USFKM 4715.05
26 August 2024

KOREA ENVIRONMENTAL GOVERNING STANDARDS

UNITED STATES FORCE KOREA
APO AP 96271-5237

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HEADQUARTERS, UNITED STATES FORCES, KOREA
UNIT #15237
APO AP 96271-5237

FKEN

MEMORANDUM FOR DISTRIBUTION

FROM: COMUSFK

SUBJECT: 2024 Korea Environmental Governing Standards

1. Commander United States Forces Korea (USFK) has been designated the Lead Environmental Component (LEC) for the Republic of Korea (ROK) as per DoDI 4715.05 Environmental Compliance at Installations Outside the United States. The LEC is responsible for the development and maintenance of the Korea Environmental Governing Standards (KEGS). The KEGS establishes and mandates environmental standards for enduring installations in the ROK.

2. Attached is the revised 2024 Korea Environmental Governing Standards (KEGS) which contains significant changes from the 2020 version. A summary of the significant changes from the previous edition are summarized in the KEGS. Components are directed to begin implementation of the 2024 KEGS upon receipt. NLT 01 October 2024, Department of Defense components and agencies with enduring installations or facilities in the ROK shall fully implement the KEGS.

3. My point of contact for the implementation of the KEGS is COL Steward U. Gast, USFK Command Engineer, at DSN 755- 8578 or email at stewart.u.guest.mil@army.mil.

JOHN W. WEIDNER
Major General, U.S. Army
Chief of Staff

1 Attachment:
1. USFKM 4715.05 Korea Environmental Governing Standards

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65th Medical Brigade, Force Health Protection and Preventive Medicine
United States Embassy Seoul, Republic of Korea

Summary of Significant Changes

Korea Environmental Governing Standards (KEGS)

Previous edition: USFK Regulation 201-1, 30 July 2020

New edition: USFK Manual 4715.05, 18 June 2024

Background

The Department of Defense Instruction (DoDI) 4715.05 Environmental Compliance at Installations Outside the United States, is the umbrella document for the development of environmental standards for a specific country. The DoD Manual 4715.05 or Overseas Environmental Baseline Governing Standards (OEBGD) is the template for environmental compliance at all DoD enduring installations overseas.

USFK has changed the naming and format structure from regulations and publications to follow standard DoD practice of using instruction and manuals. The Korea Environmental Governing Standards (KEGS), USFK Regulation 201-1 has been changed to be known as USFK Manual 4715.05.

The Lead Environmental Component (LEC) for a country, which is designed by the Office of the Secretary of Defense (OSD), is responsible for developing the Final Governing Standards (FGS) or also known as the Environmental Governing Standards (EGS) by analysis of the OEBGD and host nation environmental law and regulations. United States Forces Korea (USFK) is the LEC for the Republic of Korea (ROK).

USFK, in coordination with the components and the ROK Ministry of Environment (MOE), has been updating the Korea Environmental Governing Standards (KEGS) since 2022. The KEGS is required to update every five years. The 2024 KEGS has a number of significant changes from the 2020 KEGS that will impact current compliance requirements. The 2024 KEGS also strives to become clearer on the details to allow environmental program managers to better understand and apply these standards. The purpose of this document is to illustrate significant changes to the KEGS that illustrate the process clearer or have the potential to impact compliance.

Policy and Responsibilities

1. (*Clarification)* The LEC responsibilities are held by the Commander, USFK. The USFK Command Engineer is the Commander's representative to manage the KEGS and day to day tasks involving environmental compliance and policy.

2. (*Clarification)* The USFK Chief of Staff (CoS) has been the approval authority for the KEGS, but this role had never been formally written in the document. By adding the

CoS in this role to the document, it has defined the role and given a measure of oversight by a USFK senior leader.

3. *(Revision)* The previous versions of the KEGS established the USFK Environmental Policy Board. It is unknown if this board ever met or when the board last met. So, this board was removed and, in its place, an FKEN environmental quarterly meeting with components and installations is to be developed to discuss current and upcoming environmental policy, issues, and coordination with the ROK Government on environmental matters. FKEN environmental will in turn brief the USFK Deputy Chief of Staff on the discussions with the purpose of keeping the command current on environmental issues affecting USFK Components.

Cultural and Natural Resources

1. *(New Requirement)* Added a requirement that prior to the grant of land to the US from the ROK through the SOFA process, that an archeological survey should be performed prior to the acceptance of a land grant. This process will both protect the US from the burden of maintaining cultural resources and allow the Korean Government to have full access and protect ROK cultural and historical resources. Prior the inclusion of this process, if a cultural resource was found during construction the project could be delayed significantly with the component paying O&M funding to perform the assessment. The objective of this process is to reduce the risk for the US in finding and potentially damaging historical resources.

2. (*Revision*) Updated a list of the currently protected species in the ROK as of 2023. Provided a link to ROK resources where the continually updated list is located on the Definitions of the manual.

Air & Toxins

1. *(Revision)* Air Emission standards for boilers and incinerators were evaluated between the US OEBGD and ROK emission standards. The standards were compared and in the majority of cases the ROK emission standard was more stringent. Most boilers located in USFK installations are manufactured in the ROK and already meet the requirements. Installations should evaluate their current inventory of incinerators and boilers to determine whether they meet the current standards.

2. *(Clarification)* POV and GOV air emission standards are clarified in the KEGS. During a vehicles safety inspection these standards have already been applied but were not contained in the KEGS.

3. *(Clarification)* Open burning of trash and other materials in drums, open area or burn pits is strictly prohibited on USFK installations. Open burning for recreational purpose such as campfire, fireplaces and barbecues in designated places will be exempted.

4. *(Revision)* A comparison of vapor cleaning machines used typically in the dry-cleaning process led to the adoption of OEBGD emission standards (US) for existing and new in line cleaning machines.

5. *(Revision)* ROK air emission standards for sulfur oxides, nitrogen oxides, particulate matter, and VOCs for power generators (equal or greater than 120 kW) which is not for emergency backup purpose. The US metric and ROK emission standards are provided, and the installation shall use the standard the applicable to the equipment based on country of manufacture. Tactical power generation units like all other tactical equipment are exempt from this requirement.

6. *(New requirement)* Added dust mitigation best management practices.

7. *(New Requirement)* Added requirement for asbestos, lead-based paint, and ozone depleting substances to be labeled in both English and Hangeul. Objective is to enhance work site safety.

Water

1. *(Revision)* Updated garbage disposal use policy at USFK installations. Previously, garbage disposal units were prohibited. The 2024 KEGS highlights this change, and an updated list of approved disposal units is available on the MOE website.

2. *(Revision)* Industrial and non-industrial wastewater discharge requirements have been updated for both systems that discharge directly into a ROK water body and indirectly through a ROK wastewater treatment system. A comparison of both ROK and OEGBD standards led to the adoption of the more stringent ROK standards where applicable. In addition to updated criteria, additional industrial areas are defined following ROK regulations.

3. *(New requirement)* Stormwater and wastewater discharges requirements to ROK water bodies depend on the classification of the ROK water body. The 2024 KEGS identifies the classification system for installation to plan and understand the discharge requirements.

4. *(New Requirement)* Requirements of maintenance, closure and abandonment for groundwater wells were added in the section of Wellhead Protection Plan.

Storage Tanks, Spills

1. *(Clarification)* Petroleum, Oil, and Lubricants (POL) systems are the highest risk for environmental damage and incident. Maintenance, inspection, and proper design are key factors in preventing a release of fuel. Industry standard for maintenance, inspection, and design have been further highlighted to increase the understanding of what criteria installations have to meet. As part of the KEGS TASKORD that will be

released with the KEGS, installations will need to identify where they currently do not meet industrial standards in testing, inspection, and maintenance. The installations shall then develop a 1 to n list to program for improvements to those systems that are current deficient.

2. *(New requirement)* Vapor recovery systems are required for all new construction and existing systems that undergo repair by replacement of 50 percent or greater of the distribution system or the total storage system. This requirement only applies to gasoline systems with a total sales volume equal to or more than 300m^3 (79,252 gallons) per year. An operating procedure shall be created based on the following criteria.

3. *(New requirement)* The 2020 OEBGD allowed sampling for the first time regarding environmental incident clean up. The OEBDG set no standards for sampling, so the ROK worrisome levels for soil clean up were adopted as screening criteria for setting goals in clean up response. Components are still not allowed to remediate existing contamination unless the site poses a substantial impact to human, life, safety, and health.

Waste

1. *(New requirement)* Hazardous waste contractors support USFK installations shall use the ROK electronic manifest system for tracking hazardous waste for final disposition. This system allows more visibility for Defense Logistics Agency (DLA) and the installation to validate that hazardous waste has been disposed of properly.

2. *(Clarification)* USEPA codes used for tracking hazardous waste are not used in the ROK. To create a more streamlined process, a matrix has been created, in coordination with the ROK MOE, to corelate USEPA waste codes with ROK designated waste codes.

3. *(Clarification)* USFK medical treatment facilities dispose of medical waste through the ROK waste system. The updates to section clarify how USFK installations can dispose of medical waste in the ROK.

4. *(Clarification)* Food waste is prohibited from being disposed of in a land fill. USFK installation dining facilities and other facilities that produce large amounts of food waste shall utilize their waste contract to ensure that food waste is being properly disposed.

UNITED STATES FORCES KOREA MANUAL

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KOREA ENVIRONMENTAL GOVERNING STANDARDS

Reference(s): See Enclosure Q

1. Purpose. The primary purpose of the Environmental Governing Standards (EGS) is to provide environmental compliance criteria and management practices to be used by United States (U.S.) Department of Defense (DoD) installations in the Republic of Korea (ROK). This document implements:

a. Department of Defense Instruction (DoDI) 4715.05, Environmental Compliance at Installations Outside the United States (Incorporating Change 2, dated August 31, 2018) (reference 16).

b. Department of Defense Manual (DoDM) 4715.05, Overseas Environmental Baseline Guidance Document (OEBGD, Volumes 1 – 5, June 29, 2020) (reference 31).

c. Republic of Korea (ROK) environmental standards that are considered more stringent than OEBGD standards and meet criteria set out in section 7.b (4) of this document.

2. Superseded/Canceled. Cancels USFK Regulation 201-1, Environmental Governing Standards (EGS), dated 30 July 2020 (reference 50).

3. Applicability. This manual applies to all DoD components conducting operations or located on facilities and areas granted by the ROK to the U.S. under the U.S.-ROK Status of Forces Agreement (SOFA) (reference 47), including but not limited to USFK, U.S. Eighth Army, 7th Air Force, Commander, Naval Forces Korea, U.S. Marine Corps Forces Korea, Special Operations Command-Korea, Defense Logistics Agency, Defense Commissary Agency, Army-Air Force Exchange Service (hereinafter, the “DoD Components operating in the ROK”). It does not include DoD Components operating under the authority of the Joint U.S. Military Assistance Group-Korea (JUSMAG-K) or other DoD components operating under the authority of the U.S. Embassy Seoul.

a. Nothing in this manual creates any right or benefit, substantive or procedural, enforceable at law or in equity, by any person or entity against the United States, its agencies, its officers, or any person.

b. Under no circumstances is this manual intended to require noncompliance with applicable international law or agreements with foreign nations.

4. Exemptions: These Korea Environmental Governing Standards (EGS) do not apply to:

a. Leased, ROK-controlled joint use, and similar facilities to the extent that USFK does not control the instrumentality or operation of the facility that would be regulated by this EGS.

b. U.S. military vessels, ships, aircraft, or space vehicles. The EGS, however, apply to support functions for U.S. military vessels, ships, aircraft, or space vehicles provided by the DoD Components, including the management and disposal of off-loaded waste or hazardous materials.

c. Off-installation training.

d. Contingency locations and associated operations and deployments, including cases of hostilities, contingency operations in hazardous areas, peacekeeping missions, or relief operations. These include U.S. forces operating as part of a multinational force not under full U.S. control. Such excepted operations and deployments shall be conducted in accordance with applicable international agreements, other DoD Directives (DoDD) and DoD Instructions (DoDI), applicable service component guidance, and environmental annexes incorporated into operation plans or operation orders.

e. Facilities and activities associated with the Naval Nuclear Propulsion Program, in accordance with Executive Order (E.O.) 12344 (Reference 7) and conducted pursuant to section 7158 of Title 42, United States Code (Reference 83).

f. Actions to remediate environmental contamination. DoDI 4715.08 (Reference 17) generally covers remediation.

g. Environmental analyses conducted in accordance with E.O. 12114 (Reference 6).

h. 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 Energy, Installations, and Environment (ASD(EI&E)), the applicable Combatant Commander has determined that no significant force health protection or environmental threats exist.

i. Activities, systems, operations, and areas on DoD installations for which DoD has no authority or responsibility.

5. Permits and Licenses. In accordance with the SOFA, permits, licenses, or other forms of official approvals are not required for DoD activities. Permits, licenses, or other forms of official approvals may, however, be required under ROK law for certain contracted activities specified herein. When required, all such permits, licenses and other forms of official approval shall be obtained by the contractor from the appropriate ROK authorities. DoD Components operating in the ROK shall assist contractors when they are applying for a required permit, license, or other form of official approval by providing necessary information only.

6. Test Methods and Protocols

a. Laboratory analyses necessary to implement this manual must normally be conducted in a laboratory that has been certified by a U.S. or ROK 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 quality assurance compliance with standards for the applicable test method that are generally recognized by appropriate industry or scientific organizations.

b. 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.

7. Responsibilities.

a. The Under Secretary of Defense for Acquisition, Technology, and Logistics (USD(AT&L)) has appointed Commander, U.S. Forces Korea (USFK) as the DoD Lead Environmental Component (LEC) in the ROK. The Commander has delegated LEC responsibilities to USFK Command Engineer.

b. The LEC or a designated representative will:

(1) Perform the requirements identified by reference 16, to include the development and maintenance of the Environmental Governing Standards (EGS) for the ROK.

(2) Consult with the DoD Components in the ROK during the development, revision, and maintenance of the EGS. In addition, the LEC will consult with the legal and SOFA staff at USFK to ensure the environmental standards are consistent with U.S. law and policy and the SOFA and other relevant international agreements.

(3) Coordinate with the USFK Chief of Staff (CoS) for the approval and implementation of the KEGS. The USFK Command Engineer will seek approval by the CoS of any revisions to the KEGS issued by DoD and during the periodic five years update.

(4) Identify applicable host-nation environmental standards through consultation with the ROK Ministry of the Environment (MOE). A comparison of both the ROK and OEGBD standards will be completed where the more stringent standard will be adopted into the EGS. To be identified as applicable for the EGS, a ROK standard must meet four criteria:

(a) A published host-nation law or an applicable international agreement for the protection of human health and the environment within the host nation.

(b) Adequately defined and generally in effect and enforced against host-nation government and private-sector activities.

(c) Applicable to a function, such as construction, maintenance, or operation of an installation, for which the United States has primary responsibility.

(d) Substantive and not administrative or procedural in nature (e.g., permits and licenses) unless required by applicable international agreements.

(5) Consult with appropriate ROK officials directly or through the SOFA Environmental Subcommittee on environmental issues as required under the SOFA and SOFA-related documents to coordinate this EGS and to maintain effective cooperation on environmental matters.

(6) Review and revalidate this EGS IAW DoDI 4715.05 with USFK staff, service components, DoD Components operating in the ROK, the ROK MOE, and other appropriate entities.

(7) Keep USFK components informed of current environmental developments and trends.

c. The USFK Environmental Protection Working Group will enhance coordination and communication between USFK, components, installations, and other DoD activities on changes to environmental legislation, policy, and issues in the ROK. The USFK Command Engineer or designated representative will chair this working group and meet at least twice per year.

d. The USFK Command Engineer will serve as the U.S. Component Chairman of the Environmental Subcommittee (ENVSC). The Environmental Subcommittee, established pursuant to Article III and Article XXVIII of the US-ROK SOFA, is responsible for all environmental information exchange and facility and area access for ROK government officials and other entities.

To accomplish these requirements the Command Engineer will:

(1) Plan, fund, and host regular working groups under the Environmental Subcommittee with the ROK MOE and Ministry of National Defense (MND) on environmental issues, policy, regulations, and site visits.

(2) Plan, fund, and host a biennial working group to review the EGS in accordance with reference 16.

e. DoD Components operating in the ROK will:

(1) Implement the procedures in this manual and ensure compliance with the EGS.

(2) Plan, program, and budget to meet the standards contained in this volume.

(3) Ensure their activities and installations allocate the resources required to achieve and maintain compliance with the KEGS.

(4) Verify that contracts for services or construction, where performance takes place on an installation, comply with the KEGS and are administered to enforce such compliance. Contracts for transfer and delivery of hazardous materials and petroleum products and for the disposal of hazardous waste shall include provisions requiring the contractor to comply with appropriate KEGS criteria, Korean regulations, and other DoD requirements.

(5) Ensure that host-tenant agreements address compliance with the EGS.

(6) Oversee installation training programs to ensure compliance with these regulations.

(7) Establish and implement an environmental audit program to ensure that DoD installations in the ROK assess compliance with the EGS at least once every 3 years at all major installations. This audit program should be in coordination with installation internal and external audits.

(8) The KEGS represents the minimum environmental compliance criteria. DoD Components may impose additional criteria provided those policies and directives do not directly conflict with these KEGS. Activities and installations shall notify the Lead Environmental Component (LEC) in writing before imposing criteria more protective than provided in these KEGS.

f. Installation and unit commanders will:

(1) Comply with the environmental standards detailed in this document, component regulations, and international agreements. Compliance with these

standards is installation wide and not office or department specific. In cases where a department other than the installation environmental office is responsible for routine maintenance and operation, these departments will be responsible for the procedures, operation, maintenance, inspection, planning, acquisition, and funding required to ensure that the system is in compliance with this document and minimize the risk of environmental incident.

(2) Develop and conduct training/education programs to instruct all personnel in the environmental aspect of their jobs. Training/education programs will be specifically tailored to operations within the ROK.

(3) Establish an Environmental Protection Council or Environmental Quality Control Committee (or equivalent) to provide periodic assessment of the installation's environmental compliance programs and projects.

(4) Incorporate installation environmental compliance auditing into their inspection programs. Environmental audit programs for DoD facilities and areas will include internal and external environmental audits. Internal self-audits will be conducted at least annually unless an external audit is conducted that year, in which case the internal self-audit is not required for that given year. External compliance audits will be conducted at least once every three years at all major installations.

8. <u>Exceptions</u>:

a. A DoD Component may request an exception to a standard in the EGS only if compliance with the standard at particular installations or facilities would:

(1) Seriously impair its mission.

(2) Adversely affect relations with the ROK

(3) Require substantial expenditure of funds for physical improvements at an installation for which public notification for return is made.

(4) An installation is identified for closure or realignment, which would remove the requirement.

b. An exception may not be granted to a standard if failure to comply would constitute a breach of applicable U.S. law with extraterritorial effect or breach of an applicable international agreement or conflict with the SOFA.

c. All exception requests and decisions are in written form. The requestor and the decision-making authority will maintain complete records and provide a copy to the ASD(EI&E). These documents are permanent records and considered sufficiently valuable to warrant the Federal Government's continued preservation.

d. A DoD Component submitting a request for an exception from an applicable standard:

(1) Identifies the particular standard for which an exception is requested.

(2) Describes the extent of the relief requested and the period that the exception is in effect.

(3) Describes the anticipated impact of the exception, if any, on human health and the environment over the period of the exception.

(4) Describes the justification for the exception and, if a complete exception of the standard is requested, why a partial or temporary deviation is not sufficient.

(5) Submits the exception request to the DoD LEC.

9. Summary of Changes.

Revalidations and Updates IAW DoDI 4715.05, Encl 3 (4)(f)	
Initial Version	USFK Pamphlet 200-1 20 October 2004
Revision 1: Full Revision	USFK Pamphlet 200-1 27 July 2010
Revision 2: Full Revision	USFK Regulation 201-1 18 June 2012
Revision 3: Full Revision	USFK Regulation 201-1 30 July 2020
Revision 4: Full Revision	USFK Manual 4715.05 31 July 2024

10. Records Management. In accordance with CJCSM 5760.01B Volume II, Joint Staff and Combatant Commands Records Management Manual-Disposition Schedule. All records generated while implementing the standards in this manual must be maintained by installations in accordance with the EGS, DoDI 5015.02, and DoD Component policies.

11. Releasability. Unrestricted. This manual is approved for public release; distribution is unlimited. DoD components, other federal agencies, and the public may obtain copies of this manual through the internet from the USFK home page https://www.usfk.mil/Resources/Publications/ or on NIPRNET at https://armyeitaas.sharepoint-mil.us/sites/USFK-RM/SitePages/USFK-Publication-&-Forms.aspx.

12. Effective Date. This manual is effective upon receipt.

JOHN W. WEIDNER
Major General, USA
Chief of Staff

Enclosures:
A – Historic and Cultural Resources
B – Natural Resource and Endangered Species
C – Air Emissions
D – Asbestos
E – Lead-Based Paint (LBP)
F – Polychlorinated Biphenyls (PCBs)
G – Drinking Water
H – Wastewater and Stormwater
I – Hazardous Materials
J – Petroleum Oil and Lubricants (POL)
K – Underground Storage Tanks (USTs)
L – Spill Prevention and Response Plan
M – Pesticides
N – Solid Waste
O – Hazardous Waste
P – Medical Waste
Q – References

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ENCLOSURE A

HISTORIC AND CULTURAL RESOURCES

1. INSTRUCTION

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

2. GENERAL

In consideration of the World Heritage List and the Republic of Korea (ROK) cultural properties list recognized under the SOFA as coordinated between the U.S. and the Korea Heritage Service (KHS), installations must take into account the effect of any action on a property listed on the list for the purpose of avoiding or mitigating any adverse effects. USFK will maintain the current list of SOFA recognized cultural and historical properties. Components that have made agreements with local or regional governments or communities for the protection of cultural or historical properties not on the SOFA recognized list, shall provide the USFK Command Engineer with a listing of those properties. Components will also ensure such agreements are consistent with USFK international agreements.

3. CRITICAL DEFINITIONS

a. ROK Cultural Properties. Artificially or naturally formed national, ethnic, or world heritage properties of outstanding historic, artistic, academic, or scenic value which includes:

(1) Designated Cultural Heritage. Cultural heritage properties and materials designated by KHS, provincial governors, or city mayors.

(2) Registered Cultural Heritage. Cultural heritage properties and materials other than designated cultural heritage or cultural heritage resource registered by the KHS, provincial governors, or city mayors.

(3) Buried Cultural Heritage. Tangible cultural heritage buried or distributed underground, underwater, or in the structures, and natural caves and fossils formed and deposited on the ground surface, underground or underwater (including seas, lakes and rivers), etc. and other objects deemed to have significant geological values.

b. SOFA Cultural Properties Protection Subcommittee. Subcommittee of the SOFA Joint Committee to consult and report findings and recommendations on matters concerning cultural properties protection referred to it and other matters as deemed expedient and proper by the Joint Committee.

4. PERSONNEL QUALIFICATIONS

Installations must ensure that:

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

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.

5. CULTURAL RESOURCES MANAGEMENT PLAN

Installations must:

a. After consultation with the CPPSC through the LEC:

(1) Develop and maintain an inventory of historic and cultural resources in DoD facilities and areas using the ROK cultural properties list approved by the CPPSC, records searches, and visual surveys. Installations should use geospatial referencing to document locations of historic properties, when possible.

(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 CPPSC through the LEC.

b. If cultural resources are identified on DoD facilities and areas, prepare, maintain, and implement a historic and cultural resources management plan that includes the information needed to:

(1) Make appropriate decisions about historic and cultural resources identified on the installation inventory.

(2) Mitigate any adverse effects, as necessary.

6. 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.

a. Prior to the grant of property for the exclusive use by USFK, the component requesting the property shall engage the Facilities and Areas Sub Committee (FASC) to request from the CPPSC, that a historical and archeological site survey be performed on the requested land. The survey will:

(1) Identify and record any cultural and historical properties located on the requested property. The record should detail potential impact to mission, barriers to construction, maintenance strategy, and cost to protect the property. The component shall also evaluate the feasibility of selecting an alternate location.

(2) Evaluate the potential for the site to contain cultural or historical properties based on historical and academic research.

(3) Recommend whether any cultural or historical properties identified on site could be relocated.

(4) Develop a joint management plan through the CPPSC for properties that cannot be relocated.

b. Prior to construction during the planning for any construction, renovation, repair work, or ground-disturbing activity, the component requesting the project shall:

(1) Prepare a site report illustrating any known historical or cultural properties on the proposed and alternative project site. If no known properties are located on the site, a report of no significant finds will be created. This plan will be submitted to USFK FKEN prior to project approval through the Joint Facilities Utilization Board (JFUB). Modifications to the project boundaries after approval require re-evaluation of the project.

(2) If a known cultural or historical property is located on the proposed site, the component will prepare a mitigation plan to protect those items identified. Mitigation may include, but is not limited to:

(a) Limiting the magnitude of the action.

(b) Relocating the action in whole or in part.

(c) Repairing, rehabilitating, or restoring the affected resources or property.

(d) Recovering and recording data from cultural properties that may be destroyed or substantially altered.

c. Maintain records of processed actions.

d. If during site work, a potential historic or cultural property not previously identified prior to work is discovered on the project site, the course of action will include:

(1) Preserve and protect the newly discovered items pending consultation with the SOFA CPPSC through the LEC.

(2) Determination of the appropriate mitigation method to protect the historic or cultural resource shall be coordinated with the CPPSC through USFK FKEN.

(3) Regarding construction and the contract modification process, this will be considered an unforeseen site condition.

e. During the return process for USFK SOFA granted land

(1) The USFK component preparing the land for return shall identify all historic or cultural properties during the FASC return process.

(2) USFK will notify KHS through the CPPSC that the property is being returned.

(3) If there are any cultural properties that are protected on site, the USFK component will develop a plan to protect the property until the SOFA granted land has been officially returned.

ENCLOSURE B

NATURAL RESOURCES AND ENDANGERED SPECIES

This enclosure 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 U.S. or ROK government. Such measures may include protection of the habitats of those species.

1. GENERAL

Installations must evaluate natural resources for significance.

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

b. 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:

(1) The degree of active management needed.

(2) Special natural features.

(3) Aesthetics.

(4) Outdoor recreational opportunities.

(5) The ecological context of the installation.

c. The ROK government designates protection areas such as ecosystem and landscape conservation areas in Appendix A, Table B-3 and wetland protected areas in Appendix A, Table B-4 where the preservation of natural ecosystems is specifically required, and imposes restrictions on collecting, or importing and exporting endangered or specified wild animals or plants. The latest updated information about Table B-3 and Table B-4 can be found on the ROK Ministry of Environment website for natural resources.

d. Those who intend to capture harmful wild animals shall coordinate with the local government. Harmful wild animals are defined by the ROK government as wild animals that harm the life and property of people. These animals are designated at the MOE website.

2. PERSONNEL QUALIFICATIONS

Installations must ensure that personnel who:

a. 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).

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

3. NATURAL RESOURCES MANAGEMENT PLAN

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

a. Natural resources management plans must:

(1) Incorporate the principles of ecosystem-based management.

(2) Contain information needed to make appropriate decisions about natural resources management.

(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.

(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.

(5) Address natural resource management in support of biosecurity requirements.

(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.

b. Natural resources management plans should be coordinated with the installation commander or, after consulting with the LEC, the SOFA Environmental Subcommittee.

4. NATURAL RESOURCES MANAGEMENT PLAN IMPLEMENTATION

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

a. Maintain, or have access to, the current list of species established by Chapter 35 of Title 16, U.S.C., also known as the “Endangered Species Act” to ensure installations follow the same obligations the ROK government has in respecting and protecting U.S. endangered species that are migratory endangered species, and appear in Korea as well as Appendix A, Table B-1, “Endangered Species of Wild Fauna and Flora in Korea” and Appendix A, Table B-2, “ROK Species Designated as Natural Monument”. The latest updated information about Table B-1 can be found on the ROK Ministry of Environment website and Table B-2 can be found on the Korea Heritage Service website each.

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

c. Shall report the initial discovery of any endangered, threatened, or ROK designated natural monument species to the Lead Environmental Component (LEC) and the observation shall be recorded in the Integrated Natural Resources Management Plan (INRMP) for proper management. In turn, the LEC shall notify the ROK authorities through the SOFA Environmental Subcommittee

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

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

f. 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.

g. 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.

5. 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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APPENDIX A TO ENCLOSURE B

ROK NATURAL RESOURCES TABLE

Table B-1. Endangered Species of Wild Fauna and Flora in Korea (as of 9 Dec 2022)

	SCIENTIFIC NAME	KOREAN NAME	ENGLISH NAME
Endangered Wildlife Mammals Class I			
1	*Canis lupus coreanus*	늑대	Asiatic or Chinese Wolf
2	*Cervus nippon hortulorum*	대륙사슴	Dybowski's Sika Deer
3	*Mustela nivalis*	무산쇠족제비	Weasel
4	*Phoca largha*	물범	Spotted Seal
5	*Ursus thibetanus ussuricus*	반달가슴곰	Manchurian Black Bear
6	*Myotis rufoniger*	붉은박쥐	Korean Orange Whiskered Bat, Golden-winged Myotis, or Jobokseong Bat
7	*Moschus moschiferus*	사향노루	Korean musk Deer
8	*Naemorhedus caudatus*	산양	Chinese or Long-tailed Goral
9	*Lutra lutra*	수달	Eurasian river Otter
10	*Lynx lynx*	스라소니	Eurasian Lynx
11	*Vulpes vulpes peculiosa*	여우	Fox
12	*Murina ussuriensis*	작은관코박쥐	Ussuri Tube-nosed bat
13	*Panthera pardus orientalis*	표범	Leopard
14	*Panthera tigris altaica*	호랑이	Tiger

Table B-1. Endangered Species of Wild Fauna and Flora in Korea (as of 9 Dec 2022)

SCIENTIFIC NAME		KOREAN NAME	ENGLISH NAME
Endangered Wildlife Mammals Class II			
1	*Martes flavigula*	담비	Yellow-throated Marten
2	*Callorhinus ursinus*	물개	Northern Fur Seal
3	*Prionailurus bengalensis*	삵	Leopard Cat
4	*Eumetopias jubatus*	큰바다사자	Steller Sea Lion
5	*Plecotus ognevi*	토끼박쥐	Long-eared Bat
6	*Pteromys Volans aluco*	하늘다람쥐	Korean Small Flying Squirrel
Endangered Wildlife Birds Class I			
1	*Aquila chrysaetos*	검독수리	Golden Eagle
2	*Cygnus columbianus*	고니	Bewick‘s Swan
3	*Eurynorhynchus pygmeus*	넓적부리도요	Spoon-billed Sandpiper
4	*Egretta eulophotes*	노랑부리백로	Chinese Egret
5	*Otis tarda*	느시	Great Bustard
6	*Grus japonensis*	두루미	Manchurian (or Japanese) Crane
7	*Ciconia nigra*	먹황새	Black stork
8	*Thalasseus bernsteini*	뿔제비갈매기	Chinese crested tern
9	*Platalea minor*	저어새	Black-faced Spoonbill

Table B-1. Endangered Species of Wild Fauna and Flora in Korea (as of 9 Dec 2022)

SCIENTIFIC NAME		KOREAN NAME	ENGLISH NAME
10	*Haliaeetus pelagicus*	참수리	Steller's Sea Eagle
11	*Tringa guttifer*	청다리도요사촌	Nordmann's Sandpiper
12	*Dryocopus javensis*	크낙새	White-billed Woodpecker
13	*Mergus squamatus*	호사비오리	Scaly-sided merganser
14	*Cygnus olor*	혹고니	Mute Swan
15	*Ciconia boyciana*	황새	Oriental White Stork
16	*Haliaeetus albicilla*	흰꼬리수리	White-tailed Sea Eagle
Endangered Wildlife Birds Class II			
1	*Anser cygnoides*	개리	Swan Goose
2	*Larus saundersi*	검은머리갈매기	Saunder's Gull
3	*Haematopus ostralegus*	검은머리물떼새	Oystercatcher
4	*Emberiza aureola*	검은머리촉새	Yellow-breasted bunting
5	*Grus grus*	검은목두루미	Crane
6	*Larus relictus*	고대갈매기	Relict gull
7	*Terpsiphone atrocaudata*	긴꼬리딱새	Japanese paradise flycatcher
8	*Strix uralensis*	긴점박이올빼미	Ural Owl
9	*Dryocopus martius*	까막딱다구리	Great Black Woodpecker

Table B-1. Endangered Species of Wild Fauna and Flora in Korea (as of 9 Dec 2022)

SCIENTIFIC NAME		KOREAN NAME	ENGLISH NAME
10	*Platalea leucorodia*	노랑부리저어새	Eurasian Spoonbill
11	*Aegypius monachus*	독수리	Cinereous Vulture
12	*Nipponia nippon*	따오기	Crested ibis
13	*Gallicrex cinerea*	뜸부기	Watercock
14	*Falco peregrinus*	매	Peregrine Falcon
15	*Emberiza sulphurata*	무당새	Yellow bunting
16	*Pandion haliaetus*	물수리	Osprey
17	*Pernis ptilorhynchus*	벌매	Oriental Honey-Buzzard
18	*Aythya baeri*	붉은가슴흰죽지	Bear's Pochard
19	*Accipiter soloensis*	붉은배새매	Chinese sparrowhawk
20	*Calidris tenuirostris*	붉은어깨도요	Great knot
21	*Gorsachius goisagi*	붉은해오라기	Japanese Night Heron
22	*Synthliboramphus wumizusume*	뿔쇠오리	Japanese Murrelet
23	*Galerida cristata*	뿔종다리	Crested Lark
24	*Accipiter nisus*	새매	Eurasian Sparrowhawk
25	*Falco subbuteo*	새호리기	Hobby
26	*Locustella pleskei*	섬개개비	Styan’s Grasshopper Warbler

Table B-1. Endangered Species of Wild Fauna and Flora in Korea (as of 9 Dec 2022)

SCIENTIFIC NAME		KOREAN NAME	ENGLISH NAME
27	*Milvus migrans*	솔개	Black-eared Kite
28	*Emberiza yessoensis*	쇠검은머리쑥새	Japanese reed bunting
29	*Sterna albifrons*	쇠제비갈매기	Little Tern
30	*Bubo bubo*	수리부엉이	Eagle Owl
31	*Grus leucogeranus*	시베리아흰두루미	Siberian Crane
32	*Circus melanoleucos*	알락개구리매	Pied Harrier
33	*Numenius madagascariensis*	알락꼬리마도요	Australian Curlew
34	*Columba rupestris*	양비둘기	Hill Pigeon
35	*Strix aluco*	올빼미	Tawny Owl
36	*Grus vipio*	재두루미	White-napped Crane
37	*Circus cyaneus*	잿빛개구리매	Hen Harrier
38	*Accipiter gularis*	조롱이	Japanese Sparrow Hawk
39	*Accipiter gentilis*	참매	Goshawk
40	*Halcyon pileata*	청호반새	Black-Capped Kingfisher
41	*Cygnus cygnus*	큰고니	Whooper Swan
42	*Anser fabalis*	큰기러기	Bean Goose
43	*Ixobrychus eurhythmus*	큰덤불해오라기	Schrenck's Bittern

Table B-1. Endangered Species of Wild Fauna and Flora in Korea (as of 9 Dec 2022)

SCIENTIFIC NAME		KOREAN NAME	ENGLISH NAME
44	*Limosa lapponica*	큰뒷부리도요	Bar-tailed Godwit
45	*Buteo hemilasius*	큰말똥가리	Upland Buzzard
46	*Pitta nympha*	팔색조	Fairy Pitta
47	*Aquila clanga*	항라머리검독수리	Greater Spotted Eagle
48	*Branta bernicla*	흑기러기	Brent Goose
49	*Grus monacha*	흑두루미	Hooded Crane
50	*Columba janthina*	흑비둘기	Japanese Wood Pigeon
51	*Charadrius placidus*	흰목물떼새	Long-billed Ringed Plover
52	*Anser erythropus*	흰이마기러기	Lesser White-fronted Goose
53	*Aquila heliaca*	흰죽지수리	Imperial Eagle
Endangered Wildlife Amphibians and Reptiles Class I			
1	*Sibynophis chinensis*	비바리뱀	Chinese Mountain Snake
2	*Dryophytes suweonensis*	수원청개구리	Spotless tree toad
Endangered Wildlife Amphibians and Reptiles Class II			
1	*Hynobius yangi*	고리도롱뇽	Kori Salamander
2	*Elaphe schrenckii*	구렁이	Russian rat snake
3	*Pelophylax chosenicus*	금개구리	Eastern Golden Frog

Table B-1. Endangered Species of Wild Fauna and Flora in Korea (as of 9 Dec 2022)

SCIENTIFIC NAME		KOREAN NAME	ENGLISH NAME
4	*Mauremys reevesii*	남생이	Reeve's Turtle
5	*Kaloula borealis*	맹꽁이	Korean Narrow-mouthed Frog
6	*Eremias argus*	표범장지뱀	Tiger Lizard
Endangered Wildlife Fish Class I			
1	*Pseudopungtungia nigra*	감돌고기	Black Shinner
2	*Pseudobagrus brevicorpus*	꼬치동자개	Korean Stumpy Bullhead
3	*Odontobutis obscura*	남방동사리	Dark Sleeper
4	*Microphysogobio koreensis*	모래주사	Korean southern gudgeon
5	*Cobitis choii*	미호종개	Miho Spine Loach
6	*Koreocobitis naktongensis*	얼룩새코미꾸리	White-nosed Loach
7	*Microphysogobio rapidus*	여울마자	Korean Freshwater Fish
8	*Acheilognathus somjinensis*	임실납자루	Somjin bitterling
9	*Kichulchoia brevifasciata*	좀수수치	Cobitis brevifasciata
10	*Liobagrus obesus*	퉁사리	Bull-head Torrent Catfish
11	*Gobiobotia nakdongensis*	흰수마자	Hinsumija
Endangered Wildlife Fish Class II			
1	*Pseudopungtungia tenuicorpa*	가는돌고기	Silver/black fish

Table B-1. Endangered Species of Wild Fauna and Flora in Korea (as of 9 Dec 2022)

SCIENTIFIC NAME		KOREAN NAME	ENGLISH NAME
2	*Pungitius sinensis*	가시고기	Amur Stickleback
3	*Coreoperca kawamebari*	꺽저기	Korean Freshwater Fish
4	*Gobiobotia macrocephala*	꾸구리	Yellow/black fish
5	*Lethenteron reissneri*	다묵장어	Sand Lamprey
6	*Gobiobotia brevibarba*	돌상어	Yellow/black fish
7	*Cottus koreanus*	둑중개	Yellow Fin Sculpin/Miller's Thumb
8	*Acheilognathus signifer*	묵납자루	Korean bitterling
9	*Rhynchocypris semotilus*	버들가지	Black star fatminnow
10	*Iksookimia pumila*	부안종개	Buan Spine Loach
11	*Ladislavia taczanowskii*	새미	Taczanowski's gudgeon
12	*Hemibarbus mylodon*	어름치	Korea Spotted Barbel
13	*Phoxinus phoxinus*	연준모치	Common minnow
14	*Brachymystax lenok tsinlingensis*	열목어	Salmonid fish
15	*Lethenteron japonicus*	칠성장어	Lamprey
16	*Acheilognathus majusculus*	큰줄납자루	Ray-finned fish
17	*Rhodeus pseudosericeus*	한강납줄개	Hangang bitterling

Table B-1. Endangered Species of Wild Fauna and Flora in Korea (as of 9 Dec 2022)

SCIENTIFIC NAME		KOREAN NAME	ENGLISH NAME
18	*Cottus hangiongensis*	한둑중개	Scorpion Fish
Endangered Wildlife Insects Class I			
1	*Cicindela (Abroscelis) anchoralis*	닻무늬길앞잡이	Beetle
2	*Parnassius bremeri*	붉은점모시나비	Red-spotted Apollo Butterfly
3	*Chrysochroa (Chrysochroa) coreana*	비단벌레	Korean jewel beetle
4	*Hipparchia autonoe*	산굴뚝나비	Esper Butterfly
5	*Aporia crataegi*	상제나비	Black-veined White
6	*Polyphylla laticollis manchurica*	수염풍뎅이	Garden Chafer
7	*Callipogon (Eoxenus) relictus*	장수하늘소	Korean Relict Long-horned Beetle
8	*Sinia divina*	큰홍띠점박이푸른부전나비	Butterfly
Endangered Wildlife Insects Class II			
1	*Protantigius superans*	깊은산부전나비	Butterfly
2	*Macromia daimoji*	노란잔산잠자리	Dragonfly
3	*Libellula angelina*	대모잠자리	Dragonfly
4	*Prosopocoilus astacoides blanchardi*	두점박이사슴벌레	Beetle

Table B-1. Endangered Species of Wild Fauna and Flora in Korea (as of 9 Dec 2022)

SCIENTIFIC NAME		KOREAN NAME	ENGLISH NAME
5	*Haplotropis brunneriana*	뚱보주름메뚜기	Toad grasshoppers
6	*Acoptolabrus mirabilissimus*	멋조롱박딱정벌레	Beetle
7	*Cybister (Cybister) chinensis*	물방개	Diving beetle
8	*Lethocerus deyrolli*	물장군	Giant Water Bug
9	*Arctia caja*	불나방	Moth
10	*Gymnopleurus (Gymnopleurus) mopsus*	소똥구리	Dung Beetle
11	*Cigaritis takanonis*	쌍꼬리부전나비	Butterfly
12	*Copris (Copris) tripartitus*	애기뿔소똥구리	Dung Beetle
13	*Mellicta ambigua*	여름어리표범나비	Butterfly
14	*Argynnis nerippe*	왕은점표범나비	Silver-spotted Leopard Butterfly
15	*Acoptolabrus leechi yooni*	윤조롱박딱정벌레	Beetle
16	*Leptalina unicolor*	은줄팔랑나비	Hesperiid butterfly
17	*Bombus (Megabombus) koreanus*	참호박뒤영벌	Bee
18	*Acoptolabrus changeonleei*	창언조롱박딱정벌레	Beetle
19	*Osmoderma caeleste*	큰자색호랑꽃무지	Silver/black beetle
20	*Nannophya koreana*	한국꼬마잠자리	Little Dragonfly

Table B-1. Endangered Species of Wild Fauna and Flora in Korea (as of 9 Dec 2022)

SCIENTIFIC NAME		KOREAN NAME	ENGLISH NAME
21	*Chalinga pratti*	홍줄나비	Butterfly
Endangered Wildlife Invertebrate Class I			
1	*Cristaria plicata*	귀이빨대칭이	Leech
2	*Charonia lampas*	나팔고둥	Saul's Triton
3	*Pseudohelice subquadrata*	남방방게	Grey Shore Crab
4	*Aculamprotula coreana*	두드럭조개	Mussel
Endangered Wildlife Invertebrate Class II			
1	*Chasmagnathus convexus*	갯게	Mud-flat Crab
2	*Satsuma myomphala*	거제외줄달팽이	Snail
3	*Dendronephthya suensoni*	검붉은수지맨드라미	Soft coral
4	*Tubastraea coccinea*	금빛나팔돌산호	Coral
5	*Clithon retropictum*	기수갈고둥	Brackish Water Snail
6	*Plumarella spinosa*	깃산호	Coral
7	*Ellobium chinense*	대추귀고둥	Snail
8	*Euplexaura crassa*	둔한진총산호	Coral
9	*Echinogorgia reticulata*	망상맵시산호	Coral
10	*Argyroneta aquatica*	물거미	Water spider
11	*Dendronephthya castanea*	밤수지맨드라미	Soft coral

Table B-1. Endangered Species of Wild Fauna and Flora in Korea (as of 9 Dec 2022)

