petroleum refineries. Such sludges include, but are not limited to, those generated in: oil/water/solids separators; tanks and impoundments; ditches and other conveyances; sumps; and stormwater units receiving dry weather flow. Sludge generated in stormwater units that do not receive dry weather flow, sludges generated from non-contact once-through cooling water segregated for treatment from other process or oily cooling water, sludges generated in activated sludge, trickling filter, rotating biological contactor, or high-rate aeration biological treatment units (including sludges generated in one or more additional units after wastewater has been treated in aggressive biological treatment units) and K051 wastes are not included in this listing.	(T)
F039	Leachate (liquids that have percolated through land disposed wastes) resulting from the disposal of more than one restricted waste listed in Tables 3 or 5 (leachate resulting from the disposal of one or more of the following hazardous wastes and no other hazardous wastes retains its HW No.'s: F020, F021, F022, F026, F027, and/or F028).	(T)

HW NO.	HAZARDOUS WASTES	HAZARD CODE ^a
^a Hazard Codes: Ignitable Waste (I), Corrosive Waste (C), Reactive Waste (R), Toxicity Characteristic Waste (E), Acute Hazardous waste (H), Toxic Waste (T). (I,T) should be used to specify mixtures containing ignitable and toxic constituents.		

Table 16.4. Maximum Concentration of Contaminants for Non-Wastewater

HW NO.	CONTAMINANT	CAS NO.	REGULATORY LEVEL (MG/L)
D018	Benzene	71-43-2	0.5
D019	Carbon tetrachloride	56-23-5	0.5
D020	Chlordane	57-74-9	0.03
D021	Chlorobenzene	108-90-7	100.0
D022	Chloroform	67-66-3	6.0
D023	o-Cresol	95-48-7	200.0 ^a
D024	m-Cresol	108-39-4	200.0 ^a
D025	p-Cresol	106-44-5	200.0 ^a
D026	Cresol		200.0 ^a
D027	1,4-Dichlorobenzene	106-46-7	7.5
D028	1,2-Dichloroethane	107-06-2	0.5
D029	1,1-Dichloroethylene	75-35-4	0.7
D030	2,4-Dinitrotoluene	121-14-2	0.13
D031	Heptachlor (and its epoxide)	76-44-8	0.008
D032	Hexachlorobenzene	118-74-1	0.13
D033	Hexachlorobutadiene	87-68-3	0.5
D034	Hexachloroethane	67-72-1	3.0
D035	Methyl Ethyl Ketone	78-93-3	200.0
D036	Nitrobenzene	98-95-3	2.0
D037	Pentachlorophenol	87-86-5	100.0
D038	Pyridine	110-86-1	5.0 ^b
D039	Tetrachloroethylene	127-18-4	0.7
D040	Trichloroethylene	79-01-6	0.5
D041	2,4,5-Trichlorophenol	95-95-4	400.0
D042	2,4,6-Trichlorophenol	88-06-2	2.0
D043	Vinyl Chloride	75-01-4	0.2
a	If o-, m-, and p-Cresol concentrations cannot be differentiated, the total cresol (D026) concentration is used.		
b	Quantification limit is greater than the calculated regulatory level. The quantification limit, therefore, becomes the regulatory level.		
	L = liter		

Table 16.5. Sample Turkish Waste Transport Form (English Translation).