SCIENTIFIC NAME		KOREAN NAME	ENGLISH NAME
12	*Ellisella ceratophyta*	별혹산호	Lichen
13	*Sesarmops intermedius*	붉은발말똥게	Crab
14	*Ophiacantha linea*	선침거미불가사리	Invertebrate
15	*Dendronephthya mollis*	연수지맨드라미	Soft coral
16	*Koreanomelania nodifila*	염주알다슬기	Bead snail
17	*Karaftohelix adamsi*	울릉도달팽이	Snail
18	*Dendrophyllia cribrosa*	유착나무돌산호	Coral
19	*Nacospatangus alta*	의염통성게	Sea Urchin
20	*Dendronephthya putteri*	자색수지맨드라미	Soft coral
21	*Dendrophyllia ijimai*	잔가지나무돌산호	Coral
22	*Plumarella adhaerens*	착생깃산호	Sea fan/sea whip
23	*Koreanohadra koreana*	참달팽이	Invertebrate
24	*Echinogorgia complexa*	측맵시산호	Coral
25	*Gammarus zeongogensis*	칼세오리옆새우	Gammaridae
26	*Myriopathes japonica*	해송	Coral
27	*Austruca lactea*	흰발농게	Milky fiddler crabs
28	*Dendronephthya alba*	흰수지맨드라미	Soft coral

Table B-1. Endangered Species of Wild Fauna and Flora in Korea (as of 9 Dec 2022)

SCIENTIFIC NAME		KOREAN NAME	ENGLISH NAME
Endangered Wildlife Land Plants Class I			
1	*Cypripedium japonicum*	광릉요강꽃	Lady's Slipper
2	*Gastrochilus fuscopunctatus*	금자란	Orchid
3	*Sedirea japonica*	나도풍란	Orchid
4	*Euchresta japonica*	만년콩	Evergreen shrub
5	*Thrixspermum japonicum*	비자란	Orchid
6	*Diapensia lapponica var. obovata*	암매	Pincushion Plant
7	*Mankyua chejuense*	제주고사리삼	Fern
8	*Cymbidium lancifolium*	죽백란	Orchid
9	*Gastrochilus japonicus*	탐라란	Orchid
10	*Cypripedium guttatum*	털복주머니란	Orchid
11	*Neofinetia falcata*	풍란	Orchid
12	*Leontopodium coreanum var. hallaisanense*	한라솜다리	Orchid
13	*Cymbidium kanran*	한란	Orchid
Endangered Wildlife Land Plants Class II			
1	*Lychnis kiusiana*	가는동자꽃	Perennial herb

Table B-1. Endangered Species of Wild Fauna and Flora in Korea (as of 9 Dec 2022)

SCIENTIFIC NAME		KOREAN NAME	ENGLISH NAME
2	*Euryale ferox*	가시연	Fox Nut
3	*Eleutherococcus senticosus*	가시오갈피나무	Siberian Ginseng
4	*Nymphaea tetragona var. minima*	각시수련	Pigmy waterlily
5	*Quercus gilva*	개가시나무	Red Oak
6	*Glaux maritima var. obtusifolia*	갯봄맞이꽃	Sea milkwort
7	*Cyclosorus interruptus*	검은별고사리	Fern
8	*Neottianthe cucullata*	구름병아리난초	Orchid
9	*Trientalis europaea subsp. arctica*	기생꽃	Green leaf plant with white flowers
10	*Drosera peltata var. nipponica*	끈끈이귀개	Flowering plant
11	*Mitella nuda*	나도범의귀	Perennial Plant
12	*Kirengeshoma koreana*	나도승마	Yellow waxbells
13	*Zigadenus sibiricus*	나도여로	Perennial Plant
14	*Lilium dauricum*	날개하늘나리	Lily
15	*Viola mirabilis*	넓은잎제비꽃	Wonder Violet
16	*Rhododendron aureum*	노랑만병초	Small flowering shrub
17	*Iris koreana*	노랑붓꽃	Dwarf yellow iris

Table B-1. Endangered Species of Wild Fauna and Flora in Korea (as of 9 Dec 2022)

SCIENTIFIC NAME		KOREAN NAME	ENGLISH NAME
18	*Asplenium wrightii*	눈썹고사리	Evergreen
19	*Aster altaicus var. uchiyamae*	단양쑥부쟁이	Flowering plant
20	*Anagallidium dichotomum*	대성쓴풀	Gentianaceae
21	*Iris dichotoma*	대청부채	Purple iris fan
22	*Cymbidium macrorhizon*	대흥란	Orchid
23	*Cicuta virosa*	독미나리	Northern Water Hemlock
24	*Cremastra unguiculata*	두잎약난초	Orchid
25	*Ranunculus trichophyllus var. kadzusensis*	매화마름	Diamond shaped plum demersum
26	*Lasianthus japonicus*	무주나무	Muji Tree
27	*Ceratopteris thalictroides*	물고사리	Water fern
28	*Lycopodiella cernua*	물석송	Staghorn clubmoss
29	*Habenaria flagellifera*	방울난초	Orchid
30	*Aconitum coreanum*	백부자	Korean aconite
31	*Orobanche filicicola*	백양더부살이	
32	*Kuhlhasseltia nakaiana*	백운란	Orchid
33	*Cypripedium macranthos*	복주머니란	Orchid
34	*Silene capitata*	분홍장구채	Caryophyllaceae

Table B-1. Endangered Species of Wild Fauna and Flora in Korea (as of 9 Dec 2022)

SCIENTIFIC NAME		KOREAN NAME	ENGLISH NAME
35	*Viburnum burejaeticum*	산분꽃나무	Shrub
36	*Paeonia obovata*	산작약	Obovata Peony
37	*Saururus chinensis*	삼백초	Chinese Lizard's Tail
38	*Woodwardia japonica*	새깃아재비	Large evergreen fern
39	*Pterygopleurum neurophyllum*	서울개발나물	Perennial herbs
40	*Dendrobium moniliforme*	석곡	Orchid
41	*Adenophorat erecta*	선모시대	Perennial Plant
42	*Viola raddeana*	선제비꽃	Perennial herb
43	*Cotoneaster wilsonii*	섬개야광나무	Rosaceae
44	*Bupleurum latissimum*	섬시호	Small flowering plant
45	*Scrophularia takesimensis*	섬현삼	Small flowering plant
46	*Aconitum austrokoreense*	세뿔투구꽃	Purple flowering plant
47	*Gymnadenia conopsea*	손바닥난초	Orchid
48	*Psilotum nudum*	솔잎난	Orchid
49	*Brasenia schreberi*	순채	Water Shield
50	*Calanthe aristulifera*	신안새우난초	Orchid
51	*Pedicularis ishidoyana*	애기송이풀	Radical-flower lousewort

Table B-1. Endangered Species of Wild Fauna and Flora in Korea (as of 9 Dec 2022)

SCIENTIFIC NAME		KOREAN NAME	ENGLISH NAME
52	*Thalictrum coreanum*	연잎꿩의다리	China Meadow Rue
53	*Viola websteri*	왕제비꽃	Yellow/white flowering plant
54	*Cyrtosia septentrionalis*	으름난초	Eureum Orchid
55	*Utricularia yakusimensis*	자주땅귀개	Aquatic water plant
56	*Viola biflora*	장백제비꽃	Viola
57	*Dysophylla yatabeana*	전주물꼬리풀	Herbs
58	*Amsonia elliptica*	정향풀	Oriental Blue-Star
59	*Lychnis wilfordii*	제비동자꽃	Regel
60	*Iris laevigata*	제비붓꽃	Iris
61	*Menyanthes trifoliata*	조름나물	Buckbean
62	*Sarcandra glabra*	죽절초	Decrotive evergreen shrubbery
63	*Cleisostoma scolopendrifolium*	지네발란	Orchid
64	*Lycoris chinensis var. sinuolata*	진노랑상사화	Yellow wildflower
65	*Oberonia japonica*	차걸이란	Orchid
66	*Halenia coreana*	참닻꽃	Gentianaceae
67	*Isoetes coreana*	참물부추	Korean quillwort

Table B-1. Endangered Species of Wild Fauna and Flora in Korea (as of 9 Dec 2022)

SCIENTIFIC NAME		KOREAN NAME	ENGLISH NAME
68	*Michelia compressa*	초령목	Magnolia
69	*Metanarthecium luteo-viride*	칠보치마	Chilbo metanarthecium
70	*Bulbophyllum drymoglossum*	콩짜개란	Orchid
71	*Epilobium hirsutum*	큰바늘꽃	Hairy willowherb
72	*Asplenium antiquum*	파초일엽	Spleenwort
73	*Stellera chamaejasme*	피뿌리풀	Herbs
74	*Pedicularis hallaisanensis*	한라송이풀	Pedicularis
75	*Liparis auriculata*	한라옥잠난초	Liparis
76	*Silene fasciculata*	한라장구채	Perennial Plant
77	*Habenaria radiata*	해오라비난초	White egret flower
78	*Bulbophyllum inconspicuum*	혹난초	Orchid
79	*Arctous rubra*	홍월귤	Red Manzanita, Red Bearberry
Endangered Wildlife Macroalgae (See Plants) Class II			
1	*Dictyosphaeria cavernosa*	그물공말	Alga
2	*Coccophora langsdorfii*	삼나무말	Flowering sea plant
Endangered Wildlife Fungi Class II			
1	*Omphalotus guepiniiformis*	화경솔밭버섯	Mushroom

Table B-2. ROK Species Designated as Natural Monument (as of Dec 2023)

KOREAN NAME	ENGLISH NAME (SCIENTIFIC NAME)
Birds	
크낙새	White-bellied Woodpecker (*dryocopus javensis*)
따오기	Asian Crested Ibis (Nipponia Nippon)
황새	Oriental White Stork (*Ciconia boyciana*)
먹황새	Black Stork (*Ciconia nigra*)
고니	Bewick‘s Swan (*Cygnus columbianus*)
큰고니	Whooper Swan (*Cygnus Cygnus*)
혹고니	Mute Swan (*Cygnus olor*)
두루미	Red-crowned Crane (*Grus japonensis*)
재두루미	White-naped Crane (*Grus vipio*)
팔색조	Fairy Pitta (*Pitta nympha*)
저어새	Black-faced Spoonbill (*Platalea minor*)
노랑부리저어새	Eurasian Spoonbill (*Platalea leucorodia*)
느시	Great Bustard (*Otis tarda*)
흑비둘기	Black Wood Pigeon (*Columba janthina*)
흑두루미	Hooded Crane (*Grus monacha*)
까막딱다구리	Black Woodpecker (*Dryocopus martius*)
독수리	Cinereous Vulture (*Aegypius monachus*)

Table B-2. ROK Species Designated as Natural Monument (as of Dec 2023)

KOREAN NAME	ENGLISH NAME (SCIENTIFIC NAME)
검독수리	Golden Eagle (*Aquila chrysaetos*)
참수리	Steller‘s Sea Eagle (*Hallaetus pelagicus*)
흰꼬리수리	White-tailed Eagle (*Haliaeetus albicilla*)
참매	Northern Goshawk (*Accipiter gentilis*)
붉은배새매	Chinese Sparrowhawk (*Accipiter soloensis*)
개구리매	Eastern Marsh Harrier (*Circus spilonotus*)
새매	Eurasian Sparrowhawk (*Accipiter nisus*)
알락개구리매	Pied Harrier (*Circus melanoleucos*)
잿빛개구리매	Hen Harrier (*Circus cyaneus*)
매	Peregrine Falcon (*Falco peregrinus*)
황조롱이	Common Kestrel (*Falco tinnunculus*)
올빼미	Tawny Owl (*Strix aluco*)
수리부엉이	Eurasian Eagle Owl (*Bubo bubo*)
솔부엉이	Brown Hawk Owl (*Ninox scutulata*)
쇠부엉이	Short-eared Owl (*Asio flammeus*)
칡부엉이	Long-eared Owl (*Asio otus*)
소쩍새	Oriental Scops Owl (*Otus sunia*)

Table B-2. ROK Species Designated as Natural Monument (as of Dec 2023)

KOREAN NAME	ENGLISH NAME (SCIENTIFIC NAME)
큰소쩍새	Collared Scops Owl (*Otus bakkamoena*)
개리	Swan Goose (*Anser cygnoides*)
흑기러기	Brent Goose (*Branta bernicla*)
검은머리물떼새	Eurasian Oystercatcher (*Haematopus ostralegus*)
원앙	Mandarin Duck (*Aix galericulata*)
노랑부리백로	Chinese Egret (*Egretta eulophotes*)
뜸부기	Watercock (*Gallicrex cinerea*)
두견	Little Cuckoo (*Cuculus poliocephalus*)
호사비오리	Chinese Merganser (*Mergus squamatus*)
호사도요	Painted Snipe (*Rostratula benghalensis*)
뿔쇠오리	Japanese Murrelet (*Synthliboramphus wumizusume*)
검은목두루미	Common Crane (*Grus grus*)
Mammals	
사향노루	Musk Deer (*Moschus moschiferus*)
산양	Long-tailed Goral (*Naemorhedus caudatus*)
하늘다람쥐	Siberian Flying Squirrel (*Pteromys volans*)
반달가슴곰	Asiatic Black Bear (*Ursus thibetanus*)
수달	Eurasian Otter (*Lutra lutra*)

Table B-2. ROK Species Designated as Natural Monument (as of Dec 2023)

KOREAN NAME	ENGLISH NAME (SCIENTIFIC NAME)
점박이물범	Spotted Seal *(Phoca largha)*
붉은박쥐	Korean Orange Whiskered Bat, Golden-winged Myotis or Jobokseng Bat (*Myotis rufoniger*)
Fish	
한강의 황쏘가리	Yellow Mandarin Fish *(Siniperca scherzeri)*
어름치	Korean spotted barbel (Hemibarbus mylodon)
미호종개	Miho Spine Loach (*Cobitis choii*)
꼬치동자개	Korean Stumpy Bullhead (*Pseudobagrus brevicorpus*)
Insects	
장수하늘소	Long-horned Beetle (*Callipogon relictus*)
산굴뚝나비	Esper Butterfly (Hipparchia autonoe)
비단벌레	Metallic Wood-Boring Beetles *(Chrysochroa coreana)*
Reptiles	
남생이	Reeve‘s Turtle (*Mauremys reevesii*)
Coral	
해송	Black Coral (Myriopathes *japonica*)
긴가지해송	Coral (Myriopathes *lata*)

Table B-3. Ecosystem and Landscape Conservation Areas (as of Dec 2023)

Name	Location	Area (km^2)	Features	Designated Date
Nine (9) Areas Designated by the Ministry of Environment (248.029) km^2				
Hasidong-Anin Sand Dune 하시동·안인 사구	Areas at Hasidong-ri, Gangneung-si, Gangwon-do	0.234	Excellent topography	Dec 17, 2008
Mt. Jiri 지리산	Areas in Pia-gol Toji-myeon and Shimwon Gorge, Sandong-myeon Gurae-gun Jeonnam	20.20	Climax forest (*Abies Koreana* forest, etc.)	Dec 29, 1989
Mt. Unmoon 운문산	Areas at Unmoon-myon, Cheongdo-gun, Kyungbuk	26.395	Excellent scenery; habitat for rare wildlife species	Sep 9, 2010
Geogeum-do Mt. Jeokdae 거금도 적대봉	Areas at Jeokdaebong,Geogeum-do, Goheung-gun, Jeonnam	8.365	Habitat for rare wildlife species	Jan 7, 2011
Otters habitat at the Sumjin River 섬진강 수달서식지	Areas at Toji-myeon, Ganjeon-myeon, and Mooncheok-myeon, Gurae-gun, Jeonnam	1.834	Habitat for otters	Dec 1, 2001
Myotis formosus chofukusei habitat on Mt. Gosabong 고산봉 붉은박쥐서식지	Areas at Daedong-myon Hampyong-gun Jeonnam	8.78	Habitat for *Myotis formosus chofukusei* (Endangered wildlife mammals Class II)	May 1, 2002

Table B-3. Ecosystem and Landscape Conservation Areas (as of Dec 2023)

Name	Location	Area (km^2)	Features	Designated Date
Basin of the Dong River 동강유역	Areas at Yongwol-eup Yongwol-gun in Kangwon; and Jongsun-up and Shindong-eup, and Mitan-myeon, Pyeongchang-gun Gangwon	79.259	Excellent topography and scenery habitat for rare wildlife species	Aug 9, 2002
Basin of the Wangbicheon 왕피천 유역	Areas at Gunnam-myeon, and Seo-myeon, Uljin-gun Gyeongbuk	102.841	Excellent topography and scenery habitat for rare wildlife species	Oct 14, 2005
Sohwang sand dune 소황사구	Areas at Doksan-ri, and Sohwang-ri, Ungchon-eup, Boryeong, Chungnam	0.121	Costal sand dune	Oct 28, 2005
Twenty three (23) Areas Designated by the Governors and Mayors (37.905 km^2)				
The Han River, Bam Island 한강밤섬	84-4 Yeouido-dong, Yeongdeungpo-gu and 314 Dangin-dong, Mapo-gu Seoul	0.279	Habitats for migration birds	Aug 10, 1999
Natural wetland at Duncheon-dong 둔춘동	211 Duncheon-dong Gangdong-gu Seoul	0.030	Natural wetland	Mar 6, 2000
Wetland at Bangi-dong 방이동	Areas of 439-2 Bangi-dong Songpa-gu Seoul	0.059	Wetland	Apr 15, 2002 Nov 24, 2005
Tancheon 탄천	Suseo-dong, Gangnam-gu and Garak-dong, Songpa-gu Seoul	1.151	Habitats for migration birds	Apr 15, 2002

Table B-3. Ecosystem and Landscape Conservation Areas (as of Dec 2023)

Name	Location	Area (km^2)	Features	Designated Date
Wetland at Jingwannae-dong 진관내동	Areas at 282-1 Jin-kwan-nae-dong Un-pyong-gu Seoul	0.017	Natural wetland	Dec 30, 2002
Wetland at Amsa-dong 암사동	Area at 624-1, 659-1 Gangdong-gu Seoul	0.270	Riparian wetland	Dec 30, 2002
Terrace land on the Han River at Goduk-dong 고덕동	Area at 396 Gangdong-gu Seoul	0.320	Various native species	Oct 20, 2004
Mt. Chonggae Wonta-gol 청계산원터골	Areas at San 4-15 Wonji-dong Seocho-gu Seoul	0.146	Deciduous broad- leaved trees, such as White Oak	Oct 20, 2004
Huninrung Rorinamu 헌인릉	Areas at San 13-1 Naegok- dong, Seocho-gu Seoul	0.057	Various native species	Nov 24, 2005
Mt. Namsan 남산	Areas at San 5-6 Yejang-dong Junggu Seoul	0.705	Communities of Mongolian Oak	Jul 27, 2006
Mt. Boolam San Yudae 불암산삼육대	Areas at San 223-1 Gongnung-dong, Nowon-gu Seoul	0.204	Communities of *Carpinus laxiflora*	Jul 27, 2006
Backyard of Changdeok Palace 창덕궁후원	Areas at 2-71 Waryeong-dong, Jongno-gu Seoul	0.441	Communities of White Oak	Jul 27, 2006
Sohan Valley 소한계곡	Hamaeongbang-ri, Chodang-ri, Geunduk-myeon, Samcheok-si, Gangwon	0.104	Freshwater laver	Oct 5, 2012
Mt. Bakun 광양백운산	Okryeong-myeon, Jinsang-myeon, and Daap-myeon Jeonnam	9.74	Spectacular view and virgin forest	Apr 26, 1993

Table B-3. Ecosystem and Landscape Conservation Areas (as of Dec 2023)

Name	Location	Area (km^2)	Features	Designated Date
Twenty three (23) Areas Designated by the Governors and Mayors (37.905 km^2)				
Upstream areas of Jojong stream at Mt.Yongji and Mt. Chonggae 조종천상류 명지산·청계산	Gapyeong-gun and Pocheon-gun, Gyeonggi	22.06	Rare insects A wide range of biota	Sep 1, 1993
Bongsan Babbae Namu Forest 봉산	Areas at Sinsa-dong, Gangnam-gu, Seoul	0.073	Communities of Sorbus alnifolia	Dec 27, 2007
Mt. Inwang scenery 인왕산	Areas at Hongje-dong, Seodaemun-gu, Seoul	0.258	Excellent scenery	Dec 27, 2007
Seongnae-cheon downstream 성내천하류	Areas at Bangi-dong, Songpa-gu, Seoul	0.07	Urban natural river	Nov 26, 2009
Mt. Gwanak 관악산	Areas at Sinrim-dong, Gwanak-gu, Seoul	0.748	Boxwood habitat	Nov 26, 2009
Baeksasil Valley 백사실계곡	Areas at Buam-dong, Jongno-gu, Seoul	0.133	Rich in biodiversity	Nov 26, 2009

Table B-3. Ecosystem and Landscape Conservation Areas (as of Dec 2023)

Name	Location	Area (km^2)	Features	Designated Date
Seogundum Valley 석은덤계곡	San 101-1 Byeongsan-ri, Jeonggwan-myeon, Gijang-gun, Busan	0.02	Jeongkwan-myeon, Gijang-gun, Busan	Jun 10, 2015
Jangsan Wetland 장산습지	San 51-188, Bansong-dong, Haeundae-gu, Busan	0.037	Bansong-dong, Haewoondae-gu, Busan	Aug. 9, 2017
Daehwa River 태화강	Downstream Areas of Daehwa River at Ulsan	0.983	Habitats for migration birds	Dec 24, 2008

Table B-4. Wetland Protected Areas (as of Dec 2023)

Name	Location	Area (km^2)	Key Features	Designated Date
Thirty two (32) Areas Designated by the Ministry Of Environment (137,696 km^2)				
Nakdong Estuary 낙동강하구	Saha-gu & Gangseo-gu, Busan	37.718	Migratory birds resting site	Aug 9, 1999
Yongneup of Mt. Daeam 대암산용늪	Injae-gun, Gangwon	1.360	Moor with peat deposits under cold temperature	Aug 9, 1999
Upo wetland 우포늪	Changryeong-gun, Gyeongnam	8.652	Largest inland wetland in the country	Aug 9, 1999
Mujaeji-neup 무제치늪	Ulsan, Gyeongnam	0.184	Mountainous wetland with high biodiversity	Aug 9, 1999
Mulyeongri oreum 제주 물영아리오름	Namwon, Jeju	0.309	Wetland in volcanic catchment	Dec 5, 2000
Hwaum-neup 화엄늪	Yangsan, Gyeongnam	0.124	Mountainous wetland	Feb 1, 2002
Du-ung wetland 두웅습지	Sindoori, Wonbookmyeon, Taean, Chungnam	0.067	Oxbow lake and marsh of Shinduri dune with rare wildlife species	Nov 1, 2002
High Moor of Mt. Shinbul 신불산 고산습지	Yangsan, Gyeongnam	0.308	Mountainous wetland with rare species	Feb 20, 2004

Table B-4. Wetland Protected Areas (as of Dec 2023)

Name	Location	Area (km^2)	Key Features	Designated Date
Damyang wetland 담양하천습지	Damyang-gun & Gwangju, Jeonnam	0.981	Riverine wetland with extensive areas of bamboo population	July 8, 2004.
Jangdo island High Moor 신안 장도 산지습지	Shinan-gun, Jeonnam	0.090	Mountainous wetland in an ocean island	Aug 31, 2004
Han Estuary 한강하구	Gangwha, Gyeonggi	60.668	Large expanses of estuary	Apr 17, 2006
Sajapyeong of Mt. Jaeyak 밀양 재약산 사자평 고산습지	Milyang, Gyeongnam	0.587	Thick peat deposits	Dec 28, 2006
1100 Altitude Wetland 제주 1100 고지	Jeju and Seogwipo cities, Jeju Island	0.126	High mountainous wetland with rare species	Oct 1, 2009
Muljangori Oreum 제주 물장오리오름	Bongaedong, Jeju	0.610	Wetland in volcanic catchment	Oct 1, 2009
Dongbaekdong san 제주 동백 동산습지	Jocheon, Jeju	0.590	High biodiversity	Nov 12, 2010

Table B-4. Wetland Protected Areas (as of Dec 2023)

Name	Location	Area (km^2)	Key Features	Designated Date
Thirty two (32) Areas Designated by the Ministry Of Environment (137,696 km^2)				
Ungok wetland 고창 운곡습지	Ungok-ri, Asan-myeon, Gochang-gun, myeon, Jeonbuk	1.930	High biodiversity	Mar 14, 2011
Gongguji 상주 공검지	Sangju city, Gyeongbuk	0.264	Rice paddy of natural & folk	Jun 29, 2011
Hanbando wetland 영월 한반도습지	Hanbando-myeon, Yeongwol-gun, Gangwon	2.772	Riverine wetland with high biodiversity	Jan 13, 2012
Wolyeong wetland 정읍 월영습지	Sangam-dong, Jeongeup-si, Jeonbuk	0.375	High biodiversity and endangered species	Jul 24, 2014
Jeju Sumunmul bangdui 제주 숨은물뱅듸	Gwangryeong-ri, Ewol-eup, Jeju city, Jeju	1.175	High biodiversity	Jul 1, 2015
Dongcheon Estuary 순천 동천하구	Bulrang-myeon, Haeryeong-myeon, Suncheon city, Jeonnam	5.656	High biodiversity and protected species	Dec 24, 2015
Jimsil wetland, 섬진강 침실습지	Somjin river area, Songdong-myeon, Namwon city, Jeonbuk	2.037	High biodiversity and protected species	Nov 7, 2016
Mungyong Dolrinae 문경 돌리네	Ugok-ri, Sanbuk-myeon, Mungyong city, Gyeongbuk	0.494	Endangered species	Jun 15, 2017

Table B-4. Wetland Protected Areas (as of Dec 2023)

Name	Location	Area (km^2)	Key Features	Designated Date
Gimhae Hwapocheon 김해 화포천	Jinyoung-eup, Hanrim-myeon, Gimhae city, Gyeongnam	1.244	High biodiversity and protected species	Nov 23, 2017
Gochang, Incheon estuary 고창 인천강하구	Buan-myeon area, Simwon-myeon area and Asan-myeon area in Gochang-gun, Jeonbuk	0.722	High biodiversity and protected species	Oct 24, 2018
Gwangju Jangrok 광주광역시 장록	Gwangsan-gu area, Gwangju City	2.704	High biodiversity and protected wetland	Dec 8, 2020
Chilwon Yongyangbo 철원 용양보	Gimhwa-eup area, Cheorwon-gun, Gwangwon	0.519	High biodiversity and various habitat	Dec 8, 2020
Binae Island 충주 비내섬	Sotae-myeon area and Yangsung-myeon area, in Chungju city, Chungbuk	0.92	High biodiversity and protected species	Nov 30, 2021
Gyongnam Goseong Madongho 경남 고성 마동호	Garu-myeon and Maam-myeon area, Goseong-gun, Gyeonnam	1.079	Protected species and high biodiversity	Feb 3, 2022

Table B-4. Wetland Protected Areas (as of Dec 2023)

Name	Location	Area (km^2)	Key Features	Designated Date
Sooncheon Waryeong San gee wetland 순천와룡 산지습지	San 277 area, Waryeong-dong, Sooncheon, Jeonnam	0.899	High biodiversity	30 Dec, 2022
Daejeon Gapcheon 대전 갑천	Wonshinheung-dong area, Yuseong-gu and Jeongrim, Wolpyeong, Doan-dong, Seo-gu, Daejeon	0.901	High biodiversity including endangered species	5 Jun, 2023
Cheolwon Egilri 철원 이길리	Egil-ri area, Cheolwon-gun, Gangwon-do	1.390	High biodiversity, Migratory birds resting site	29 Dec 2023
Sixteen (16) Areas Designated by the Ministry of Oceans and Fisheries (1,494.82km^2)				
Muan Tidal Flat 무안갯벌	Muan-gun, Jeonnam	42.000	High biodiversity, Geologic values	Dec 28, 2001
Jindo Tidal Flat 진도갯벌	Jindo-gun, Jeonnam province	1.440	Picturesque landscape, high biodiversity, Migratory birds resting site	Dec 28, 2002
Suncheon Bay 순천만갯벌	Suncheon city, Jeonnam	28.000	Hooded crane resting site, Picturesque landscape	Dec 31, 2003

Table B-4. Wetland Protected Areas (as of Dec 2023)

Name	Location	Area (km^2)	Key Features	Designated Date
Boseong-Bulgyo Tidal Flat 보성·벌교 갯벌	Boseong-gun, Jeonnam	33.92	Affluent marine resources	Dec 31, 2003
Ungjin-Jangbongdo Tidal Flat 옹진 장봉도 갯벌	Jangbong-ri, Ungjin-gun, Incheon	68.400	A resting site of rare migratory birds species, High biodiversity	Dec 31, 2003
Julpo Bay Tidal Flat 부안줄포만 갯벌	Julpo-myeon and Boan-myeon area, Buan-gun, Jeonbuk	4.900	A resting site of rare migratory bird species, High biodiversity	Dec 15, 2006
Gochang Tidal Flat 고창갯벌	Gochang-gun, Jeonbuk	64.66	Large expanses of tidal flats, Beautiful landscape, Municipal water source	Dec 31, 2007
Seocheon Tidal Flat 서천갯벌	Beein-myeon and Jongcheon-myeon Area, Seocheon-gun, Chungnam	68.09	Habitat of Eurasian Oystercatcher, Beautiful Landscape	Jan 30, 2008
Sinan Tidal Flat 신안갯벌	Sinan-gun, Jeonnam	1,100.86	Habitat of birds of international importance	Sep 3, 2018

Table B-4. Wetland Protected Areas (as of Dec 2023)

Name	Location	Area (km^2)	Key Features	Designated Date
Masan Bay Bongam Tidal Flat 마산만 봉암갯벌	Bongam, Changwon city	0.1	Wetland near urban settlement, Habitat of rare, endangered and threatened species	Dec 16, 2011
Siheung Tidal Flat 시흥갯벌	Janggok-dong, Siheung-si, Gyeonggi	0.71	Endangered species	Feb 17, 2012
Daebudo Tidal Flat 대부도갯벌	Danwon-gu, Ansan-si, Gyeonggi	4.53	High Biodiversity and Endangered species	Mar 22, 2017
Hwasung Maehangri Tidal Flat 화성 매향리갯벌	Maehang-ri, Ujeong-eup, Hwaseong-si, Gyeonggi	14.08	High Biodiversity	Jul 20, 2021
Goheung Tidal Flat 고흥갯벌	Yezaman area, Goheung-gun, Jeonnam	59.43	Endangered Species of bird migration and high biodiversity	Dec 29,2022
Sacheon Gwangpo Man 사천 광포만	Gwangpoman area, Sacheon-si, Gyeongnam	3.46	High Biodiversity	Oct 23, 2023
Jeju Ozori 제주 오조리	Ozori area, Seongsan-eup, Seogwipo-si, Jeju-do	0.24	Endangered Species	Dec 21, 2023

Table B-4. Wetland Protected Areas (as of Dec 2023)

Name	Location	Area (km^2)	Key Features	Designated Date
Seven (7) Areas Designated by the Governors and Mayors (8.254 km^2)				
Dalsung Riverine Wetland 대구달성 하천습지	Dalseo-gu, Daegu City	0.178	Migratory birds resting site, affluent aquatic plants (inland wetland)	May 25, 2007
Chudong Wetland 대청호 추동습지	Chu-dong 91, Dong-gu, Daejeon City	0.346	Habitat of rare species (inland wetland)	Dec 26, 2008
Songdo Tidal Flat 송도갯벌	Songdo, Incheon City	6.110	On a Route of East Asian-Australasian Flyway (coastal wetland)	Dec 31, 2009
Gasiyeon Wetland 경포호 가시연습지	Unjeong-dong, Anhyon-dong, Chodang-dong, Jeodong, Gangreung city, Gangwon	1.314	Migratory birds resting site, endangered species	Nov 15, 2016
Sunpoho 순포호	Sandaewol-ri, Sacheon-myeon, Gangreung city, Gangwon	0.133	Endangered species, Migratory birds resting site, High Biodiversity	Nov 15, 2016
Sangho 쌍호	Osan-ri, Sonyang-myeon, Yangyang-gun, Gangwon	0.139	Special Habitat	Nov 15, 2016
Gapyeongri Wetland 가평리습지	Gapyeong-ri, Sonyang-myeon, Yangyang-gun, Gwangwon province	0.034	Protected Species Habitat	Nov 15, 2016

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ENCLOSURE C
AIR EMISSIONS

1. INTRODUCTION

This enclosure 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 (ODSs). See Table C-1 for the location of additional standards in this manual related to air emission sources.

Table C-1. Additional Standards Related to Air Emission Sources

For:	See:
Asbestos	Enclosure D
Hazardous materials	Enclosure I
Petroleum, oil, and lubricants	Enclosure J
Underground storage tanks	Enclosure K
Hazardous waste	Enclosure O

2. GENERAL

Installations must ensure compliance with the following standards for air emission sources, as applicable. For sources covered in Tables, 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.

a. 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 enclosure 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.

b. 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.

c. 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.

d. Recordkeeping.

The following recordkeeping requirements apply to all units.

(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).

(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.

e. 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 Paragraphs 4.d. and 9.b.(1), as applicable.

f. Open Burning

Open burning of trash and other materials in drums, open area or burn pits is strictly prohibited on USFK installations. Open burning for recreational purpose such as campfire, fireplaces and barbecues in designated places will be exempted.

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.

a. Air Emission Limits.

(1) The following standards apply to units with a maximum design heat input capacity greater than or equal to 1,238,000 kcal/hr [4.9 million British thermal units per hour (MMBtu/hr)] or steam generation greater than or equal to 2 tons per hour (ton/hr) for industry and business purpose:

(a) Boiler units must meet the emission limits for specific sized units shown in Table C-4 and C-30.

(b) For units combusting liquid fossil fuel, compliance with particulate matter (PM) and sulfur dioxide (SO_2) emission limits must be demonstrated by combusting oil containing no more than 0.50 weight percent sulfur demonstrated by fuel certification.

(2) Initial demonstration of compliance with the Table C-4 emission limits can be accomplished using one or more of the following:

(a) Test data from the boiler manufacturer.

(b) Test data from the owner/operator.

(c) Data from a CEMS and/or a continuous opacity monitoring system.

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

(3) Subsequent demonstration of compliance:

(a) 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.

(b) Must be accomplished for the emission limits in the Table C-4

(c) Shall be monitored in accordance with the frequency in the Table C-31

(d) Amount of air pollutants can be obtained by the Table C-32

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

(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 2 (every 2 years or every 5 years).

(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 C-3. Unless specifically exempted in Table C-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.

Table C-2. Tune-up Requirements for Boilers

Exempt Units	
The following types of units are exempt from all tune-up requirements: - Gas-fired boilers[a] - Temporary boilers[d] - Boilers that burn solid or hazardous waste- Residential boilers - Hot water heaters[b] - Electric boilers[e] - Waste heat boilers[c] - 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

Table C-2. Tune-up Requirements for Boilers - continued

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 O_2 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.	
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.	

Table C-2. Tune-up Requirements for Boilers - continued

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 O_2 and/or CO monitor that automatically provides a feedback signal to the combustion air controller.

Table C-3. 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.

Table C-3. Energy Assessment for Boilers - continued

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 [1TBtu/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 4 JUN 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.	

Table C-4. ROK Permissible Standards for Boilers

Pollutants	Type of Facility	Permissible Emission Standard
Sulfur Oxides as SO_2	➢ **General Boiler (2 ton/hour ≤ evaporation rate or 1,238,000 kcal/hour ≤ heat input**	
	• Using Liquid Fuel (evaporation rate ≥ 40 ton/hour or 24,760,000 kcal/hour ≤ heat input)	
	- Installed before 31 Dec 2004 ▪ Area of using low sulfur fuel (≤ 0.3%) ▪ Other area - Installed after 1 Jan 2005 - Installed after 1 Jan 2015	 ≤ 140 (4) ppm ≤ 210 (4) ppm ≤ 80 (4) ppm ≤ 50 (4) ppm
	• Using Liquid Fuel (10 ton/hour ≤ evaporation rate < 40 ton/hour or 6,190,000 kcal/hour ≤ heat input < 24,760,000 kcal/hour)	
	- Installed before 31 Dec 2014 ▪ Area of using low sulfur fuel (≤ 0.3%) ▪ Area of using low sulfur fuel (≤ 0.5%) ▪ Other area - Installed after 1 Jan 2015	 ≤ 140 (4) ppm ≤ 210 (4) ppm ≤ 210 (4) ppm ≤ 50 (4) ppm
	• Using Liquid Fuel (2 ton/hour ≤ evaporation rate < 10 ton/hour or 1,238,000 kcal/hour ≤ heat input < 6,190,000 kcal/hour)	
	- Installed before 31 Dec 2019 ▪ Area of using low sulfur fuel (≤ 0.3%) ▪ Other area - Installed after 1 Jan 2020	 ≤ 140 (4) ppm ≤ 210 (4) ppm ≤ 50 (4) ppm
	• Using Solid Fuel (Including mixture of liquid fuel)	
	- Installed before 30 Jun 2001 - Installed after 1 Jul 2001 - Installed after 1 Jan 2015 - Installed after 1 Jan 2020	≤ 120 (6) ppm ≤ 100 (6) ppm ≤ 50 (6) ppm ≤ 20 (6) ppm
	• Using Gas Fuel	
	- Installed before 31 Dec 2014 - Installed after 1 Jan 2015 - Installed after 1 Jan 2020	≤ 70 (4) ppm ≤ 35 (4) ppm ≤ 10 (4) ppm
	• Using Biogas	≤ 125 (4) ppm
Nitrogen Oxides as NO_2	➢ **General Boiler (2 ton/hour ≤ evaporation rate or 1,238,000 kcal/hour ≤ heat input**	

Table C-4. ROK Permissible Standards for Boilers - continued

Pollutants	Type of Facility	Permissible Emission Standard
	• Using Liquid Fuel (evaporation rate ≥ 40 ton/hour or heat input ≥ 24,760,000 kcal/hour)	
Nitrogen Oxides as NO_2	- Installed before 30 Jun 2001 - Installed after 1 Jul 2001 - Installed after 1 Jan 2015	≤ 70 (4) ppm ≤ 70 (4) ppm ≤ 50 (4) ppm
	• Using Liquid Fuel (10 ton/hour ≤ evaporation rate < 40 ton/hour or 6,190,000 kcal/hour ≤ heat input < 24,760,000 kcal/hour)	
	- Installed before 31 Jan 2007 - Installed after 1 Feb 2007 - Installed after 1 Jan 2015	≤ 100 (4) ppm ≤ 80 (4) ppm ≤ 50 (4) ppm
	• Using Liquid Fuel (2 ton/hour ≤ evaporation rate < 10 ton/hour or 1,238,000 kcal/hour ≤ heat input < 6,190,000 kcal/hour)	
	- Installed before 31 Jan 2007 - Installed after 1 Feb 2007 - Installed after 1 Jan 2015	≤ 140 (4) ppm ≤ 120 (4) ppm ≤ 70 (4) ppm
	• Using Solid Fuel	
	- Installed before 31 Jan 2007 - Installed after 1 Feb 2007 - Installed after 1 Jan 2020	≤ 70 (6) ppm ≤ 60 (6) ppm ≤ 50 (6) ppm
	• Using Gas Fuel (evaporation rate ≥ 40 ton/hour or 24,760,000 kcal/hour ≤ heat input)	
	- Installed before 31 Dec 2014 - Installed after 1 Jan 2015 - Installed after 1 Jan 2020	≤ 60 (4) ppm ≤ 40 (4) ppm ≤ 20 (4) ppm
	• Using Gas Fuel (10 ton/hour ≤ evaporation rate < 40 ton/hour or 6,190,000 kcal/hour ≤ heat input < 24,760,000 kcal/hour)	
	- Installed before 31 Dec 2014 - Installed after 1 Jan 2015	≤ 60 (4) ppm ≤ 40 (4) ppm
	• Using Gas Fuel (2 ton/hour ≤ evaporation rate < 10 ton/hour or 1,238,000 kcal/hour ≤ heat input < 6,190,000 kcal/hour)	
	- Installed before 31 Dec 2014 - Installed after 1 Jan 2015	≤ 60 (4) ppm ≤ 40 (4) ppm
	• Using Biogas	≤ 70 (4) ppm
Particulate Matter	➢ **General Boiler (2 ton/hour ≤ evaporation rate or 1,238,000 kcal/hour ≤ heat input**	
	• Using Liquid Fuel (evaporation rate ≥ 150 ton/hour or 92,850,000 kcal/hour ≤ heat input)	

Table C-4. ROK Permissible Standards for Boilers - continued

Pollutants	Type of Facility	Permissible Emission Standard
Particulate Matter	- Installed before 30 Jun 2001 - Installed after 1 Jul 2001 - Installed after 1 Jan 2015	≤ 15 (4) mg/Sm^3 ≤ 15 (4) mg/Sm^3 ≤ 10 (4) mg/Sm^3
	• Using Liquid Fuel (20 ton/hour ≤ evaporation rate < 150 ton/hour or 12,380,000 kcal/hour ≤ heat input < 92,850,000 kcal)	
	- Installed before 31 Jan 2007 - Installed after 1 Feb 2007 - Installed after 1 Jan 2015	≤ 20 (4) mg/Sm^3 ≤ 20 (4) mg/Sm^3 ≤ 16 (4) mg/Sm^3
	• Using Liquid Fuel (5 ton/hour ≤ evaporation rate < 20 ton/hour or 3,095,000 kcal/hour ≤ heat input < 12,380,000 kcal/hour)	
	- Installed before 31 Dec 2014 - Installed after 1 Jan 2015	≤ 25 (4) mg/Sm^3 ≤ 16 (4) mg/Sm^3
	• Using Liquid Fuel (2 ton/hour ≤ evaporation rate < 5 ton/hour or 1,238,000 kcal/hour ≤ heat input < 3,095,000 kcal/hour)	
	- Installed before 31 Dec 2014 - Installed after 1 Jan 2015	≤ 30 (4) mg/Sm^3 ≤ 16 (4) mg/Sm^3
	• Using Solid Fuel (Including mixture of liquid fuel) (20 ton/hour ≤ evaporation rate or 12,380,000 kcal/hour ≤ heat input)	
	- Installed before 31 Dec 2014 - Installed after 1 Jan 2015	≤ 16 (6) mg/Sm^3 ≤ 10 (6) mg/Sm^3
	• Using Solid Fuel (Including mixture of liquid fuel) (5 ton/hour ≤ evaporation rate < 20 ton/hour or 3,095,000 kcal/hour ≤ heat input < 12,380,000 kcal/hour)	
	- Installed before 31 Dec 2014 - Installed after 1 Jan 2015	≤ 25 (6) mg/Sm^3 ≤ 16 (6) mg/Sm^3
	• Using Solid Fuel (Including mixture of liquid fuel) (2 ton/hour ≤ evaporation rate < 5 ton/hour or 1,238,000 kcal/hour ≤ heat input < 3,095,000 kcal/hour)	
	- Installed before 31 Dec 2014 - Installed after 1 Jan 2015	≤ 30 (6) mg/Sm^3 ≤ 16 (6) mg/Sm^3
Cadmium Compounds	• Applicable air emission sources*	≤ 0.2 mg/Sm^3
Lead Compounds as Pb	• Applicable air emission sources*	≤ 0.8 mg/Sm^3
Chromium Compounds as Cr	• Applicable air emission sources*	≤ 0.4 mg/Sm^3

Table C-4. ROK Permissible Standards for Boilers - continued

Pollutants	Type of Facility	Permissible Emission Standard
Copper Compounds as Cu	• Applicable air emission sources*	≤ 4 mg/Sm^3
Nickel and Nickel Compounds	• Applicable air emission sources*	≤ 2 mg/Sm^3
Zinc Compounds as Zn	• Applicable air emission sources*	≤ 4 mg/Sm^3
Flying dust	• Applicable air emission sources*	≤ 0.4 mg/Sm^3
Smoke	• Applicable air emission sources*	≤ level 2 in Ringelmann smoke chart
Benzo(a)pyrene	• Applicable air emission sources*	≤ 0.05 mg/Sm^3
Carbon disulfide	• Applicable air emission sources*	≤ 10 ppm
Formaldehyde	• Applicable air emission sources*	≤ 8 ppm
Hydrogen sulfide	• Applicable air emission sources*	≤ 6 ppm
Fluorides as F	• Applicable air emission sources*	≤ 2 ppm
Hydrogen cyanide	• Applicable air emission sources*	≤ 4 ppm
Bromine compounds	• Applicable air emission sources*	≤ 3 ppm
Benzene	• Applicable air emission sources*	≤ 6 ppm
Phenol compounds	• Applicable air emission sources*	≤ 4 ppm
Mercury compounds as Hg	• Applicable air emission sources*	≤ 0.1 mg/Sm^3
Arsenic compounds	• Applicable air emission sources*	≤ 0.5 ppm
Dichloromethane	• Applicable air emission sources*	≤ 50 ppm
Trichloroethylene	• Applicable air emission sources*	≤ 50 ppm
1,3-Butadiene	• Applicable air emission sources*	≤ 6 ppm
Acrylonitrile	• Applicable air emission sources*	≤ 3 ppm
1,2-Dichloroethane	• Applicable air emission sources*	≤ 12 ppm
Chloroform	• Applicable air emission sources*	≤ 5 ppm
Tetrachloroethylene	• Applicable air emission sources*	≤ 10 ppm
Styrene	• Applicable air emission sources*	≤ 23 ppm
Ethylbenzene	• Applicable air emission sources*	≤ 23 ppm
Carbon tetrachloride	• Applicable air emission sources*	≤ 3 ppm

Table C-4. ROK Permissible Standards for Boilers - continued

Pollutants	Type of Facility	Permissible Emission Standard
*Air emission testing must be conducted in accordance with the ROK environmental standard test method if an air emission source has the potential to emit a listed compound. If analytical results do not indicate the presence of the compound then no further testing will be required unless modifications of the air emissions source or facility processes occur. Remarks: 1. ( ) in the permissible emission standard column means standard oxygen density in percentage. (% of O2). 2. The emission volume of general boilers is determined by the boiler capacity. The volume of an emergency boiler installed as a back-up boiler is not counted. 3. Standard oxygen density is not applied for the following: a. Facilities using direct combustion or catalysts under the category of waste gas incineration facilities. b. Facilities using pure oxygen instead of air.		

4. INCINERATORS

Installations must ensure that incinerators meet the standards of this paragraph, as applicable. The following requirements apply to all incinerators except those combusting hazardous waste or munitions. Refer to Enclosure O of this manual regulation for information regarding hazardous waste management. Emission limits do not apply during periods of startup, shutdown, or malfunction. Table C-5, 6 and 7 will be reviewed to apply more protective standard for incinerators.

a. Municipal Waste Combustion (MWC) Units.

Each MWC unit must comply with the applicable emission limits and monitoring requirements in Table C-5. If more than one MWC unit is at the same location, their capacities should be considered in aggregate to determine their emission limits.

b. Hospital and Infectious Medical Waste Incinerator (HIMWI).

Each HIMWI unit must comply with the applicable emission limits and monitoring requirements in Table C-6. These requirements do not apply to pyrolysis units, or units that burn only pathology waste, low-level radioactive waste, or chemotherapeutic waste. Refer to Enclosure P of this manual for medical waste management requirements.

c. ROK Standards.

The ROK emission standards in Table C-7 shall be compared with the standards in Table C-5 and C-6 and apply more protective standards to incineration units with a burning capacity greater than or equal to 25 kilograms per hour (kg/hr).

(1) Shall be monitored in accordance with the frequency in the Table C-31

(2) Amount of air pollutants can be obtained by the Table C-32

d. Operator Training.

No incinerators can be operated unless a fully trained and qualified unit operator is accessible at the facility or able to be at the facility within one hour. The trained unit operator may operate the unit directly or be the direct supervisor of one or more other plant personnel who operate the unit. Operators must have completed a training course that includes:

(1) Environmental concerns, including types of emissions.

(2) Basic combustion principles, including products of combustion.

(3) Operation of the specific type of incinerator to be used by the operator, including proper startup, waste charging, and shutdown procedures.

(4) Combustion controls and monitoring.

(5) Operation of air pollution control equipment and factors affecting performance, if applicable.

(6) Inspection and maintenance of the incinerator and air pollution control devices.

(7) Methods to monitor pollutants, including monitoring of incinerator and control device operating parameters, and monitoring equipment calibration procedures, where applicable.

(8) Actions to correct malfunctions or conditions that may lead to malfunction.

(9) Bottom and fly ash characteristics and handling procedures.

(10) Applicable regulations.

(11) Pollution prevention.

(12) Waste management practices.

(13) Recordkeeping requirements.

Table C-5. Emission Limits for MWCs[a]

Unit Type	Large MWC		
	Constructed / Modified / Reconstructed		
	Between 20 DEC 1998 and 20 SEP 1994	Between 20 SEP 1994 and 19 DEC 2005	After 19 DEC 2005
Rated Capacity	Greater than 227 Mtons/day [250 tons/day]		
PM	34 mg/dscm[b,d,f]	24 mg/dscm[b,d,f]	20 mg/dscm[b,d,f]
Opacity	10 percent[b,d,g]	10 percent[b,d,g]	
Dioxin/Furan	30 ng/dscm[b,h]	30 ng/dscm or 13 ng/dscm[b,h,i]	
SO_2	30 ppmv or 80% reduction[d,e,k]	30 ppmv or 80% reduction[d,e,k]	
Hydrogen chloride	30 ppmv or 80% reduction[d,e,k]	25 ppmv or 80% reduction[b,f,k]	
NO_x	180 ppmv[d,e]	150 ppmv or 180 ppmv[d,e,l]	
Mass burn water wall			
Mass burn rotary water wall			

Table C-5. Emission Limits for MWCs[a] – continued

Unit Type	Small MWC				OSWI and Air Curtain Incinerators
	Constructed on or before 30 AUG 1999		Constructed after 30 AUG 1999 or Modified /Reconstructed after 6 JUN 2001		Began Construction after 9 DEC 2004 or Modified/Reconstructed on or after 16 JUN 2006
Rated Capacity	32-227 Mtons/day [35-250 tons/day]				Less than 32 Mtons/day [35 tons/day]
	Class I[c]	Class II[c]	Class I[c]	Class II[c]	
PM	27mg/ dscm[b,d,f]	70mg/ dscm[b,d,f]	24mg/ dscm[b,d,f]		29mg/ dscm[b,f]
Opacity	10 percent[b,d,g]		10 percent[b,d,g]		10 percent[b,f,g]
Dioxin/ Furan	30ng/dscm (w/o ESP)[b,h,j] 60ng/dscm (w/ ESP)[b,j]	125ng/ dscm[b,h]	13ng/dscm[b,h]		33ng/dscm[b,f]
SO_2	31ppmv or 75% reduction[d,e,k]	50ppmv or 75% reduction[d,e,k]	30ppmv or 80% reduction[d,e,k]		3.1ppmv[f]
Hydrogen chloride	31ppmv or 95% reduction[b,f,k]	250ppmv or 50% reduction[b,f,k]	25ppmv or 95% reduction[b,f,k]		15ppmv[b,f]
NO_x			180ppmv or 150ppmv[d,e,l]	50 ppmv[d,e]	103ppmv[f]
Mass burn water wall	200ppmv[d,e,m]				
Mass burn rotary water wall	170ppmv[d,e,m]				

Table C-5. Emission Limits for MWCs[a] – continued

Unit Type	Large MWC	Small MWC			OSWI and Air Curtain Incinerators
	Constructed/ Modified/ Reconstructed	Constructed on or before 30 AUG 1999	Constructed after 30 AUG 1999 or Modified/Reconstructed after 6 JUN 2001		Began construction after 9 DEC 2004 or Modified/Reconstructed on or after 16 JUN 2006
Rated Capacity	Greater than 227 Mtons/day [250 tons/day]	32-227 Mtons/day [35-250 tons/day]			Less than 32 Mtons/day [35 tons/day]
		Class I[c]	Class I[c]	Class II[c]	
Mass burn refractory		350 ppmv[d,e,m]			
Mass burn rotary refractory		350 ppmv[d,e,m]			
RDF		250 ppmv[d,e,m]			
Fluidized bed		220 ppmv[d,e,m]			
Modular excess air		190 ppmv[d,e,m]			
Modular starved air		380 ppmv[d,e,m]			
CO[n]					40 ppmv[d,o]
Mass burn water wall	100 ppmv[d,p]				
Mass burn refractory					
Mass burn rotary refractory		100 ppmv[d,p]			
Mass burn rotary water wall	100 ppmv[d,m]				
Modular starved air	50 ppmv[d,p]				
Modular excess air					
RDF stoker	150 ppmv[d,m]	200 ppmv[d,m]	150 ppmv[d,m]		

Table C-5. Emission Limits for MWCs[a] - continued

Unit Type	Large MWC		
	Constructed/ Modified/ Reconstructed		
	Between 20 DEC 1989 and 20 SEP 1994	20 SEP 1994 and 19 DEC 2005	19 DEC 2005
Rated Capacity	Greater than 227 Mtons/day [250 tons/day]		
Fluidized bed, mixed fuel, (wood/refuse derived fuel)			
Fluidized bed			
Bubbling fluidized bed combustor	100 ppmv[d,p]		
Circulating fluidized bed combustor			
Pulverized coal/RDF mixed fuel-fired combustor	150 ppmv[d,o]	150 ppmv[d,p]	
Spreader stoker coal/RDF mixed fuel-fired combustor	150 ppmv[d,m]		
Cadmium		20 μg/dscm[b]	10 μg/dscm[b]

Table C-5. Emission Limits for MWCs[a] - continued

Unit Type	Small MWC				OSWI and Air Curtain Incinerators
	Constructed before 30 AUG 1999		Constructed after 30 AUG 1999 or Modified/ Reconstructed after 6 JUN 2001		Began Construction after 9 DEC 2004 or Modified/ Reconstructed on or after 16 JUN 2006
Rated Capacity	32-227 Mtons/day [35-250 tons/day]				Less than 32Mtons/day [35 tons/day]
	Class I[c]	Class II[c]	Class I[c]	Class II[c]	
Fluidized bed, mixed fuel, (wood/refuse derived fuel)	200 ppmv[d,m]				
Fluidized bed	100 ppmv[d,p]				
Bubbling fluidized bed combustor					
Circulating fluidized bed combustor					
Pulverized coal/RDF mixed fuel-fired combustor			150 ppmv[d,p]		
Spreader stoker coal/RDF mixed fuel-fired combustor	200 ppmv[d,m]		150 ppmv[d,m]		
Cadmium	0.040 mg/dscm[b]	0.10 mg/dscm[b]	0.020 mg/dscm[b]		18 µg/dscm[b,f]

Table C-5. Emission Limits for MWCs[a] - continued

Unit Type	Large MWC		
	Constructed/ Modified/ Reconstructed		
	Between 20 DEC 1989 and 20 SEP 1994	Between 20 SEP 1994 and 19 DEC 2005	After 19 DEC 2005
Rated Capacity	Greater than 227 Mtons/day [250 tons/day]		
Lead		200 mg/dscm[b]	140 mg/dscm[b]
Mercury		80 µg/dscm or 85% reduction[b,q]	50 µg/dscm or 85% reduction[b,q]
Fugitive Ash		5% of hourly observation period[b,f]	

Table C-5. Emission Limits for MWCs[a] - continued

Unit Type	Small MWC		OSWI and Air Curtain Incinerators
	Constructed before 30 AUG 1999	Constructed after 30 AUG 1999 or Modified/Reconstructed after 6 JUN 2001	Began Construction after 9 DEC 2004 or Modified/ Reconstructed on or after 16 JUN 2006
Rated Capacity	32-227 Mtons/day [35-250 tons/day]		Less than 32 Mtons/day [35 tons/day]
Lead	0.49 mg/dscm[b]	1.6 mg/dscm[b]	0.20 mg/dscm[b]
Mercury	0.080 mg/dscm or 85% reduction[b,q]	0.080 mg/dscm or 85% reduction[b,q]	74 µg/dscm[b,f]
Fugitive Ash	5% of hourly observation period[d,f]	5% of hourly observation period[d,f]	

dscm = dry standard cubic meter, ESP = electrostatic precipitator, mg = milligram, Mton = metric ton, OSWI = other solid waste incinerator, ppmv = parts per million by volume, RDF = refuse-derived fuel, µg = microgram

[a] Emission limit concentrations (mg/dscm, ppmv) are corrected to 7 percent O_2, dry basis at standard conditions.

[b] Requires annual demonstration of compliance, except for Class II and OSWI pollutants that have shown compliance with emission limits for 3 consecutive years. For these pollutants, demonstration of compliance can be demonstrated every 3 years.

[c] Class I units mean small MWC units that are located at MWC plants with an aggregate plant combustion capacity more than 227 Mtons/day [250 ton/day] of municipal solid waste (MSW). Class II units mean small MWC units that are located at MWC plants with an aggregate plant combustion capacity no more than 227 Mtons/day [250 ton/day] of MSW.

[d] Emission rate and parameters measured using a CEMS, except for OSWI units, which only require CEMS for CO monitoring.

[e] 1-hour (hr) average.

[f] Average over three 1-hr minimum runs.

[g] 6-minute average.

[h] Average over three 4-hr runs.

[i] 30 ng/dscm for first 3 years following the date of initial startup, for facilities constructed, modified, or reconstructed or before November 20, 1997, 13 ng/dscm thereafter.

[j] ESP = electrostatic precipitator.

[k] Comply with less stringent requirement; reduced by weight or volume from potential emissions.

[l] 180 ppmv during first year, 150 ppmv thereafter.

[m] 24-hr average.

[n] Measured at the combustor outlet.

[o] 12-hr average.

[p] 4-hr average.

[q] Comply with less stringent requirement; reduced by weight from potential emissions.

Table C-6. Emission Limits for HIMWI[a]

Rated Capacity	HIMWI Constructed between 20 JUN 1996 and 1 DEC 2008, or Modified between 16 MAR 1998 and 6 April 2010		
	Small Continuous or Intermittent: <90 kg/hr [200 lb/hr] Batch: <726 kg/day [1600 lb/day]	Medium Continuous or Intermittent: 91-226 kg/hr [201-499 lb/hr] Batch: 726-1814 kg/day [1601-3999 lb/day]	Large Continuous or Intermittent: >227 kg/hr [500 lb/hr] Batch: >1814 kg/day [4000 lb/day]
PM[e,g,i]	69 mg/dscm	34 mg/dscm	
Opacity[e]	10 percent[b]		
Dioxins/Furans[h,i]	125 ng/dscm or 2.3 ng/dscm TEQ	25 ng/dscm or 0.6 ng/dscm TEQ	
SO_2[j]	55 ppmv		
HCl[e,g,i]	15 ppmv or 99% reduction[c]		
NO_x[j]	250 ppmv		
CO[d,e,g,i]	40 ppmv		
Cadmium[g,i]	0.16 mg/dscm or 65% reduction[c]	0.04 mg/dscm or 90% reduction[c]	
Lead[g,i]	1.2 mg/dscm or 70% reduction[c]	0.07 mg/dscm or 98% reduction[c]	
Mercury[g,i]	0.55 mg/dscm or 85% reduction[c]		
Fugitive Ash	5% of hourly observation period[f]		

Table C-6. Emission Limits for HIMWI[a] - continued

Rated Capacity	HIMWI Constructed after 1 DEC 2008 or Modified after 6 APR 2010		
	Small Continuous or Intermittent: <90 kg/hr [200 lb/hr] Batch: <726 kg/day [1600 lb/day]	Medium Continuous or Intermittent: 91-226 kg/hr [201-499 lb/hr] Batch: 726-1814 kg/day [1601-3999 lb/day]	Large Continuous or Intermittent: >227 kg/hr [500 lb/hr] Batch: >1814 kg/day [4000 lb/day]
PM[e,g,i]	66 mg/dscm	22 mg/dscm	18 mg/dscm
Opacity[e]	6 percent[b]		
Dioxins/Furans[h,i]	16 ng/dscm or 0.013 ng/dscm TEQ	0.47 ng/dscm or 0.014 ng/dscm TEQ	9.3 ng/dscm or 0.035 ng/dscm TEQ
SO_2[j]	1.4 ppmv		8.1 ppmv
HCl[e,g,i]	15 ppmv	7.7 ppmv	5.1 ppmv
NO_x[j]	67 ppmv		140 ppmv
CO[d,e,g,i]	20 ppmv	1.8 ppmv	11 ppmv
Cadmium[g,i]	0.017 mg/dscm	0.0098 mg/dscm	0.00013 mg/dscm
Lead[g,i]	0.31 mg/dscm	0.018 mg/dscm	0.0069 mg/dscm
Mercury[g,i]	0.014 mg/dscm	0.0035 mg/dscm	0.00013 mg/dscm
Fugitive Ash	5% of hourly observation period[f]		

TEQ = toxic equivalency factor

[a] Emission limit concentrations (mg/dscm, ppmv) are corrected to 7 percent O_2, dry basis at standard conditions. Conduct an initial performance test to determine compliance with emission and opacity limits, and to establish operating parameters.

[b] 6-minute average.

[c] Comply with less stringent requirement; reduced by weight or volume from potential emissions.

[d] Measured at the combustor outlet in conjunction with a measurement of O_2 concentration.

[e] Conduct annual performance tests to determine compliance. Facilities may conduct performance tests for PM, CO, and hydrochloride every third year if the previous three HMIWI performance tests demonstrate that the facility is in compliance with the emission limits for PM, CO, or hydrochloride.

[f] Perform annual fugitive testing (large HMIWI only).

[g] 3-run average, 1-hr minimum per run. Unless equipped with CEMS.

[h] 3-run average, 4-hr minimum per run. Unless equipped with CEMS.

[i] If equipped with CEMS, determine compliance using a 12-hr rolling average.

[j] Testing not required.

Table C-7. ROK Permissible Standards for Incinerator

Pollutants	Type of Facility	Permissible emission standard
Ammonia	➢ **Incinerator (25 kg/hour ≤ Incineration capacity)**	≤ 20 (12) ppm
Carbon monoxide	➢ **Incinerator (25 kg/hour ≤ Incineration capacity)**	
	• Incineration capacity ≥ 2 ton/hour (in case of medical wastes, 200kg/hour)	≤ 50 (12) ppm
	• 25 kg/hour ≤ Incineration capacity < 2 ton/hour (in case of medical wastes, 200kg/hour)	≤ 200 (12) ppm
Hydrogen chloride	➢ **Incinerator (25 kg/hour ≤ Incineration capacity)**	
	• Incineration capacity ≥ 2 ton/hour (in case of medical wastes, 200kg/hour)	≤ 12 (12) ppm
	• 25 kg/hour ≤ Incineration capacity < 2 ton/hour (in case of medical wastes, 200kg/hour)	≤ 15 (12) ppm
Dioxin (Persistent Organic Pollutant (POP))	➢ **Incinerator (25 kg/hour ≤ Incineration capacity)**	
	• Incineration capacity ≥ 4 ton/hour	≤ 0.1 (12) ng-TEQ/Sm^3
	• 2 ton/hour ≤ Incineration capacity < 4 ton/hour	≤ 1 (12) ng-TEQ/Sm^3
	• 25 kg/hour ≤ Incineration capacity < 2 ton/hour	≤ 5 (12) ng-TEQ/Sm^3
	➢ **Medical Waste Incinerator**	
	• 4 ton/hour ≤ Incineration capacity	≤ 0.1 (12) ng-TEQ/Sm^3
	• 1 ton/hour ≤ Incineration capacity < 4 ton/hour	≤ 1 (12) ng-TEQ/Sm^3
	• 25 kg/hour ≤ Incineration capacity < 1 ton/hour	≤ 5 (12) ng-TEQ/Sm^3
Sulfur oxides as SO_2	➢ **Incinerator (25 kg/hour ≤ Incineration capacity)**	
	• Incineration capacity ≥ 2 ton/hour (in case of medical wastes, 200kg/hour)	≤ 20 (12) ppm
	• 200 kg/hour ≤ Incineration capacity < 2 ton/hour (in case of medical wastes, 200kg/hour)	≤ 30 (12) ppm
	• 25 kg/hour ≤ Incineration capacity < 200 kg/hour (in case of medical wastes, 200kg/hour)	≤ 35 (12) ppm
Nitrogen Oxides as NO_2	➢ **Incinerator (25 kg/hour ≤ Incineration capacity)**	
	• Incineration capacity ≥ 2 ton/hour (in case of medical wastes, 200kg/hour)	≤ 50 (12) ppm

Table C-7. ROK Permissible Standards for Incinerator - continued

Pollutants	Type of Facility	Permissible emission standard
	• 25 kg/hour ≤ Incineration capacity < 2 ton/hour (in case of medical wastes, 200kg/hour)	≤ 70 (12) ppm
Particulate Matter	➢ **Incinerator (25 kg/hour ≤ Incineration capacity)**	
	• Installed before 31 Dec 2014	
	- Incineration capacity ≥ 2 ton/hour (in case of medical wastes, 200kg/hour)	≤ 15 (12)mg/Sm^3
	- 200 kg/hour ≤ Incineration capacity < 2 ton/hour (in case of medical wastes, 200kg/hour)	≤ 20 (12)mg/Sm^3
	- 25 kg/hour ≤ Incineration capacity < 200 kg/hour (in case of medical wastes, 200kg/hour)	≤ 25 (12)mg/Sm^3
	• Installed after 1 Jan 2015	
	- Incineration capacity ≥ 2 ton/hour (in case of medical wastes, 200kg/hour)	≤ 10 (12)mg/Sm^3
	- 200 kg/hour ≤ Incineration capacity < 2 ton/hour (in case of medical wastes, 200kg/hour)	≤ 15 (12)mg/Sm^3
	- 25 kg/hour ≤ Incineration capacity < 200 kg/hour (in case of medical wastes, 200kg/hour)	≤ 15 (12)mg/Sm^3
Hydrogen sulfide	➢ **Incinerator (25 kg/hour ≤ Incineration capacity)**	
	• Incineration capacity ≥ 200kg/hour • 25 kg/hour ≤ Incineration capacity < 200kg/hour	≤ 2 (12) ppm ≤ 4 (12) ppm
Fluorides as F	➢ **Incinerator (25 kg/hour ≤ Incineration capacity)**	
	• Incineration capacity ≥ 200kg/hour	≤ 2 (12) ppm
	• 25 kg/hour ≤ Incineration capacity < 200kg/hour	≤ 2 (12) ppm
Hydrogen cyanide	• Applicable air emission sources*	≤ 4 ppm
Bromine compounds as Br	• Applicable air emission sources*	≤ 3 ppm
Benzene	• Applicable air emission sources*	≤ 6 ppm
Phenol compounds	• Applicable air emission sources*	≤ 4 ppm
Mercury compounds	• Applicable air emission sources*	≤ 0.05 (12) mg/Sm^3

Table C-7. ROK Permissible Standards for Incinerator - continued

Pollutants	Type of Facility	Permissible emission standard
Arsenic compounds	• Incinerator (25 kg/hour ≤ Incineration capacity)	≤ 0.2 (12) ppm
Dichloromethane	• Applicable air emission sources*	≤ 50 ppm
Trichloroethylene	• Applicable air emission sources*	≤ 50 ppm
1,3-Butadiene	• Applicable air emission sources*	≤ 6 ppm
Carbon disulfide	• Applicable air emission sources*	≤ 10 ppm
Formaldehyde	• Applicable air emission sources*	≤ 8 ppm
Acrylonitrile	• Applicable air emission sources*	≤ 3 ppm
1,2-Dichloroethane	• Applicable air emission sources*	≤ 12 ppm
Chloroform	• Applicable air emission sources*	≤ 5 ppm
Tetrachloroethylene	• Applicable air emission sources*	≤ 10 ppm
Styrene	• Applicable air emission sources*	≤ 23 ppm
Ethylbenzene	• Applicable air emission sources*	≤ 23 ppm
Carbon tetrachloride	• Applicable air emission sources*	≤ 3 ppm
Cadmium Compounds	➢ **Incinerator (25 kg/hour ≤ Incineration capacity)**	
	• Incineration capacity ≥ 2 ton/hour (in case of medical wastes, 200kg/hour)	≤ 0.02 (12) mg/Sm^3
	• 200 kg/hour ≤ Incineration capacity < 2 ton/hour (in case of medical wastes, 200kg/hour)	≤ 0.08 (12) mg/Sm^3
	• 25 kg/hour ≤ Incineration capacity < 200 kg/hour (in case of medical wastes, 200kg/hour)	≤ 0.15 (12) mg/Sm^3
Lead Compounds as Pb	➢ **Incinerator (25 kg/hour ≤ Incineration capacity)**	
	• Incineration capacity ≥ 2 ton/hour (in case of medical wastes, 200kg/hour)	≤ 0.2 (12) mg/Sm^3
	• 200 kg/hour ≤ Incineration capacity < 2 ton/hour (in case of medical wastes, 200kg/hour)	≤ 0.4 (12) mg/Sm^3
	• 25 kg/hour ≤ Incineration capacity < 200 kg/hour (in case of medical wastes, 200kg/hour)	≤ 0.8 mg/Sm^3
Chromium compounds as Cr	• Incinerator (25 kg/hour ≤ Incineration capacity)	≤ 0.2 (12) mg/Sm^3
Copper compounds as Cu	• Applicable air emission sources*	≤ 4 mg/Sm^3
Nickel and nickel	• Applicable air emission sources*	≤ 2 mg/Sm^3

Table C-7. ROK Permissible Standards for Incinerator - continued

Pollutants	Type of Facility	Permissible emission standard
compounds		
Zinc compounds as Zn	• Applicable air emission sources*	≤ 4 mg/Sm^3
Flying dust	• Applicable air emission sources*	≤ 0.4 mg/Sm^3
Smoke	• Applicable air emission sources*	≤ level 2 in Ringelmann smoke chart
Benzo(a)pyrene	• Applicable air emission sources*	≤ 0.05 mg/Sm^3

*Air emission testing must be conducted in accordance with the ROK environmental standard test method if an air emission source has the potential to emit a listed compound. If analytical results do not indicate the presence of the compound then no further testing will be required unless modifications of the air emissions source or facility processes occur.

Remarks:
1. ( ) in the permissible emission standard column means standard oxygen density in percentage. (% of O2).
2. The emission volume of general boilers is determined by the boiler capacity. The volume of an emergency boiler installed as a back-up boiler is not counted.
3. Standard oxygen density is not applied for the following:
   a. Facilities using direct combustion or catalysts under the category of waste gas incineration facilities.
   b. Facilities using pure oxygen instead of air.

5. DRY CLEANING MACHINES

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

a. Emissions from Tetrachloroethene (PCE) dry cleaning machines installed before 22 September 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 7ºC (45ºF) or less.

b. All PCE dry cleaning systems installed between 22 September 1993 and 21 December 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 7ºC (45ºF) or less.

c. All PCE dry cleaning systems installed on or after 21 December 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 7ºC (45ºF) or less.

d. All Trichloroethylene (TCE), fluorosolvents and petroleum solvents dry-cleaning machines which have equal or greater than 30kg capacity must be equipped with emission control device.

6. <u>HALOGENATED SOLVENT CLEANING MACHINES.</u>

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), TCE (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.

a. Cold Solvent Cleaning Machine.

(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.

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

(3) Collect and store waste solvent in closed containers.

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

(5) Drain solvent cleaned parts.

(6) Maintain solvent level at or below the fill line.

(7) Immediately wipe up spills that occur during solvent transfer. Store used wipe rags in covered containers in accordance with of Enclosure O of this manual.

(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.

(9) When the cover is open, do not expose the cold cleaning machine to drafts.

b. Vapor Cleaning Machines (Vapor Degreasers).

All vapor cleaning machines (vapor degreasers) must incorporate control designs and meet solvent idling emission limits found in Table C-8. In addition, these work practices must be observed:

(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.

(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.

(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) 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.

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

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

(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.

(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.

(9) Collect and store waste solvent, still bottoms, and sump bottoms in closed containers and mange in accordance with Enclosure O of this manual.

(10) Sponges, fabric, wood, and paper products must not be cleaned.

Table C-8. 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[b] [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[a]/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[a]/Superheated Vapor[c]/Carbon Adsorber[g]	

Table C-8. Vapor Cleaning Machine Control Combinations and Solvent Idling Emission Limits[a] – continued

Unit Type	Solvent/Air Interface Area	Control Combination Options	Solvent Idling Emission Limits
Existing In-line Cleaning Machines		Superheated Vapor[c]/Freeboard Ratio of 1.0	0.10 kg/hr/m^2 [0.021 lb/hr/ft^2]
		Freeboard Refrigeration Device[d]/Freeboard Ratio of 1.0	
		Dwell[g]/Freeboard Refrigeration Device[d]	
		Dwell[g]/Carbon Adsorber[g]	
New In-line Cleaning Machines		Superheated Vapor[c]/Freeboard Refrigeration Device[a]	0.10 kg/hr/m^2 [0.021 lb/hr/ft^2]
		Freeboard Refrigeration Device[d]/Carbon Adsorber[g]	
		Superheated Vapor[c]/Carbon Adsorber[g]	

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 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.

7. STATIONARY COMBUSTION TURBINES (STATIONARY GAS TURBINES)

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

a. 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.

b. 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 3 October 1977, but before 18 February 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 3 October 1982.

(1) Each unit must comply with the NO_x emission limits in Table C-9 and C-22.

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

a. 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 18 February 2005. Combustion turbine test cells and stands are exempt. Emergency combustion turbines are exempt from the NO_x emission limits.

(1) Each unit must meet the applicable NO_x emission limits in Table C-11.

(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 feet].

Table C-9. NO_x Emission Limits for Stationary Gas Turbines – Non-Emergency Engines that Began Construction, Modification, or Reconstruction after 3 OCT 1977, but on or before 18 FEB 2005[a,b]

Gas Turbine Heat Input at Peak Load	Y[c]	NO_x Emission Concentration[d]
$\geq$ 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 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 7.b.

[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 NOX and O_2 monitors or use a carbon dioxide (CO_2) monitor to adjust the measured NO_x concentration to 15 percent O_2. 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 percent O_2 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 C-10.

Table C-10. NO_x Emission Allowance for Fuel-Bound Nitrogen

N (Fuel-Bound Nitrogen Percent by Weight)	F (NO_x Percent by Volume)
N ≤ 0.015	0
0.015 < N ≤ 0.1	0.04 (N)
0.1 < N ≤ 0.25	0.004 + 0.0067 (N–0.1)
N > 0.25	0.005

Table C-11. NO_X Emission Limits for Stationary Gas Turbines that began Construction, Modification, or Reconstruction after 18 FEB 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]
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 C-11. NO_X Emission Limits for Stationary Gas Turbines that began Construction, Modification, or Reconstruction after 18 FEB 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 7.c.

[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.

8. STATIONARY RECIPROCATING INTERNAL COMBUSTION ENGINES (RICE)

Installations must ensure that stationary RICE meet the standards of this paragraph, as applicable. The air emission standards in the Table C-22 for power generation equipment which generates equal or greater than 120kW electrical power and not for emergency or backup purpose shall be compared with the standards in the Table C-12 through 21 to apply more protective emission limit.

a. Operation and Maintenance.

(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.

(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.

b. Compression Ignition RICE

(1) Each compression ignition RICE must meet the emission limits or work practices identified in Tables C-12 through 17 and Table C-22, 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 12 June 2006, are exempt from the requirements of Table C-17.

(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].

(3) For all model year 2007 and later engines, model year 2006 engines manufactured after 1 April 2006 (1 July 2006, for fire pump engines), and all engines reconstructed after 1 July 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) 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).

Table C-12. Emergency Compression Ignition RICE Model Years 2007 and After - Emission Limits[a]

Engine Power Range	Engine Model Year Range	Emission Limits (g/kW-hr [g/HP-hr])					Remarks[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]	20%-acceleration, 15%-lugging, 50%-peak
	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]	
130 ≤ kW < 225 [171 ≤ HP < 302]			4.0 [3.0]		0.2 [0.15]	3.5 [2.6]	
225 ≤ kW < 450 [302 ≤ HP < 603]			4.0 [3.0]		0.2 [0.15]	3.5 [2.6]	
450 ≤ kW < 560 [603 ≤ HP < 751]			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 C-16.

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

Table C-13. Non-Emergency Compression Ignition RICE Model Years 2007 and After - Emission Limits

Engine Power Range	Engine Model Year Range	Emission Limits (g/kW-hr [g/HP-hr])					Remarks[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%-acceleration, 15%-lugging, 50%-peak
	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 [0.15]		
75 ≤ kW < 130 [101 ≤ HP < 171]	2007 - 2011		4.0 [3.0]		0.3 [0.22]	5.0 [3.7]	
	2012 - 2013	0.19 [0.14]		0.4 [0.3]	0.02 [0.015]		
	2014and 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]		

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

Table C-13. Non-Emergency Compression Ignition RICE Model Years 2007 and After - Emission Limits - continued

Engine Power Range	Engine Model Year Range	Emission Limits (g/kW-hr [g/HP-hr])					Remarks[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]	3.5 [2.6]	20%-acceleration, 15%-lugging, 50%-peak
	2011 - 2013	0.19 [0.14]		0.40 [0.30]	0.02 [0.015]		
	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]	3.5 [2.6]	
	2011 - 2013	0.19 [0.14]		0.40 [0.30]	0.02 [0.015]		
	2014 and later	0.19 [0.14]		0.4 [0.3]	0.02 [0.015]		
560 ≤ kW < 900 [751 ≤ HP < 1,207]	2007 - 2010		6.4 [4.8]		0.2 [0.15]	3.5 [2.6]	
	2011 - 2014	0.4 [0.3]		3.5 [2.6]	0.1 [0.075]		
	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]	3.5 [2.6]	
	2011 - 2014	0.4 [0.3]		0.67 [0.50]	0.1 [0.075]		
	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 C-14. Compression Ignition RICE Pre 2007[a] Model Year and 2007 to 2010 Model Years Rated >2,237 kW [3,000 HP] – Emission Limits[b]

<table>
<tr><th rowspan="2">Engine Power Range</th><th rowspan="2">Engine Model Year Range</th><th colspan="5">Emission Limits (g/kW-hr [g/HP-hr])</th></tr>
<tr><th>NMHC + NO_X</th><th>HC</th><th>NO_X</th><th>CO</th><th>PM</th></tr>
<tr><td>kW < 8
[HP < 11]</td><td>2006 and earlier</td><td>10.5 [7.8]</td><td></td><td></td><td>8.0 [6.0]</td><td>1.0 [0.75]</td></tr>
<tr><td>8 ≤ kW < 19
7[11 ≤ HP < 25]</td><td>2006 and earlier</td><td rowspan="2">9.5 [7.1]</td><td></td><td></td><td>6.6 [4.9]</td><td rowspan="2">0.80 [0.60]</td></tr>
<tr><td>19 ≤ kW < 37
[25 ≤ HP < 50]</td><td>2006 and earlier</td><td></td><td></td><td>5.5 [4.1]</td></tr>
<tr><td>37 ≤ kW < 56
[50 ≤ HP < 75]</td><td>2006 and earlier</td><td></td><td></td><td rowspan="8">9.2 [6.9]</td><td></td><td></td></tr>
<tr><td>56 ≤ kW < 75
[75 ≤ HP < 101]</td><td>2006 and earlier</td><td></td><td></td><td></td><td></td></tr>
<tr><td>75 ≤ kW < 130
[101 ≤ HP < 175]</td><td>2006 and earlier</td><td></td><td></td><td></td><td></td></tr>
<tr><td>130 ≤ kW < 225
[175 ≤ HP < 300]</td><td>2006 and earlier</td><td></td><td rowspan="5">1.3 [1.0]</td><td rowspan="5">11.4 [8.5]</td><td rowspan="5">0.54 [0.40]</td></tr>
<tr><td>225 ≤ kW < 450
[300 ≤ HP < 600]</td><td>2006 and earlier</td><td></td></tr>
<tr><td>450 ≤ kW < 560
[600 ≤ HP < 750]</td><td>2006 and earlier</td><td></td></tr>
<tr><td>kW ≥ 560
[HP ≥ 750]</td><td>2006 and earlier</td><td></td></tr>
<tr><td>kW ≥ 2,237
[HP ≥ 3,000]</td><td>2007 - 2010</td><td></td></tr>
</table>

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 C-15. Non-Emergency Compression Ignition RICE Manufactured on or before 1 APR 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 11 JUL 2005 are subject to the emission limits in Table C-14 instead of Table C-15. 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 C-16. Fire Pump Compression Ignition Engines Model Years 2007 and After - Emission Limits

Engine Power Range	Engine Model Year Range	Emission Limits (g/kW-hr [g/HP-hr])			Remarks[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%-acceleration, 15%-lugging, 50%-peak
	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 C-17. Compression Ignition RICE Purchased before 12 JUN 2006 – Work Practice Standards

Engine Poser Range	Work Practice Standards[a]		
	Change oil and filter[b]	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		

[a] Perform annually or at the frequency listed below, whichever comes first.

[b] 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.

c. Spark Ignition RICE.

(1) Spark ignition RICE must meet the emission limits identified in Tables C-18, 19, 20, 21, and 22 as appropriate. Engines with a U.S. 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 C-21. Existing engines are those that commenced construction or reconstruction before 12 June 2006.

(2) For engines manufactured after 1 July 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.

Table C-18. Emergency Spark Ignition RICE Purchased or Reconstructed on or after 12 JUN 2006 – Emission Limits

Fuel Type	Engine Power Range	Manufactured Date[a]	Emission Limits (g/kW-hr [g/HP-hr])			
			HC + NO_x	NO_x	CO	VOC
All	kW < 19 [HP < 25]	1 JUL 2008 to 31 DEC 2010	13.4 [10.0]		519 [387]	
		On or after 1 JAN 2011	8.0 [6.0]		610 [455]	
Natural Gas and Liquefied Petroleum Gas (LPG)[b]	19 ≤ kW < 99 [25 ≤ HP < 130]	On or after 1 JAN 2009	13.4 [10.0]		519 [387]	
	kW ≥ 99 [HP ≥ 130]	On or after 1 JAN 2009		2.7 [2.0]	5.4 [4.0]	1.3 [1.0]
Gasoline	19 ≤ kW < 99 [25 < HP < 130]	On or after 1 JAN 2009	13.4 [10.0]		519 [387]	
	kW ≥ 99 [HP ≥ 130]	On or after 1 JAN 2009	2.7 [2.0]		4.4 [3.3]	

VOC = volatile organic compound

[a] Reconstructed engines with a manufactured date prior to 1 JUL 2009 (prior to 1 JUL 2008 for engines < 19 kW) must meet the standards applicable to engines manufactured on 1 JUL 2009 (on 1 JUL 2008 for engines < 19 kW).

[b] Demonstrate compliance in either g/kW-hr or ppmvd at 15 percent O_2

Table C-18. Emergency Spark Ignition RICE Purchased or Reconstructed on or after 12 JUN 2006 – Emission Limits - continued

Fuel Type	Engine Power Range	Manufactured Date[a]	Emission Limits (ppmvd at 15% O_2)		
			NO_x	CO	VOC
All	kW < 19 [HP < 25]	1 JUL 2008 to 31 DEC 2010			
		On or after 1 JAN 2011			
Natural Gas and Liquefied Petroleum Gas (LPG)[b]	19 ≤ kW < 99 [25 ≤ HP < 130]	On or after 1 JAN 2009			
	kW ≥ 99 [HP ≥ 130]	On or after 1 JAN 2009	160	540	86
Gasoline	19 ≤ kW < 99 [25 < HP < 130]	On or after 1 JAN 2009			
	kW ≥ 99 [HP ≥ 130]	On or after 1 JAN 2009			

VOC = volatile organic compound

[a] Reconstructed engines with a manufactured date prior to 1 JUL 2009 (prior to 1 JUL 2008 for engines < 19 kW) must meet the standards applicable to engines manufactured on 1 JUL 2009 (on 1 JUL 2008 for engines < 19 kW).

[b] Demonstrate compliance in either g/kW-hr or ppmvd at 15 percent O_2.

Table C-19. Non-Emergency Spark Ignition RICE Purchased or Reconstructed on or after 12 JUN 2006 – Emission Limits

Engine Type and Fuel	Engine Power Range	Manufactu-red 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	VOC[b]
All	kW≤19 [HP < 25]	1 JUL 2008 to 31 DEC 2010	13.4 [10.0]		519 [387]				
		On or after 1 JAN 2011	8.0 [6.0]		610 [455]				
Rich Burn LPG	kW ≥ 19 [HP ≥ 25]	1 JUL 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]	1 JUL 2008	2.7 [2.0]		4.4 [3.3]				
	75 ≤ kW < 373 [100 ≤ HP < 500]	1 JUL 2008		2.7 [2.0]	5.4 [4.0]	1.3 [1.0]	160	540	86
		1 JAN 2011		1.3 [1.0]	2.7 [2.0]	0.9 [0.7]	82	270	60
	kW ≥ 373 [HP ≥ 500]	1 JUL 2007		2.7 [2.0]	5.4 [4.0]	1.3 [1.0]	160	540	86
		1 JUL 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]	1 JAN 2008		2.7 [2.0]	5.4 [4.0]	1.3 [1.0]	160	540	86
		1 JUL 2010		1.3 [1.0]	2.7 [2.0]	0.9 [0.7]	82	270	60
Gasoline[d]	kW ≥ 19 [HP ≥ 25]	1 JUL 2008	2.7 [2.0][d]		4.4 [3.3]	NA			

[a] Reconstructed engines with a manufactured date prior to 1 JUL 2008 (prior to 1 JUL 2007 for natural gas and lean burn LPG engines > 373 kW or prior to 1 JAN 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 1 JUL 2008 (on 1 JUL 2007 for natural gas and lean burn LPG engines > 373 kW or on 1 JAN 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 O_2.

[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.