FORM-9 A		REPUBLIC OF TURKEY MINISTRY OF ENVIRONMENT & FORESTRY NATIONAL WASTE TRANSPORT FORM		Form Serial Number	
(A) copy is kept by the Disposer. The Disposer is obliged to send a copy of Form A to the Ministry. The Form shall be filled in accordance with the list given in the National Waste Transportation Guidebook.					
1) CONSIGNOR					
1) Title of Firm:			12) Waste Code ¹		
2) Name Surname of the Firm Owner (s):			13) Description of Waste ²		
Address of Firm:			14) Physical characteristics at 20 °C ⁴		
3) Name and Code of Town:			15) Color ⁵		
5) Neighborhood			16) Weight ⁶		
6) Street:			17) Type of Packages & Containers ⁷		
7) Number:			18) Number of Packages and Containers ⁸		
8) Tax Reg. No:			19) Dispatch Date of Waste:		
9) Telephone Number			20) Name Surname of Person in Charge		
10) Fax:			21) Signature of Person in Charge		
11) H Number ³					
2) CARRIER					
1) Title of Firm:			11) License No		
2) Name Surname of the Firm Owner (s):			12) Vehicle License Plate No:		
Address of Firm:			13) Shipping Method ⁹		
3) Name and Code of Town:			14) Delivery Date		
4) District:			15) Name Surname of Person in Charge		
5) Neighborhood			16) Signature of Person in Charge		
6) Street:					
7) Number					
8) Tax Reg. No:					
9) Telephone Number					
10) Fax:					
3) CONSIGNEE					
1) Title of Firm:			11) License No		
2) Name Surname of the Firm Owner (s):			12) Weight of Waste		
Address of Firm:			13) Waste Disposal Method/Recovery Method		
3) Name and Code of Town:			14) Transfer of Waste from an interim storage facility (Enter X in related box)		
4) District:			a) Waste not treated passed on to disposal/recovery facility		
5) Neighborhood			b) Waste treated then passed on to disposal/recovery facility (via production of other waste)		
6) Street:			c) Waste treated then passed on to disposal/recovery facility (without production of other waste)		
7) Number			d) Other (Specify)		
8) Tax ID Number of Firm:			In case question 14. is marked re: (a, b, c, d) procedures Interim Storage Facility is obliged to issue a new 9-A Form		
9) Telephone Number			15) Waste Acceptance Date		
10) Fax			16) Name and Signature of the Person in Charge:		

CHAPTER 17: MEDICAL WASTE

17.1. INTRODUCTION.

This chapter contains standards on the safe handling, storage, treatment, and disposal of medical waste generated by medical, dental, research and development, and veterinary facilities. Medical waste includes wastes generated in the diagnosis, treatment, or immunization of human beings or animals or in the production or testing of biologicals (i.e., medical products, such as a vaccine, made from biological sources) subject to certain exclusions. It also includes mixtures of medical waste and hazardous waste. Wastes that would otherwise be solid waste or radiological waste are not covered in this chapter. Standards for solid waste are provided in Chapter 15, “*Solid Waste*”. Standards for radiological wastes are covered in DoDI 4715.27.

17.2. TRAINING.

Installations must:

17.2.1. Ensure that all employees are adequately trained to perform their duties.

17.2.2. Train employees who come in direct contact with patients, or who generate, segregate, package, store, transport, treat, or dispose of infectious medical waste, in the safe handling and management of infectious medical waste.

17.2.3. Train employees who handle infectious medical waste on the risks posed by such waste materials, injuries and diseases that can be caused by them, and measures to be taken in case of an accident or injury.

17.3. GENERATION.

Installations must:

17.3.1. Separate infectious medical waste and infectious hazardous waste, if practical, from other solid waste at the point of origin. Segregated wastes shall be characterized and assigned a 6-digit waste code according to the European Union List of Wastes and disposed in accordance with Chapter 16, “*Hazardous Waste*”, Chapter 15, “*Solid Waste*”, or this chapter, as appropriate.

17.3.1.1. Handle mixtures of infectious medical waste and hazardous waste as infectious hazardous waste in accordance with Volume 4 of DoDM 4160.21.

17.3.1.1.1. These mixtures are the responsibility of the generating DoD Component, with priority given to the hazard that presents the greatest risk.

17.3.1.1.2. DLA Disposition Services has no responsibility for this type of hazardous waste until it is rendered noninfectious, as determined by the appropriate DoD medical authority.

17.3.1.2. Handle mixtures of other solid waste and infectious medical waste as infectious medical waste.

17.3.1.3. Radioactive medical waste will be segregated at the point of origin and managed in accordance with DoD Component guidance.

17.3.1.4. Segregate, at the point of origin, and manage mixtures of infectious medical waste and radioactive waste in accordance with DoD Component guidance.

17.3.2. Segregate from routine infectious medical waste any medical wastes from animal or human treatment containing a Category A infectious substance and manage in accordance with regulations of the Turkish and the International Air Transport Association.

17.3.3. Segregate, transport, and store infectious medical waste in red bags or receptacles that are a minimum of 3-mils [0.0762-millimeters] thick, or 4-mils [0.1016-millimeters] thick when double-layered, have durability, puncture resistance, and burst strength as to prevent rupture or leaks during ordinary use, and have a minimum lifting capacity of 10 kilograms. Liquid medical waste shall not be put into bags unless properly treated with suitable absorbents.

17.3.3.1. These bags shall be filled until they are 75% full at the most. The contents shall not be compressed, removed, discharged, or transferred to another container. A second bag or container shall be used to contain the infectious wastes, when necessary. These bags shall never be recycled or reused.