Table C-20. Non-Emergency Spark Ignition RICE Manufactured before 1 JUL 2007[a] – Pollution Control Requirements

Engine Power Range	Annual Operation Time	Burn Type	Pollution Control Requirement 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 1 JUL 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 C-21. Spark Ignition RICE Manufactured before 12 JUN 2006 – Work Practice Standards

Engine Power Range	Engine Ignition Type	Work Practice Standards[a]			
		Change Oil and Filter[b]	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	2SLB	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 C-22. ROK Permissible Standards for Power Generation

Pollutants	Type of Facility	Permissible emission standard
Sulfur oxides as SO_2	➢ **Power Generation (120 kW ≤)**	
	• Using Liquid Fuel	
	• Internal Combustion Engine	
	• ≥ 100 MW	
	- Installed before 30 Jun 2001	≤ 20 (15) ppm
	- Installed after 1 Jul 1996	≤ 20 (15) ppm
	- Installed after 1 Jan 2015	≤ 20 (15) ppm
	• < 100 MW	
	- Installed before 30 Jun 1996	≤ 40 (15) ppm
	- Installed after 1 Jul 1996	≤ 25 (15) ppm
	- Installed after 1 Jan 2015	≤ 20 (15) ppm
	• Others	
	• ≥ 100 MW	
	- Installed before 30 Jun 1996	≤ 50 (4) ppm
	- Installed after 1 Jul 1996	≤ 50 (4) ppm
	- Installed after 1 Jan 2015	≤ 35 (4) ppm
	- Installed after 1 Jan 2020	≤ 25 (4) ppm
	• < 100 MW	
	- Installed before 30 Jun 1996	≤ 140 (4) ppm
	- Installed after 1 Jul 1996	≤ 50 (4) ppm
	- Installed after 1 Jan 2015	≤ 35 (4) ppm
	• Using Solid Fuel (Including mixture of liquid fuel)	
	• Power generation	
	• ≥ 100 MW	
	- Installed before 30 Jun 1996	≤ 60 (6) ppm
	- Installed after 31 Dec 2014	≤ 50 (6) ppm
	- Installed after 1 Jan 2015	≤ 25 (6) ppm
	• < 100 MW	
	- Installed before 30 Jun 1996	≤ 90 (6) ppm
	- Installed after 1 Jul 1996	≤ 60 (6) ppm
	- Installed after 1 Jan 2015	≤ 35 (6) ppm
	• Using Gas Fuel	
	• Internal Combustion Engine (Including Gas Turbine)	
	- Installed before 31 Dec 2014	≤ 20 (15) ppm
	- Installed after 1 Jan 2015	≤ 15 (15) ppm
	- Installed after 1 Jan 2020	≤ 10 (15) ppm
	• Others	
	- Installed before 31 Dec 2014	≤ 60 (4) ppm
	- Installed after 1 Jan 2015	≤ 60 (4) ppm
	- Installed after 1 Jan 2020	≤ 10 (4) ppm

Table C-22. ROK Permissible Standards for Power Generation - continued

Pollutants	Type of Facility	Permissible emission standard
Sulfur oxides as SO_2	• Using Biogas	≤ 120 (4) ppm
Nitrogen Oxides as NO_2	➢ **Power Generation (120 kW ≤)**	
	• Using Liquid Fuel	
	• Internal Combustion Engine • Gas Turbine - Installed before 30 Jun 2001 - Installed after 1 Jul 2001 - Installed after 1 Jan 2015 • Diesel Engine - Installed before 30 Jun 2001 - Installed after 1 Jul 2001 - Installed after 1 Jan 2015	 ≤ 55 (15) ppm ≤ 50 (15) ppm ≤ 50 (15) ppm ≤ 55 (15) ppm ≤ 50 (15) ppm ≤ 50 (15) ppm
	• Other power generation • ≥ 100 MW - Installed before 30 Jun 2001 - Installed after 1 Jul 2001 - Installed after 1 Jan 2015 • < 100 MW - Installed before 30 Jun 2001 - Installed after 1 Jul 2001 - Installed after 1 Jan 2015	 ≤ 70 (4) ppm ≤ 55 (4) ppm ≤ 50 (4) ppm ≤ 90 (15) ppm ≤ 55 (15) ppm ≤ 50 (15) ppm
	• Using Solid Fuel	
	• Power generation • ≥ 100 MW - Installed before 30 Jun 1996 - Installed after 1 Jul 1996 - Installed after 1 Jan 2015 • < 100 MW - Installed before 30 Jun 1996 - Installed after 1 Jul 1996 - Installed after 1 Jan 2015	 ≤ 70 (6) ppm ≤ 50 (6) ppm ≤ 15 (6) ppm ≤ 90 (6) ppm ≤ 60 (6) ppm ≤ 30 (6) ppm
	• Using Gas Fuel	
	• Internal Combustion Engine (Including Gas Turbine) - Installed before 30 Jun 2001 - Installed after 1 Jul 2001 - Installed after 1 Jan 2015 - Installed after 1 Jan 2020	 ≤ 40 (15) ppm ≤ 25 (15) ppm ≤ 20 (15) ppm ≤ 10 (15) ppm

Table C-22. ROK Permissible Standards for Power Generation - continued

Pollutants	Type of Facility	Permissible emission standard
Nitrogen Oxides as NO_2	• Internal Combustion Engine (Lean Burn) • Other than Landfill Gas and Biogas - Installed before 30 Jun 2001 - Installed after 1 Jul 2001 • Using Landfill Gas and Biogas - All • Biogas	 ≤ 40 (15) ppm ≤ 40 (15) ppm ≤ 95 (15) ppm ≤ 120 (4) ppm
Particulate Matter	➢ **Power Generation (120 kW ≤)**	
	• Using Liquid Fuel	
	• Internal Combustion Engine - Installed before 30 Jun 2001 - Installed after 1 Jul 2001 - Installed after 1 Jan 2015	 ≤ 20 (15) mg/Sm^3 ≤ 20 (15) mg/Sm^3 ≤ 12 (15) mg/Sm^3
	• Others • ≥ 100 MW - Installed before 30 Jun 2001 - Installed after 1 Jul 2001 - Installed after 1 Jan 2015 • < 100 MW - Installed before 30 Jun 2001 - Installed after 1 Jul 2001 - Installed after 1 Jan 2015	 ≤ 12 (4) mg/Sm^3 ≤ 12 (4) mg/Sm^3 ≤ 10 (4) mg/Sm^3 ≤ 20 (4) mg/Sm^3 ≤ 12 (4) mg/Sm^3 ≤ 10 (4) mg/Sm^3
	• Using Solid Fuel (Including mixture of liquid fuel)	
	• Power generation • ≥ 100 MW - Installed before 30 Jun 2001 - Installed after 1 Jul 2001 - Installed after 1 Jan 2015 • < 100 MW - Installed before 30 Jun 2001 - Installed after 1 Jul 2001 - Installed after 1 Jan 2015	 ≤ 12 (6) mg/Sm^3 ≤ 10 (6) mg/Sm^3 ≤ 5 (6) mg/Sm^3 ≤ 20 (6) mg/Sm^3 ≤ 15 (6) mg/Sm^3 ≤ 10 (6) mg/Sm^3
	• Using Gas Fuel	
	• Internal Combustion Engine (Including Gas Turbine) - Installed before 30 Jun 2001 - Installed after 1 Jul 2001 - Installed after 1 Jan 2015 • Others - Installed before 30 Jun 2001	 ≤ 10 (15) mg/Sm^3 ≤ 10 (15) mg/Sm^3 ≤ 10 (15) mg/Sm^3 ≤ 20 (4) mg/Sm^3

Table C-22. ROK Permissible Standards for Power Generation - continued

Pollutants	Type of Facility	Permissible emission standard
	- Installed after 1 Jul 2001 - Installed after 1 Jan 2015	≤ 20 (4) mg/Sm^3 ≤ 10 (4) mg/Sm^3
Carbon disulfide	• Applicable air emission sources*	≤ 10 ppm
Formaldehyde	• Applicable air emission sources*	≤ 8 ppm
Hydrogen Sulfide	• Applicable air emission sources*	≤ 6 ppm
Fluoride as F	• Applicable air emission sources*	≤ 2 ppm
Hydrogen cyanide	• Applicable air emission sources*	≤ 4 ppm
Bromine compounds	• Applicable air emission sources*	≤ 3 ppm
Benzene	• Applicable air emission sources*	≤ 6 ppm
Phenol compounds	• Applicable air emission sources*	≤ 4 ppm
Mercury compounds	• Applicable air emission sources*	≤ 0.1 mg/Sm^3
Arsenic compounds	• Applicable air emission sources*	≤ 0.5 ppm
Dichloromethane	• Applicable air emission sources*	≤ 50 ppm
Trichloroethylene	• Applicable air emission sources*	≤ 50 ppm
1,3-Butadiene	• Applicable air emission sources*	≤ 6 ppm
Acrylonitrile	• Applicable air emission sources*	≤ 3 ppm
1,2-Dichloroethane	• Applicable air emission sources*	≤ 12 ppm
Chloroform	• Applicable air emission sources*	≤ 5 ppm
Tetrachloroethylene	• Applicable air emission sources*	≤ 10 ppm
Styrene	• Applicable air emission sources*	≤ 23 ppm
Ethylbenzene	• Applicable air emission sources*	≤ 23 ppm
Carbon tetrachloride	• Applicable air emission sources*	≤ 3 ppm
Cadmium Compounds	• Applicable air emission sources*	≤ 0.2 mg/Sm^3
Lead Compounds as Pb	• Applicable air emission sources*	≤ 0.8 mg/Sm^3
Chromium Compounds as Cr	• Applicable air emission sources*	≤ 0.4 mg/Sm^3
Copper compounds as Cu	• Applicable air emission sources*	≤ 4 mg/Sm^3
Nickel and nickel compounds	• Applicable air emission sources*	≤ 2 mg/Sm^3
Zinc compounds as Zn	• Applicable air emission sources*	≤ 4 mg/Sm^3
Flying dust	• Applicable air emission sources*	≤ 0.4 mg/Sm^3
Smoke	• Applicable air emission sources*	≤ level 2 in Ringelmann smoke chart

Table C-22. ROK Permissible Standards for Power Generation - continued

Pollutants	Type of Facility	Permissible emission standard
Benzo(a)pyrene	• Applicable air emission sources*	≤ 0.05 mg/Sm^3

*Air emission testing must be conducted in accordance with the ROK environmental standard test method if an air emission source has the potential to emit a listed compound. If analytical results do not indicate the presence of the compound then no further testing will be required unless modifications of the air emissions source or facility processes occur.

Remarks:
1. ( ) in the permissible emission standard column means standard oxygen density in percentage.(% of O_2).
2. The emission volume of general boilers is determined by the boiler capacity. The volume of an emergency boiler installed as a back-up boiler is not counted.
3. Standard oxygen density is not applied for the following:
   a. Facilities using direct combustion or catalysts under the category of waste gas incineration facilities.
   b. Facilities using pure oxygen instead of air.

9. UNITS CONTAINING ODSS AND SUBSTITUTES FOR ODSS

Installations must ensure that units containing ODSs meet the standards of this paragraph, as applicable. ODSs are listed in Table C-23 (Class I), Table C-24 (Class II), and Table C-25 (Blend). The standards in Paragraphs 9.b. through 9.e. apply to direct atmospheric emissions of ODSs from refrigeration and fire suppression equipment. These standards also apply to substitutes for ODSs, such as hydrofluorocarbons (HFCs) where indicated.

a. Substitutes Exempt from Refrigerant Management Requirements. The following substitutes are exempt from the refrigerant management requirements:

(1) Carbon dioxide in any application.

(2) Nitrogen in any application.

(3) Water in any application.

(4) Ammonia in commercial or industrial process refrigeration or absorption units.

(5) Chlorine in industrial process refrigeration (processing of chlorine and chlorine compounds).

(6) Hydrocarbons in industrial process refrigeration (processing of hydrocarbons).

(7) Ethane (R-170) in very low temperature refrigeration equipment and equipment for non-mechanical heat transfer.

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

(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.

(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.

Table C-23. Class I ODS Chemicals

Chemical Name[a]	Symbol	CAS No.	Ref. No.	Comm. Name
Fire Suppressants				
Bromochlorodifluoromethane	CF_2ClBr	353-59-3	Halon 1211	
Bromotrifluoromethane	CF_3Br	75-63-8	Halon 1301	
Dibromotetrafluoroethane	$C_2F_4Br_2$	124-73-2	Halon 2402	
Chlorobromomethane	CH_2BrCl	74-97-5	Halon 1011	CBM
Bromodifluoromethane	HBFC-12B1	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	

Table C-23. Class I ODS Chemicals - continued

Chemical Name[a]	Symbol	CAS No.	Ref. No.	Comm. Name
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	CCL4	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 ODSs, except isomers of 1,1,1-trichloroethane (also known as methyl chloroform) such as 1,1,2-trichloroethane.				

Table C-24. Class II ODS Chemicals

Chemical Name[a]	HCFC	Symbol	CAS No.	Ref. No.	Comm. Name
Fire Suppressants					
Dichlorotrifluoroethane	HCFC-123	$C_2HF_3Cl_2$	306-83-2	R-123	Halotron I
Refrigerants					
Dichlorofluoromethane	HCFC-21	$CHFCl_2$	75-43-4	R-21	Freon 21
Monochlorodifluoromethane	HCFC-22	CHF_2Cl	75-45-6	R-22	Freon 22, Genetron 22, Forane 22, Refron 22

Table C-24. Class II ODS Chemicals - continued

Chemical Name[a]	HCFC	Symbol	CAS No.	Ref. No.	Comm. Name
Monochlorofluoromethane	HCFC-31	CH_2FCl	593-70-4	R-31	Genetron 31
Dichlorotrifluoroethane	HCFC-123	$C_2HF_3Cl_2$	306-83-2	R-123	Suva 123, Freon 123, Genetron 123, Halotron I
Monochlorotetrafluoroethane	HCFC-124	C_2HF_4Cl	2837-89-0	R-124	Suva 124, Freon 124, Genetron 124, FE-241
Trichlorofluoroethane	HCFC-131	$C_2H_2FCl_3$	359-28-4		
Dichlorodifluoroethane	HCFC-132b	$C_2H_2F_2Cl_2$	1649-08-7		
Monochlorotrifluoroethane	HCFC-133a	$C_2H_2F_3Cl$	75-88-7		
Monochlorodifluoroethane	HCFC-142b	$C_2H_3F_2Cl$	75-68-3	R-142b	Genetron 142b
Hexachlorofluoropropane	HCFC-221	C_3HFCl_6	422-26-4		
Pentachlorodifluoropropane	HCFC-222	$C_3HF_2Cl_5$	422-49-1		
Tetrachlorotrifluoropropane	HCFC-223	$C_3HF_3Cl_4$	422-52-6		
Trichlorotetrafluoropropane	HCFC-224	$C_3HF_4Cl_3$	422-54-8		
Monochlorohexafluoropropane	HCFC-226	C_3HF_6Cl	431-87-8		
Pentachlorofluoropropane	HCFC-231	$C_3H_2FCl_5$	421-94-3		
Tetrachlorodifluoropropane	HCFC-232	$C_3H_2F_2Cl_4$	460-89-9		
Trichlorotrifluoropropane	HCFC-233	$C_3H_2F_3Cl_3$	7125-84-0		
Dichlorotetrafluoropropane	HCFC-234	$C_3H_2F_4Cl_2$	425-94-5		
Monochlorotetrafluoropropane	HCFC-244	$C_3H_3F_4Cl$	134190-50-5		
Trichlorofluoropropane	HCFC-251	$C_3H_4FCl_3$	421-41-0		
Dichlorodifluoropropane	HCFC-252	$C_3H_4F_2Cl_2$	819-00-1		
Monochlorotrifluoropropane	HCFC-253	$C_3H_4F_3Cl$	460-35-5		
Dichlorofluoropropane	HCFC-261	$C_3H_5FCl_2$	420-97-3		
Monochlorodifluoropropane	HCFC-262	C3H5F2Cl	421-02-3		
Monochlorofluoropropane	HCFC-271	C3H6FCl	430-55-7		

HCFC = Hydrochlorofluorocarbon

a All isomers of these chemicals are ODSs, except isomers of 1,1,1-trichloroethane (also known as methyl chloroform) such as 1,1,2-trichloroethane.

Table C-25. Class II ODS Blend Chemicals

Chemical Name[a]	Symbol	CAS No.	Ref. No.	Comm. 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
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	

Table C-25. Class II ODS Blend Chemicals - continued

Chemical Name[a]	Symbol	CAS No.	Ref. No.	Comm. Name
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 ODSs, except isomers of 1,1,1-trichloroethane (also known as methyl chloroform) such as 1,1,2-trichloroethane.

b. Production and Use of Class I and II ODSs.

Production of Class I ODSs has been banned. Production of Class II ODSs is being phased out and no Class II ODSs will be produced after January 1, 2030. All existing commercial systems using Class I and Class II ODSs 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 ODSs is only permitted for weapons systems and when supplied by the Defense Logistics Agency (DLA) from the DoD stockpile. Use of Class II ODSs is permitted only in existing air-conditioning and refrigeration equipment until the end of their life cycle.

c. Labeling.

All containers or products containing a Class I or Class II substance must bear the warning statement, both in English and Korean as shown in Figure 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 Enclosure I of this manual, as applicable.

Figure 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. 경고: 대기 상층부에서 오존을 분해하여 대중의 건강과 환경에 악영향을 끼치는 물질 [물질명 또는 첨가된 물질명 추가]

d. Refrigerants.

(1) 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 Ozone-Depleting Substances (ODS) 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 ROK equivalent. Use of refrigerant recovery and recycling equipment is not required for ammonia, carbon dioxide, and pure hydrocarbon refrigerants.

(2) Refrigerant Venting Prohibition.

Any ODS refrigerants and their substitutes 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.

(3) Refrigerant Leak Monitoring and Repair.

Monitor refrigeration equipment containing 22.7 kg [50 lbs] or more of ODS refrigerant for leakage and, if found to be leaking, repair in accordance with the following standards within 30 days.

(a) Commercial Refrigeration Equipment.

Commercial refrigeration equipment and industrial process refrigeration equipment normally containing 22.7 kg [50 lbs] or more of refrigerant in any single circuit must have leaks repaired if the appliance is leaking at a rate such that the loss of refrigerant will exceed 35 percent of the total charge during a 12-month period.

(b) Industrial Process Refrigeration (IPR) Equipment.

IPR equipment normally containing 22.7 kg [50 lbs] or more of refrigerant in any single circuit must have leaks repaired if the appliance is leaking at a rate such that the loss of refrigerant will exceed 35 percent of the total charge during a 12-month period.

(c) Comfort Cooling and Other Appliances.

Comfort cooling and other appliances normally containing more than 22.7 kg [50 lbs] of refrigerant in any single circuit and not covered by paragraphs 9.d.(3)(a) and 9.d.(3)(b) must have leaks repaired if the appliance is leaking at a rate such that the loss of refrigerant will exceed 15 percent of the total charge during a 12-month period.

(d) Leak Rate Calculation.

Leak rates must be calculated every time an ODS refrigerant is added to an appliance with a full charge of 22.7 kg [50 lbs] or more of refrigerant in any single circuit unless the addition qualifies as a seasonal variance or is made immediately after a retrofit or the installation of a new appliance.

(e) 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.

e. Fire Suppression Agent (Halon).

(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.

(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:

(a) 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).

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

(c) Releases during the testing of fire extinguishing systems if all of the following are true:

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

2. Release of extinguishing agent is essential to demonstrate equipment functionality.

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

4. A simulant agent cannot be used.

10. MOTOR VEHICLES

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

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

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

b. Installations must ensure that the USFK certified vehicle inspection facilities apply the ROK emission standards in the Table C-26 through 28 to inspect motor vehicles.

Table C-26. Operating Motor Vehicle Emission Standards for Gasoline or Liquefied Petroleum Gas (LPG)

Type		Manufactured Date Range	Carbon Monoxide	Hydrocarbons	Excess Air Rate
Light Weight		31 Dec 1997 and earlier	≤ 4.5%	≤ 1,200ppm	≤ 1±0.1, ≤ 1±0.15 for vehicles equipped with carburetor, ≤ 1±0.20 for vehicles without catalyst
		1 Jan 1998 – 31 Dec 2000	≤ 2.5%	≤ 400ppm	
		1 Jan 1998 – 31 Dec 2000	≤ 1.2%	≤ 220ppm	
		1 Jan 2004 and later	≤ 1.0%	≤ 150ppm	
Passenger Vehicle		31 Dec 1987 and earlier	≤ 4.5%	≤ 1,200ppm	
		1 Jan 1988 – 31 Dec 2000	≤ 1.2%	≤ 220ppm (Gasoline or Alcohol) ≤ 400ppm (LPG)	
		1 Jan 2001 – 31 Dec 2005	≤ 1.2%	≤ 220ppm	
		1 Jan 2006 and later	≤ 1.0%	≤ 120ppm	
Van, Freight, and Special Purpose Vehicle	Small Size	31 Dec 1989 and earlier	≤ 4.5%	≤ 1,200ppm	
		1 Jan 1990 – 31 Dec 2003	≤ 2.5%	≤ 400ppm	
		1 Jan 2004 and later	≤ 1.2%	≤ 220ppm	
	Medium and Large Size	31 Dec 2003 and earlier	≤ 4.5%	≤ 1,200ppm	
		1 Jan 2004 and later	≤ 2.5%	≤ 400ppm	
Motor-cycle	Small and Medium Size	1 Jan 2018 and later	≤ 3.0%	≤ 1,000ppm	N/A
	Large Size	31 Dec 1999 and earlier	≤ 5.0%	≤ 2,000ppm	
		1 Jan 2000 – 31 Dec 2006	≤ 3.5%	≤ 1,500ppm	
		1 Jan 2007 – 31 Dec 2008	≤ 3.0%	≤ 1,200ppm	
		1 Jan 2009 and later	≤ 3.0%	≤ 1,000ppm	

Table C-27. Operating Motor Vehicle Emission Standards for Diesel

<table>
<tr><th colspan="2">Type</th><th colspan="2">Manufactured Date Range</th><th>Soot</th></tr>
<tr><td colspan="2" rowspan="6">Light Weight and Passenger Vehicle</td><td colspan="2">31 DEC 1995 and earlier</td><td>≤ 60%</td></tr>
<tr><td colspan="2">1 JAN 1996 – 31 DEC 2000</td><td>≤ 55%</td></tr>
<tr><td colspan="2">1 JAN 2001 – 31 DEC 2003</td><td>≤ 45%</td></tr>
<tr><td colspan="2">1 JAN 2004 – 31 DEC 2007</td><td>≤ 40%</td></tr>
<tr><td colspan="2">1 JAN 2008 – 31 AUG 2016</td><td>≤ 20%</td></tr>
<tr><td colspan="2">1 SEP 2016 and later</td><td>≤ 10%</td></tr>
<tr><td rowspan="24">Van, Freight, and Special Purpose Vehicle</td><td rowspan="6">Small Size</td><td colspan="2">31 DEC 1995 and earlier</td><td>≤ 60%</td></tr>
<tr><td colspan="2">1 JAN 1996 – 31 DEC 2000</td><td>≤ 55%</td></tr>
<tr><td colspan="2">1 JAN 2001 – 31 DEC 2003</td><td>≤ 45%</td></tr>
<tr><td colspan="2">1 JAN 2004 – 31 DEC 2007</td><td>≤ 40%</td></tr>
<tr><td colspan="2">1 JAN 2008 – 31 AUG 2016</td><td>≤ 20%</td></tr>
<tr><td colspan="2">1 SEP 2016 and later</td><td>≤ 10%</td></tr>
<tr><td rowspan="9">Medium Size</td><td colspan="2">31 DEC 1992 and earlier</td><td>≤ 60%</td></tr>
<tr><td colspan="2">1 JAN 1993 – 31 DEC 1995</td><td>≤ 55%</td></tr>
<tr><td colspan="2">1 JAN 1996 – 31 DEC 1997</td><td>≤ 45%</td></tr>
<tr><td rowspan="2">1 JAN 1998 – 31 DEC 2000</td><td>Intra-city bus</td><td>≤ 40%</td></tr>
<tr><td>Others</td><td>≤ 45%</td></tr>
<tr><td colspan="2">1 JAN 2001 – 30 SEP 2004</td><td>≤ 45%</td></tr>
<tr><td colspan="2">1 OCT 2004 – 31 DEC 2007</td><td>≤ 40%</td></tr>
<tr><td colspan="2">1 JAN 2008 – 31 AUG 2016</td><td>≤ 20%</td></tr>
<tr><td colspan="2">1 SEP 2016 and later</td><td>≤ 10%</td></tr>
<tr><td rowspan="8">Large Size</td><td colspan="2">31 DEC 1992 and earlier</td><td>≤ 60%</td></tr>
<tr><td colspan="2">1 JAN 1993 – 31 DEC 1995</td><td>≤ 55%</td></tr>
<tr><td colspan="2">1 JAN 1996 – 31 DEC 1997</td><td>≤ 45%</td></tr>
<tr><td rowspan="2">1 JAN 1998 – 31 DEC 2000</td><td>Intra-city bus</td><td>≤ 40%</td></tr>
<tr><td>Others</td><td>≤ 45%</td></tr>
<tr><td colspan="2">1 Jan 2001 – 30 Sep 2004</td><td>≤ 45%</td></tr>
<tr><td colspan="2">1 Oct 2004 – 31 Dec 2007</td><td>≤ 40%</td></tr>
<tr><td colspan="2">1 Jan 2008 and later</td><td>≤ 20%</td></tr>
</table>

Table C-28. Types of Motor Vehicle

Type	Light Weight		Small Size	Medium Size	Large Size
	Extra Small	Regular			
Passenger Vehicle	Engine displacement 250cc (for electric vehicles, the maximum rated output, 15kW) or less and length 3.6m, width 1.5m, height 2.0m or less	Engine displaceme nt less than 1,000cc, and length 3.6m, width 1.6m, height 2.0m or less	Engine displaceme nt less than 1,600cc, and length 4.7m, width 1.6m, height 2.0m or less	Engine displacement 1,600cc or more and less than 2,000cc, or any length, width or height exceeding a small size	Engine displaceme nt 2,000cc or more, or any length, width or height exceeding a small size
Van	Engine displacement less than 1,000cc, and length 3.6m, width 1.6m, height 2.0m or less		Passenger capacity 15 or less, and length 4.7m, width 1.7m, and height 2.0m or less	Passenger capacity 16 or more and less than 36, or any length, width or height exceeding a small size and length less than 9m	Passenger capacity 36 or more, or any length, width or height exceeding a small size and length 9m or more
Freight Vehicle	Engine displacement 250cc (for electric vehicles, the maximum rated output, 15kW) or less and length 3.6m, width 1.5m, height 2.0m or less	Engine displaceme nt less than 1,000cc, and length 3.6m, width 1.6m, height 2.0m or less	Maximum loading capacity 1 tons or less and gross weight 3.5 tons or less	Maximum loading capacity more than 1 ton and less than 5 tons, or gross weight is more than 3.5 tons and less than 10 tons	Maximum loading capacity 5 tons or more, or gross weight 10 tons or more
Special Purpose Vehicle	Engine displacement less than 1,000cc, and length 3.6m, width 1.6m, height 2.0m or less		Gross weight 3.5 tons or less	Gross weight more than 3.5 tons	Gross weight more than 10 tons

11. DUST REDUCTION

Implement the best management practices for dust reductions in Table C-29.

Table C-29. Best Management Practices for Dust Reduction

No.	Discharge process	Standards for installation & necessary measures
1	Field storage (when powdery material is stored in the field)	a. Field stored material shall be covered by anti-dust cover. b. Anti-dust cover wall of 1/3 of field storage height shall be installed and anti- dust net (screen) of 1.25 times the height of storage shall be installed. For construction site, landscaping site, and demolition site, the boundary shall be guarded with anti-dust wall of 1.8m or more. When two or more sites are adjacent to each other, the inner boundary does not need a wall. c. Field stored material shall have water content of 7-10% and sprinkler shall be installed to maintain the water content.(For iron scrap site, this does not apply) d. When the same measures equivalent to or better than a – c are taken, those measures may substitute a – c.
2	Loading/unloading criteria for potential dust-generating activities, such as those involving soil, coal, and concrete/cement	a. Install portable dust booth or spraying dust booth to control flying dust produced during the work processes (limited to coal manufacturing industry, iron/steel industry, and grain transportation industry). b. Install and use fixed or portable water sprays (spraying radius ≥ 5m and water pressure ≥ 3 kg/cm^2) to control flying dust (grain processing and loading facilities are excluded). c. Stop working when wind velocity ≥ 8 m/sec (~18 miles per hour). d. If current actions are more effective than a - c, then implementation of a -c is exempted.

Table C-29. Best Management Practices for Dust Reduction - continued

No.	Discharge process	Standards for installation & necessary measures
3	Transportation [cement, coal, soil, feeds, grain, scrap iron are limited to a, b, f, g and wood is limited to g and h]	a. Cover the loaded materials. b. Loaded materials shall not extend above 5 cm (~2 inches) below the top of the truck bed. c. If 10 or more residences are located with 500 meters of the road, pavement, temporary pavement or appropriate covering (with water spray application) shall be provided on the unpaved roads within the 1 km radius. d. One of the following will be made available: (1) Automatic wheel washer (2) Automatic wheel washer with a water containment basin with the following specifications: (a) Area of basin: ≥ 1.2 times area of the truck (b) Depth of basin: ≥ 20 cm (~8 inches) (c) Length of basin: ≥ 2 times of truck length (d) Equipment to assure continuous water flow within the basin e. Install side water sprinkler IAW the following criteria: (1) Water sprinkler should reach bottom of wheels to lower portion of truck bed. (2) Length: ≥ 1.5 times of truck length (3) Pressure of water spray: 3 kg/cm^2 f. Truck sides and wheels must be washed before exiting site. g. Speed limits within work site shall not exceed 20 km/hr to prevent excessive dust. h. The work site shall be sprayed at least once a day while there is traffic.
4	Conveyance	a. Outdoor conveyance equipment shall be covered and sealed to prevent the release of dust. b. Appropriate dust booths shall be installed at the entrance, exit, falling points, and ventilation areas. c. Water spray or other dust control measures shall be available using non- mechanical devices. e. If current actions more effective than a through c are being practiced, then implementation of a through c is exempted.

Table C-29. Best Management Practices for Dust Reduction - continued

No.	Discharge process	Standards for installation & necessary measures
5	Outdoor cutting	a. It is recommended that iron scrap cutting be conducted indoors. b. Partitions will be installed for dust control when outdoor cutting is necessary. c. Stop working when wind velocity ≥ 8 m/sec (~18 miles per hour); for ship industries, stop working when wind velocity ≥ 10 m/sec (~22 miles per hour). d. If current actions more effective than a through c are being practiced, then implementation of a through c is exempted.
6	Outdoor media blasting	a. Media blasting will be conducted indoors if the length of an object is less than 15 cm (~6 inches). b. Install partitions for dust control. c. Use portable dust booths if conducting outdoor media blasting. If dust booths are not feasible, media blasting area will be cleaned with vacuum truck. d. Blasting media, dust, and debris will be contained to prevent dust. e. Stop working when wind velocity ≥ 8 m/sec (~18 miles per hour); for ship industries, stop working when wind velocity ≥ 10 m/sec (~22 miles per hour). f. If current actions more effective than a through e are being practiced, then implementation of a through e is exempted.
7	Outdoor grinding	a. Use portable dust booths if conducting outdoor grinding. If dust booths are not feasible, grinding area will be cleaned with vacuum truck. b. Use portable dust net or panels higher than grinding table when outdoor grinding is performed within 40 m (~120 feet) of the property boundary. c. Grinding media, dust, and debris will be contained to prevent dust. d. Stop working when wind velocity ≥ 8 m/sec (~18 miles per hour); for ship industries, stop working when wind velocity ≥ 10 m/sec (~22 miles per hour). e. If current actions more effective than a through e are being practiced, then implementation of a through e is exempted.
8	Other processes (i.e., building	a. The following shall be implemented at building construction sites:

Table C-29. Best Management Practices for Dust Reduction - continued

No.	Discharge process	Standards for installation & necessary measures
	construction sites, earthwork sites, building demolition)	(1) Install dust control panels at the work site when dust generation is anticipated (i.e., activities such as floor cleaning, wall grinding, cutting, spray painting, etc.). (2) Install dust control panels to contain dust within the work site. Special precautions should be considered when applying fire- retardant materials to steel construction beams and when grinding/polishing uneven concrete surfaces. b. Install dust control panels when spray painting at building construction or ground working sites. c. Install dust control panels, dust control walls, and wetting of materials during building demolition activities. d. All major construction must take into account dust control management practices which shall be preapproved by the Installation Environmental Office. If current actions are more effective than a through c, then implementation of a through c is exempted.

Table C-30. Applicable Facility for ROK Air Emission Standards

Type of Facility	Description
Power Generation	- Internal Combustion Engine (greater than or equal to 120 kW) (Not applicable for emergency backup purpose, use in islands and transportation purpose and mobile generators) - Landfill Gas or Biogas Power Plant (greater than or equal to 120 kW) - Goal Gas Power Plant (greater than or equal to 120 kW) - Waste Gas Power Plant (greater than or equal to 120 kW) - Lean Burn Engine Power Plant (greater than or equal to 120 kW)
Incinerator	- Greater than or equal to 25 kg/hour incineration capacity
Boiler	- Industrial or business purpose of boiler with evaporation rate is greater than or equal to 2 ton/hour or heat input is greater than or equal to 1,238,000 kcal/hour using only liquid fossil fuel or gas fuel

Table C-31. Monitoring Frequency for ROK Air Emission Standards

Category	Amount of Air Pollutants	Frequency	Remark
1	A stack which generates pollutants (particulate matter, sulfur oxides and nitrogen oxides) greater than or equal to 80 ton per year	At least once a week	The pollutants listed on Table 23 and Table 24. Flying dust will not be included.
2	A stack which generates pollutants (particulate matter, sulfur oxides and nitrogen oxides) greater than or equal to 20 ton per year and less than 80 ton per year	At least twice a month	
3	A stack which generates pollutants (particulate matter, sulfur oxides and nitrogen oxides) greater than or equal to 10 ton per year and less than 20 ton per year	At least once every two (2) months	
4	A stack which generates pollutants (particulate matter, sulfur oxides and nitrogen oxides) greater than or equal to 2 ton per year and less than 10 ton per year	At least once every six (6) months	
5	A stack which generates pollutants (particulate matter, sulfur oxides and nitrogen oxides) less than 2 ton per year	At least once every six (6) months	

Table C-32. Generated Amount of Air Pollutants

<table>
<tr><th rowspan="3">Fuel</th><th colspan="9">Air Emission Pollutants Discharge Factor</th></tr>
<tr><th colspan="3">Particulate Matter</th><th colspan="3">Sulfur Oxides</th><th colspan="3">Nitrogen Oxides</th></tr>
<tr><th>H</th><th>I</th><th>G</th><th>H</th><th>I</th><th>G</th><th>H</th><th>I</th><th>G</th></tr>
<tr><td>Kerosene (Sulfur 0.001%)</td><td colspan="2">0.05</td><td>0.05</td><td colspan="3">17.0S</td><td>2.16</td><td>2.16</td><td>2.16</td></tr>
<tr><td>Kerosene (Sulfur 0.1%)</td><td colspan="2">0.24</td><td>0.24
0.07[1)]</td><td colspan="3">17.0S</td><td>2.40</td><td>2.40</td><td>2.40
14.7[1)]</td></tr>
<tr><td>Diesel (Sulfur 0.1% or 0.05%)</td><td colspan="2">0.24</td><td>0.24
1.67[2)]</td><td colspan="3">17.0S</td><td>2.40</td><td>2.40</td><td>2.40
53.4[2)]</td></tr>
<tr><td>Bunker A oil</td><td colspan="2">0.84</td><td>0.84</td><td colspan="3">5.28</td><td>5.99</td><td>5.99</td><td>5.99</td></tr>
<tr><td>Bunker B oil</td><td colspan="2">1.20</td><td>1.20</td><td colspan="3">14.3S</td><td>2.47</td><td>2.47</td><td>2.47</td></tr>
<tr><td>Bunker C oil
(Sulfur Content 0.3 – 4.0 %)</td><td colspan="2">1.1S
+0.39</td><td>1.1S
+0.39</td><td colspan="3">14.3S</td><td>6.64</td><td>6.64</td><td>6.64</td></tr>
<tr><td>Black Coal (Less than 14% of Volatile Organic Chemicals)</td><td colspan="2">5.0A</td><td>5.0A</td><td colspan="3">19.5S</td><td>5.83</td><td>5.83</td><td>9.00</td></tr>
<tr><td>Soft Coal (Equal or more than 14% of Volatile Organic Chemicals)</td><td colspan="2">5.0A</td><td>5.0A</td><td colspan="3">19.0S</td><td>4.55</td><td>5.55</td><td>7.50</td></tr>
<tr><td>Liquefied Natural Gas (LNG)</td><td colspan="2">0.03</td><td>0.03</td><td colspan="3">0.01</td><td>3.70</td><td>3.70</td><td>6.04
42.9[2)]</td></tr>
<tr><td>Liquefied Petroleum Gas (LPG)</td><td colspan="2">0.07</td><td>0.07</td><td colspan="3">0.01</td><td>2.18</td><td>2.28</td><td>2.28</td></tr>
</table>

*Amount of Air Pollutants = Air Emission Pollutant Discharge Factor x Maximum Fuel Use Rate (hourly) x Operation Hours

1. A (Ash Content): Black Coal (40%: 40) and Soft Coal (10%: 10)
2. S (Sulfur Content): Kerosene (0.1%: 0.1), B-A oil (1.5%: 1.5), B-B oil (1.2%: 1.2), Black Coal (0.7%: 0.7, Soft Coal (0.5%: 0.5)
3. Discharge Factor Unit: Oil (g/L), Coal (g/kg), Liquefied Natural Gas (LNG) (g/m^3), Liquefied Petroleum Gas (LPG) (g/kg)
4. Change Factor: Liquefied Natural Gas (1kg = 1.238m^3), Liquefied Petroleum Gas (1kg = 1.97L = 0.529m^3)
5. 1): Gas Turbine Engine
   2): Internal Combustion Engine
6. H: Heating, I: Industry, G: Generation

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ENCLOSURE D

ASBESTOS

1. INTRODUCTION

This enclosure 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 enclosure. To protect personnel from asbestos exposure, refer to DoDI 6055.01 and DoDI 6055.05.

2. PERSONAL QUALIFICATION

Installations must ensure that:

a. The asbestos program manager, custodial staff, maintenance staff, contractor, and individuals involved in asbestos management are trained and/or certified consistent with responsibilities and DoDI 6055.01 and DoDI 6055.05., or Republic of Korea equivalent requirements. Custodial staff and maintenance staff may not necessarily be required to be certified.

b. Training includes, as appropriate:

(1) Asbestos hazards and worker protection.

(2) Notifications.

(3) Material identification.

(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) Waste disposal work practices and recordkeeping.

3. ASBESTOS CONTROLS

Installations must:

a. Appoint an asbestos program manager to serve as the single point of contact for all asbestos-related activities.

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

(1) A list of known and presumed ACM, by location, on the installation.

(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.

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

(4) Work control or permit systems to control activities that might disturb ACM.

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

(6) Recordkeeping to document operations and maintenance activities related to asbestos identification management and abatement.

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

(8) Procedures to assess and prioritize identified hazards for abatement.

(9) Procedures to prevent the use of ACM in new construction.

4. ASBESTOS ABATEMENT

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

a. 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).

b. 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:

(1) Type of operation: demolition or renovation.

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

(3) Procedure, including analytical methods, used to detect the presence of regulated ACM and Category I and Category II nonfriable ACM.

(4) Estimated amount of:

(a) Regulated ACM to be removed from the facility.

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

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

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

(7) Scheduled starting and completion dates of demolition or renovation.

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

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

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

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

c. Asbestos Removal

(1) Remove friable ACM when it poses a threat to release airborne asbestos fibers and can’t reliably repaired or isolated.

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

(3) Remove ACM according to the following procedures:

(a) Adequately wet all regulated ACM exposed during cutting or disjointing operations.

(b) 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.

(c) 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.

(d) Wetting is not required in renovation operations if the following emission control methods are used:

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.

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

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

4. Other methods equivalent to wetting, when wetting would result in equipment damage or a safety hazard and the methods in Paragraphs 4.c.(3)(d)1. through 4.c.(3)(d)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 4.c.(4)(b).

(a) If stripped, either:

1. Adequately wet the regulated ACM during stripping, or

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.

(b) 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 both languages of English and Korean, shown in Figure 2.

Figure 2. Leak-Tight Wrapping Label

DANGER ASBESTOS DUST HAZARD CANCER AND LUNG DISEASE HAZARD AUTHORIZED PERSONNEL ONLY **위 험** 석면 분진 폐암 및 폐질환 위험 허가된 자만 취급

(c) For all ACM, including material that has been removed or stripped:

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

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

3. Transport the material to the ground using leak-tight chutes or containers if it has been removed or stripped more than 15.2 meter [50 ft] above ground level and was not removed as units or in sections.

(d) When the temperature at the point of wetting is below 0°C (32°F), the wetting provisions identified in Paragraphs 4.c.(3)(a) and 4.c.(3)(c) need not be followed.

(e) 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.

(f) 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. ASBESTOS DISPOSAL

Installations must dispose of asbestos in accordance with these standards.

a. When disposing of ACM waste, adequately wet and seal it (including any wastewater containing ACM) in a leak-proof container, and properly disposed of it through a licensed contractor for designated waste disposal IAW ROK regulations. Label containers in both English and Korean languages as shown in Figure 3.

Figure 3. Leak - Proof Container Label

DANGER
CONTAINS ASBESTOS FIBERS
MAY CAUSE CANCER
CAUSES DAMAGE TO LUNG
DO NOT BREATH DUST
AVOID CREATING DUST
위 험
석면 함유
폐손상 및 암유발 가능
먼지 흡입 금지
먼지 발생 금지

b. Maintain permanent records documenting the disposal action and site.

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.

7. RECORDKEEPING

Installations must maintain records of asbestos operation and maintenance activities consistent with the asbestos management plan, including at a minimum, records of asbestos determinations and disposal.

ENCLOSURE E

LEAD-BASED PAINT (LBP)

1. INTRODUCTION

This enclosure contains standards on the identification, control, or elimination of 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 and 6055.05.

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 and certified.

3. USE OF LEAD-CONTAINING PAINT IN CONSUMER PRODUCTS

a. Installations and activities must ensure that they do not use consumer products with lead-containing paint. Installation environment may voluntarily participate to campaign the public on installations. 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:

(1) Toys and other articles intended for use by children that are labelled "lead-containing paint."

(2) Furniture that is labelled "lead-containing paint."

b. 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.

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.

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

(1) LBP risk assessment screening. If the screening identifies dust-lead levels greater than 431 $\mu g/m^2$ [40 $\mu g/ft^2$] for floors or greater than 2,691 $\mu g/m^2$ [250 $\mu g/ft^2$] for interior windowsills, perform an LBP risk assessment.

(2) LBP risk assessments.

(3) Routine facility inspection for fire and safety.

(4) Occupant, facility manager, and worker reports of deteriorated paint.

(5) Results of childhood blood lead screening or reports of children identified to have a confirmed concentration of lead in whole blood of 20 μg/deciliter for single test or 15-19 μg/deciliter in two tests at least 3 months apart.

(6) LBP re-evaluations.

(7) Review of construction, painting, and maintenance histories.

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

c. 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.

d. 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.

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

5. DISPOSAL OF LEAD-CONTAMINATED WASTE

Installations must dispose of lead-contaminated waste that meets the definition of a hazardous waste in accordance with Enclosure O, Hazardous Waste, of USFKM 4715.05.

ENCLOSURE F

POLYCHLORINATED BIPHENYLS (PCBs)

1. INTRODUCTION

This enclosure 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.

2. GENERAL

Installations must comply with the following standards:

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

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

c. 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 (less than 2 ppm).

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

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

(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.

(2) Maintain the inventory for a period of at least 3 years the disposal of the last item on the list.

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

g. Prominently mark all PCB large high-voltage capacitors, equipment, items, and transformers that contain PCBs greater than or equal to 2 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 Korean languages and may be painted, affixed using an adhesive label, or accomplished using any other method that meets these standards:

(1) Identifies the item as containing PCBs.

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

(3) Warns against improper disposal and handling.

(4) Provides a phone number in case of spills or if questions arise about disposal.

h. 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 2.g.(1) through 2.g.(4).

3. SPILL PREVENTION AND RESPONSE

Installations must:

a. Ensure the installation spill prevention and response plan addresses PCB items, including temporary storage items. Enclosure L of this manual provides standards for spill prevention and response plans.

b. Immediately respond to spills of PCB liquids at concentrations of 2 ppm or greater and clean up in accordance with the following:

(1) Clean surfaces in substantial contact areas to 10 µg per 100 square centimeters (cm^2) [0.065 µg per 100 square inches].

(2) Clean surfaces in all other contact areas to 100 µg per 100 cm^2 [0.65µg per 100 square inches].

(3) Remove contaminated soil in restricted access areas until the soil tests no higher than 1 ppm PCBs and backfill with clean soil containing less than 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.

(4) Remove contaminated soil in unrestricted access areas to a minimum depth 25.4 cm [10 inches] or until the soil tests no higher than 1 ppm PCBs, which is deeper, and backfill with clean soil containing less than 1 ppm PCBs.

4. PCB TRANSFORMER MANAGEMENT

Installations must comply with the following standards:

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

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

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

d. 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.

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

f. Service PCB transformers as follow:

(1) Only service transformers classified as PCB-contaminated electrical equipment with dielectric fluid containing less than 500 ppm PCBs.

(2) Do not perform any servicing of PCB transformers that requires removal of the transformer coil.

(3) Capture and reuse dielectric fluids removed during servicing as dielectric fluid for PCB transformers or dispose of fluids in accordance with Paragraph 7. Do not mix dielectric fluid from a PCB transformer with the dielectric fluid from PCB-contaminated electrical equipment.

(4) Do not use in any dielectric fluids containing less than 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 greater than 500 ppm PCBs.

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

(1) PCB transformers with an impervious, undrained secondary containment capacity of 110 percent of dielectric fluid.

(2) PCB transformers tested and found to contain less than 60,000 ppm PCBs at least every 12 months.

h. Mange leaking PCB transformers in manner that minimizes exposure and contamination. Perform appropriate spill response in accordance with Paragraph 3. capture and dispose of leaking PCB fluids in accordance with Paragraph 7.

(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:

(a) Blocking of all floor drains in the vicinity of the transformer.

(b) Containing water runoff.

(c) Controlling and treating (prior to release) any water used in subsequent cleanup operations.

(2) Leaking PCB transformers must be:

(a) Repair or replaced within 48 hours of discovery of a leak, or as soon as possible thereafter.

(b) Inspected daily until repaired or replaced.

5. <u>MANAGEMENT OF OTHER ITEMS</u>

Installations must:

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

(1) Only service PCB-contaminated electrical equipment with dielectric fluid containing less than 500 ppm PCBs.

(2) Do not service any electromagnet, switch, or voltage regulator with a PCB concentration of greater than or equal to 500 ppm that requires the removal and rework of the internal components.

(3) Capture PCBs removed during servicing and either reuse them as dielectric fluid or dispose of them properly in accordance with Paragraph 7.

(4) Do not mix or add PCBs from electromagnets, switches, and voltage regulators with a PCB concentration of greater than or equal to 500 ppm to dielectric fluid from PCB-contaminated electrical equipment.

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

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

(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.

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

6. STORAGE

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

(1) Roofs and walls that exclude precipitation.

(2) A containment berm at least 15.2 cm [6 inches] high, sufficient to contain twice the internal volume of the largest PCB article, or 25 percent of the total internal volume of all PCB articles or containers stored, whichever is greater.

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

(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.

b. Installations may temporarily store these items in an area that does not comply with Paragraph 6.a. for up to 30 days from the date of removal from service, subject to weekly inspection:

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

(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.

(3) PCB containers in which non-liquid PCBs have been placed.

(4) PCB containers in which:

(a) PCBs at a concentration between 2-499 ppm have been placed.

(b) The containers are marked to indicate there is less than 500 ppm PCB.

c. Installations must store non-leaking and structurally undamaged large high-voltage PCB capacitors and PCB-contaminated electric equipment that have not been drained of frees-flowing dielectric fluid on pallets or raised platforms, next to a storage area meeting the standards of Paragraph 6.a. if they are inspected weekly.

d. 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. DISPOSAL

a. Disposal through DLA Disposition Services.

Installations must dispose of PCBs through DLA Disposition Services, who will dispose of PCB items in accordance with Volume 4 of DoD Manual 4160.21 and the disposal requirements of this paragraph.
Disposal of PCBs off SOFA-granted land will be completed using a contractor that has all applicable licenses and permits IAW ROK law.

b. Disposal Records.

If the installation generates PCB waste, it must maintain an audit trail for the waste that is at least as stringent as that required under the standards in Paragraph 9.c.(4) of Enclosure O.

c. 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 ROK 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 2.g.

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.

ENCLOSURE G

DRINKING WATER

1. INTRODUCTION

This enclosure 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 Republic of Korea (ROK) PWS

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 ROK PWS. Applicability of specific standards in this chapter 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 Glossary definition of PWS). Samples taken to conform to the standards of this section must be validated by independent testing or validated supplier testing.

a. 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 chapter.

b. PWSs.

DoD PWSs must provide proper monitoring and treatment for all water provided for human consumption in accordance with the requirements of this chapter. For drinking water that is purchased or otherwise provided from a ROK treatment plant or other source, Paragraphs 2.b.(1) through (5) are only applicable within the installation fence line. Additionally, DoD PWSs must meet the following general standards:

(1) Design, Operation, and Maintenance.

(a) 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.

(b) Maintain a map or drawing of the complete PWS.

(c) Perform water distribution system operation and maintenance practices:

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

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

3. Conduct an annual water main flushing program.

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

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

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

(d) Establish a cross-connection control and backflow prevention program.

(e) 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.

(2) Documentation and Recordkeeping

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

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

(b) Cryptosporidium and E. coli source water records – 10 years.

(c) Chemical records – 10 years.

(d) Cross-connection and backflow prevention testing and repair records – 10 years.

(3) Source Water Protection.

(a) Protect all groundwater and surface water sources of drinking water from contamination by operations on DoD installations by:

1. Suitable placement and construction of wells.

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

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

4. Appropriate land use management.

5. Appropriate stormwater management.

6. Appropriate wellhead protection program

(b) 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-site 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 should be coordinated with the ROK authorities.

(c) Manage 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).

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

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.

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

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

(4) Wellhead Protection Plan.

The wellhead protection plan shall consist of at least the following:

(a) Maintenance: Groundwater wells, once drilled and completed, will be periodically evaluated, and maintained at least once a year. A well maintenance record will contain maintenance activities performed (i.e., equipment used, well pumping and surging, cleaning and disinfection conducted, condition of well pump, any replacement of well material and equipment, etc.) and will be kept for 5 years.

(b) Any well no longer used for its designed function or where maintenance has not been performed in greater than a year, then a determination of the closure and abandonment shall be made. When a well with no useful purpose, potential future use, or has no real value and may constitute a liability. When a decision is made to close and abandon a well, as a minimum, a well shall be properly decommissioned by:

1. Removing all well components, including the submersible pump and motor, well casing and screen.

2. Sealing the well borehole using concrete, cement grout, bentonite, or sealing clay. Detailed and precise records of the decommissioning procedures will be documented. The objective is creating an impermeable barrier into the underlying aquifer.

(5) 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:

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

(b) Key personnel.

(c) Procedures to restore service, including supplemental sampling procedures.

(d) Procedures to isolate damaged lines.

(e) Alternative water supplies.

(f) Installation public notification procedures.

(6) Source Water Sampling for DoD PWSs with ROK PWS Sources.

DoD PWSs that purchase or are provided water from a ROK PWS, and that are required to perform source water sampling in accordance with Paragraphs 7., 9., and 11., must perform sampling at the point of entry to the installation before any additional treatment by the installation.

3. PERSONNEL QUALIFICATIONS

a. 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.

b. Operators in responsible charge must:

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

(2) Be certified by having successfully completed, and been licensed through, a U.S. State-approved water system operator certification course, or a similar ROK course, or a course that meets industry standards and practices.

(3) Maintain current certification for the duration of the appointment.

4. COLIFORM BACTERIA REQUIREMENTS

a. 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.

(1) The total coliform-related OEL is exceeded whenever more than 5 percent 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.

(2) The MCL for E. coli is exceeded whenever:

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

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

(c) Any required repeat samples are not collected following an E. coli positive routine sample.

(d) Any repeat total coliform positive sample is not tested for E. coli.

(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.

b. 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 G-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.

Table G-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.

c. Follow-up Sampling and Assessment.

(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.

(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.

(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.

d. 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 16 as follows:

(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.

(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.

5. INORGANIC CHEMICAL REQUIREMENTS

a. DoD PWSs must ensure that the water distributed for human consumption does not exceed inorganic chemical MCLs provided in Table G-2, as applicable based on the system classification.

Table G-2. Inorganic Chemical MCLs

CONTAMINANT	MCL (mg/L unless otherwise noted)
Arsenic[a]	0.010
Antimony[a]	0.006
Asbestos[a]	7 million fibers/liter (longer than 10 micrometers)
Barium[a]	2.0

Table G-2. Inorganic Chemical MCLs

CONTAMINANT	MCL (mg/L unless otherwise noted)
Beryllium[a]	0.004
Cadmium[a]	0.005
Chromium[a]	0.1
Cyanide[a]	0.2 (as free cyanide)
Fluoride[b]	4.0
Fluoride (Secondary MCL)[c]	2.0
Mercury[a]	0.002
Nickel[d]	
Nitrate[e]	10 (as N)
Nitrite[e]	1 (as N)
Total Nitrite and Nitrate[e]	10 (as N)
Selenium[a]	0.05
Sodium[d]	
Thallium[a]	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] No MCL established or in effect. Monitoring is required so that concentration levels can be made available on request. Sodium and nickel levels must be reported to the DoD medical authority on receipt of analysis.

[e] MCLs apply to CWSs, NTNCWSs, and TNCWSs.

*Use U.S EPA test methods.

(1) Except for nitrate, nitrite, and total nitrate and nitrite, 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.

(2) For systems monitored annually or less frequently, a system is out of compliance if a single sample exceeds the MCL.

(3) For nitrate, nitrite, and total nitrate and nitrite, system compliance is determined by averaging the single sample that exceeds the MCL with its confirmation sample; if this average exceeds the MCL, the system is out of compliance.

b. Systems must be monitored for inorganic chemicals at the frequency provided in Table G-3.

Table G-3. Inorganic Chemical Monitoring Requirements

CONTAMINANT	GROUNDWATER BASELINE REQUIREMENT	SURFACE WATER BASELINE REQUIREMENT	TRIGGER THAT INCREASES MONITORING	REDUCED MONITORING
Arsenic	1 sample/every 3 years	Annual sample	>MCL	
Antimony	1 sample/every 3 years	Annual sample	>MCL	
Barium	1 sample/every 3 years	Annual sample	>MCL	
Beryllium	1 sample/every 3 years	Annual sample	>MCL	
Cadmium	1 sample/every 3 years	Annual sample	>MCL	
Chromium	1 sample/every 3 years	Annual sample	>MCL	
Cyanide	1 sample/every 3 years	Annual sample	>MCL	
Fluoride	1 sample/every 3 years	Annual sample	>MCL	
Mercury	1 sample/every 3 years	Annual sample	>MCL	
Nickel	1 sample/every 3 years	Annual sample		
Selenium	1 sample/every 3 years	Annual sample	>MCL	
Thallium	1 sample/every 3 years	Annual sample	>MCL	
Sodium	1 sample/every 3 years	Annual sample		
Asbestos[a]	1 sample/every 9 years	1 sample/ every 9 years	>MCL	Yes
Total Nitrate/Nitrite	Annual sample	Quarterly	≥50% Nitrite MCL	
Nitrate	Annual sample[b]	Quarterly[b]	≥50% MCL[C]	Yes[d]
Nitrite	Annual sample[b]	Quarterly[b]	≥50% MCL[C]	Yes[e]
Corrosivity[f]	Once	Once		

a Necessity for analysis is predicated upon a sanitary survey conducted by the PWS.
b Any sampling point with an analytical value greater than or equal to 0.5 mg/L as N (50 percent 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 percent of the nitrite MCL, then the value of nitrite in the sample would also be below 50 percent of its MCL.

[c] 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 percent of the MCL. Groundwater systems may return to baseline monitoring requirements if all sample results are less than the nitrate or nitrite MCLs.
[d] The appropriate DoD medical authority may reduce repeat sampling frequency for surface water systems to annually if after 1 year results are less than 50 percent of the MCL.
[e] The appropriate DoD medical authority may reduce repeat sampling frequency to one annual sample if results are less than 50 percent of the MCL.
[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.

(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.

(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 G-3.

c. If a DoD PWS is out of compliance, the installation must complete the notification in accordance with Paragraph 16 as soon as possible. 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:

(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.

(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 G-3 until corrective actions are completed and authorities determine the system is reliable and consistent.

6. FLUORIDE REQUIREMENTS

a. 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 ROK regulations.

(1) Where ROK regulations do not allow fluoridation to a concentration of 0.7 mg/L, fluoridate to the concentration specified by ROK regulations.

(2) Where ROK regulations specify fluoride concentrations within a range, fluoridate to a concentration within the range that is closest to 0.7 mg/L.

b. DoD PWSs practicing fluoridation must sample at least daily for operational control of fluoridation. 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.

c. DoD PWSs must be monitored for fluoride at the entry point to the distribution system as specified in Table G-3 to determine compliance with the fluoride MCL.

d. An installation commander responsible for a DoD CWS must ensure that the fluoride content of drinking water does not exceed the MCL of 4.0 mg/L and should ensure the fluoride content does not exceed the secondary MCL of 2.0 mg/L, as stated in Table G-2.

(1) If any sample exceeds the MCL, the installation must complete the notification requirements specified in Paragraph 16.

(2) If fluoride exceeds the secondary MCL, but not the MCL, the command responsible for operating the DoD CWSs must notify the appropriate DoD medical authority within 14 calendar days and the installation public within 1 year, in accordance with Paragraph 16. Notification of the installation public must be included in the annual consumer confidence report.

7. LEAD AND COPPER REQUIREMENTS

DoD CWSs and NTNCWSs must not exceed action levels (distinguished from the MCL) of 0.015 mg/L of lead or 1.3 mg/L of copper in more than 10 percent 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.

a. Affected DoD systems must conduct monitoring in accordance with Table G-4. 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.

Table G-4. 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.

(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.

(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.

b. 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.

c. 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 x 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:

(1) Collect additional monitoring of water quality parameters as specified in Table G-4.

(2) Pursue optimal corrosion control treatment.

(a) 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.

(b) 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.

(c) Return to the standard monitoring schedule identified in Table G-4.

d. The installation commander must implement an education program for installation personnel (including United States and HN) 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 16 as soon as possible, but in no case later than 14 calendar days after the violation.

8. ORGANIC CHEMICAL REQUIREMENTS

a. 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 G-5.

Table G-5. Organic Chemical MCLs

ORGANIC CHEMICALS	mg/L	DETECTION LIMIT, mg/L
SOCs		
Alachlor	0.002	0.0002
Atrazine	0.003	0.0001
Benzo[a]pyrene	0.0002	0.00002
Carbofuran	0.04	0.0009
Chlordane	0.002	0.0002
Dalapon	0.2	0.001
2,4-D	0.07	0.0001
1,2-Dibromo-3-chloropropane (DBCP)	0.0002	0.00002
Di (2-ethylhexyl) adipate	0.4	0.0006
Di (2-ethylhexyl) phthalate	0.006	0.0006

Table G-5. Organic Chemical MCLs

ORGANIC CHEMICALS	mg/L	DETECTION LIMIT, mg/L
Dinoseb	0.007	0.0002
Diquat	0.02	0.0004
Endrin	0.002	0.00001
Endothall	0.1	0.009
Ethylene dibromide (EDB)	0.00005	0.00001
Glyphosate	0.7	0.006
Heptachlor	0.0004	0.00004
Heptachlorepoxide	0.0002	0.00002
Hexachlorobenzene	0.001	0.0001
Hexachlorocyclopentadiene	0.05	0.0001
Lindane	0.0002	0.00002
Methoxychlor	0.04	0.0001
Oxamyl (Vydate)	0.2	0.002
PCBs (as decachlorobiphenyls)	0.0005	0.0001
Pentachlorophenol	0.001	0.00004
Picloram	0.5	0.0001
Simazine	0.004	0.00007
2,3,7,8-TCDD (Dioxin)	0.00000003	0.000000005
Toxaphene	0.003	0.001
2,4,5-TP (Silvex)	0.05	0.0002
VOCs		
Benzene	0.005	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-Trichlorobenzene	0.07	0.0005
1,2-Dichloropropane	0.005	0.0005
Ethylbenzene	0.7	0.0005
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]	

Table G-5. Organic Chemical MCLs

ORGANIC CHEMICALS	mg/L	DETECTION LIMIT, mg/L
Epichlorohydrin	treatment technique 0.01% dosed at 20 parts per million[a]	
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. *Use U.S EPA test methods.		

(1) Systems monitoring quarterly or more frequently are out of compliance if the annual running average concentration of an organic chemical, for each sample point, exceeds the MCL.

(2) Systems monitoring annually or less frequently with a detection greater than the MCL are not out of compliance until an annual average is calculated and exceeds the MCL. The annual average is based on the annual or less frequent sample result and the quarterly monitoring sample results, required under the increased monitoring criteria delineated in Table G-6.

b. CWSs and NTNCWSs must be monitored for SOCs and VOCs according to the schedule stated in Table G-6.

Table G-6. Organic Chemical Monitoring Requirements

CONTAMINANT	BASE MONITORING FREQUENCY		TRIGGER FOR INCREASED MONITORING	REDUCED MONITORING
	GROUNDWATER	SURFACE WATER		
VOCs	One sample every 3 years	Annual	>0.0005 mg/L	Yes[a, b]
SOCs	Four consecutive quarterly samples every 3 years	Four consecutive quarterly samples every 3 years	>Detection limit[c]	Yes[b, d]

[a] 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.

[b] Monitoring frequency may be reduced if warranted based on a sanitary survey of the PWS.

[c] Detection limits provided in Table G-5 or as determined by the best available testing methods.

[d] 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.

(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 G-6.

(2) CWSs and NTNCWSs must choose sampling location in accordance with the following:

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

(b) 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.

(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.

(a) 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.

(b) 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.

(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.

c. If a CWS or NTNCWS is out of compliance, the notification in accordance with Paragraph 1.16. 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 G-6, and must continue until the installation commander determines the system is back in compliance and all necessary corrective measures have been implemented.

9. <u>DISINFECTANT/DISINFECTION BYPRODUCTS (DDBP) REQUIREMENTS</u>

a. DDBP Precursor Requirements.

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

(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.

(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.

b. 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.

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

(a) TTHM MCL of 0.080 mg/L

(b) HAA5 MCL of 0.060 mg/L

(c) Chlorite MCL of 1.0 mg/L

(d) Bromate MCL of 0.010 mg/L

(e) Chlorine MRDL of 4.0 mg/L (as Cl_2)

(f) Chloramines MRDL of 4.0 mg/L (as Cl_2)

(2) Noncompliance is determined as:

(a) For TTHM or HAA5, when any locational running annual average (LRAA), computed quarterly for each sampling location, exceeds the MCL.

(b) 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.

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

(d) 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

(e) For chlorine dioxide, when:

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.

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

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

(3) Routinely monitor TTHM, HAA5, chlorine dioxide, chloramine, chlorine, and ozone in accordance with Table G-7. Determine sample locations as follows:

Table G-7. DDBP Monitoring Requirements

<table>
<tr><th>SOURCE WATER TYPE</th><th>POPULATION SERVED BY SYSTEM</th><th>ANALYTE AND ROUTINE MONITORING FREQUENCY</th><th>NUMBER OF SAMPLING LOCATIONS</th></tr>
<tr><td>Surface water or GWUDI</td><td>50,000 or more</td><td>TTHM & HAA5 – Quarterly</td><td>8</td></tr>
<tr><td>Surface water or GWUDI</td><td>10,000 – 49,999</td><td>TTHM & HAA5 –Quarterly</td><td>4</td></tr>
<tr><td>Surface water or GWUDI</td><td>Serving 500 to 9,999</td><td>TTHM & HAA5 – Quarterly</td><td>2</td></tr>
<tr><td>Surface water or GWUDI</td><td>499 or less</td><td>TTHM & HAA5[a] - Yearly</td><td>2</td></tr>
<tr><td>Groundwater</td><td>10,000 or more</td><td>TTHM & HAA5 – Quarterly</td><td>4</td></tr>
<tr><td>Groundwater</td><td>500 - 9,999</td><td>TTHM & HAA5 – Yearly</td><td>2</td></tr>
<tr><td>Groundwater</td><td>499 or less</td><td>TTHM & HAA5 – Yearly</td><td>2</td></tr>
<tr><th colspan="2">WATER SYSTEM CRITERIA</th><th colspan="2">ANALYTE AND ROUTINE MONITORING FREQUENCY</th></tr>
<tr><td colspan="2" rowspan="2">Water systems using chlorine dioxide</td><td colspan="2">Chlorite - Daily and Monthly</td></tr>
<tr><td colspan="2">Chlorine Dioxide – Daily</td></tr>
<tr><td colspan="2">Water systems using ozone</td><td colspan="2">Bromate – Monthly</td></tr>
</table>

Table G-7. DDBP Monitoring Requirements

WATER SYSTEM CRITERIA	ANALYTE AND ROUTINE MONITORING FREQUENCY
Water systems using chlorine	Chlorine - Same time and location as monthly bacteriological samples in accordance with Paragraph 4.4.
Water systems using chloramines	Chloramines –Same time and location as monthly bacteriological samples in accordance with Paragraph 4.4.
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.	

(a) For TTHM and HAA5, CWSs and NTNCWs must collect the number of samples listed in Table G-7. 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.

(b) 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).

(c) 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.

(d) 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.

(e) 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.

(4) Increased monitoring is required as follows:

(a) 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.

(b) 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.

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

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).

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.

(5) Reduced monitoring is as follows:

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

(b) 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.

(c) Systems using surface water or GWUDI source water may reduce TTHM and HAA5 monitoring as follows:

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

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

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

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

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

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

3. Systems serving a population of 500 – 9,999 that meets the eligibility requirements in Paragraphs 9.b.(5)(c)2.a. through 9.b.(5)(c)2.d. may reduce monitoring frequency to two sample locations per year. 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.

4. Systems serving a population of 10,000 – 49,999 that meets the eligibility requirements in Paragraphs 9.b.(5)(c)2.a. through 9.b.(5)(c)2.d. may reduce monitoring frequency to two sample locations per quarter. 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

5. Systems serving a population of 50,000 or more that meet the eligibility requirements of Paragraphs 9.b.(5)(c)2.a. through 9.b.(5)(c)2.d. may reduce monitoring of TTHM and HAA5 to four sample locations per quarter. 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.

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

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

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

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

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

2. Systems serving a population of 10,000 or more that meet the eligibility requirements of Paragraphs 9.b.(5)(d)1.a. through 9.b.(5)(d)1.c. may reduce monitoring of TTHM and HAA5 to two sample locations per year. 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.

3. Systems serving a population of 500 – 9,999 that meet the eligibility requirements of Paragraphs 9.b.(5)(d)1.a. through 9.b.(5)(d)1.c. may reduce monitoring of TTHM and HAA5 to one sampling location per year. 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.

4. Systems serving a population of 499 or less that meet the eligibility requirements of Paragraphs 9.b.(5)(d)1.a. through 9.b.(5)(d)1.c. may reduce monitoring of TTHM and HAA5 to two sample locations every 3 years. 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.

(6) If a CWS or NTNCWS is out of compliance as described in Paragraph 9.a.(2), the installation must perform the notification in accordance with Paragraph 16 as soon as possible, but in no case later than 14 calendar days after the violation, and undertake corrective measures.

c. 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.

10. RADIONUCLIDE REQUIREMENTS

a. A DoD CWS must comply with the radionuclide MCLs in Table G-8 and associated monitoring requirements.

Table G-8. Radionuclide MCLs

CONTAMINANT	MCL
Gross Alpha[a]	15 pCi/L
Combined Radium-226 and -228	5 pCi/L
Beta Particle and Photon Radioactivity[b]	4 mrem/year
Uranium	30 micrograms per liter
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.	

(1) Routine Monitoring.

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.

(a) 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.

(b) 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.

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

2. 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.

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

(c) 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.

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.

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.

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

(2) Follow-up Requirements.

(a) 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 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.

(b) 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:

1. Provide the notification in accordance with Paragraph 16 within 14 calendar days.

2. Increase monitoring frequency to monthly as delineated in Paragraph 10.a.(2)(c).

(c) 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.

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 2, must meet the surface water treatment requirements.

a. Unfiltered Systems.

(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.

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

(b) 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 16 as soon as possible, but no later than 14 calendar days after the violation, and undertake corrective action.

(2) Disinfection must achieve at least 99.9 percent (3.0-log) inactivation of Giardia lamblia cysts and 99.99 percent (4.0-log) inactivation of viruses by meeting applicable CT values, as shown in Tables G-12 through G-29 in Appendix 1A. 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.

(a) Disinfection systems must have redundant components to ensure uninterrupted disinfection during operational periods.

(b) 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.

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

(d) 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.

(e) If disinfectant residuals in the distribution system are undetected in more than 5 percent 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.

(f) 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 9 must ensure that protection from microbial pathogens is not compromised.

(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:

(a) Characterize the watershed hydrology and land ownership.

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

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

(4) Installations must physically cover all finished water reservoirs, holding tanks, and storage water facilities.

b. Filtered Systems.

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

(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 percent 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 16 as soon as possible, but no later than 14 calendar days after the violation and undertake corrective action.

(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.

(4) Disinfection residual maintenance and monitoring requirements are the same as those for unfiltered systems outlined in Paragraph 11.a.(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 9 must ensure that protection from microbial pathogens is not compromised.

(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.

(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.

(a) 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.

(b) 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.

(c) 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) Installations must cover all finished water reservoirs, holding tanks, and storage water facilities.

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

(1) Unfiltered Systems.

(a) 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.

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.

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.

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.

(b) 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.

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.

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

(c) 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.

(d) 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.

(e) 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 11.c.(1)(a) 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.

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.

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.

(2) Filtered Systems.

(a) 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.

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.

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.

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.

(b) 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 G-9 to determine initial bin classification.

Table G-9. Bin Classification for Filtered Systems

BIN CLASSIFICATION	*CRYPTOSPORIDIUM* BIN CONCENTRATION
Bin 1	< 0.075 oocysts/L
Bin 2	0.075 oocysts/L ≤ *Cryptosporidium* < 1.0 oocysts/L
Bin 3	1.0 oocysts/L ≤ *Cryptosporidium* < 3.0 oocysts/L
Bin 4	*Cryptosporidium* ≥3.0 oocysts/L

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.

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.

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.

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.

(c) Inactivation Treatment Technology Requirements.

Systems must provide the level of additional treatment for Cryptosporidium inactivation specified in Table G-10.

Table G-10. 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.

(d) 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 11.c.(2)(a) 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.

1. Filtered systems must recalculate their Cryptosporidium bin concentration following completion of the second round of source water monitoring.

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.

3. Filtered systems may use one or more of the treatment and management options listed in Table G-11.

Table G-11. Microbial Toolbox

OPTIONS	*CRYPTOSPORIDIUM* 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 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 G-27.

Ozone	Log credit based on measured CT in relation to Table G-28.
UV	Log credit based on validated UV dose in relation to Table G-29[g]

[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:

Maximum Feed Concentration = $(1 \times 10^4) \times$ (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: $LRV = LOG_{10}(C_f) –$

$LOG_{10}(C_p)$

Where: LRV = Log removal value demonstrated during challenge test.
C_f = Feed concentration measured during challenge test (same units as C_p).
C_p = Filtrate concentration measured during the challenge test (same units as C_f).

If *Cryptosporidium* or surrogate is not detected in the filtrate, then the term C_p 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 percent of the terminal pressure drop; and (3) at the end of the cycle after pressure drop has reached 100 percent 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.

12. GROUNDWATER TREATMENT REQUIREMENTS

a. 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 16 as soon as possible, but in no case later than 14 calendar days after the violation, and undertake corrective action.

b. 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.

(1) Disinfection Treatment.

(a) Groundwater systems using chlorine for disinfection must achieve 4.0-log inactivation of viruses by meeting applicable CT values as shown in Table G-19 in Appendix A.

(b) Groundwater systems using chlorine dioxide for disinfection must achieve 4.0- log inactivation of viruses by meeting applicable CT values as shown in Table G-21 in Appendix A.

(c) Groundwater systems using ozone for disinfection must achieve 4.0-log inactivation of viruses by meeting applicable CT values as shown in Table G-22 in Appendix 4A. Groundwater systems that use ozone must also add a chemical disinfectant (chlorine, chloramines, chlorine dioxide) to maintain a disinfectant residual in accordance with Paragraph 2.b.(1)(c)1.

(d) Groundwater systems are not allowed to use UV for disinfection as the only treatment provided. 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 2.b.(1)(c)1.

(e) Groundwater systems providing disinfection treatment must meet the following monitoring requirements:

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 4.0- log inactivation of viruses is achieved. 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 1.16. as soon as possible, but in no case later than 14 calendar days after the violation, and undertake corrective action.

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 achieved. 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 16 as soon as possible, but no later than 14 calendar days after the violation, and undertake corrective action.

(2) Filtration and Disinfection Treatment.

(a) 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 12.b.(1) or through a combination of filtration and disinfection treatment in accordance with the following requirements.

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 11.b.(2).

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.

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.

4. Groundwater systems must comply with the disinfection treatment and monitoring requirements as delineated under disinfection treatment in Paragraph 12.b.(1)(e)

(b) 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.

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:

a. Use surface water or GWUDI and are in control of the treatment plant in accordance with Paragraph 2.

b. Use direct or conventional filtration processes.

c. Recycle spent filter backwash water, sludge thickener supernatant, or liquids from dewatering processes.

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.

a. The use of point-of-use treatment devices to comply with microbiological contaminant requirements (e.g., coliform bacteria) and VOC MCLs is prohibited.

b. 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.

c. Monitoring for applicable contaminants covered by this section is required.

d. 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 U.S. Army Veterinary Services approved source.

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 1. 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:

a. Name, phone number, and e-mail for a water system contact person.

b. Source(s) of water.

c. Definitions (e.g., definition of MCL).

d. Information about contaminants detected.

e. Information about compliance with drinking water standards in this section.

f. Additional information, as appropriate, regarding system operations, drinking water quality, and public information.

16. NOTIFICATION REQUIREMENTS

a. 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 4 through 12. The notice must provide:

(1) A clear and readily understandable explanation of the violation.

(2) Any potential adverse health effects; the population at risk.

(3) The steps being taken to correct the violation.

(4) The necessity for seeking an alternative water supply, if any.

(5) Any preventive measures the consumer should take until the violation is corrected.

b. The appropriate DoD medical authority must coordinate notification of ROK authorities in cases where ROK populations are at risk.

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APPENDIX A TO ENCLOSURE G

DRINKING WATER DISINFECTION TABLES

Table G-12. 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.

Table G-13. 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 LOG INACTIVATIONS						pH = 6.5 LOG INACTIVATIONS						pH = 7.0 LOG INACTIVATIONS						pH = 7.5 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 LOG INACTIVATIONS						pH = 8.5 LOG INACTIVATIONS						pH = 9.0 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
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 G-14. CT Values for Inactivation of *Giardia* Cysts by Free Chlorine at 5.0 °C [41 °F][a]

CHLORINE CONCENTRATION (mg/L)	pH ≤ 6 LOG INACTIVATIONS						pH = 6.5 LOG INACTIVATIONS						pH = 7.0 LOG INACTIVATIONS						pH = 7.5 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	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 LOG INACTIVATIONS						pH = 8.5 LOG INACTIVATIONS						pH = 9.0 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	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
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 G-15. CT Values for Inactivation of *Giardia* Cysts by Free Chlorine at 10 °C [50 °F][a]

CHLORINE CONCENTRATION (mg/L)	pH ≤ 6 LOG INACTIVATIONS						pH = 6.5 LOG INACTIVATIONS						pH = 7.0 LOG INACTIVATIONS						pH = 7.5 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

CHLORINE CONCENTRATION (mg/L)	pH ≤ 8 LOG INACTIVATIONS						pH = 8.5 LOG INACTIVATIONS						pH = 9.0 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] $CT_{99.9}$ = CT for 3.0-log inactivation.

Table G-16. CT Values for Inactivation of *Giardia* Cysts by Free Chlorine at 15 °C [59 °F][a]

CHLORINE CONCENTRATION (mg/L)	pH ≤ 6 LOG INACTIVATIONS						pH = 6.5 LOG INACTIVATIONS						pH = 7.0 LOG INACTIVATIONS						pH = 7.5 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 LOG INACTIVATIONS						pH = 8.5 LOG INACTIVATIONS						pH = 9.0 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	17	33	50	66	83	99	20	39	59	79	98	118	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
0.8	18	35	53	70	88	105	21	42	63	84	105	126	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
1.2	19	37	56	74	93	111	22	45	67	89	112	134	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
1.6	19	39	58	77	97	116	24	47	71	94	118	141	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
2	20	41	61	81	102	122	25	49	74	98	123	147	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
2.4	21	42	64	85	106	127	26	51	77	102	128	153	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
2.8	22	44	66	88	110	132	27	53	80	106	133	159	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

[a] $CT_{99.9}$ = CT for 3.0-log inactivation.

Table G-17. CT Values for Inactivation of *Giardia* Cysts by Free Chlorine at 20 °C [68 °F][a]

CHLORINE CONCENTRATION (mg/L)	pH ≤ 6 LOG INACTIVATIONS						pH = 6.5 LOG INACTIVATIONS						pH = 7.0 LOG INACTIVATIONS						pH = 7.5 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 LOG INACTIVATIONS						pH = 8.5 LOG INACTIVATIONS						pH = 9.0 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 G-18. CT Values for Inactivation of *Giardia* Cysts by Free Chlorine at 25 °C [77 °F][a]

CHLORINE CONCENTRATION (mg/L)	pH ≤ 6 LOG INACTIVATIONS						pH = 6.5 LOG INACTIVATIONS						pH = 7.0 LOG INACTIVATIONS						pH = 7.5 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 LOG INACTIVATIONS						pH = 8.5 LOG INACTIVATIONS						pH = 9.0 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.

Table G-19. 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 G-20. 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 G-21. CT Values for Inactivation of Viruses by Free Chlorine Dioxide pH 6-9

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]
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 G-22. CT Values for Inactivation of *Giardia* Cysts by Ozone

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	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 G-23. CT Values for Inactivation of Viruses by Free Ozone

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]
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 G-24. CT Values for Inactivation of *Giardia* Cysts by Chloramine pH 6-9

INACTIVATION	TEMPERATURE					
	≤ 1 °C [38 F]	5 °C [41 F]	10 °C [50 F]	15 °C [59 F]	20 °C [68 F]	25 °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 G-25. CT Values for Inactivation of Viruses by Chloramine

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]
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 G-26. UV Dose for Viruses Inactivation Credit (mJ/cm^2)

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 G-27. CT Values (mg•min/L) for *Cryptosporidium* Inactivation by Chlorine Dioxide[a]

INACTIVATION	WATER 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	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 = $(0.001506 \times (1.09116)^{Temp}) \times CT$

Table G-28. CT Values (mg•min/L) for *Cryptosporidium* Inactivation by Ozone[a]

INACTIVATION	WATER 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	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 = $(0.0397 \times (1.09757)^{Temp}) \times CT$

Table G-29. 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

ENCLOSURE H

WASTEWATER AND STORMWATER

1. INTRODUCTION

This enclosure contains standards on the control of discharges of wastewater and stormwater into waters of Korea 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.

2. GENERAL

Installation commanders are responsible for ensuring that wastewater discharges and stormwater management activities comply with the standards of this section, as applicable.

a. Personnel Qualifications.

(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.

(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 in Paragraphs 12.a. through 12.d and Table H-9.

b. 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.

c. Complaint System.

Establish a system that involves the LEC, as appropriate, to investigate water pollution complaints from individuals or ROK water pollution control authorities.

d. Recordkeeping Requirements.

Retain the following records for 3 years:

(1) Effluent concentration, or other measurement specified for each regulated parameter.

(2) Daily volume of effluent discharge from each point source.

(3) Test procedures for the analysis of pollutants.

(4) Date, exact place, and time of sampling and measurements.

(5) Name of the person who performed the sampling or measurements.

(6) Date of analysis.

(7) Records documenting personnel training and certification.

(8) Records of complaints.

e. Laboratory Analysis

U.S EPA or ROK standard methods of analysis will be used to determine compliance with this section.

f. A domestic garbage disposal unit (grinder) certified by ROK government shall be allowed for household use only in USFK installations or leased facilities. Equal or more than 80% of food waste must be collected from the unit. Certified units can be found at the website of MOE or Korea Institute for Water Technology Certification.

g. Effluent Limitations for the Direct and Indirect Industrial Discharge and non-Industrial Pollutants.

(1) All direct and indirect discharges to the waters of the Republic of Korea shall comply with the minimum criteria in paragraph 3.a. with additional criteria in paragraph 4 for non-categorical industrial charges, Table H-8 for industrial activities identified in Table H-7, and Tables H-4 and H-8 for electroplating.

(2) Effluent criteria in Table H-8 are divided into two columns where the first column is direct discharge to a Class I water body and the second column is the discharge criteria for direct discharge to Class II-V water bodies and indirect discharge to a DWTS.

(3) Categorical industrial discharges shall use ROK or USEPA Industrial Effluent Guidelines to develop a sampling profile. The guidelines provide a basis for deciding which chemical constituents will be sampled. Installations can also apply

typical industrial practice sampling profiles for that specific industry. Wastewater program managers shall be responsible for developing the sampling profile using these guidelines and industry standards. Installations shall use the standards in this enclosure of the KEGS and only the sampling profile of the EPA standard and not the numerical limitations under the USEPA Industrial Effluent Guidelines unless otherwise authorized.

(4) When the effluent concentrations cannot meet the DWTS permit criteria, the DoD component shall utilize a pretreatment process prior to discharge into the DWTS.

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 waters of Korea.

a. Non-industrial Effluent Limits.

(1) For locations with 50 m^3/day (13,200 gallons/day) or more flow rate:

(a) BOD_5 and TSS: 10 mg/L

(b) Total Nitrogen (T-N): 20 mg/L

(c) Total Phosphorous (T-P): 2 mg/L

(d) Total Coliform Bacteria: 3,000 CFU/ml

(e) pH: 6.0 – 9.0

(2) For locations with less than 50 m^3/day flow rate:

(a) Discharge to four major river (Han River, Kum River, Nakdong River and Somjin River) or Class I locations: BOD_5 and TSS: 10 mg/L, pH: 6.0 – 9.0.

(b) Discharge to other locations: BOD_5 and TSS: 20 mg/L, pH: 6.0 – 9.0.

(3) For golf courses.

(a) This requirement only applies to golf courses with a wastewater treatment system that has a direct discharge to the waters of the ROK.

(b) With no accommodation facilities: BOD5 and TSS, 10 mg/L.

(c) With accommodation facilities: BOD5 and TSS, 5 mg/L.

(4) For septic tank servicing 11 or more people per day.

(a) Discharge to four major river (Han River, Kum River, Nakdong River and Somjin River) or Class I locations: BOD_5 removal rate 65% equal or greater and with discharge concentration limit: BOD_5 100 mg/L.

(b) Class II – V locations: BOD_5 removal rate 50% equal or greater.

(c) Effluent monitoring is not required provided that an appropriately maintained septic tank is installed prior to connection to a domestic wastewater treatment system.

(d) The tanks must be cleaned at least annually.

(e) Effluent from septic tanks used daily by 500 people or more must be chlorinated if discharged to ROK waters.

(5) For coastal, estuarine and marine facilities:

(a) Special Environmental Protection Coast Area (Busan or Chinhae Coastal Area): the BOD_5 limitation is 50 mg/L

(b) Other Coast Area: the BOD_5 limitation is 100 mg/L

b. 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, the system should be designed to meet the effluent standards in Paragraph 3 of this manual.

c. Monitoring.

Monitoring requirements apply to DWTS and septic tanks which discharge to the ROK waters. Septic tanks which are connected to DWTS don't need to be monitored but just cleaned once a year. If a septic tank in restaurants and lodgings is connected to DWTS, it will just need to be cleaned every six (6) months. The monitoring frequency (including both sampling and analysis) in Table H-1 and H-2 includes all three parameters that are regulated (BOD_5, TSS, and pH). Samples must be collected at the point of discharge to the waters of Korea. Sampling which occurs once a month or once a week or daily shall consist of more than two samples, taken 30 minutes apart to comply with the non-industrial effluent limit.

Table H-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, LPD = liter per day		

Table H-2. Septic Tank Discharge Monitoring Requirements

SEPTIC TANK CAPACITY	MONITORING FREQUENCY
Servicing ≥ 2,000 people	Once every 6 months
Servicing 1,000 to 2,000 people	Annually
Servicing less than 1,000 people	Not required

4. EFFLUENT LIMITATIONS FOR NON-CATEGORICAL INDUSTRIAL INDIRECT DISCHARGES

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 5 and Table H-7 and H-8 for categorical industrial discharge standards.

a. 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.

b. Ignitability and Explosivity.

(1) The discharge of wastewater with a closed cup flashpoint of less than 60 °C [140 °F] is prohibited.

(2) The discharge of waste with any of the following characteristics is prohibited:

(a) A liquid solution that contains more than 24 percent alcohol by volume and has a flash point less than 60 °C [140 °F].

(b) A non-liquid that, under standard temperature and pressure, can cause a fire through friction.

(c) An ignitable compressed gas.

(d) An oxidizer, such as peroxide.

c. Reactivity and Fume Toxicity.

The discharge of any of the following wastes is prohibited:

(1) Wastes that are normally unstable and readily undergo violent changes without detonating.

(2) Wastes that react violently with water.

(3) Wastes that form explosive mixtures with water or form toxic gases or fumes when mixed with water.

(4) Cyanide or sulfide waste that can generate potentially harmful toxic fumes, gases, or vapors.

(5) Waste capable of detonation or explosive decomposition or reaction at standard temperature and pressure.

(6) Wastes that contain explosives regulated as hazardous materials in accordance with Enclosure I.

(7) Wastes that produce any toxic fumes, vapors, or gases with the potential to cause safety problems or harm to workers.

d. 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.

e. 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.

f. 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:

(1) Description of discharge practices, including non-routine batch discharges.

(2) Description of stored chemicals.

(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.

(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.

(5) Procedures for building containment structures or equipment.

(6) Necessary measures to control toxic organic pollutants and solvents.

(7) Procedures and equipment for emergency response, and any subsequent plans necessary to limit damage suffered by the treatment plant or the environment.

g. Trucked and Hauled Waste.

The discharge of trucked and hauled waste into the DWTS, except at locations specified by the DWTS operator, is prohibited.

h. 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].

5. <u>EFFLUENT LIMITATIONS FOR CATEGORICAL INDUSTRIAL DISCHARGES, DIRECT OR INDIRECT</u>

Any installations that have activities that fall into any of the industrial categories listed below or Table H-7 “Industrial Wastewater Sources” must comply with the effluent limitations (i.e., either direct or indirect discharge limitations at the source of the discharge) in Table H-8 “Industrial Wastewater Effluent Limitations”. Facilities in installation which generates industrial wastewater shall install pretreatment facility to meet the effluent limitations in Table H-8.

a. 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:

(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.

(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.

(3) Anodizing.

Discharges of pollutants in process waters resulting from the anodizing of ferrous and nonferrous materials.

(4) Metal Coatings.

Discharges of pollutants in process waters resulting from the chromating, phosphating, or immersion plating on ferrous and nonferrous materials.

(5) Chemical Etching and Milling.

Discharges of pollutants in process waters resulting from the chemical milling or etching of ferrous and nonferrous materials.

(6) Electroless Plating.

Discharges of pollutants in process waters resulting from the electroless plating of a metallic layer on a metallic or nonmetallic substrate.

(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.

(8) Discharge Standards for Electroplating Facilities.

(a) The discharge standards in Table H-8 and the maximum daily discharge limit (4.57 mg/L) for Total Toxic Organics (TTO) apply to facilities in the electroplating in Paragraphs 5.a.(1) through 5.a.(7) that directly or indirectly discharge less than 38,000 LPD [10,000 gallons per day (GPD)].