17.3.3.2. Clearly mark all bags or receptacles used to segregate, transport, or store infectious medical waste with:

17.3.3.2.1. The universal biohazard symbol.

17.3.3.2.2. The word “*BIOHAZARD*” in English and “*BİYOTEHLİKE*” in Turkish.

17.3.3.2.3. The term “Attention! Medical Waste” in English and Turkish “*DİKKAT! TIBBİ ATIK*”.

17.3.3.2.4. Markings or a label that identify the generator, date of generation, and contents.

17.3.3.3. Medical waste bags shall be kept in a medical waste bin or bucket throughout the collection process. Medical waste bins or buckets must be made of orange plastic material, waterproof and leakproof, and resistant to tear, puncture, rupture, and bursting, and carry the emblem of International Biohazard in black and the words “*DİKKAT! TIBBİ ATIK*” (*ATTENTION! MEDICAL WASTE*) printed in black.

17.3.4. Segregate, transport, and store pathological waste in red plastic storage bins that are waterproof and leakproof and resistant to puncture, rupture, and bursting. Blood bags as well as

body parts and organs, including blood reserves, can be collected in medical waste bags according to 17.3.3. provided they have not been subject to any chemical processing.

17.3.4.1. These storage bins must not be opened, emptied, or recycled once they are full.

17.3.4.2. The red plastic storage bins must be clearly marked with:

17.3.4.2.1. The universal biohazard symbol.

17.3.4.2.2. The word “*BIOHAZARD*” in English and “*BİYOTEHLİKE*” in Turkish.

17.3.4.2.3. The term “ATTENTION! PATHOLOGICAL MEDICAL WASTE” in English and Turkish “DİKKAT! PATOLOJİK TIBBİ ATIK”.

17.3.4.2.4. Markings or a label that identify the generator, date of generation, and contents.

17.3.5. Segregate and store sharps in upright and stable heavy-duty puncture resistant plastic boxes or containers with tight- fitting, puncture-resistant, leak-resistant lids, that cannot be tampered with or opened. Discard sharps in rigid receptacles. Do not clip, cut, bend, or recap needles before disposal.

17.3.5.1. These storage boxes or containers shall be filled until they are 75% full at the most, tightly sealed, and placed in medical waste bags. The contents shall not be compressed, opened, emptied, or recycled once they are full.

17.3.5.2. Clearly mark all sharps containers with:

17.3.5.2.1. The universal biohazard symbol.

17.3.5.2.2. The word “*BIOHAZARD*” in English and “*BİYOTEHLİKE*” in Turkish.

17.3.5.2.3. The term “ATTENTION! MEDICAL SHARPS WASTE” in English and Turkish “DİKKAT! KESİCİ VE DELİCİ TIBBİ ATIK”.

17.3.5.2.4. Markings or a label that identify the generator, date of generation, and contents.

17.3.6. Ensure all receptacles can be closed and are kept closed, except when the container is actively being used.

17.4. HANDLING WITHIN THE FACILITY.

Installations must:

17.4.1. Ensure that medical waste bags are collected and transported, by trained personnel, in capped containers/boxes/buckets, allocated to this purpose only, that are made of stainless metal, plastic or similar materials, that do not have sharp edges that could damage or puncture the bags while they are loaded/unloaded, and that are easy to load, unload, clean, and disinfect.

17.4.1.1. These containers/boxes/buckets shall be orange and carry the emblem of International Biohazard in black and the words “DİKKAT! TIBBİ ATIK” (ATTENTION! MEDICAL WASTE) printed in black.

17.4.2. Transport infectious medical waste to minimize human exposure. Routes to be followed by waste transport vehicles and personnel shall be as far as possible from places where patients are treated and other clean areas, and from areas where human and patient traffic is heavy.

17.4.3. Do not place in chutes or dumbwaiters.

17.4.4. Transport medical waste and other wastes together.

17.4.5. Avoid compacting infectious medical waste unless first converted to noninfectious medical waste by the treatment described in Paragraph 17.6. Do not compact containers holding sharps.

17.4.6. Ensure all personnel handling infectious medical waste wear appropriate protective apparel or equipment such as gloves, coveralls, masks, and goggles, and receive appropriate training on the use of protective equipment and risk reduction associated with exposure to infectious agents, pathogens, and physical hazards.

17.5. STORAGE.

Installations must:

17.5.1. Manage infectious waste when stored on-site.

17.5.1.1. Store infectious medical waste in a manner that prevents decay, spoilage, or becoming putrid. Refrigeration is required for pathology waste.