Table H-3. Components of TTO for electroplating facility

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

Table H-3. Components of TTO for electroplating facility

VOLATILE ORGANICS	
Chloroform (trichloromethane)	Toluene
1,1,1-Trichloroethane	Chlorobenzene
Carbon Tetrachloride (tetrachloromethane)	Ethylbenzene
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
N-nitrosodi-n-propylamine	Di-n-butyl phthalate
Nitrobenzene	Fluoranthene
Isophorone	Pyrene
bis (2-chloroethoxy) methane	Benzidine
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 (dibenezo (a,h) anthracene)
4-Chlorophenyl phenyl ether	1,12-Benzoperylene (benzo (g,h,i) perylene)
ACID EXTRACTABLE ORGANICS	
2-Chlorophenol	2,4,6-Trichlorphenol
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)

Table H-3. Components of TTO for electroplating facility

PESTICIDES/PCBS	
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	

(b) Electroplating facilities defined in Paragraphs 5.a.(1) through 5.a.(7) that directly or indirectly discharge 38,000 LPD [10,000 gallons per day (GPD)] or more will use discharge standards in Tables H-4 and H-8.

Table H-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)
TTO	2.13	---
Silver[b]	1.2	0.7
[b] Standard for silver only applies to facilities that electroplate precious metals.		

b. Monitoring.

Conduct monitoring of categorical industrial discharges (including both sampling and analysis) quarterly for parameters that are potentially discharged into DWTS or ROK waters. The installation will determine on which parameters are tested based on the type of industry monitored.

(1) Samples must be collected at the point of discharge before any mixing with the receiving water. Sampling shall be performed by taking equal or more than two samples, taken 30 minutes apart at the point of discharge prior to any mixing with the receiving water or wastewater system.

(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 H-3.

6. <u>PESTICIDES</u>

Installations shall not discharge pesticides directly to waters of the ROK and must follow the BMPs in Enclosure M.

7. COOLING WATER INTAKE STRUCTURES

Installations that have facilities designed to withdraw more than 7.57 million LPD [2 MGD] of water from waters of Korea, and that use at least 25 percent of the water they withdraw exclusively for cooling purposes, must minimize impingement and entrainment of aquatic species.

8. SEPTIC SYSTEMS

New septic systems must be sited, constructed, and operated with the approval of environmental office at each installation. 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. CESSPOOLS

a. Large capacity cesspools (i.e., cesspools with a capacity to serve 20 or more people per day) are prohibited.

b. Small capacity cesspools must be managed consistent with the septic systems requirements of Paragraph 8.

10. SLUDGE DISPOSAL

All sludge produced during the treatment of wastewater must be disposed of in accordance with the guidance for hazardous waste in Enclosure O or solid waste in Enclosure N, as appropriate. Environmental office in installations shall take a sample and do analysis to determine characteristics of sludge.

11. 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 environmental office at each installation.

12. STORMWATER MANAGEMENT

Develop and implement SWPPPs for activities to include applicable requirements in Paragraphs 12.a. through 12.d and Table H-9. Update the SWPPP every 5 years, at a minimum.

a. 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:

(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.

(2) Locate materials, equipment, and activities so that potential leaks and spills are contained or able to be contained or diverted before discharge.

(3) Clean up spills and leaks promptly using dry methods (e.g., absorbents) to prevent the discharge of pollutants.

(4) Store leaky vehicles and equipment indoors, unless impractical. If stored outdoors, repair leaks, remove fluids, or use drip pans and absorbents.

(5) Use spill and overflow protection equipment.

(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.

(7) Drain fluids from equipment and vehicles that will be decommissioned, are unserviceable, or will remain unused for extended periods of time.

b. 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:

(1) Sweep or vacuum at regular intervals.

(2) Store materials in appropriate containers.

(3) Keep all dumpsters under cover or fit with a lid that must remain closed when not in use.

(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.

c. Illicit Storm Sewer Discharge Detection and Elimination.

Implement programs to detect and eliminate illicit discharges to storm sewer systems that discharge to waters of Korea (Table H-6). Such programs must include these elements:

(1) Creation of a storm sewer system map showing the location of all stormwater inlets, stormwater outfalls, and locations of all waters of Korea that receive discharges from those outfalls. These maps should include, as applicable:

(a) Direction of stormwater flow and slopes (before and after grading).

(b) Areas and timing of soil disturbance, areas that will not be disturbed, natural features to be preserved.

(c) Locations of BMPs identified in the SWPPP.

(d) Locations and timing of stabilization measures, locations of storage areas.

(e) Areas where stabilization has been accomplished.

(2) Installation-wide prohibition of non-stormwater discharges into the storm sewer system, to the extent practicable.

(3) A plan to detect and address non-stormwater discharges, including prohibited dumping, into the storm sewer system.

(4) Education of installation personnel, facilities, and tenant commands about the hazards associated with prohibited discharges and improper disposal of waste.

d. 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:

(1) Control stormwater volume and velocity to minimize soil erosion in order to minimize pollutant discharges.

(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.

(3) Provide and maintain natural buffers around waters of Korea. 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.

(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.

(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.

(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.

(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 H-5. Existing Sources – Classification of ROK Receiving Waters Relevant to USFK Installations

USFK INSTALLATION **	STREAM/RIVER (Discharge to)	CLASS ***
Camp Casey	Shin Chon	II
Camp Hovey	Shin Chon	II
Camp Castle	Shin Chon	II
H-220 Heliport	Shin Chon	II
MPRC	Imjin River (downstream)	II
Warrior Base	Imjin River (downstream)	II
NNSC Compound	Imjin River (downstream)	II
Camp Stanley	Chungryang Chon (upstream)	II
K-16	Seongnam City Sewer*	NC
Yongsan Garrison	Seoul City Sewer*	NC
CP Tango	Seongnam City Sewer*	NC
Camp Yongin	Gyongan Chon	II
DRMO DS Gimcheon	Yangsa Chon	II
Camp Humphreys	Paengsung Sewer*	NC
Camp Carroll	Nakdong River (Dongjeong Chon)	I
Camp Henry	Daegu City Sewer*	NC
Camp Walker	Daegu City Sewer*	NC
Camp George	Daegu City Sewer*	NC
Pusan Storage Area	Busan City Sewer*	NC
Pier #8	Busan City Sewer*	NC
Osan Air Base	Jangdang Sewer*	NC
Kunsan Air Base	Kunsan City Sewer*	NC
Daegu Air Base	Daegu City Sewer*	NC
Gwangju Air Base	Gwangju City Sewer*	NC
Kimhae Air Base	Busan City Sewer*	NC
Suwon Air Base	Suwon City Sewer*	NC
Chinhae Navy Base	Changwon City Sewer*	NC
Camp Mujuk	Pohang City Sewer*	NC

NOTES:
* NC: No class.
** Most remote sites and training areas are not included.
*** Classification of the receiving water. Use in conjunction with Paragraph 5

Table H-6. Stormwater Discharges – Classification of ROK Receiving Waters Relevant to USFK Installations

USFK INSTALLATION **	STREAM/RIVER (Discharge to)	CLASS ***
Camp Casey	Shin Chon	II
Camp Hovey	Shin Chon	II
Camp Castle	Shin Chon	II
H-220 Heliport	Shin Chon	II
MPRC	Imjin River (downstream)	II
Warrior Base	Imjin River (downstream)	II
NNSC Compound	Imjin River (downstream)	II
Camp Stanley	Chungryang Chon (upstream)	II
K-16	Tan Chon	II
Yongsan Garrison	Han River	II
CP Tango	Sangjuk Chon	I
Camp Yongin	Gyongan Chon	II
DRMO DS Gimcheon	Yang Sa Chon	II
Camp Humphreys	Anseong Chon	III
Camp Carroll	Nakdong River (Dongjeong Chon)	I
Camp Henry	Sin Chon	II
Camp Walker	Sin Chon	II
Camp George	Sin Chon	II
Pusan Storage Area	Busan Bay	NC
Pier #8	Busan Bay	NC
Osan Air Base	Chinwi Chon	III
Kunsan Air Base	SaemanKum Lake	III
Daegu Air Base	Kumho River	II
Gwangju Air Base	Hwangryong River	II
Kimhae Air Base	Nakdong River (downstream)	II
Suwon Air Base	Hwanggoogee Chon	III
Chinhae Navy Base	Chinhae Bay	NC
Camp Mujuk	Janggee Chon	III

NOTES:
a. * NC: No class.
b. ** Most remote sites and training areas are not included.
c. *** Classification of the receiving water. Use in conjunction with Paragraph 5 and 12

Table H-7. Industrial Wastewater Sources

No.	Standard Industry	Remarks
1	Food production	Tofu and similar food, bread, grain powder snacks, noodle and similar food, cocoa and sugar snacks, coffee, tea, instant soup mix, ginseng products, health supplement, and food production not specifically categorized are included. Noodles and similar food cooked on-site are excluded. Bakery and mills occupying less than 100 m3 in the category of —bread and grain powder snacks" are excluded.
2	Printing, photo processing, and recording media copying	Processing facilities for dental X-ray and microfilms and facilities categorized as "other water-pollution sources" are excluded.
3	Refined petroleum	Oil storage, distillation, inversion, refining, manufacturing of lubricant and grease, refining of oil not specifically categorized and reprocessing facilities for oil refining byproducts are included. Oil storage includes oil refining and tanks. Gas recovery, desalination, desulfurization, striping, stabilization, reforming, cracking, alkylation, polymerization included.
4	Power plants	
5	Water supply facilities	The following facilities will be excluded. - a facility which doesn't backwash. - less than 1,000 m^3/ day treatment capacity.
7	Hospitals (the number of beds is larger than the standard number of beds for general hospital)	
8	Wastewater storage in the wastewater treatment facility and wastewater from the waste treatment facility	
9	Laundry (volume ≥ 2 m^3/hr, water consumption ≥ 1 m^3/hr)	Facility not discharging specific water contaminants is not included.
10	Washing and condensing industrial waste gas and dust (≥ 0.01 m^3/hr)	Public wastewater treatment facility, livestock night soil treatment plant, private wastewater treatment facility and terminal wastewater treatment facility are excluded.

Table H-7. Industrial Wastewater Sources

No.	Standard Industry	Remarks
11	Industrial water purification facility (≥ 100m^3/d)	Facility with only physical treatment units are excluded. Swimming pool units are excluded.
12	Scientific labs (≥ 100m^3/d)	Labs associated with public wastewater treatment plant, livestock night soil treatment plant, private wastewater treatment facility, terminal wastewater treatment facility, elementary and middle schools are excluded.
13	Plating	Facility where the main process is plating.
14	Vehicle repairing and washing	Repair and washing facilities for vehicles and heavy construction machinery, train and aircraft included. Temporary dust cleaning at construction site is excluded.
15	Golf courses	At least 30,000 m^2 or Par 3 holes
16	Transportation maintenance or junkyard facilities	Facilities used for the purpose of maintenance of all machinery, instruments and equipment operated area at least 200m^2. Automobile junkyard facilities area at least 1,500m^2
17	Photo processing or X-ray facilities	Automatic development, printing, and settlement facility. Photo processing facility including X-ray facility for photography and processing business
18	Complex logistics terminal facilities	Facilities that carry, store and unload cargo with at least 200,000m^2
19	Optical stores	Facilities that manufacture lenses in an optical store

NOTES:
1. Printing, automatic photo processing, X-ray, production for precious metals and jewelry facilities are categorized as industrial wastewater producing facilities.
2. Among the industrial wastewater-producing facilities, the facility producing specific water contaminants must be reported and inspected by installation environmental office and must not discharge specific water contaminants to public water bodies. Those specific water contaminants must be treated by the facility producing specific water contaminants or by a licensed wastewater treatment contractor. Specific water contaminants are defined as water contaminants that might cause direct or indirect adverse effects on human health or wealth, or growth of animal and plants and include the following:

Table H-7. Industrial Wastewater Sources

No.	Standard Industry	Remarks
a. Copper and copper compounds. b. Lead and lead compounds. c. Arsenic and arsenic compounds. d. Mercury and mercury compounds. e. Cyan compounds. f. Organic phosphorus compounds. g. Hexavalent chromium compounds. h. Cadmium and cadmium compounds. i. Tetrachloroethylene. j. Trichloroethylene. k. Phenol. l. PCBs. m. Selenium and selenium compounds. n. Benzene. o. Carbon tetrachloride. p. Dichloromethane. q. 1, 1-dichloroethylene. r. 1, 2-dichloroethane. s. Chloroform. t. 1,4-dioxane. u. Bis(2-ethylhexyl)phthalate. v. Vinyl chloride. w. Acrylonitrile. x. Bromoform. y. Acrylamide z. Naphthalene aa. Formaldehyde bb. Epichlorohydrin cc. Pentachlorophenol dd. Styrene ee. Bis (2-ethylhexyl) adipate ff. Antimony		

Table H-8. Industrial Wastewater Effluent (Maximum Daily Discharge) Limitations

Pollutant Category	ROK Receiving Waters and Wastewater Systems	
	Class I	Class II – V or Wastewater Systems
pH	5.8 - 8.6	5.8 - 8.6
Normal hexane extracts:		
Mineral oil (mg/L)	1 or less	5 or less
Animal/vegetable oil (mg/L)	5 or less	30 or less
Phenol (mg/L)	0.1 or less	1 or less
Phenolic compounds (mg/L)	1 or less	3 or less
Pentachlorophenol (mg/L)	0.001 or less	0.01 or less
Cyanide (mg/L)	0.2 or less	1 or less
Chromium (mg/L)	0.5 or less	2 or less
Soluble iron (mg/L)	2 or less	10 or less
Zinc (mg/L)	1 or less	5 or less
Copper (mg/L)	1 or less	3 or less
Cadmium (mg/L)	0.02 or less	0.1 or less
Mercury (mg/L)	0.001 or less	0.005 or less
Organic phosphorous (mg/L)	0.2 or less	1 or less
Arsenic (mg/L)	0.05 or less	0.25 or less
Lead (mg/L)	0.1 or less	0.5 or less
Hexavalent chromium (mg/L)	0.1 or less	0.5 or less
Soluble manganese (mg/L)	2 or less	10 or less
Fluorine (mg/L)	3 or less	15 or less
PCB (mg/L)	Undetectable	0.003 or less
Coliform bacteria (numbers/mL)	100 or less	3,000 or less
Total suspended solids (mg/L)	30-402	30-1202
Temperature (°C)	40 or less	40 or less
Total nitrogen (mg/L)	30 or less	60 or less
Total phosphorous (mg/L)	4 or less	8 or less
Trichlorethylene (mg/L)	0.06 or less	0.3 or less
Tetrachloroethylene (mg/L)	0.02 or less	0.1 or less
Alkyl benzene sulfonate (mg/L)	3 or less	5 or less
Benzene (mg/L)	0.01 or less	0.1 or less
Dichloromethane (mg/L)	0.02 or less	0.2 or less
Toxic Unit (TU)	1 or less	2 or less
Selenium (mg/L)	0.1 or less	1 or less
Carbon Tetrachloride (mg/L)	0.004 or less	0.04 or less
1,1-Dichloroethylene (mg/L)	0.03 or less	0.3 or less
1,2-Dichloroethan (mg/L)	0.03 or less	0.3 or less
Chloroform (mg/L)	0.08 or less	0.8 or less

Table H-8. Industrial Wastewater Effluent (Maximum Daily Discharge) Limitations

Pollutant Category	ROK Receiving Waters and Wastewater Systems	
	Class I	Class II – V or Wastewater Systems
Nickel (mg/L)	0.1 or less	3.0 or less
Barium (mg/L)	1.0 or less	10.0 or less
1,4-Dioxane (mg/L)	0.05 or less	4.0 or less
Bis phthalate (DEHP)(mg/L)	0.02 or less	0.2 or less
Vinyl Chloride (mg/L)	0.01 or less	0.5 or less
Acrylonitrile (mg/L)	0.01 or less	0.2 or less
Bromoform (mg/L)	0.03 or less	0.3 or less
Naphthalene (mg/L)	0.05 or less	0.5 or less
Formaldehyde (mg/L)	0.5 or less	5.0 or less
Epichlorohydrin (mg/L)	0.03 or less	0.3 or less
Toluene (mg/L)	0.7 or less	7.0 or less
Xylene (mg/L)	0.5 or less	5.0 or less
Perchlorate (mg/L)	0.03 or less	0.3 or less
Acrylamide (mg/L)	0.015 or less	0.04 or less
Styrene (mg/L)	0.02 or less	0.2 or less
Bis(2-ethylhexyl)adipate (mg/L)	0.2 or less	2.0 or less
Antimony (mg/L)	0.02 or less	0.2 or less
Tin (mg/L)	0.5 or less	5.0 or less

NOTES:

1. The receiving water classifications are identified in table 34, and are defined as follows:
    a. Class I (clean area): water bodies that should be maintained to conserve excellent (Ia) level of water quality.
    b. Class II (Area A): water bodies that should be maintained to conserve good (Ib) to slightly good (II) level of water quality.
    c. Class III-V (Area B): water bodies that should be maintained to conserve average (III), slightly bad (IV), or bad (V) level of water quality.

2. Biochemical Oxygen Demand or Total Suspended Solids limits:
    a. 30 mg/L for Class I with equal or more than 2,000 m3/day flow rate.
    b. 40 mg/L for Class I with less than 2,000 m3/day flow rate.
    c. 60 mg/L for Class II with equal or more than 2,000 m3/day flow rate.
    d. 80 mg/L for Class II with less than 2,000 m3/day flow rate.
    e. 80 mg/L for Class III-V with equal or more than 2,000 m3/day flow rate.
    f. 120 mg/L for Class III-V with less than 2,000m3/day flow rate.
    g. 80 mg/L for Wastewater System with equal or more than 2,000 m3/day flow rate.
    h. 120 mg/L for Wastewater System with less than 2,000 m3/day flow rate.

3. Total Organic Carbon limits:
    a. 25 mg/L for Class I with equal or more than 2,000 m3/day flow rate.

Table H-8. Industrial Wastewater Effluent (Maximum Daily Discharge) Limitations

Pollutant Category	ROK Receiving Waters and Wastewater Systems	
	Class I	Class II – V or Wastewater Systems

b. 30 mg/L for Class I with less than 2,000 m3/day flow rate.
c. 40 mg/L for Class II with equal or more than 2,000 m3/day flow rate.
d. 50 mg/L for Class II with less than 2,000 m3/day flow rate.
e. 50 mg/L for Class III-V with equal or more than 2,000 m3/day flow rate.
f. 75 mg/L for Class III-V with less than 2,000m3/day flow rate.
g. 50 mg/L for Wastewater System with equal or more than 2,000 m3/day flow rate.
h. 75 mg/L for Wastewater System with less than 2,000 m3/day flow rate.

4. Sampling and analysis will be performed quarterly for potential parameters in table H-8.

5. Sampling shall be performed by taking equal or more than two samples, taken 30 minutes apart at the point of discharge prior to any mixing with the receiving water or wastewater system.

6. Effluent standards for sewage treatment plants are applied for facilities discharging wastewater into public water bodies (not connected to sewer system), and facilities discharging wastewater into public water bodies without the installation of specific discharge systems.

7. Coliform bacteria standard will not be applied for the wastewater discharged to ROK wastewater plant.

Table H-9. Best Management Practices

Activity	Best Management Practice
Aircraft Ground Support Equipment Maintenance	Perform maintenance/repair activities inside. Use drip pans to capture drained fluids. Cap hoses to prevent drips and spills.
Aircraft/runway deicing	Perform anti-icing before the storm. Put critical aircraft in hangars/shelters.
Aircraft/vehicle fueling operations	Protect fueling areas from the rain. Provide spill response equipment at fueling station.
Aircraft/vehicle maintenance & repair	Perform maintenance/repair activities inside. Use drip pans to capture drained fluids.
Aircraft/vehicle washing	Wash aircraft and vehicles in designated areas. Capture wash water and send to wastewater treatment plant. Do not discharge into storm drains. Treat wash water with oil water separator before discharge into wastewater treatment plant. Do not discharge into storm drains.
Bulk fuel storage areas	Use dry camlock connectors to reduce fuel loss. Capture spills with drip pans when breaking connections. Curb fuel transfer areas, treat with oil water separator.
Construction activities	Construct sediment dams/silt fences around construction sites.
Corrosion control activities	Capture solvent/soaps used to prepare aircraft for painting. Perform corrosion control activities inside.
Hazardous material storage	Store hazardous materials inside or under cover. Reduce use of hazardous materials.
Outdoor material storage areas	Cover and curb salt, coal, urea piles. Store product drums inside or under cover. Reduce quantity of material stored outside.
Outdoor painting/depainting operations	Capture sandblasting media for proper disposal. Capture paint clean up materials (thinners, rinsates).
Pesticide operations	Capture rinse water when mixing chemicals. Store spray equipment inside.
Power production	Capture leaks and spills from power production equipment using drip pans, etc.
Vehicle storage yards	Check vehicles in storage for leaks and spills. Use drip pans to capture leaking fluids.
Dewatering operation at construction sites	Separate solids and treat with oil water separator.

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ENCLOSURE I

HAZARDOUS MATERIALS

1. INTRODUCTION

This enclosure 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 DoDI 6050.05. It does not cover.

a. Solid, medical, and hazardous waste, which are covered in Enclosures N, O, and P of this manual.

b. Storage of POL, UST systems, and related spill planning and response requirements, which are covered in Enclosures J, K, and L.

c. Transportation of hazardous materials, which is covered in Parts I, II, III, and IV of Defense Transportation Regulation (DTR) 4500.9.-R.

d. Ammunition and explosives, which are covered in DoD 6055.09.M.

e. Radioactive materials, which are covered in DoD 4715.6.R.

2. GENERAL

a. Materials that exhibit any of the characteristics in Table I-1 are considered hazardous.

Table I-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.

Table I-1. Typical Characteristics of Hazardous Materials

TYPE OF HAZARD	CHARACTERISTICS
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 ºC (130 ºF) or below.
Republic of Korea (ROK) Regulated	The item or its disposal is regulated by the ROK because of its hazardous nature.

b. All personnel who use, handle, or store hazardous materials must be trained in accordance with, and comply with DoDI 6050.0.5.

c. 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.

d. 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. This section is not intended to prohibit the transfer of usable hazardous materials between DoD activities.

3. STORAGE AND HANDLING

a. 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 DLAI 4145.11/TM 38-410/NAVSUP PUB 573/AFJMAN 23-209/MCO 4450.12A.

b. 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 3.c.(3) of Enclosure L for details regarding hazardous substance inventory.

c. The installation must prevent the unauthorized entry of persons or livestock into hazardous materials storage areas.

d. All hazardous materials on DoD installations must have a hazardous material warning label in accordance with DoDI 6050.05, or comparable ROK 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 Paragraph 9.c of Enclosure C. These requirements apply throughout the life cycle of these materials.

e. 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 Korean, the work center supervisor will determine if Korean is the predominant language in the workplace, and include information on:

(1) Identification.

(2) Hazard(s) identification.

(3) Composition and information on ingredients.

(4) First-aid measures.

(5) Firefighting measures.

(6) Accidental release measures.

(7) Handling and storage.

(8) Exposure control and personal protection.

(9) Physical and chemical properties.

(10) Stability and reactivity.

(11) Toxicology information.

(12) Preparation or last revision.

(13) Ecological information (optional).

(14) Disposal considerations (optional).

f. Hazardous material dispensing areas must be properly maintained. Installations must:

(1) Ensure drums and containers are not leaking.

(2) Provide appropriate secondary containment and place drip pans and absorbent materials under containers, as necessary, to collect drips or spills.

(3) Clearly mark container contents.

(4) Locate dispensing areas away from catch basins and floor and storm drains.

4. PRE-TRANSPORT REQUIREMENT

Installations must ensure that before each hazardous material shipments:

a. The shipment is accompanied by shipping papers that clearly describe the quantity and identity of the material and includes an SDS.

b. All drivers:

(1) Have the appropriate valid driver’s license in accordance with Part II of DTR 4500.9-R.

(2) 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.

(3) Are trained on spill control and emergency notification procedures.

(4) Perform a walk-around inspection before and after the hazardous material is loaded.

c. Hazardous material containers are labeled in accordance with Paragraph 3.d.

d. The requirement for transport outlined in Part II of DTR 4500.9-R have been met before releasing the shipment.

ENCLOSURE J

PETROLEUM OIL AND LUBRICANTS (POL)

1. INTRODUCTION

This enclosure contains standards on the prevention and control of pollution resulting from the storage, transport, and distribution of Petroleum, Oils and Lubricants (POL).

a. Standard for Underground Storage Tank (UST) systems containing POL or hazardous substances are addressed in Enclosure K, except:

(1) Underground Storage Tanks (USTs) that are considered storage vessels and covered in Paragraph 4.d.

(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 enclosure. Installations must evaluate such UST systems to determine applicability of standards and comply with such standards, as practicable.

b. POL spill prevention and response standards are contained in Enclosure L.

2. GENERAL

Installations that are considered POL facilities must comply with the applicable requirements of this enclosure 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 Enclosure L and the requirements of Paragraphs 6.c. and 6.d., as applicable.

3. PERSONNEL TRAINING

a. General facility operations.

b. Operation and maintenance (O&M) of equipment to prevent accidental discharges.

c. Spill response procedures.

d. Contents of the Spill Prevention and Response Plan.

4. POL STORAGE CONTAINERS

a. Design and Construction.

(1) All POL Storage Containers, POL storage containers must be designed or modernized in accordance with industry standards and practices to prevent unintentional discharges.

(a) The material and construction of POL storage containers must be compatible with the material stored.

(b) Design must be in accordance with industry standards and practices.

(c) 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).

(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.

b. Inspections and Testing.

(1) All POL Storage Containers.

(a) 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.

(b) All aboveground valves, piping, and equipment associated with POL storage containers must be inspected in accordance with industry standards and practices.

(c) Except for mobile refuelers and mobile aboveground storage containers, liquid level sensing devices must be tested to ensure proper operation.

(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. Pressurized underground piping shall be equipped with an automatic line release detector and monitored for releases via interstitial monitoring. If an automatic line release detector is not installed or not working, other detection methods such as soil testing, groundwater monitoring, vapor monitoring, line tightness testing or interstitial monitoring which can detect a leak any portion of the piping shall be conducted in accordance with industry standards and practices.

(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.

c. Secondary Containment.

(1) All POL Storage Containers. If a professional engineer or HN 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.

(a) 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. Thid 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.

(b) 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.

(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.

(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 Korea.

(4) Containment Area Permeability. Permeability for containment areas may not exceed 10^{-7} centimeters per second.

(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. 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. Sorbent materials exhibiting the hazardous characteristics in Appendix A of Enclosure O must be managed and disposed of in accordance with Enclosure O.

d. Additional Requirements for Storage Vessels.

(1) Storage vessel designs must comply with the requirements listed in Table J-1.

(2) Storage vessels and emission controls must follow industry standards and practices for proper O&M.

Table J-1. Storage Vessel Requirement for Petroleum Liquids

<table>
<tr><th>DATES</th><th>STORAGE CAPACITY</th><th>REQUIREMENT</th></tr>
<tr><td>Construction after March 8, 1974, and before May 19, 1978</td><td>Greater than 151,416 linters [40,000 gallons] but not exceeding 246,052 liters [65,000 gallons]</td><td rowspan="2">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.
If vapor pressure is greater than 570 millimeters of mercury [11.1 psia], the storage vessel must be equipped with a vapor recovery system or its equivalent.</td></tr>
<tr><td>Construction or modification after June 11, 1973; and before May 19, 1978</td><td>Greater than 246,052 linters [65,000 gallons]</td></tr>
<tr><td>Began construction after May 18, 1978, and before July 23, 1984</td><td>Greater than 151,416 liters [40,000 gallons]</td><td>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.</td></tr>
<tr><td>Began construction, reconstruction, or modification after July 23, 1984</td><td>Greater than or equal to 75,000 liters [19,813 gallons] but less than 151,000 liters [39,890 gallons]</td><td>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.</td></tr>
</table>

Table J-1. Storage Vessel Requirement for Petroleum Liquids

DATES	STORAGE CAPACITY	REQUIREMENT
Began construction, reconstruction, or modification after July 23, 1984	Greater than or equal to 75,000 liters [19,813 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 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		

c. Storage Container Wastes.

(1) POL storage container wastes (e.g., sludges, residues, and bottom waters) must be characterized in accordance with Paragraph 4 of Enclosure O to determine if they are hazardous. If a waste exhibits a characteristic of hazardous waste as defined in Appendix A of Enclosure O, it must be handled and disposed of in accordance with the requirements of Enclosure O.

(2) If testing confirms a storage container waste does not exhibit a characteristic and is not hazardous, it must be managed and disposed of in accordance with the designated waste requirements of Enclosure O or the wastewater requirements of Enclosure H, as appropriate.

5. <u>OIL-FILLED OPERATIONAL EQUIPMENT</u>

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 oi-filled operational equipment greater than 3,785 liters [1,000 gallons] or two discharges greater than 159 liters [42 gallons] within the past 12 months. If general secondary containment is not provided, the facility must:

a. Have a written inspection and monitoring program to detect oil-filled equipment failure or discharges.

b. Have a written commitment of manpower, equipment, and materials required to expeditiously control and remove any quantity of oil discharged.

c. Include this information in the facility Spill Prevention and Response Plan.

6. TRANSPORT AND DISTRIBUTION

a. Loading and Unloading Racks and Transfer Areas.

(1) Secondary Containment.

(a) Loading and Unloading Racks. Sized secondary containment must be provided that is designed to handle discharge 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.

(b) 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.

(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.

b. POL Pipeline Facilities. All pipeline facilities carrying POL must be inspected, tested, and maintained in accordance with industry standards and practices, including:

(1) Each pipeline operator handling POL must prepare and follow a procedural manual for operations, maintenance, and emergencies.

(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.

(3) All new POL pipeline facilities must be designed and constructed to meet industrial standards and practices such as API, STI, or UFC.

c. Bulk Gasoline Plants. The following requirements apply to the loading of gasoline into storage tanks with a capacity of 946 liters [250 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.

(1) Gasoline Handling. Gasoline must not be handled in a manner that results in vapor release to the atmosphere for an extended period time. Measures to be taken include, but are not limited to:

(a) Minimize gasoline spills and clean up spills as expeditiously as practicable.

(b) Cover all open gasoline containers and all gasoline storage tank fill-pipes with a gasketed seal when not in use.

(c) Minimize gasoline sent to open waste collection systems that collect and transport gasoline to reclamation and recycling devices, such as oil and water separators.

(2) Submerged Filling. Gasoline must only be loaded into storage tanks and cargo tanks using submerged filling.

(3) Inspections. Monthly leak inspection of all equipment in gasoline service at the facility must be performed. Document each inspection in a logbook. Include a list, summary description, or diagram in the logbook showing the location of all equipment in gasoline service.

(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 of replacement of leaking equipment must be completed within 15 calendar days after detection, if practicable.

d. 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:

(1) GDF with Monthly Throughput Less Than 37,854 Liters [10,000 Gallos]. 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:

(a) Minimizing gasoline spills and cleaning up spills as expeditiously as practicable.

(b) Covering all open gasoline containers and all gasoline storage tank fill-pipes with a gasketed seal when not in use.

(c) Minimizing gasoline sent to open waste collection systems that collect and transport gasoline to reclamation and recycling devices, such as oil/water separators.

(2) GDF with Monthly Throughput Greater Than or Equal to 37,854 Liters [10,000 Gallons]. Measures to be taken include, but are not limited to:

(a) Complying with the requirement of Paragraph 6.d.(1).

(b) Only loading gasoline into storage tanks using submerged filling.

(3) GDF with Monthly Throughput Greater Than or Equal to 378,541 Liters [100,000 Gallons]. Measure to be taken include, but are not limited to:

(a) Complying with the requirement of Paragraphs 6.d.(1) and 6.d.(2).

(b) Installing and operating a vapor balanced system on each storage tank at the GDF. At a minimum, each vapor balance system must meet all of these design standards:

1. All vapor connections and lines on the storage tank must be equipped with closures that seal upon disconnect.

2. The vapor line from the gasoline storage tank to the gasoline cargo tank must be vapor-tight.

3. The pressure in the tank truck must not exceed 4.5kPa [18 inches water] pressure or 1.5kPa [5.9 inches water] vacuum during product transfer.

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.

5. If a gauge well separate from the fill tube is used, it must be provided with a submerge drop tube.

6. Liquid fill connections for all systems must be equipped with vapor-tight caps.

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 1.5kPa [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].

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).

(c) 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

1. All houses in the vapor balance system are properly connected.

2. The adapters or couplers that attach to the vapor line on the storage tank have closures that seal upon disconnect.

3. All vapor return hoses, couplers, adapters used in the gasoline delivery are vapor-tight.

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.

5. All hatches on the tank truck are closed and securely fastened.

6. The filling of storage tanks at GDFs is limited to unloading from vapor-tight gasoline cargo tanks.

7. RECORDKEEPING

Installation must maintain records associated with POL design and construction, inspections and testing, secondary containment, and other standards of this enclosure. Such recordkeeping may be performed as part of the spill prevention and response standards in Enclosure L.

8. VOLATILE ORGANIC COMPOUNDS (VOCs)

All new construction and existing systems that undergo repair by replacement of 50 percent or greater of the distribution system or the total storage system shall have a vapor recovery system installed. This requirement only applies to gasoline systems with a total sales volume equal to or more than $300m^3$ (79,252 gallons) per year. An operating procedure shall be created based on the following criteria:

a. The recovery hose from tank trucks must be connected to recovery system on gasoline storage tanks and do not open the cap of storage tanks or tank trucks during unloading petroleum products to minimize VOC emissions.

b. Minimization of VOC emissions with proper installation and maintenance of vent pipe on gasoline storage tanks and recovery system on gasoline dispensers.

c. The recovery system’s efficiency should be equal or more than 90%.

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ENCLOSURE K

UNDERGROUND STORAGE TANKS (USTs)

1. INTRODUCTION

This enclosure contains standards on the prevention and control of pollution resulting from Petroleum, Oils and Lubricants (POL) and hazardous substances stored in Underground Storage Tank (UST) systems.

2. GENERAL

a. The standards in this section apply to all UST systems, except for the following excluded UST systems:

(1) Any UST system holding hazardous waste. See Enclosure O.

(2) Any wastewater treatment tank that is part of a wastewater treatment facility.

(3) Equipment or machinery (operational tanks) that contains hazardous substances or POL for operational purposes such as hydraulic lift tanks and electrical equipment tanks.

(4) Any UST system whose capacity is 416 liters [110 gallons] or less. If greater than or equal to 208 liters [55 gallons], this is a below ground storage tank subject to the requirements in Enclosure J [POL].

(5) Any UST system that contains de minimis concentration of hazardous substances or POL.

(6) Any emergency spill or overflow containment UST system that is expeditiously emptied after use.

b. Some specialty UST systems may also be considered aboveground storage containers or below ground storage containers and subject to the standards of Section 2. Installations must evaluate such UST systems to determine applicability of standards and comply, as practicable.

c. Owners and operators of UST systems must implement the requirements of this section. 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.

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.

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 7, which describes the appli7cability 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.

a. 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.

(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.

(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:

(a) A non-corrodible material such as fiberglass-reinforced plastic.

(b) 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.

(c) Steel and clad (enclosed or jacketed) with a non-corrodible material that completely isolates the steel from contact with the surrounding soil.

(3) Compatibility for Tanks. Tanks must be constructed of, or lined with, materials that are compatible with the substance stored.

(4) Release Detection for Tanks in Existing UST systems.

(a) 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 4.a may use tank tightness testing if used in combination with monthly inventory control.

(b) Existing hazardous substance tanks must, at a minimum, use interstitial monitoring.

(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.

(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:

(a) Can detect a release from any portion of the tank that routinely contains hazardous substances or POL.

(b) Is installed and calibrated in accordance with the manufacturer's specifications.

(c) Is capable of detecting a leak rate or quantity of at least 0.76 liters [0.2 gallons] per hour or 568 liters [150 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.

(d) Meets the performance requirements for these specific release detection methods:

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 gallons] 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.

2.. Groundwater monitoring must be consistent with industry standards and practices.

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.

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 gallons] per hour or a release of 568 liters [150 gallons] within 30 days. The threshold must not exceed one-half the minimum detectible leak rate.

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.

6.. Tank tightness testing must be capable of detecting a 0.38 liter [0.1 gallons] 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.

b. Piping Design, Construction, and Installation.

(1) Secondary Containment for Piping.

(a) 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.

(b) 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.

(c) When 50 percent 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.

(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:

(a) A non-corrodible material; or

(b) 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.

(3) Compatibility for Piping. Piping must be constructed of, or lined with, materials that are compatible with the substance stored.

(4) Release Detection for Piping.

(a) 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 4.b.(4)(b) through 4.b.(4)(e), that:

1. Can detect a release from any portion of the connected underground piping that routinely contains hazardous substances or POL.

2. Is installed and calibrated in accordance with the manufacturer's specifications.

3. Meets the performance requirements for the specific release detection method.

a. Automatic line release detectors must be capable of detecting leaks of 11.36 liters [3 gallons] per hour at 68.9 kPa [10 psi] line pressure within 1 hour.

b. Groundwater monitoring must be consistent with industry standards and practices.

c. 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.

d. 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.

e. 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.

f. Other methods including, but not limited to, electronic pressurized line leak detection may be used if they can detect a 0.2 gallons per hour leak rate with a probability of detection of 0.95 and a probability of false alarm of 0.05.

(b) Existing Pressurized Piping. Existing piping that conveys:

1. Hazardous substances under pressure must use interstitial monitoring and automatic line release detection.

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.

(c) 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.

(d) 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:

1. Conduct line tightness testing at least every 3 years; or

2. Use monthly monitoring methods: automatic tank gauging, groundwater monitoring, interstitial monitoring, or vapor monitoring.

(e) 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.

c. 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:

(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.

(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:

(a) An automatic shut-off device set at 95 percent of tank capacity; or

(b) A high-level alarm set at 90 percent of tank capacity that alerts the transfer operator.

d. 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.

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.

a. 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.

(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.

(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:

(a) 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:

1. Visually checking for damage.

2. Removing liquid and debris.

3. Checking for and removing obstructions in the fill pipe.

4. Checking the fill cap to ensure it is securely on the fill pipe.

5. Checking for leaks in interstitial areas of double-walled spill prevention equipment with interstitial monitoring.

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.

(b) Inspecting containment sumps annually. Inspections must include:

1. Visually inspecting for damage.

2. Checking for leaks to the containment area or releases to the environment.

3. Removing liquid or debris.

4. Checking for a leak in the interstitial area for double-walled sumps with interstitial monitoring.

(c) 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 5.a.(2)(a)6. require this triennial testing.

(d) 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.

(e) Maintaining records for O&M inspections in accordance with the requirements in Paragraph 10.

(f) Maintaining records demonstrating compliance for spill and overfill prevention equipment in accordance with the requirements in Paragraph 10.

b. 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:

(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.

(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.

(3) Every 60 days, inspecting UST systems with impressed current cathodic protection systems to validate the equipment is running properly.

(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 10.

c. 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.

d. 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:

(1) Conduct O&M walkthrough inspections of release detection equipment at least every 30 days to confirm:

(a) Proper operation and no alarms.

(b) Hand-held release detection equipment is properly functioning.

(c) Release detection records are reviewed and current.

(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.

(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.

(4) Maintain records on release detection systems to demonstrate equipment and operational compliance. Detailed recordkeeping requirements for release detection systems are identified in Paragraph 10.

(5) Report failure of release detection systems and suspected releases in accordance with Service-specific guidance.

e. 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.

(1) UST System Repairs.

(a) 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.

(b) All UST System Repairs. Repairs must be completed in accordance with manufacturer's specifications and industry standards and practices.

(2) Testing of Repaired UST Systems.

(a) 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.

(b) 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:

1. The repaired tank is internally inspected in accordance with industry standards and practices; or

2. The repaired portion of the UST system is monitored monthly for releases.

(3) Documentation of Repairs. Records of each repair and testing will be maintained until the UST system is permanently closed.

f. Inventory. Installations must maintain an updated UST system inventory for the entire installation that includes the following items for each UST:

(1) Location.

(2) Installation date.

(3) Capacity.

(4) Tank and piping attributes, such as material, protection, secondary containment.

(5) Piping delivery type (safe suction, pressurized).

(6) Spill and overfill protection equipment details.

(7) Under-dispenser containment.

(8) Substance stored and confirmation of compatibility.

(9) Release detection details for tanks and pipes.

(10) Removal details.

(11) Replacement details.

Closure details, including closure date, location, and related information for all historic UST systems on the UST inventory

6. OPERATOR TAINING

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.

a. Designation of Class A, B, and C Operators. Owners and operators must designate:

(1) At least one Class A and one Class B operator for each UST system or group of UST systems at a facility; and

(2) Each individual who meets the definition of Class C operator at the UST facility as a Class C operator.

b. Operator Training Content. Owners and operators must ensure all operators receive the required training, by operator class, as specified in Table K-1.

Table K-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.

Table K-1. UST System Operator Training Requirements

OPERATOR CLASS	MINIMUM TRAINING REQUIREMENTS
	• 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.

c. Timing of UST System Operator Training.

(1) New Class A and B operators must meet requirements within 30 days of assuming duties.

(2) New Class C operators must be trained before assuming duties of a Class C operator.

d. Retraining of UST System Operators.

(1) Class A and B operators must take annual refresher training that covers all the required content in Table K-1.

(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.

e. Documentation. For as long as operators are designated, UST system owners and operators must maintain records regarding designation and training.

7. <u>SPECIALTY UST SYSTEMS</u>

a. 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 4, 5, 6, 8, 9, and 10.

b. Exceptions and Alternatives for Specialty UST Systems.

(1) Pressurized Piping Exceptions.

(a) 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.

(b) 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 4.b.(1) when installed or replaced.

(c) Existing piping must comply upon replacement.

(2) Additional Corrosion Protection Standards for Specialty UST Systems. In addition to complying with UST system corrosion protection standards in Paragraphs 4.a.(2) and 4.b.(2), owners and operators of specialty UST systems must meet these additional requirements:

(a) Specialty UST systems must be equipped with cathodic protection as a means of corrosion protection.

(b) 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.

(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 5., including walkthrough inspections, reporting, recordkeeping, guidance on repairs, and other standards in Paragraph 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:

(a) Hydrant Pits. Visually check for damage, remove liquid or debris, and check for leaks.

(b) Hydrant Piping Vaults. Check for hydrant piping leaks.

(4) Release Detection Requirements for FCTs.

(a) 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 4.a.(4).

(b) 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:

1. Meet the release detection requirements for new UST systems in Paragraph 4.a.(5);

2. Meet the release detection requirements for existing UST systems in Paragraph 4.a.(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 percent of flow-through; or

3. Monitor for releases using one or a combination of the following:

a. Conduct an annual tank tightness test that can detect 1.9 liters [0.5 gallons] per hour leak rate;

b. 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 0.76 liters [0.2 gallons] per hour leak rate, performed at least every 3 years;

c. 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 0.76 liters [0.2 gallons] per hour leak rate, performed at least every 2 years;

d. Perform vapor monitoring capable of detecting 0.38 liters [0.1 gallon] per hour leak rate at least every 2 years; or

e. Perform inventory control at least every 30 days that can detect a leak equal to or less than 0.5 percent 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.

(5) Release Detection Requirements for Piping.

(a) 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 4.b.(4).

(b) 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 3.4.b.(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:

1. Perform a semiannual or annual line tightness test at or above the piping operating pressure in accordance with Table 4. 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 K-3.

2. Perform vapor monitoring capable of detecting 0.38 liters [0.1 gallons] per hour leak rate at least every 2 years.

3. Perform inventory control at least every 30 days that can detect a leak equal to or less than 0.5 percent 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.

Table K-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
Liter [Gallon]	Liter [Gallon] 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 K-3. Specialty UST System Phase-in for Piping Segments Greater Than or Equal to 378,541 Liters [100,000 Gallons].

TEST	FREQUENCY	LEAK RATE
First Test	As soon as possible but not 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	
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 K-2	

8. RELEASE RESPONSE

a. Installations must ensure proper response to suspected and confirmed releases from UST systems.

b. Owners and operators must:

(1) Investigate suspected leaks, including conducting confirmation sampling, as appropriate.

(2) Notify appropriate authorities of verified leaks.