17.5.1.2. Infectious medical waste must not be placed in hallways.

17.5.1.3. Infectious medical waste with multiple hazards (e.g., infectious hazardous waste or infectious radioactive waste) must be segregated from the general infectious waste stream when additional or alternate treatment and disposal is required.

17.5.2. Ensure storage sites:

17.5.2.1. Are specifically designated for such use.

17.5.2.2. Are adequately designed. The capacity of the medical waste storage area shall be calculated based on the frequency of collection and disposal. At a minimum, the capacity of storage areas shall be sufficient to contain the volume of waste produced over a period of 2 days.

17.5.2.3. Are easy to clean and disinfect. The ceiling and walls of storage shall be coated with a durable material that is impermeable, dirt and microorganism repellent.

17.5.2.4. If the storage is not cooled, it is equipped with a passive ventilation system.

17.5.2.5. Are constructed to prevent entry of insects, rodents, and other pests.

17.5.2.6. Prevent access by unauthorized personnel.

17.5.2.7. Are clearly marked on the outside with the universal biohazard symbol, the word “*BIOHAZARD*” (“*BİYOTEHLİKE*”) and the words “*DİKKAT! TIBBİ ATIK*” (*ATTENTION! MEDICAL WASTE*) written in black in both English and Turkish. The door of the storage area shall be orange or painted orange.

17.5.3. Post signage that:

17.5.3.1. Identifies any special requirements for entering the site, and the name and telephone number of the person responsible for the storage site.

17.5.3.2. Is fluorescent orange-red in color, or predominately so, with lettering and symbols in contrasting color, and easily visible to workers.

17.5.4. Remove waste from:

17.5.4.1. Interim storage sites (e.g., soiled utility rooms) daily.

17.5.4.2. The final storage site at least every 7 calendar days unless refrigerated. If refrigerated, the infectious medical waste may remain in the final storage site for 30 calendar days. Infectious medical waste is typically refrigerated at temperatures between 0-4 °C [32-39.2 °F].

17.6. TREATMENT AND DISPOSAL.

Installations must:

17.6.1. Treat and dispose of blood, blood products, and other liquid infectious wastes as follows:

17.6.1.1. Decant bulk blood and blood products into a sewer system connection (e.g., sinks, drains), unless pre-treatment is required.

17.6.1.1.1. If pre-treatment is required, use the methods outlined in Table 17.1 before discharge to the sewer system. Continue to manage the emptied containers as infectious medical waste.

17.6.1.1.2. If pre-treatment is not feasible to allow for sewer system disposal, seal the liquid waste in leak-proof containers and incinerate.

17.6.1.2. Either decant suction canister waste from operating rooms into a clinical sink (if pre-treatment is available) or sealed in leak-proof containers and incinerate.

17.6.2. Bags and receptacles containing infectious medical waste must be placed into rigid or semi-rigid, leak-proof containers before being transported off-site.

17.6.3. Transportation of medical waste shall be conducted by authorized waste management operators or producers of the waste. DoD installations transporting medical waste off an installation shall do so in accordance with DoD Component Policies.

17.6.4. Before disposal, treat infectious medical waste in accordance with Table 17.1 and:

17.6.4.1. Installations with medical waste incinerators and sterilizers shall contact the Turkish Installation Commander to determine if an authorization is required. If an authorization is needed for these operations and the authorization conditions require a more protective standard than those listed below, the standards in the authorization shall be the compliance standard. However, if an authorization allows a less protective standard, those listed below shall be the compliance standard.

17.6.4.2. Ensure sterilizers maintain their temperature at 121 °C [250 °F] for at least 30 minutes at 103.4 kilopascal [15 pounds per square inch].

17.6.4.3. Check the effectiveness of sterilizers at least weekly using *Bacillus stearothermophilus* spore strips or an equivalent biological performance test.

17.6.4.4. Design and operate incinerators used to treat infectious medical waste to maintain a minimum temperature and retention time sufficient to destroy all infectious agents and pathogens and meet the applicable air emission standards in Chapter 4, “*Air Emissions*”. Medical wastes must be fed directly to the incinerator by automatic feed and without being mixed with other types of wastes.

17.6.4.5. Assess ash or residue from the incineration of infectious medical waste for classification as hazardous waste in accordance with Paragraph 16.3.

17.6.4.5.1. Manage ash that is determined to be hazardous waste in accordance with Chapter 16, “*Hazardous Waste*”.

17.6.4.5.2. Dispose of all other residue in a landfill that complies with the standards in Chapter 15, “*Solid Waste*”.

17.6.4.6. Conduct chemical disinfection using procedures and compounds approved by the appropriate DoD medical authority for use on any pathogen or infectious agent suspected to be present in the waste.