(3) Ensure that any verified leaking tanks or piping are immediately removed from service.

(4) Repair or replace UST systems that are still required.

(5) In accordance with Paragraph 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 Enclosure L.

c. Installations must maintain records of releases and response actions until the installation is permanently closed.

9. OUT-OF-SERVICE SYSTEMS AND CLOSURE

Installations must properly close UST systems using the following standards.

a. 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:

(1) Vent lines must be left open and functioning.

(2) All other lines, pumps, manways, and ancillary equipment must be secured and capped.

b. 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.

c. 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 8.

d. 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 3 of Enclosure O to determine if they are hazardous. If a waste exhibits a characteristic of hazardous waste as defined in Appendix A of Enclosure O, it must be handled and disposed of in accordance with the requirements Enclosure O. 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 designated waste requirements of Enclosure O or the wastewater requirements of Enclosure H, as appropriate.

e. 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.

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 K-4 identifies specific UST system recordkeeping requirements.

Table K-4. UST System Recordkeeping Requirements

TYPE OF RECORDS		REENTION PERIOD
UST System Inventory	UST system inventory for the entire installation that includes the items listed in Paragraph 5.f.	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

Table K-4. UST System Recordkeeping Requirements

TYPE OF RECORDS		REENTION PERIOD
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

11. VOLATILE ORGANIC COMPOUNDS (VOCs)

All new construction and existing systems that undergo repair by replacement of 50 percent or greater of the distribution system or the total storage system shall have a vapor recovery system installed. This requirement only applies to gasoline systems with a total sales volume equal to or more than 300m^3 (79,252 gallons) per year. An operating procedure shall be created based on the following criteria:

a. The recovery hose from tank trucks must be connected to recovery system on gasoline storage tanks and do not open the cap of storage tanks or tank trucks during unloading petroleum products to minimize VOC emissions.

b. Minimization of VOC emissions with proper installation and maintenance of vent pipe on gasoline storage tanks and recovery system on gasoline dispensers.

c. The recovery system’s efficiency should be equal or more than 90%.

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ENCLOSURE L

SPILL PREVENTION AND RESPONSE PLAN

1. INTRODUCTION

This enclosure contains standards for planning, prevention, control, and reporting of spills of POL and hazardous substances, Enclosures I, J, and K in this manual 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.

2. CRITICAL DEFINITIONS

a. Significant Spill.

(1) A hazardous wastes or hazardous substances released at any quantity equal to or in excess of the value listed in Table O-5 of Appendix A of Enclosure O.

(2) POL or liquid or semi-liquid hazardous material, hazardous waste, or hazardous substances in excess of 416 liters [110 gallons].

(3) Solid hazardous material not identified in Table O-5 of Appendix A of Enclosure O in excess of 225 kilograms [500 pounds].

(4) Any combinations of POL and liquid, semi-liquid, and solid hazardous materials, hazardous waste, or hazardous substance in excess of 340 kilograms [750 pounds].

(5) Any quantity of a hazardous waste or substance or POL that is not contained withing a USFK installation perimeter or fence line.

(6) Any quantity of a hazardous waste or substance or POL product that is released into a water body on or off a USFK installation.

(7) Any quantity of a hazardous waste or substance or POL product that is released adjacent to a USFK Installation by a USFK activity or third party.

b. Non-Significant Spill

(1) Is a spill that is below the thresholds of a significant spill.

(2) A spill is contained within an impervious berm, on a nonporous surface, or inside a building, and do not volatilize, and are subsequently cleaned up.

c. Facility Incident Commander (FIC). The designated installation on-scene coordinator responsible for the control and cleanup efforts at the scene of a POL or hazardous substance spill due to DoD activities on or near the installation. This position and an alternate position are designated by the Installation commander.

3. 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 enclosure. The plan must provide measures to prevent and, to the maximum extent practicable, remove a worst-case discharge (WCD) from the facility. Appendix A provides guidance for determining the WCD planning volume. The plan should be kept in a location easily accessible to the FIC and facility response team (FRT) who performs emergency functions as defined and directed by the FIC.

a. Plan Updates. The plan must be updated at least every 5 years or:

(1) Within 6 months of any significant changes to operations.

(2) When there have been two significant spills to waters of the ROK in any 12-month period.

(3) When there has been a spill of 3,785 liters [1,000 gallons] or greater.

b. Plan Certification. The plan must be certified by a registered professional engineer or ROK 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.

c. Prevention Section. At a minimum, the prevention section of the plan must include:

(1) Name, title, responsibilities, duties, and telephone number of the designated FIC and an alternate.

(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 3.c.(3), critical water resources, land uses, and possible migration pathways.

(3) An inventory that identifies:

(a) Storage, handling, transfer areas, loading and unloading racks, and areas that have one or more POL storage containers.

(b) 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.

(c) POL and hazardous substance containers with capacities of 208 liters [55 gallons] or more at the locations described in Paragraphs 3.c.(3)(a) and 3.c(3)(b), including the total capacity of each container and the substance stored.

(4) Procedures for the periodic integrity testing of storage containers in accordance with Paragraph 4.b.(1) of Enclosure J.

(5) Procedures for the periodic integrity testing of aboveground valves in accordance with Paragraph 4.b.(1)(b) of Enclosure J.

(6) Procedures for testing buried piping associated with POL storage containers for integrity and leaks in accordance with Paragraph 4.b.(2) of Enclosure J.

(7) Procedures for performing leak tests for below ground storage containers in accordance with Paragraph 4.b.(3) of Enclosure J.

(8) A detailed description of the facility's prevention, control, and countermeasures, including sized secondary containment and general secondary containment as required by Paragraph 4.c. of Enclosure J for diversion and containment of spills, for each site listed in the inventory. Measures should permit, as far as practical, reclamation of spilled substances. Enclosures governing hazardous waste (Enclosure O), POL (Enclosure J), USTs (Enclosure K), and PCBs (Enclosure F) provide specific standards for containment structure requirements.

(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.

(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.

(11) Written procedures for:

(a) Operations to preclude spills of POLs and hazardous substances.

(b) Inspections.

(c) Testing for integrity and leaks.

(d) Recordkeeping requirements.

(12) Site-specific procedures should be maintained at each site on the facility where significant spills could occur.

(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:

(a) 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.

(b) 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).

(14) Installation Spill Prevention and Response plans shall include at minimum these actions designed to prevent injury and damage to property and the environment:

(a) In the event of a spill, safety of the personnel on the site affected by the incident is the first consideration for both the person who reports and the Facility Response Team (FRT).

(b) The FRT or first responder must immediately take action to eliminate and control the source to prevent additional discharge. Where possible the FRT should have access to information which describes the operation of equipment or systems which could potentially be a source for the environmental incident.

(c) The response plan shall detail specific measures available which can contain any free product on the ground, or any POL or chemical released into a water body or conveyance system.

(d) The FIC must take into consideration when responding to an incident the potential impact to sensitive natural biomes, drinking water sources, agricultural areas, or culturally significant property.

d. 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 enclosure of the plan must contain:

(1) Provisions specifying the responsibilities, duties, procedures, and resources to be used to contain and clean up spills.

(2) A description of immediate response actions that should be taken when a spill is first discovered.

(3) The responsibilities, composition, and training requirements of the FRT.

(4) The command structure that will be established to manage a WCD including an organization chart and the responsibilities and composition of the organization.

(5) Procedures for FRT alert and response to include provisions for:

(a) Access to a reliable communications system for timely notification of a POL spill or hazardous substance spill.

(b) Public affairs involvement.

(c) A current roster of the persons and alternates who must receive notice of a POL or hazardous substance spill, including a Defense Energy Support Center 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.

(6) A description of arrangements with installation and local police departments, fire departments, hospitals, contractors, and emergency response teams to coordinate emergency services.

(7) A telephone number or other means to contact the appropriate emergency service provider (e.g., installation fire department) on a 24-hour basis.

(8) A requirement to notify the FIC, installation commander, and local authorities in the event of hazard to human health or environment.

(9) Assignment of responsibilities for making the necessary notifications, including notification to the emergency services providers.

(10) Surveillance procedures for early detection of POL and hazardous substance spills.

(11) A prioritized list of various critical water and natural resources that will be protected in the event of a spill.

(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) 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.

(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.

(15) A description of general health, safety, and fire prevention precautions for spill response actions.

(16) A public affairs section that describes the procedures, responsibilities, and methods for releasing information in the event of a spill.

e. Reporting Section. The reporting section of the plan must address how the required reporting contained in Paragraph 6. will be accomplished, including recordkeeping when emergency procedures are invoked.

f. Training Section. The training section of the plan must identify and describe how the required training and response drills required in Paragraph 7. will be accomplished.

4. SPILL RESPONSE

Installation commanders shall ensure that installation or tenant organizations are familiar with the approved Spill Prevention and Response Plan specific to that installation and understand how to report and respond to environmental incidents. All spills regardless of size shall be reported to the installation FIC immediately. The FIC will determine if the spill is “significant” or “not significant” and report accordingly.

a. 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 ROK 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 ROK.

b. After the spill has been contained and is under control, any remaining free product and obviously contaminated soil resulting from the spill shall be appropriately removed and managed. Obviously contaminated soil includes visual and olfactory indications, observations such as leaking containers, missing material, sampling results and investigation findings. Installations should perform sampling, if necessary, to confirm the obviously contaminated soil has been removed. Standards for the cleanup of environmental incidents are detailed in paragraph 5 of this enclosure. Clean up of environmental event is limited to the specific chemicals released in the incident. Further action beyond this level constitutes remediation, which is governed under DODI 4715.08 “Remediation of Environmental Contamination Outside the United States” (reference 17).

(1) Any byproducts of the initial spill response that are being disposed of must be characterized in accordance with paragraph 3 of Enclosure O to determine if they

are hazardous. If a waste exhibits a characteristic of hazardous waste as defined in Appendix A of Enclosure O, it must be handled and disposed of in accordance with the requirements of Enclosure O.

(2) If testing confirms that a waste does not exhibit a characteristic and is not hazardous, it may be managed and disposed of in accordance with the solid waste requirements of Enclosure N or the wastewater requirements of Enclosure H if local regulations permit.

c. Any off-installation spill response must be coordinated with appropriate ROK authorities and USFK before any response is taken outside the installation. USFK is the final approving authority for spill response outside an installation.

d. In the event that an environmental incident occurs outside the boundaries of a USFK installation, the unit that was the source of the release will take immediate action to safely stop the source and contain the spill/leakage. In order to mitigate damage, installation FRT may conduct immediate spill response efforts off-installation in coordination with ROK authorities but may not conduct remediation of any existing contamination not related to this incident. DoD does not conduct remediation outside of DoD installations, even if the contamination was caused by DoD. Local ROK authorities and affected civilians shall be directed to file any claims for environmental contamination of off-installation property or damages therefrom with the servicing USFK claims office.

e. 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.

f. Local ROK Government and USFK installation authorities will cooperate with each other in taking appropriate measures immediately to prevent the diffusion of pollution when an event occurs.

5. ENVIRONMENTAL INCIDENT CLEAN UP SCREENING CRITERIA

The screening criteria outlined in this enclosure is specifically for action related to the cleanup of an environmental incident which occurred after the publication of this document. The objective of these standards is to provide a minimum screening level to be utilized during the cleanup process and take out the guess work of what is considered “obviously contaminated”. USFK installations have the flexibility to utilize their preferred screening method to make a determination that the clean up of the environmental incident has meet the criteria detailed in Table L-1.

a. USFK installations are not authorized to remediate existing environmental contamination at overseas locations except under specific guidelines outlined in DoDI 4715.08. However, situations can occur where an environmental incident happens at the same location of existing environmental contamination. In those cases, USFK installations shall take action to clean up the site based on the specific type of location and the chemical constituent present even though existing contamination is present. The installation will notify and request concurrence from USFK Environmental.

b. Field screening methods are to be utilized during the clean up process to plan and direct the work effort. Field screening methods can consist of using a portable Photo Ionization Detector (PID) analyzer or a portable Flame Ionization Detector (FID) analyzer for gasoline, kerosene, diesel, and #2 fuel oil utilizing the Soil Headspace Screening Method where a sample is placed in an airtight container, typically a glass jar or polyethylene bag. A PID or FID cannot be used for low volatility petroleum contamination. Instruments shall be calibrated according to the manufacture's specifications. An approved head space method such as EPA SW-846 Method 5021A or relevant ROK test method shall be used. An on-site Total Petroleum Hydrocarbon (TPH) test kit can be used following EPA SW-846 method 4030 or ROK equivalent.

c. Soil and ground water sampling methods shall be used to certify a site has met the environmental incident screening criteria for the specific contaminant(s) released by the incident. USEPA or equivalent ROK testing methods shall be used to certify the hazardous material released onto the site has met the criteria in Table L-1 Environmental Incident Screening Standards by Designated Area.

d. Confirmation screening of the site during clean up shall consist of a minimum of 5 samples by the selected screening method. One screening sample per 20 linear feet around the perimeter wall and one screening sample for each 400 square feet.

e. The immediate objective is to recover free liquids and prevent them from contaminating surface water or ground water. Appropriate action (i.e., booms, dikes, etc.) must be taken to keep free liquids from reaching surface water. Once free liquids are addressed excavation of contaminated soil will be necessary.

f. Contaminated soil needs to be removed because contaminants can leach to ground water or spread to surface water if there is rain. Soil excavation during the cleanup process shall at a minimum be stockpiled on plastic sheeting (minimum 10 mil) and covered and a berm constructed to prevent run off and run on. The installation shall determine the disposal process for contaminated soil.

g. The screening standards used in this section are based on the Republic of Korea Soil Environmental Conservation Act. The standard for cleanup is based on the location of the environmental incident. These locations are broken down into three specific areas:

(1) Area 1: Consist of residential, dining, school, historical sites, cultural sites, outdoor play parks for children, and designated parks.

(2) Area 2: Consist of commercial offices and shops, museums and any associated outdoor garden areas, designated forests, water wells and production facilities, recreation and sports areas, and religious sites.

(3) Area 3: Consists of industrial areas, motor pools, warehouses, gas

stations, roads and railways, airfields, military training areas, port facilities, waste collection points, parking lots, utilities other than water, and any other area not specified in Area 1 and 2.

Table L-1. Environmental Incident Screening Standards by Designated Area

Contaminants	Area 1	Area 2	Area 3
Cadmium (Cd)	4	10	60
Copper (Cu)	150	500	2,000
Arsenic (As)	25	50	200
Mercury (Mg)	4	10	20
Lead (Pb)	200	400	700
Hexavalent Chromium [Cr(VI)]	5	15	40
Zinc (Zn)	300	600	2,000
Nickel (Ni)	100	200	500
Fluorine (F)	400	400	800
Organic Phosphorus Compounds	10	10	30
Polychlorinated biphenyls (PCBs)	1	4	12
Cyanide (CN)	2	2	120
Phenol	4	4	20
Benzene	1	1	3
Toluene	20	20	60
Ethylbenzene	50	50	340
Xylenes	15	15	45
Total Petroleum Hydrocarbons (TPH)	500	800	2,000
Trichloroethylene (TCE)	8	8	40
Perchloroethylene (PCE)	4	4	25
Benzo(a)pyrene	0.7	2	7
1,2-Dichloroethane	5	7	70

If the chemical released during the environmental incident is not in Table, notify USFK Environmental for clarification.

The agency, department, or contractor responsible for cleanup of the environmental incident will utilize EPA standard test methods or ROK equivalent to validate that the action to clean the site as met the minimum standards in the Table.

6. REPORTING

a. Concurrent with undertaking a spill response, any significant spill must be reported to the FIC immediately.

b. The FIC must immediately notify the installation commander who will report to USFK FKEN and Component Commander or Defense Agency then submit a follow-up written report within 48 hours and a final report within 30 days after a spill response is completed. Requirements for reporting are as follows:

(1) The spill occurs inside a DoD installation and cannot be contained within any required berm or secondary containment.

(2) A water resource that has been polluted.

(3) The FIC has determined that the spill is significant.

(4) Any fuel spill greater than 100 gallons (378 liters) or reportable quantity of hazardous material defined in Table O-2, Appendix A to Enclosure O even if contained.

(5) A spill regardless of volume, from the same system, and this is the third incident within 5 years.

c. When a spill occurs inside a DoD installation and cannot be contained within the installation boundaries or threatens the local ROK drinking water resource, the appropriate In-Theater Component Commander or Defense Agency, USFK, and local ROK authorities must be notified immediately. The department responsible for management of the cleanup must submit a follow-up written report within 48 hours and a final report within 30 days after a spill response is completed.

d. If a 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 3.d.(5)(c). 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 local ROK authorities. The department responsible for management of the cleanup must submit a follow-up written report within 48 hours and a final report within 30 days after a spill response is completed.

e. Non-Significant Spills. An installation environmental office will maintain a log of non-significant spills in accordance with the FIC.

f. Reportable Spills to USFK

(1) Notification by the department responsible for management of a reportable environmental incident shall be completed immediately by phone to Environmental Policy Branch, USFK Engineers at land line 755-2553/8589/2956.

(2) A follow-up report prepared by the department responsible for management of the environmental incident shall be submitted by email to the Environmental Policy Branch, USFK Engineers mailbox, indopacom.humphreys.usfk.mbx.usfk-fken-environemtnal-policy@army.mil, within the next 48 hours, using the reporting format in Appendix B

(3) The installation commander must submit a final spill response and actions taken report to the USFK Command Engineer within 30 days after a spill response is completed.

7. 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 3.

8. 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 3.c.(11)).

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APPENDIX A TO ENCLOSURE L
DETERMINATION OF WCD PLANNING VOLUME

A.1. This appendix provides standards to determine:

a. On an installation-specific basis, the extent of a WCD.

b. 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.

A.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:

a. 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

b. 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 4.

Figure 4. 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.

A.3. For installations with POL or hazardous substance storage containers:

a. 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.

b. Facilities with Multiple Storage Containers.

(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.

(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.

(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:

(a) The total capacity of the aboveground POL and hazardous substance storage container that lacks adequate secondary containment; plus

(b) 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.

APPENDIX B TO ENCLOSURE
SPILL NOTIFICATION FORM

United States Forces Korea

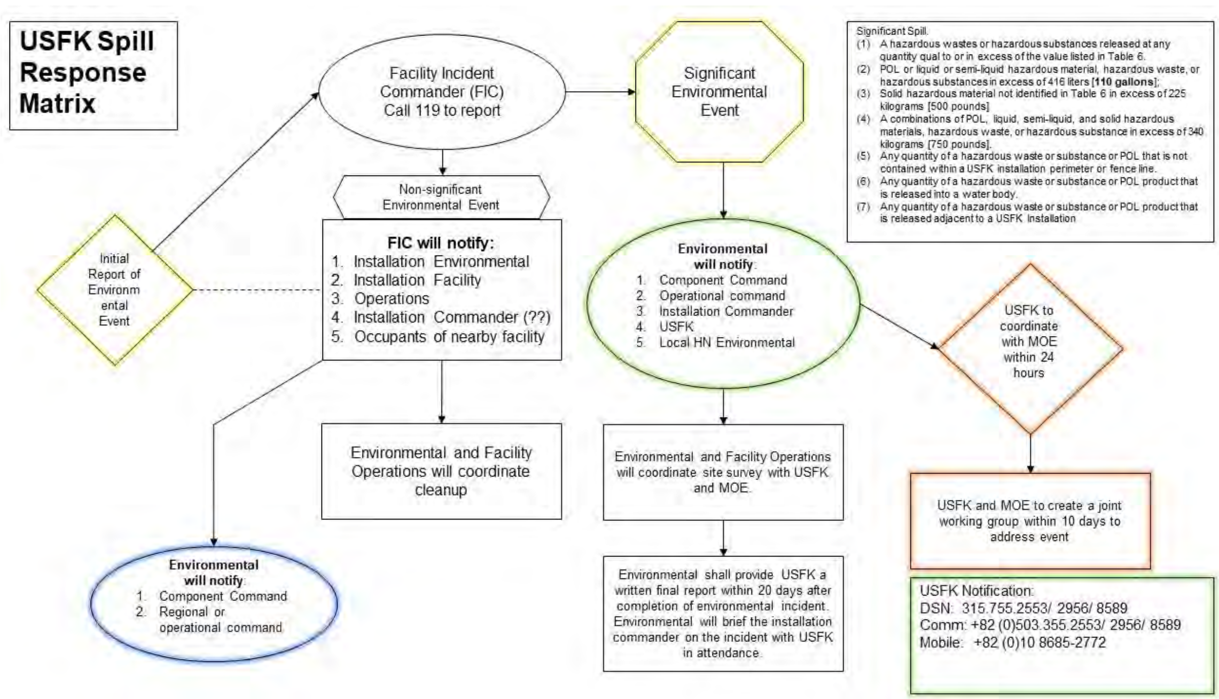
Environmental Incident and Spill Notification Form

	USFK SPILL NUMBER:	INITIAL ☐	48 HR FOLLOW-UP ☐
PERSON REPORTING:	PHONE (DSN):	PHONE (COMMERCIAL):	
RANK/POSITION:	ORGANIZATION:	EMAIL:	
FACILITY INCIDENT COMMANDER (FIC)		EMAIL:	
PHONE (DSN):	PHONE (COMMERCIAL):		
DATE/TIME OF SPILL:	DATE/TIME DISCOVERED:	DATE/TIME REPORTED	
INCIDENT LOCATION/ADDRESS:	INSTALLATION: VESSEL/AIRCRAFT/VEHICLE:	PRODUCT SPILLED:	
INCIDENT CONTAINED ON INSTALLATION: ☐ INCIDENT MIGRATED OFF INSTALLATION: ☐ INCIDENT OCCURRED OFF INSTALLATION: ☐ INCIDENT AFFECTED A WATER BODY: ☐		ROK NOTIFIED: (WHO, ORGANIZATION, PHONE, EMAIL)	
QUANTITY SPILLED:	QUANTITY CONTAINED:	QUANTITY RECOVERED:	QUANTITY DISPOSED:
SOURCE OF SPILL:			
CAUSE OF SPILL:		ACCIDENT ☐ HUMAN FACTOR ☐ STRUCTURAL/MECHANICAL ☐ OTHER ☐	
CLEANUP ACTIONS:			
DISPOSAL METHODS AND LOCATION			
AFFECTED AREA SIZE	SURFACE TYPE: (GRAVEL, ASPHALT, ETC.)	RESOURCES AFFECTED/ THREATENED	
COMMENTS:			

ADDITIONAL REMARKS:

USFK PHONE NUMBERS	SPILLS REPORTABLE TO USFK
(Mobile) 010-8685-2772	SPILL CANNOT BE CONTAINED ON A DOD INSTALLATION
(DSN) 755-2956, 8589, 2553	SPILL OCCURED OFF A DOD INSTALLATION
(C) 050-3355-2956. 8589, 2553	SIGNIFICANT SPILL: LIQUID 100 GAL/ 416 L; SOLID 500 LBS/ 225 KG
	COMBO 750 LBS/ 340 KG; OEGBD VOL 5 TABLE 3 REPORTABLE QUANTITY

APPENDIX C TO ENCLOSURE L
SPILL NOTIFICATION MATRIX



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ENCLOSURE M

PESTICIDES

1. INTRODUCTION

This enclosure contains standards on the prevention of threats to human health and the environment from the storage and use of pesticides. This section does not address the personal use of pesticides by individuals in residences or gardens. It does not cover.

a. The storage of pesticides as hazardous materials, which is addressed in Enclosure I, and requirements for spill prevention and response, which are addressed in Section 4 of Enclosure D.

b. 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 DoDI 4150.07.

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 DoDI 4150.07. This written plan must:

a. Include IPM procedures to control pests and minimize the use of pesticides.

b. Include appropriate security procedures to prevent unauthorized access to, or use of, pesticides.

c. Identify the designated coordinator to oversee all aspects of implementation.

d. Be implemented using trained personnel and certified pesticide applicators.

e. Be reviewed, updated, and approved annually by a designated pest management consultant and reviewed, revised as necessary, and approved by the installation commander every 5 years.

3. IPM COORDINATOR

Each installation must have a designated IPM coordinator to oversee the installation's pest management program including development, implementation, maintenance, and annual update of the IPM plan. The IPM coordinator must have the educational background, training, technical knowledge, and management skills to implement and oversee the pest management program.

4. PEST MANAGEMENT CONTRACTORS

All pest management contractors must use IPM and comply with certification, licensing, registration, and other requirements in accordance with DoDI 4150.07.

5. REQUIREMENTS FOR PESTICIDE APPLICATORS

Installations must ensure:

a. All pesticides are applied by pesticide applicators certified for the specific application category in accordance with DoDI 4150.07, with the following exceptions:

(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.

(2) Arthropod repellents applied to skin and clothing.

(3) Pesticides applied as part of an installation’s self-help program.

b. 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.

c. 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.

6. STORAGE, USE, AND DISPOSAL OF PESTICIDES

Installations must ensure:

a. Pesticides are included in the installation spill prevention and response plan. See Enclosure L for spill prevention and response plan requirements.

b. Pest management facilities, including mixing and storage areas, comply with design requirements of Armed Forces Pest Management Board (AFPMB) Technical Guide (TG) 17.

c. SDSs and labels for all pesticides are available at the storage facility. Labels must comply with the guidelines in Paragraph 3.d. of Enclosure I. Labels must bear the appropriate use instructions and precautionary message based on the toxicity category of the pesticide. The precautionary messages and use instruction must be in both English and Korean.

d. 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. Warning signs are required on storage areas IAW AFPMB TG 17.

e. 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.

f. All pesticides are applied in accordance with the procedures established in DoDI 4150.07 for specific pest management operations and consistent with the label.

g. The unintended discharge of pesticides to waters of the ROK is minimized by implementing the following measures:

(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.

(2) Maintain pesticide application equipment in proper operating condition by calibrating, cleaning, and repairing such equipment to prevent leaks, spills, or other unintended discharges.

(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 waters of the ROK.

h. 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:

(1) The generator of pesticide wastes must determine whether or not the waste is hazardous in accordance with Enclosure O.

(2) Pesticide waste determined to be hazardous waste must be disposed of in accordance with the standards for hazardous waste disposal in Enclosure O.

(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 21.

7. REPORTS AND RECORDKEEPING

For recordkeeping, Volume 1 of DoDM 4150.07 prescribes DD Form 1532-1 available at http://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.

ENCLOSURE N

SOLID WASTE

1. INTRODUCTION

This enclosure 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:

a. Apply to institutional, residential, commercial, and industrial solid waste generated at the installation.

b. Address general solid waste not otherwise classified or specially managed. Standards for hazardous waste and medical waste are provided in Enclosure O and Enclosure P respectively. Standards for disposal of asbestos and polychlorinated biphenyls (PCBs) are provided in Enclosure D and Enclosure F respectively.

2. GENERAL

a. 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 3. thru 5.

b. DoD solid wastes must be treated or disposed of at facilities that meet the requirements for landfills in Paragraph 6., incinerators in Paragraph 7., or sludge land application in Paragraph 8., as appropriate.

c. The disposal of solid waste in landfills that do not meet the standards of Paragraph 6. constitutes open dumping and is prohibited.

d. Except as provided in Paragraph 6.c.(5), open burning of solid waste is prohibited.

e. Personnel performing solid waste management activities should be trained in accordance with assigned responsibilities.

f. Installations must maintain records associated with the design, operation, and maintenance of solid waste management facilities, as appropriate.

g. Installations will cooperate with Republic of Korea (ROK) officials, to the extent possible, in the solid waste management process for environmental conservation and efficient use of resources.

h. Installations must ensure that the contractor(s) transporting, recycling, and reusing DoD solid wastes and operating disposal facilities outside the installation meet all of the ROK license and permit requirements and use the ROK electronic information processing program, known as Allbaro, to record an audit trail of construction and demolition debris.

3. COLLECTION

Installations must:

a. 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.

b. 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.

4. STORAGE

Installations must:

a. 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 Enclosure N for solid waste management requirements associated with municipal waste combustor units.

(1) Screen bulky wastes for the presence of ozone-depleting substances in accordance with Enclosure C or hazardous constituents in accordance with Enclosure O of this manual.

(2) Segregate and dispose of readily detachable or removable hazardous waste in accordance with Enclosure O, or asbestos and PCBs in accordance with Enclosure D and Enclosure F.

b. Design all buildings or other facilities that are constructed, modified, or leased after the effective date of this manual to:

(1) Provide adequate storage to accommodate the anticipated volume of solid waste and recyclables.

(2) Ensure storage areas are easily cleaned and maintained and allow for safe, efficient collection.

c. Securely store solid waste that contains food waste in containers that:

(1) Are leak-proof, waterproof, and vermin-proof, including sides, seams, and bottoms.

(2) Are durable enough to withstand anticipated use and environmental conditions without rusting, cracking, or deforming in a manner that impairs serviceability.

(3) Have functional lids.

d. 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.

5. RECYCLING

Installations must:

a. Recycle:

(1) Office paper if there are more than 100 office workers.

(2) Cardboard if more than 10 tons are generated per month.

(3) Newspapers if more than 500 families reside on the installation.

b. Store all solid wastes or materials that have been separated for recycling so they:

(1) Do not create a fire, health, or safety hazard.

(2) Do not provide food or harborage for vectors and pests.

(3) Are contained or bundled to avoid spillage.

c. If implementing a qualified recycling program, institute it in accordance with DoDI 4715.23.

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 ROK landfills must ensure the landfills comply with the requirements of Paragraph 1.6.c. 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:

a. Not initiate new landfill units or expand existing waste landfill units without consulting with the LEC and the Combatant 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 Combatant Commander that no suitable alternative exists.

b. Design and operate new DoD MSWLF units that incorporate these factors:

(1) Location restrictions regarding airport safety (e.g., bird hazards), floodplains, wetlands, aquifers, seismic zones, and unstable areas.

(2) Procedures for excluding hazardous waste.

(3) Cover material standards (e.g., daily cover), disease vector control, explosive gas control, air quality standards (e.g., no open burning), access requirements, liquids restrictions, and recordkeeping requirements.

(4) An inspection program.

(5) A liner and leachate collection system designed and installed consistent with Unified Facilities Criteria 3-240-10A and in consideration of the location to prevent groundwater contamination that would adversely affect human health.

(a) 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.

(b) Leachate collection systems must be designed and constructed to maintain less than 30 cm [11.8 inch] depth of leachate over the liner.

(6) 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.

(7) 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:

(a) Post-closure management period calculated in consideration of the design criteria such as type of landfill, properties and materials used for the construction of the landfill, amount and type of waste in the landfill, and surrounding site conditions.

(b) Monitoring and maintenance activities required to ensure the integrity of the final cover.

(c) Planned uses of the site during the post-closure period.

(d) Plans for continuing (during the post-closure period) leachate collection, groundwater monitoring, and methane monitoring.

(e) A survey plot showing the exact site location.

c. When operating MSWLF units:

(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.

(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.

(3) 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.

(4) Investigate options for composting municipal solid waste (MSW) as an alternative to landfilling or treatment before landfilling.

(5) Prohibit open burning, except in case where the ROK authorities and LEC grants approval for infrequent burning of agricultural wastes, silvicultural wastes, land-clearing debris, diseased trees, or debris from emergency cleanup operations.

(6) Develop procedures to divert recyclables, yard waste, and construction and demolition debris from MSWLF units to the maximum extent possible (e.g., composting, recycling).

(7) Operate the MSWLF unit in a manner to protect the health and safety of personnel associated with the operation.

(8) Maintain conditions that are unfavorable for the harboring, feeding, and breeding of disease vectors.

(9) 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.

(10) Operate in an aesthetically acceptable manner.

(11) Operate in a manner to protect aquifers.

(12) Control public access to landfill facilities to prevent illegal dumping of waste and scavenging.

(13) If possible, prohibit the disposal of bulk or noncontainerized liquids.

(14) Maintain records of MSWLF operations specified in Paragraphs 6.c.(1) through 6.c.(13).

d. During closure and post-closure:

(1) Install a final cover system that is designed to minimize infiltration and erosion.

(2) Ensure the infiltration layer is composed of a minimum of 46 cm [18 inches] of earthen material, geotextiles, or a combination of the two, with a permeability:

(a) Less than or equal to the permeability of any bottom liner system or natural subsoil present, or

(b) No greater than 5×10^{-5} cm per second [1.97×10^{-5} inch per second], whichever is less.

(3) Ensure the final layer consists of a minimum of 21 cm [8 inches] of earthen material that is capable of sustaining native plant growth.

(4) If possible, revegetate the final cap with native plants that are compatible with the landfill design, including the liner.

7. INCINERATIONS

a. Installations operating incinerators must meet the air quality requirements in Enclosure C.

b. Installations operating MSW incinerators processing, or designed to process, more than 50 tons per day aggregate must also:

(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.

(2) Treat all waters discharged from the facility to meet the more protective of applicable water quality standards. See Enclosure H for wastewater and stormwater standards.

(3) Maintain conditions that are unfavorable for the harboring, feeding, and breeding of disease vectors.

(4) Operate in an aesthetically acceptable manner (e.g., perform routine housekeeping and regularly remove waste that cannot be processed by the facility).

(5) Characterize and dispose of residue and other solid waste resulting from incineration in an environmentally acceptable manner. See Enclosure O for waste characterization and hazardous waste management standards.

c. 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.

8. LAND APPLICATION OF SEWAGE SLUDGE

Installations must comply with the following requirements for land application of sewage sludge.

a. 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 6. or 7, respectively.

b. 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.

(1) Ensure biosolids applied to the land meet:

(a) The ceiling concentration for the pollutants shown in Table N-1.

Table N-1. Sewage Sludge Pollutant for Land Application

Pollutant	Ceiling Concn*	Cumulative Pollutant Loading Rate	Monthly Average Conc.	Annual Pollutant Loading Rate
	mg/kg**	kg/hectare	mg/kg**	kg/hectare/365-day
Arsenic	45	41	41	2.0
Cadmium	5	39	39	1.9
Copper	360	1,500	1,500	75.0
Lead	130	300	300	15.0
Mercury	2	17	17	0.85
Molybdenum	75	-	-	-
Nickel	45	420	420	21.0
Selenium	100	100	100	5.0
Zinc	900	2,800	2,800	140.0
Ricin	10	-	-	-
Escherichiacoli O157:H7	Not Detected	-	-	-
Salmonella spp.	Not Detected	-	-	-

*Concentration, ** milligram/kilogram (dry weight basis)

(b) Either the cumulative pollutant loading rate, monthly average concentration, or annual loading rate.

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 enclosure, as appropriate.

10. FOOD WASTE MANAGEMENT

USFK installations and activities shall not dispose of food wastes in a landfill. They must ensure all processed and unprocessed food wastes to be collected by a licensed contractor(s) for off installation disposal. All food wastes shall be disposed of in a manner that meets ROK's standards.

ENCLOSURE O

HAZARDOUS WASTE

1. INTRODUCTION

This enclosure contains standards on all hazardous waste and ROK designated 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. It covers wastes that exhibits one or more characteristics of hazardous waste (ignitability, corrosivity, reactivity, or toxicity) or which are listed hazardous wastes or ROK designated wastes. It does not cover:

a. Ammunition and explosive, which are covered in Defense Explosive Safety Regulation 6055.09.

b. Radioactive materials, which are covered in DoDI 4715.27.

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.

a. Refresher Training.

All personnel performing hazardous waste duties must successfully complete annual refresher hazardous waste training.

b. Training Contents and Requirements.

The training program must:

(1) Include sufficient information to enable personnel to perform their assigned duties and fully comply with pertinent hazardous waste requirements.

(2) Be conducted by qualified personnel who have completed a training program in the subject, have comparable academic credentials, or possess relevant experience.

(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.

(4) Address the following areas, in particular for personnel whose duties

include hazardous waste handling and management:

(a) Emergency procedures (response to fire, explosion, and spills; use of communications and alarm systems; body and equipment decontamination).

(b) Drum and container handling and storage (including waste compatibility and segregation requirements); safe use of hazardous waste equipment; proper sampling procedures.

(c) Employee protection, including personal protective equipment, safety and health hazards, hazard communication, and worker exposure.

(d) Recordkeeping, security, inspections, spill prevention and response plans, storage requirements, and transportation requirements.

c. 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.

3. HAZARDOUS WASTE DETERMINATION AND CHARACTERIZATION

Generators must:

a. 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.

b. 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 Appendix 5A and Tables 2 through 6 for characteristics of hazardous wastes and lists of hazardous wastes.

c. 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.

d. Use a unique (generator specific) identification number for all recordkeeping, reports, and manifests for hazardous waste.

e. Use Table O-6 to determine the type of ROK designated waste and then assign a ROK waste number in Table O-8. Annotate the number on the hazardous waste profile sheet.

4. HAZARDOUS WASTE ACCUMULATION POINTS (HWAPS)

Installations must ensure that HWAPs comply with the following standards.

a. An HWAP must be at or near the point of generation and under the control of the operator.

b. 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).

c. An HWAP may accumulate no more than the equivalent of 208 liters [55 gallons] drum of hazardous waste, or 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 liters [55 gallons] and 1 liter [1 quart] volume accumulation limits, but must be transported off-site to a final destination facility within 1 year of first accumulation start date.

d. Installations must have procedures in place to deal with unknown wastes.

e. All standards for use and management of containers in Paragraph 6. apply to HWAPs with the exception of weekly inspections in Paragraph 6.b.(5).

f. The recordkeeping requirements for turn-in documents, manifests, and waste analysis and characterization records in Paragraphs 11.c.(1), 11.c.(4), and 11.c.(5) apply to HWAPs.

5. HWSAS (Hazardous Waste Storage Area)

Installations must ensure that HWSAs comply with the following standards.

a. 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.

b. 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.

c. Waste Analysis and Verification.

(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.

(2) Waste Analysis Records. The HWSA must have, and keep on file, an HWPS for each waste stream that is stored at that HWSA.

(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:

(a) Inspect the waste to ensure it matches the description provided.

(b) Ensure that no waste is accepted for storage unless an HWPS is provided, or is available and properly referenced.

(c) Request a new HWPS from the generator if there is reason to believe that the process generating the waste has changed.

(d) 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.

(e) Reject wastes that do not match the accompanying waste descriptions unless the generator provides an accurate description.

(4) Waste Identification. HWSA managers should have an appropriate plan in place for the acceptance or identification of unknown waste.

d. Security.

(1) General. The installation must prevent the accidental entry, and minimize the possibility for unauthorized entry, of persons or livestock onto the HWSA grounds.

(2) Security System Design. An acceptable security system for an HWSA consists of either:

(a) 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

(b) 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).

(3) Required Signs. A sign with the legend “Danger: Unauthorized Personnel Keep Out,” 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 Korean, 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.

e. 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.

f. Required Equipment.

(1) All HWSAs must be equipped with the following:

(a) An internal communications or alarm system capable of providing immediate emergency instruction (voice or signal) to HWSA personnel.

(b) 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.

(c) 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.

(d) Water at adequate volume and pressure to supply water hose streams, foam- producing equipment, automatic sprinklers, or water spray systems.

(e) Readily available personal protective equipment appropriate to the materials stored, and eyewash and shower facilities.

(2) 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.

g. Access to Communications or Alarm System.

(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.

(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.

h. General Inspection Requirements.

(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.

(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).

(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).

(4) Frequency of Inspections. Minimum frequencies for inspecting containers and container storage areas are found in Paragraph 6.b.(5). Minimum frequencies for inspecting tank systems are found in Paragraph 7.d.(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.

(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.

(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.

i. Storage Practices.

(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.

(2) Ignitable or Reactive Wastes. The HWSA manager must take precautions to prevent accidental ignition or reaction of ignitable or reactive waste.

(a) 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.

(b) 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” legend must be written in English and Korean.

(c) Water reactive waste cannot be stored in the same area as flammable and combustible liquid.

j. Closure and Closure Plans.

(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.

(2) Closure. When the decision is made to close an HWSA, the closure plan must be implemented. Closure should be done:

(a) In a manner that eliminates or minimizes the need for future maintenance or the potential for future releases of hazardous waste.

(b) 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.

6. USE AND MANAGEMENT OF CONTAINERS

Installations must ensure that hazardous waste containers comply with the following standards.

a. Container Handling and Storage.

(1) Containers holding hazardous waste must be in good condition, free from severe rusting, bulging, or structural defects.

(2) Containers used to store hazardous waste, including overpack containers, must be compatible with the materials stored.

b. Management of Containers.

(1) Containers holding hazardous waste must always be closed during storage, except when it is necessary to add or remove waste.

(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.

(3) Containers of flammable liquids must be grounded when transferring flammable liquids from one container to the other.

(4) Containers holding hazardous waste must be marked with a hazardous waste marking.

(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.

c. Secondary Containment Systems. HWAPs and HWSAs with containers must have a secondary containment system that meets the following standards:

(1) Must be sufficiently impervious to contain leaks, spills, and accumulated precipitation until the collected material is detected and removed.

(2) Must have sufficient capacity to contain 10 percent of the volume of stored containers or the volume of the largest container, whichever is greater.

(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 6.c.(1) and 6.c.(2) provided:

(a) The area is sloped or is otherwise designed and operated to drain and remove liquid resulting from precipitation; or

(b) The containers are elevated or are otherwise protected from contact with accumulated liquid.

(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.

d. Incompatible Wastes.

(1) Incompatible wastes and materials must not be placed in the same container.

(2) Hazardous waste must not be placed in an unwashed container that previously held an incompatible waste or material.

(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.

e. 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.

f. 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:

(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 percent 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 percent by weight of the total capacity if the container remains.

(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.

(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.

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 Enclosure K 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 7.c. 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 7.c.

a. Assessment of Existing Tank System Integrity. For each existing tank system that does not have secondary containment meeting the requirements of Paragraph 7.c, 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.

b. 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 ROK 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.

c. Containment and Detection of Releases. To prevent the release of hazardous waste or hazardous constituents from tank systems to the environment, installations must:

(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.

(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.

(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).

(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.

(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.

(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.

d. Operation and Inspection.

(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.

(2) The installation must inspect and log at least once each operating day:

(a) The aboveground portions of the tank system, if any, to detect corrosion or releases of waste.

(b) 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.

(c) 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).

(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.

e. 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 Enclosure L. Installations must immediately:

(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.

(2) Conduct an inspection of the release and based on that inspection:

(a) Prevent further migration of the leak or spill to soil or surface water.

(b) Remove and properly dispose of any contaminated soil or surface water.

(c) Remove free product to the maximum extent possible.

(d) Continue monitoring and mitigating for any additional fire and safety hazards posed by vapors or free products in subsurface structures.

(3) Make required notifications and reports.

f. 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.

8. MANAGEMENT OF USED OIL, BATTERIES, ANTIFEEZER, AND WIPES

Installations must ensure that used oil, batteries, antifreeze, and wipes are managed and disposed of in accordance with the following standards.

a. Used Oil Burned for Energy Recovery. Used oil fuel in compliance with the ROK standards may be burned only in the following devices:

(1) Industrial furnaces.

(2) Boilers that are identified as:

(a) 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.

(b) Utility boilers used to produce electric power, steam, heated or cooled air, or other gases or fluids.

(c) Used oil-fired space heaters, provided that:

1. The heater burns only used oil that the installation generates.

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].

3. The combustion gases from the heater are properly vented to the ambient air.

b. Prohibitions on Dust Suppression or Road Treatment. Installations must not use used oil, hazardous waste, or used oil contaminated with any hazardous waste for dust suppression or road treatment.

c. Disposal 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 3.

d. 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 3.

e. Management of Used Wipes. Used wipes must be characterized in accordance with Paragraph 3. and managed accordingly. Solvent-contaminated wipes may be managed as follows:

(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.

(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.

(3) The conditions in Paragraphs 8.e.(1) and 8.e.(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 enclosure.

9. HAZARDOUS WASTE DISPOSAL

Installations must ensure that hazardous waste is disposed of in accordance with the following standards.

a. Disposal Through DLA Disposition Services. All DoD hazardous waste must be disposed of through the DLA Disposition Services, except as follows:

(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 to best accomplish the installation mission.