17.6.5. If infectious medical waste cannot be treated on site, it will be managed during storage as follows:

17.6.5.1. Infectious medical waste will be maintained in a non-putrescent state, using refrigeration as necessary. At a minimum, wastes stored for more than 2 days shall be refrigerated. Medical wastes shall be collected at least once per week.

17.6.5.2. Infectious medical waste with multiple hazards (i.e., infectious hazardous waste or infectious radioactive waste) will be segregated from the general infectious waste stream when additional or alternative treatment is required.

17.6.6. For the disposal of non-contaminated animal carcasses, consider and appropriately address Turkish requirements that may vary from the standards in this section.

17.6.7. Place bags and receptacles containing infectious medical waste in rigid or semi-rigid, leak-proof containers before being transported off-site.

17.6.8. Package and document the transport of infectious medical waste off-site for disposal in accordance with transportation regulations of the Turkish and the International Air Transport Association. At a minimum, the transporter must be appropriately credentialed by Türkiye to transport the waste and must provide a receipt for transport to the installation.

17.7. CONTINGENCY PLANNING.

Installations must:

17.7.1. Develop contingency plans for treatment or disposal of infectious medical waste in case the primary means become inoperable.

17.7.2. Include alternate storage sites or alternate means of treatment and disposal in the contingency plans.

17.8. SPILLS.

Installations must:

17.8.1. Clean up spills of infectious medical waste as soon as possible.

17.8.2. Comply with personal protection equipment requirements in Paragraph 17.4.7.

17.8.3. Remove blood, body fluid, and other infectious fluid spills with an absorbent material that must then be managed as infectious medical waste.

17.8.4. Wash surfaces contacted by infectious medical waste with soap and water and chemically decontaminate the surfaces in accordance with Paragraph 17.6.4.7.

17.9. RECORDKEEPING.

Installations must keep records, for at least 5 years after the date of disposal, of the following information concerning infectious medical waste:

17.9.1. Name, address, and telephone of responsible waste producer.

17.9.2. Type of waste.

17.9.3. Amount of waste (volume or weight).

17.9.4. Treatment method, including date of treatment.

17.9.5. Name of waste carrier, vehicle license plate number, name of driver, and the waste carrier's license number.

17.9.6. Disposition, including:

17.9.6.1. Date of disposition.

17.9.6.2. If the waste was transferred to Turkish facilities.

17.9.6.3. Receipts acknowledging Paragraphs 17.9.1. through 17.9.3. for each transfer.

17.9.6.4. If transportation, treatment and/or disposal of medical waste is conducted through contract, DoD personnel shall ensure those contractors are authorized by Turkish authorities to perform the activities.

Table 17.1. Treatment and Disposal Methods for Infectious Medical Waste

TYPE OF MEDICAL WASTE	METHOD OF TREATMENT	METHOD OF DISPOSAL
Microbiological	Steam sterilization ^a	MSWLF ^b
	Chemical disinfection	MSWLF
	Incineration	MSWLF
Pathology	Incineration ^c	MSWLF
	Cremation ^c	Burial
	Chemical sterilization ^d	Domestic wastewater treatment plant (DWTP) ^e
	Steam sterilization ^d	DWTP
Bulk blood and suction canister waste	Steam sterilization ^f	DWTP
	Chemical disinfection	
	Incineration ^f	MSWLF
Sharps in sharps containers	Steam sterilization	MSWLF
	Incineration	MSWLF
^a Preferred method for cultures and stocks because they can be treated at point of generation. ^b See Chapter 15, “ <i>Solid Waste</i> ” for solid waste landfill standards. ^c Treat anatomical pathology waste (e.g., large body parts) either by incineration or cremation before disposal. See Chapter 4, “ <i>Air Emissions</i> ” for incinerator standards. ^d This only applies to placentas, small organs, and small body parts that may be steam sterilized or chemically sterilized, ground, and discharged to a domestic wastewater treatment plant. ^e See Chapter 9, “ <i>Wastewater and Stormwater</i> ” for wastewater standards. ^f Treat bulk blood or suction canister waste known to be infectious by incineration or steam sterilization before disposal.		

Table 17.2. Sample Biohazard Label

BIOHAZARD
CAUTION: MEDICAL WASTE



BİYOTEHLİKE
DİKKAT TIBBİ ATIK