(2) A decision must have the concurrence of the DoD Component chain of command to ensure that, if waste is disposed of in ROK, the standards of Paragraph 9.b. have been met and installation contracts and disposal standards are at least as protective as those used by the DLA Disposition Services.

(3) Decisions must be documented in accordance with DoD Component guidelines.

b. Disposal Location. DoD Components must ensure that hazardous waste generated by DoD operations and considered hazardous under either U.S. law or applicable ROK standards is not disposed of in the ROK unless the disposal complies with this manual and is in accordance with any applicable international agreements. If there is no international agreement that grants disposal authority, DoD Components must obtain verification of the waste disposal plan from the ROK authorities through DLA Disposition Services prior to initial receipt of the waste by DLA Disposition Services. The United States 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.

(1) When the requirements of Paragraph 9.b. cannot be met, DoD Components will dispose of hazardous waste in the United States or in another foreign nation where the applicable conditions are met.

(2) The determination of whether particular DoD-generated hazardous waste may be disposed of in ROK will be made by the LEC, in coordination with the Combatant Commander, the Director, DLA, other relevant DoD Component heads, and the chief of the U.S. diplomatic mission, in accordance with Paragraph 9.c.(5).

c. Disposal Procedures.

(1) Pre-Transport. When transporting hazardous waste via commercial transportation on ROK public roads and highways, hazardous waste generators will prepare off-installation hazardous waste shipments in compliance with applicable ROK transportation regulations. Requirements may include placarding, marking, containerization, and labeling. Hazardous waste designated for international transport will be prepared in accordance with applicable international regulations. In the absence of ROK regulations, international standards will be used.

(2) Transportation. When transporting hazardous waste via military vehicle on ROK public roads and highways, generators will ensure compliance with Parts I, II, III, and IV of Defense Transportation Regulation 4500.9-R, applicable international agreements, and ROK transportation regulations.

(3) ROK Transportation Requirements.

(a) Designated wastes containing dust, pesticide or asbestos in the form of small particles must be collected and transported in polyethylene or other equivalent bags (in case of asbestos waste, it must be discarded in either sturdy container of double packed bag with a high-density water-resistant material, so as not to be scattered, after humidity control) to prevent it from being scattered. In this case, in addition to the labeling requirements stated in Paragraph 9.c.(1), vehicles that collect and transport asbestos waste must be marked or displayed with labels on both sides of the cargo bay in red letters on white background, with a size of at least 100 centimeters in width and 50 centimeters in height.

(b) For collecting and transporting designated wastes in liquid form, a designated tank, container, pipe, or equivalent equipment that is leakage-proof must be used, and there must be no risk of mixing or flow.

(c) Designated wastes must be collected and transported by the following vehicles:

1. Designated wastes in solid state must be collected and transported in an enclosed vehicle. However, when collected and transported in a sealed container exclusively used for collection, it may also be collected and transported by a vehicle with barriers to prevent spill or leakage of leachate, and sealing covers made of metals, plastics, or other ROK Ministry of Environment (MOE) selected and announced materials that can prevent scattering, leakage, and odor.

2. Designated wastes in liquid state must be transported by a tank truck. However, when collected and transported in a sealed container exclusively used for collection, it may also be collected and transported by a vehicle with barriers to prevent spill or leakage of leachate, and sealing covers made of metals, plastics, or other ROK MOE selected and announced materials that can prevent scattering, leakage, and odor.

3. In the case of the waste recognized by the competent Mayor/Do Governor or the head of a local environmental agency as being difficult to collect and transport in an enclosed vehicle or a vehicle with a sealed cover because the length of the waste, such as a waste transformer, exceeds the maximum length of the vehicle loading container, the loaded waste may be collected and transported by vehicles covered with material made of synthetic resin, etc. In this case, necessary measures must be taken, such as covering and fixing the waste in an airtight state using synthetic resin, etc. so that the waste does not leak or scatter during the collection and transportation process.

(d) Vehicles used for designated waste collection and transport must be painted yellow. However, this does not apply to vehicles for temporary use.

(e) On both sides of the cargo bay of the vehicles collecting and transporting designated wastes, the company name and contact number of the designated waste collection or transportation vehicle must be marked or displayed with labels in a way that is noticeable. The marking or label shall be at least 100 centimeters in width and 50 centimeters in height and the letters must be in black, but the size of the marking or label may be adjusted by vehicle size if the head of waste collection/transport permit-issuing agency approves. The same shall be applied to the vehicles collecting and transporting designated wastes for temporary use also.

(f) Waste Mercury and its compounds must not be mixed with other waste when stored in a container and must be collected and must be collected and transported according to the following:

1. Waste Mercury and its compounds must be sealed and double packed with high-density, water-resistant materials such as polyethylene and transported by inserting cushioning materials on the bottom and around the walls of the container to protect damage.

2. Wastes consisting of mercury must be transported in a mercury-only container that meets the standards announces by the head of the National Institute of Environmental Sciences

3. Waste treatment residues containing Mercury must be collected and transported by double-packaging with high density and water-resistant materials such as polyethylene.

(g) Even when using military vehicles to transport hazardous/designated wastes on public roads or highways in the Republic of Korea, all the requirements mentioned above must be complied with.

(4) Manifesting. All hazardous wastes (HW) and designated wastes (DW) leaving USFK installations and activities must be accompanied by a Uniform Hazardous Waste Manifest, EPA Form 8700-22 (or updates thereto) for transportation over public roadways in ROK. When more than four (4) discrete waste streams are transported on a single conveyance vehicle, Uniform Hazardous Waste Manifest Continuation Sheet(s), EPA Form 8700-22A (or updates thereto) will be additionally used as needed to reflect all HW/DW being transported. EPA Forms 8700-22 and 8700-22A shall replace DD Forms 1348-1A and 1348-2 as shipping documents for off-installation transportation of HW/DW and are used to document a complete audit trail from the generating point of origin to the designated facility providing ultimate disposal or recycling. If the ROK government should introduce and require the use of Host Nation (HN) shipping documents, DLA, its contractors, and USFK generators shall transition to the use of such documents accordingly. DLA contractors shall maintain registry and compliance with ROK electronic information processing systems as required under ROK

laws and regulations. DLA contractors shall ensure all shipping documents are complete and accurate prior to commencing transportation. Uniform Hazardous Waste Manifest instructions and sample EPA Forms 8700-22 and 8700-22A may be found at: https://www.epa.gov/hwgenerators/uniform-hazardous-waste-manifest-instructions-sample-form-and-continuation-sheet.

(5) Audit Trail. Generators must maintain an audit trail of HW/DW from the point of generation to disposal.

(a) Generators using DLA Disposition Services will receive a copy of the initial pickup manifest, signed by the Generator and transporter, at the time of waste removal from the contractor. The Generator will then receive a copy of the final disposal manifest, signed by the designated facility representative acknowledging receipt of the waste. 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.

(b) 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.

(6) Disposal in ROK.

(a) 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 ROK, the LEC must also consider whether the means of treatment and containment technologies employed in the ROK program, as enacted and enforced, effectively mitigate the hazards of such waste to human health and the environment. They must consider whether the ROK program includes:

1. An effective system for tracking the movement of hazardous waste to its ultimate destination.

2. An effective system for granting authorization or permission to those engaged in the collection, transportation, storage, treatment, and disposal of hazardous waste.

3. Appropriate standards and limitations on the methods that may be used to treat and dispose of hazardous waste.

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.

(b) The LEC must also be satisfied, either through reliance on the ROK regulatory system or provisions in the disposal contracts, that:

1. Persons and facilities in the waste management process have demonstrated the appropriate level of training and reliability.

2. Effective inspections, monitoring, and recordkeeping have taken place.

3. ROK facilities that store, treat, or dispose of DoD-generated waste have been evaluated and approved by the ROK government as being in compliance with their regulatory requirements. This evaluation and approval may consist of having a valid permit or ROK equivalent for the hazardous waste that will be handled.

(7) 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.

(8) Land Disposal. Installations must not dispose of hazardous waste in land disposal facilities on the installation. DLA Disposition Services may dispose of hazardous waste through qualified land disposal facilities that have:

(a) Location restrictions regarding floodplains, wetlands, aquifers, seismic zones, and other unstable areas.

(b) 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:

1. A top liner designed and constructed of materials (e.g., a geomembrane) to prevent the migration of hazardous constituents into such liner.

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/sec [3.94×10^{-8} inches/sec].

(c) 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].

(d) 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:

1. Constructed with a bottom slope of 1 percent or more.

2. Constructed of granular drainage materials with a hydraulic conductivity of 1×10^{-2} cm per second [3.94×10^{-3} inches/sec] 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} m^2/sec [3.2×10^{-4} ft^2/sec] or more.

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.

4. Designed and operated to minimize clogging.

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.

(e) A groundwater monitoring program capable of determining the facility's impact on the quality of water in the aquifers underlying the facility.

(9) Underground Injection Wells. Installations must not dispose of hazardous waste by underground injection.

d. 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.

(1) Incinerators used to dispose of hazardous waste must be licensed or permitted by a competent ROK authority or approved by the LEC. This license, permit, or approval must comply with the standards listed in Paragraph 9.d.(2).

(2) A license, permit, or LEC approval 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 9.d.(2)(a) or 9.d.(2)(b) is acceptable.

(a) 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.

(b) The incinerator has demonstrated, as a condition for obtaining a license, permit, or LEC approval, 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 ROK authority or the LEC uses the provided information to conclude that the incinerator will effectively destroy the principal organic hazardous constituents of each waste to be burned.

e. Treatment. Treatment technologies may be used to reduce the volume or hazardous characteristics of wastes. Wastes categorized as hazardous on the basis of Paragraph 1 of Appendix A, 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 under any other paragraph of Appendix 5A will continue to be managed as hazardous waste under the standards of this manual, including those for disposal. The treatment technologies listed in Paragraphs 9.e.(1) through 9.e.(5) are provided as baseline treatment and disposal technologies for use in determining suitability of ROK disposal alternatives. These technologies should not be implemented without consultation with the LEC, or the Combatant Commander if there is no LEC.

(1) Organics.

(a) Incinerations. Incineration in accordance with the requirements of Paragraph 9.d.(1).

(b) 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.

(c) 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.

(d) 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.

(e) Chemical Degradation. The wastes are chemically degraded in such a manner to destroy hazardous constituents and control harmful emissions.

(2) Heavy Metals.

(a) 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 landfill environment.

(b) 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.

(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 1.c. of Appendix A

(4) Corrosives. Corrosive wastes as defined in Paragraph 1.b. of Appendix A 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.

(5) Batteries. Mercury, nickel-cadmium, lithium, and lead-acid batteries will be processed in accordance with Paragraphs 9.e.(2)(a) or 9.e.(2)(b) to stabilize, fix, or recover heavy metals, as appropriate, and in accordance with Paragraph 9.e.(4) to neutralize any corrosives before disposal.

f. 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.

10. <u>SPILL PREVENTION AND RESPONSE PLAN</u>

a. 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 Enclosure L.

b. 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.

11. <u>RECORDKEEPING REQUIREMENTS</u>

Installations must ensure that the following records are maintained.

a. HWSAs. Maintain all of the records identified in Paragraphs 11.c.(1) through 11.c.(5).

b. HWAPs. Maintain the records identified in Paragraphs 11.c.(1), 11.c.(4), and 11.c.(5)

c. Records.

(1) Turn-in Documents. Turn-in documents (e.g., DD 1348-1A) or manifests must be maintained for 3 years.

(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:

(a) Name and address of generator.

(b) Description and hazard class of the hazardous waste.

(c) Number and types of containers.

(d) Quantity of hazardous waste.

(e) Date stored.

(f) Storage location.

(g) Disposition data, including dates received, sealed, and transported, and transporter used.

(3) Inspection Logs. Records of inspections should be maintained for a period of 3 years.

(4) Manifests. Manifests of incoming and outgoing hazardous wastes will be retained for a period of 3 years.

(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.

APPENDIX A TO ENCLSORUE O
CHARACTERISTICS OF HAZARDOUS WASTES AND LISTS OF HAZARDOUS WASTES AND HAZARDOUS SUBSTANCES

1. CHARACTOERISTICS OF HAZARDOUS WASTES.

a. Ignitability.

(1) A solid waste exhibits the characteristic of ignitability if a representative sample of the waste has any of the following properties:

(a) It is a liquid, other than an aqueous solution containing less than 24 percent alcohol by volume and has a flash point less than 60°C (140°F), as determined by a:

1. Pensky-Martens Closed Cup Tester, using the test method specified in American Society for Testing and Materials Standard D-93-79 or D-93-80;

2. Setaflash Closed Cup Tester, using the test method specified in American Society for Testing and Materials Standard D-3278-78; or

3. An equivalent test method.

(b) It is not a liquid and is capable, under standard temperature and pressure, of causing fire through friction, absorption of moisture, or spontaneous chemical changes and, when ignited, burns so vigorously and persistently that it creates a hazard.

(c) It is an ignitable compressed gas as determined by appropriate test methods.

(d) It is an oxidizer.

(2) A solid waste that exhibits the characteristic of ignitability has the Environmental Protection Agency (EPA) Hazardous Waste Number (HW No.) D001.

b. Corrosivity.

(1) A solid waste exhibits the characteristic of corrosivity if a representative sample of the waste has either of the following properties:

(a) It is aqueous and has a pH less than or equal to 2, or greater than or equal to 12.5, as determined by a pH meter.

(b) It is a liquid and corrodes steel (Society of Automotive Engineers Standard 1020) at a rate greater than 6.35 millimeters [0.250 inches] per year at a test temperature of 55 °C [130°F] as determined by Method 1110A in EPA SW-846.

(2) A solid waste that exhibits the characteristic of corrosivity has the EPA HW No. D002.

c. Reactivity.

(1) A solid waste exhibits the characteristic of reactivity if a representative sample of the waste has any of the following properties:

(a) It is normally unstable and readily undergoes violent change without detonating.

(b) It reacts violently with water.

(c) It forms potentially explosive mixtures with water.

(d) When mixed with water, it generates toxic gases, vapors, or fumes in a quantity sufficient to present a danger to human health or the environment.

(e) It is a cyanide or sulfide-bearing waste that, when exposed to pH conditions between 2 and 12.5, can generate toxic gases, vapors, or fumes in a quantity sufficient to present a danger to human health or the environment.

(f) It is capable of detonation or explosive reaction if it is subjected to a strong initiating source or if heated under confinement.

(g) It is readily capable of detonation or explosive decomposition or reaction at standard temperature and pressure.

(h) It is a forbidden explosive.

(2) A solid waste that exhibits the characteristic of reactivity has the EPA HW No. D003.

d. Toxicity.

(1) A solid waste exhibits the characteristic of toxicity if, using the Toxicity Characteristic Leaching Procedure, the extract from a representative sample of the waste contains any of the contaminants listed for the toxicity characteristic in Table O-1, in accordance with Section 261.24 of Title 40, Code of Federal Regulations (CFR) at the concentration equal to or greater than the respective value given in that table. Where the waste contains less than 0.5 percent filterable solids, the waste itself is considered to be the extract for the purpose of this section.

(2) A solid waste that exhibits the characteristic of toxicity has the HW No. specified in Table O-1, which corresponds to the toxic contaminant causing it to be hazardous.

Table O-1. Maximum Concentration of Contaminants for the Toxicity Characteristic

HW NO.¥	Contaminant	CAS NO.‡	Regulatory level (mg/L)
D004	Arsenic	7440-38-2	5.0
D005	Barium	7440-39-3	100.0
D018	Benzene	71-43-2	0.5
D006	Cadmium	7440-43-9	1.0
D019	Carbon tetrachloride	56-23-5	0.5
D020	Chlordane	57-74-9	0.03
D021	Chlorobenzene	108-90-7	100.60
D022	Chloroform	67-66-3	6.0
D007	Chromium	7440-47-3	5.0
D023	o-Cresol	95-48-7	200.00[1]
D024	m-Cresol	108-39-4	200.0[1]
D025	p-Cresol	106-44-5	200.0[1]
D026	Cresol		200.0[1]
D016	2,4-D	94-75-7	10.0
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[2]
D012	Endrin	72-20-8	0.02
D031	Heptachlor and its exoxide	76-44-8	0.008
D032	Hexachlorobenzene	118-74-1	0.13[2]
D033	Hexachlorobutadiene	87-68-3	0.5
D034	Hexachloroethane	67-72-1	3.0

Table O-1. Maximum Concentration of Contaminants for the Toxicity Characteristic

HW NO.¥	Contaminant	CAS NO.‡	Regulatory level (mg/L)
D008	Lead	7439-92-1	5.0
D013	Lindane	58-89-9	0.4
D009	Mercury	7439-97-6	0.2
D014	Methoxychlor	72-43-5	10.0
D035	Methyl ethyl ketone	78-93-3	200.0
D036	Nitrobenzene	98-95-3	2.0
D037	Pentrachlorophenol	87-86-5	100.0
D038	Pyridine	110-86-1	5.0[2]
D010	Selenium	7782-49-2	1.0
D011	Silver	7440-22-4	5.0
D039	Tetrachloroethylene	127-18-4	0.7
D015	Toxaphene	8001-35-2	0.5
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
D017	2,4,5-TP (Silvex)	93-72-1	1.0
D043	Vinyl chloride	75-01-4	0.2

¥ Hazardous wastes number

‡ Chemical Abstracts Service number

[1] If o-, m-, and p-Cresol concentrations cannot be differentiated, the total cresol (D026) concentration is used. The regulatory level of total cresol is 200 milligrams per liter (mg/L).

[2] Quantitation limit is greater than the calculated regulatory level. The quantitation limit therefore becomes the regulatory level.

2. LIST OF HAZARDOUS WASTES.

a. General.

(1) A solid waste is a hazardous waste if it is identified in Table O-2.

Table O-2. List of Hazardous Wastes and Hazardous Substances

HW and HS¥	CAS No.‡	HW No.β	Reportable Quantity (RQ)	
			lb§	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

Table O-2. List of Hazardous Wastes and Hazardous Substances

HW and HS¥	CAS No.‡	HW No.β	Reportable Quantity (RQ)	
			lb§	Kg
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
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

Table O-2. List of Hazardous Wastes and Hazardous Substances

HW and HS¥	CAS No.‡	HW No.β	Reportable Quantity (RQ)	
			lb§	Kg
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	-	-	&	&

Table O-2. List of Hazardous Wastes and Hazardous Substances

HW and HS[¥]	CAS No.[‡]	HW No.[β]	Reportable Quantity (RQ)	
			lb[§]	Kg
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
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

Table O-2. List of Hazardous Wastes and Hazardous Substances

HW and HS¥	CAS No.‡	HW No.β	Reportable Quantity (RQ)	
			lb§	Kg
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-	115-32-2	-	10	4.5

Table O-2. List of Hazardous Wastes and Hazardous Substances

HW and HS¥	CAS No.‡	HW No.β	Reportable Quantity (RQ)	
			lb§	Kg
.alpha.-4-chlorophenyl)-.alpha.-(trichloromethyl)-				
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
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

Table O-2. List of Hazardous Wastes and Hazardous Substances

HW and HS¥	CAS No.‡	HW No.β	Reportable Quantity (RQ)	
			lb§	Kg
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

Table O-2. List of Hazardous Wastes and Hazardous Substances

HW and HS¥	CAS No.‡	HW No.β	Reportable Quantity (RQ)	
			lb§	Kg
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
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

Table O-2. List of Hazardous Wastes and Hazardous Substances

HW and HS¥	CAS No.‡	HW No.β	Reportable Quantity (RQ)	
			lb§	Kg
Calcium hypochlorite	7778-54-3	-	10	4.5
Camphechlor	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

Table O-2. List of Hazardous Wastes and Hazardous Substances

HW and HS¥	CAS No.‡	HW No.β	Reportable Quantity (RQ)	
			lb§	Kg
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
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

Table O-2. List of Hazardous Wastes and Hazardous Substances

HW and HS[¥]	CAS No.[‡]	HW No.[β]	Reportable Quantity (RQ)	
			lb[§]	Kg
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	-	-	&	&

Table O-2. List of Hazardous Wastes and Hazardous Substances

HW and HS¥	CAS No.‡	HW No.β	Reportable Quantity (RQ)	
			lb§	Kg
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
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

Table O-2. List of Hazardous Wastes and Hazardous Substances

HW and HS¥	CAS No.‡	HW No.β	Reportable Quantity (RQ)	
			lb§	Kg
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

Table O-2. List of Hazardous Wastes and Hazardous Substances

HW and HS¥	CAS No.‡	HW No.β	Reportable Quantity (RQ)	
			lb§	Kg
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
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

Table O-2. List of Hazardous Wastes and Hazardous Substances

HW and HS¥	CAS No.‡	HW No.β	Reportable Quantity (RQ)	
			lb§	Kg
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

Table O-2. List of Hazardous Wastes and Hazardous Substances

HW and HS¥	CAS No.‡	HW No.β	Reportable Quantity (RQ)	
			lb§	Kg
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
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

Table O-2. List of Hazardous Wastes and Hazardous Substances

HW and HS¥	CAS No.‡	HW No.β	Reportable Quantity (RQ)	
			lb§	Kg
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

Table O-2. List of Hazardous Wastes and Hazardous Substances

HW and HS¥	CAS No.‡	HW No.β	Reportable Quantity (RQ)	
			lb§	Kg
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
1,4-Dioxane	123-91-1	U108	100	45.4
1,2-Diphenylhydrazine	122-66-7	U109	10	4.5
Diphenylhydrazine	-	-	&	&
Diphosphoramide, 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

Table O-2. List of Hazardous Wastes and Hazardous Substances

HW and HS¥	CAS No.‡	HW No.β	Reportable Quantity (RQ)	
			lb§	Kg
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

Table O-2. List of Hazardous Wastes and Hazardous Substances

HW and HS¥	CAS No.‡	HW No.β	Reportable Quantity (RQ)	
			lb§	Kg
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
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

Table O-2. List of Hazardous Wastes and Hazardous Substances

HW and HS¥	CAS No.‡	HW No.β	Reportable Quantity (RQ)	
			lb§	Kg
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

Table O-2. List of Hazardous Wastes and Hazardous Substances

HW and HS¥	CAS No.‡	HW No.β	Reportable Quantity (RQ)	
			lb§	Kg
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-a,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
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

Table O-2. List of Hazardous Wastes and Hazardous Substances

HW and HS¥	CAS No.‡	HW No.β	Reportable Quantity (RQ)	
			lb§	Kg
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
Isofluorphate	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

Table O-2. List of Hazardous Wastes and Hazardous Substances

HW and HS[¥]	CAS No.[‡]	HW No.[β]	Reportable Quantity (RQ)	
			lb[§]	Kg
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
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

Table O-2. List of Hazardous Wastes and Hazardous Substances

HW and HS¥	CAS No.‡	HW No.β	Reportable Quantity (RQ)	
			lb§	Kg
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

Table O-2. List of Hazardous Wastes and Hazardous Substances

HW and HS¥	CAS No.‡	HW No.β	Reportable Quantity (RQ)	
			lb§	Kg
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
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

Table O-2. List of Hazardous Wastes and Hazardous Substances

HW and HS¥	CAS No.‡	HW No.β	Reportable Quantity (RQ)	
			lb§	Kg
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-Methyllactonitrile	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

Table O-2. List of Hazardous Wastes and Hazardous Substances

HW and HS[¥]	CAS No.[‡]	HW No.[β]	Reportable Quantity (RQ)	
			lb[§]	Kg
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
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

Table O-2. List of Hazardous Wastes and Hazardous Substances

HW and HS¥	CAS No.‡	HW No.β	Reportable Quantity (RQ)	
			lb§	Kg
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

Table O-2. List of Hazardous Wastes and Hazardous Substances

HW and HS¥	CAS No.‡	HW No.β	Reportable Quantity (RQ)	
			lb§	Kg
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
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 OsO4 (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

Table O-2. List of Hazardous Wastes and Hazardous Substances

HW and HS¥	CAS No.‡	HW No.β	Reportable Quantity (RQ)	
			lb§	Kg
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

Table O-2. List of Hazardous Wastes and Hazardous Substances

HW and HS¥	CAS No.‡	HW No.β	Reportable Quantity (RQ)	
			lb§	Kg
Phosphorus	7723-14-0	-	1	0.454
Phosphorus oxychloride	10025-87-3	-	1,000	454
Phosphorus trichloride	7719-12-2	-	1,000	454
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

Table O-2. List of Hazardous Wastes and Hazardous Substances

HW and HS¥	CAS No.‡	HW No.β	Reportable Quantity (RQ)	
			lb§	Kg
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-pyrrolidinyl)-,(S)-	54-11-5	P075	100	45.4

Table O-2. List of Hazardous Wastes and Hazardous Substances

HW and HS¥	CAS No.‡	HW No.β	Reportable Quantity (RQ)	
			lb§	Kg
Quinoline	91-22-5	-	5,000	2,270
Quinone	106-51-4	U197	10	4.5
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

Table O-2. List of Hazardous Wastes and Hazardous Substances

HW and HS¥	CAS No.‡	HW No.β	Reportable Quantity (RQ)	
			lb§	Kg
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

Table O-2. List of Hazardous Wastes and Hazardous Substances

HW and HS¥	CAS No.‡	HW No.β	Reportable Quantity (RQ)	
			lb§	Kg
Strychnine, sulfate	60-41-3	-	10	4.5
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

Table O-2. List of Hazardous Wastes and Hazardous Substances

HW and HS¥	CAS No.‡	HW No.β	Reportable Quantity (RQ)	
			lb§	Kg
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
Thallous carbonate	6533-73-9	U215	100	45.4
Thallous chloride	7791-12-0	U216	100	45.4
Thallous 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 O-2. List of Hazardous Wastes and Hazardous Substances

HW and HS¥	CAS No.‡	HW No.β	Reportable Quantity (RQ)	
			lb§	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 (TiCl4) (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

Table O-2. List of Hazardous Wastes and Hazardous Substances

HW and HS¥	CAS No.‡	HW No.β	Reportable Quantity (RQ)	
			lb§	Kg
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
Trichloromethanesulfenyl 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 O-2. List of Hazardous Wastes and Hazardous Substances

HW and HS¥	CAS No.‡	HW No.β	Reportable Quantity (RQ)	
			lb§	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 (TiCl4) (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

Table O-2. List of Hazardous Wastes and Hazardous Substances

HW and HS¥	CAS No.‡	HW No.β	Reportable Quantity (RQ)	
			lb§	Kg
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
Trichloromethanesulfenyl 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

Table O-2. List of Hazardous Wastes and Hazardous Substances

HW and HS¥	CAS No.‡	HW No.β	Reportable Quantity (RQ)	
			lb§	Kg
Uranyl acetate	541-09-3	-	100	45.4
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

Table O-2. List of Hazardous Wastes and Hazardous Substances

HW and HS¥	CAS No.‡	HW No.β	Reportable Quantity (RQ)	
			lb§	Kg
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	-	D002	100	45.4

Table O-2. List of Hazardous Wastes and Hazardous Substances

HW and HS¥	CAS No.‡	HW No.β	Reportable Quantity (RQ)	
			lb§	Kg
characteristic of corrosivity				
Unlisted hazardous wastes characteristic of reactivity	-	D003	100	45.4
UNLISTED HAZARDOUS WASTES CHARACTERISTICS 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

Table O-2. List of Hazardous Wastes and Hazardous Substances

HW and HS¥	CAS No.‡	HW No.β	Reportable Quantity (RQ)	
			lb§	Kg
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

Table O-2. List of Hazardous Wastes and Hazardous Substances

HW and HS¥	CAS No.‡	HW No.β	Reportable Quantity (RQ)	
			lb§	Kg
(f) Chlorinated fluorocarbons	-	-	5,000	2270
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

Table O-2. List of Hazardous Wastes and Hazardous Substances

HW and HS¥	CAS No.‡	HW No.β	Reportable Quantity (RQ)	
			lb§	Kg
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
Wastes from production or use of pentachlorophenol or	-	F021	1	0.454

Table O-2. List of Hazardous Wastes and Hazardous Substances

HW and HS¥	CAS No.‡	HW No.β	Reportable Quantity (RQ)	
			lb§	Kg
intermediates for derivatives				
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
Wastewate Hazardous Waste Determinationrs, 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)	-	F038	1	0.454

Table O-2. List of Hazardous Wastes and Hazardous Substances

HW and HS¥	CAS No.‡	HW No.β	Reportable Quantity (RQ)	
			lb§	Kg
oil/water/solids separation sludge				
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
Bottom stream from wastewater stripper in acrylonitrile production	-	K011	10	4.54
Bottom stream from acetonitrile column in acrylonitrile production	-	K013	10	4.54

Table O-2. List of Hazardous Wastes and Hazardous Substances

HW and HS¥	CAS No.‡	HW No.β	Reportable Quantity (RQ)	
			lb§	Kg
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

Table O-2. List of Hazardous Wastes and Hazardous Substances

HW and HS¥	CAS No.‡	HW No.β	Reportable Quantity (RQ)	
			lb§	Kg
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
Wastewaster/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
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

Table O-2. List of Hazardous Wastes and Hazardous Substances

HW and HS¥	CAS No.‡	HW No.β	Reportable Quantity (RQ)	
			lb§	Kg
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 trinitrotolune 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

Table O-2. List of Hazardous Wastes and Hazardous Substances

HW and HS¥	CAS No.‡	HW No.β	Reportable Quantity (RQ)	
			lb§	Kg
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
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

Table O-2. List of Hazardous Wastes and Hazardous Substances

HW and HS¥	CAS No.‡	HW No.β	Reportable Quantity (RQ)	
			lb§	Kg
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

Table O-2. List of Hazardous Wastes and Hazardous Substances

HW and HS¥	CAS No.‡	HW No.β	Reportable Quantity (RQ)	
			lb§	Kg
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
Product washwaters from production of dinitrotoluene vianitration of toluene	-	K111	10	4.54
Reaction by-product water from drying in toluenediamineproduction 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

Table O-2. List of Hazardous Wastes and Hazardous Substances

HW and HS¥	CAS No.‡	HW No.β	Reportable Quantity (RQ)	
			lb§	Kg
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 coalor 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	-	K145	1	0.454

Table O-2. List of Hazardous Wastes and Hazardous Substances

HW and HS[¥]	CAS No.[‡]	HW No.[β]	Reportable Quantity (RQ)	
			lb[§]	Kg
by-products				
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
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

Table O-2. List of Hazardous Wastes and Hazardous Substances

HW and HS¥	CAS No.‡	HW No.β	Reportable Quantity (RQ)	
			lb§	Kg
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

¥ Hazardous waste and hazardous substance

‡ Chemical Abstracts Service number

β Hazardous waste number

§ Pound

& = Indicates that no RQ is assigned to this generic or broad class, although the

Table O-2. List of Hazardous Wastes and Hazardous Substances

HW and HS¥	CAS No.‡	HW No.β	Reportable Quantity (RQ)	
			lb§	Kg
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 Enclosure L) [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 O-4.				

(2) Each listed waste was listed because of one or more of the hazard codes shown in Table O-3.

Table O-3. Hazard Code

TYPE OF WASTE	HAZARD CODE
Ignitable waste	(I)
Corrosive waste	(C)
Reactive waste	(R)
Toxicity characteristic waste	(E)
Acute hazardous waste	(A)
Toxic waste	(T)

(3) Each listed hazardous waste is assigned an HW No.

b. Hazardous Wastes from Nonspecific Sources.

The solid wastes in Table O-4 are listed hazardous waste from nonspecific sources.

These hazardous wastes are designated with an “F.”

Table O-4. List of Hazardous Wastes from Nonspecific Sources

HW NO.	HAZARDOS 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 ten percent 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 percent 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 percent 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 percent 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)

Table O-4. List of Hazardous Wastes from Nonspecific Sources

HW NO.	HAZARDOS WASTES	HAZARD CODE[A]
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)

Table O-4. List of Hazardous Wastes from Nonspecific Sources

HW NO.	HAZARDOS WASTES	HAZARD CODE[A]
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)
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	(H)

Table O-4. List of Hazardous Wastes from Nonspecific Sources

HW NO.	HAZARDOS WASTES	HAZARD CODE[A]
	from pre-purified 2,4,5- trichlorophenol as the sole component).	
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)

Table O-4. List of Hazardous Wastes from Nonspecific Sources

HW NO.	HAZARDOS WASTES	HAZARD CODE[A]
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)
[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.		

c. Hazardous Wastes from Specific Sources.

The solid wastes listed in Table O-2, annotated "K" as the first character of the HW No. column, are listed hazardous wastes from specific sources.

d. Discarded Commercial Chemical Products, Off-Specification Species, Container Residues, and Spill Residue.

(1) The commercial chemical product or manufacturing chemical intermediate generic name listed in Table O-2 refers to a chemical substance that is manufactured or formulated for commercial or manufacturing use. These chemicals and chemical intermediates include the commercially pure grade of the chemical, any technical grades of the chemical that are produced or marketed, and all formulations in which the chemical is the sole active ingredient. It does not refer to a manufacturing process waste that contains any of the substances listed in Table O-2, annotated “P” or “U” as the first character in the HW No., since it is considered used. This manufacturing process waste is deemed a hazardous waste even if containing a substance listed in Table 3, annotated “P” or “U” as the first character in the HW No., when it exhibits a characteristic of hazardous waste or is a listed hazardous waste from a nonspecific source identified in Table O-4.

(2) Residue intended for discard is a hazardous waste unless it is being beneficially used or reused; legitimately recycled or reclaimed; or being accumulated, stored, transported or treated before such use, reuse, recycling, or reclamation. An example of a legitimate re-use of the residue would be where the residue remains in the container and the container is used to hold the same commercial chemical product or manufacturing chemical intermediate it previously held. An example of the discard of the residue would be where the drum is sent to a drum reconditioner who reconditions the drum but discards the residue.

(3) The following materials or items are hazardous wastes if and when they are discarded or intended to be discarded; mixed with waste oil, used oil, or other material and applied to the land for dust suppression or road treatment; otherwise applied to the land in lieu of their original intended use or contained in products that are applied to the land in lieu of their original intended use; or, in lieu of their original intended use, produced for use as (or as a component of) a fuel, distributed for use as a fuel, or burned as a fuel:

(a) Any commercial chemical product or manufacturing chemical intermediate having the generic name listed in Table O-2, annotated “P” or “U” as the first character in the HW No.

(b) Any off-specification commercial chemical product or manufacturing chemical intermediate that, if it met specifications, would have the generic name listed in Table 3, annotated “P” or “U” as the first character in the HW No.

(c) Any residue remaining in a container or in an inner liner removed from a container that has held any commercial chemical product or manufacturing chemical intermediate having the generic name listed in Table O-2, annotated “P” or “U” as the first character in the HW No., unless the container is empty.

(d) Any residue or contaminated soil, water, or other debris resulting from the cleanup of a spill into or on any land or water of any commercial chemical product or manufacturing chemical intermediate having the generic name listed in Table O-2, annotated “P” or “U” as the first character in the HW No. Any residue or contaminated soil, water, or other debris resulting from the cleanup of a spill into or on any land or water of any off-specification chemical product and manufacturing chemical intermediate that, if it met specifications, would have the generic name listed in Table O-2, annotated “P” or “U” as the first character in the HW No.

(e) The commercial chemical products, manufacturing chemical intermediates or off- specification commercial chemical products or manufacturing chemical intermediates referred to in Table O-2, annotated “P” as the first character in the HW No. are identified as acute hazardous waste (H). For the convenience of the regulated community, the primary hazardous properties of these materials have been indicated by the letters “T” (Toxicity), and “R” (Reactivity). Absence of a letter indicates that the compound is only listed for acute toxicity. These wastes and their corresponding HW numbers are listed in Table O-2, annotated “P” as the first character in the HW No.

(f) The commercial chemical products, manufacturing chemical intermediates, or off- specification commercial chemical products referred to in Table O-2 are identified as toxic wastes (T), unless otherwise designated. For the convenience of the regulated community, the primary hazardous properties of these materials are designated with the letter “T” (Toxicity), “R” (Reactivity), “I” (Ignitability), and “C” (Corrosivity).

Table O-5. 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

Table O-5. Maximum Concentration of Contaminants for Non-Wastewater

HW NO.	Contaminant	CAS NO.	Regulatory level (mg/L)
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.

3. ROK DESIGNATED WASTES.

a. A solid waste is a ROK designated waste if it is identified in Table O-6.

Table O-6. List of ROK Designated Wastes

Types of Designated Waste		Description
Waste generated at specific facilities		
Synthetic polymer compounds	Synthetic resins	Excluding those in solid state
	Synthetic rubbers	

Table O-6. List of ROK Designated Wastes

Types of Designated Waste		Description
Sludge	Wastewater treatment sludge	Water content less than 95% or solids content greater than 5% and exceeding regulatory levels in Table O-7.
	Manufacturing process sludge	Water content less than 95% or solids content greater than 5% and exceeding regulatory level in Table O-7.
Pesticides		It is limited to those generated at the manufacturing and sales establishment of pesticide.
Waste corrosives		
Acids		Liquid waste with a hydrogen ion concentration index is 2.0 or less.
Alkalis		Liquid waste with a hydrogen ion concentration index is 2.0 or less including potassium hydroxide and sodium hydroxide.
Waste containing hazardous substances		
Mine tailing		It is limited to those exceeding regulatory levels in Table O-7 but excluding blast furnace slag using iron ore.
Dust		It is limited to those collected at air pollution prevention facilities and exceeding regulatory levels in Table O-7, but those generated at incineration facilities are excluded.
Foundry and blasting sands		Exceeding regulatory levels in Table O-7
Refractory materials and glazed pottery pieces before re-firing		
Incineration ash		
Stabilization or solidification wastes		
Catalysts		
Sorbents		Including waste soil and sand used for refinery of mineral oil, animal oil and vegetable oil, exceeding regulatory levels in Table O-7

Table O-6. List of ROK Designated Wastes

Types of Designated Waste	Description
Waste organic solvents	
Halogenated solvents	Wastes containing 5 % or more by weight of Dichloromethane, Trichloromethane, Tetrachloromethane, Dichlorodifluoromethane, Trichlorofluoromethane, Dichloroethane, Trichloroethane, Trichlorotrifluoroethane, Trichloroethylene, Tetrachloroethylene, Chlorobenzene, Dichlorobenzene, Monochlorophenol, Dichlorophenol, 1,1-Dichloroethylene, 1,3-Dichloropropene, or, 1,1,2-Trichloro-1,2,2-trifluroethane
Other waste organic solvents	
Waste paint and lacquer	
Mixture of paint, lacquer, or organic solvent	Waste generated at recycling facilities, paint and lacquer manufacturing facilities, or painting facilities with a volume of 5 cubic meters or more or power of 3 horsepower or more
Mixture of paint and organic solvent to remove the paint remaining in the paint storage container	
Paint storage container	Excluding those in which the paint remaining in the container is dried and the residual amount does not exceed 6mm from the bottom of the container
Waste oils	
Waste oils	It is limited to those contains 5% or more oil content but excluding wastes containing Polychlorinated Biphenyls (PCBs), waste cooking oil and its residues, and waste sorbents.
Waste asbestos containing materials (ACMs)	
ACMs generated from building demolition	Products with a dry solids content of

Table O-6. List of ROK Designated Wastes

Types of Designated Waste	Description
	1% or more of asbestos
ACMs generated from manufacturing process	Debris and dust collected from manufacturing process
Items used for asbestos abatement	Floor vinyl sheet, respirator, workwear, etc.
Waste containing Polychlorinated Biphenyls (PCBs)	
Liquid wastes containing PCBs	It is limited to 2 milligrams per liter of PCBs or more.
Wastes containing PCBs other than liquid	It is limited to 0.003 milligrams per 1 liter of PCBs or more in leachate.
Waste toxic substances	
Waste Toxic Substances	It is limited to the case of disposing of toxic substances under Article 2, Item 2 of the Chemical Substances Control Act.
Medical Wastes [a]	
Waste Mercury	
Wastes containing Mercury	Lamps containing Mercury and its compounds excluding fluorescent lamp, measuring instruments (e.g., thermometer, sphygmomanometer, and thermometer), batteries, etc.
Wastes consisting of Mercury	It is limited to Mercury and its compounds separated from waste containing Mercury.
Waste treatment residues containing Mercury	Among those generated from the process of treating wastes containing Mercury and recycling waste fluorescent lamps, it is limited to those containing 0.005 mg per liter or more of mercury and its compounds as a result of the ROK leachate test method.
[a] See Enclosure P.	

b. The toxic substances contained in designated waste are listed in Table O-7.

Table O-7. List of ROK Designated Wastes

Types of designated waste	Toxic substances	Regulatory level	
		Value	Unit
Sludge and waste sorbent	Lead and its compounds	3	mg/L [a]
	Copper and its compounds	3	mg/L [a]
	Arsenic and its compounds	1.5	mg/L [a]
	Mercury and its compounds	0.005	mg/L [a]
	Cadmium and its compounds	0.3	mg/L [a]
	Hexavalent chromium compounds	1.5	mg/L [a]
	Cyanide	1.0	mg/L [a]
	Organic phosphorus compounds	1.0	mg/L [a]
	Tetrachlorethylene	0.1	mg/L [a]
	Trichlorethylene	0.3	mg/L [a]
	Oil component	5	% [b]
Mine tailing, dust, foundry and blasting sand, refractory materials, ceramic pieces, incineration ash, stabilization or solidification products, catalysts and waste treatment residues containing Mercury	Lead and its compounds	3	mg/L [a]
	Copper and its compounds	3	mg/L [a]
	Arsenic and its compounds	1.5	mg/L [a]
	Mercury and its compounds	0.005	mg/L [a]
	Cadmium and its compounds	0.3	mg/L [a]
	Hexavalent chromium compounds	1.5	mg/L [a]
	Cyanide	1.0	mg/L [a]
	Asbestos containing material	1	% [c]

[a] as the leachate test result of environmental pollution standard method in accordance with the article 6 (1) of ROK Environmental Testing and Inspection Act
[b] by weight
[c] as the content of dry solids for solidification product only

c. The types of ROK designated waste and waste numbers are listed in Table O-8.

Table O-8. Types of ROK designated waste and waste numbers

ROK waste no.	Types of ROK designated waste
01 Waste generated at specific facilities	
01-01 Waste synthetic polymer compound	
01-01-01	Polyethylene
01-01-02	Polypropylene
01-01-03	Polyvinyl Chloride resin
01-01-04	Polyethylene Terephthalate
01-01-05	Phenolic resin
01-01-06	Polyurethane
01-01-07	Synthetic rubber
01-01-08	Polystyrene
01-01-09	Acrylonitrile Butadiene Styrene (ABS)
01-01-99	Other synthetic polymer compounds
01-02 Sludge	
01-02-01	Wastewater treatment sludge
01-02-02	Glass etching process sludge
01-02-03	Papermaking process sludge
01-02-04	Silicon manufacturing process sludge
01-02-05	Bauxite residue
01-02-99	Other sludges
01-03 Waste pesticide	
01-03-01	Organic Phosphorus pesticide
01-03-02	Organic chlorine-based pesticide
01-03-03	Carbamate pesticide

Table O-8. Types of ROK designated waste and waste numbers

ROK waste no.	Types of ROK designated waste
01-03-99	Other waste pesticides
02 Waste corrosives	
02-01 Acids	
02-01-01	Hydrochloric acid
02-01-02	Sulfuric acid excluding waste secondary storage batteries containing sulfuric acid
02-01-03	Nitric acid
02-01-04	Hydrofluoric acid
02-01-05	Waste acids generated from LCD or Semiconductor manufacturing process
02-01-06	Secondary storage batteries containing sulfuric acid
02-01-99	Other acids
02-02 Alkalis	
02-02-01	Caustic soda aqueous solution
02-02-02	Ammonia aqueous solution
02-02-03	Sodium Hydroxide, solid
02-02-04	Potassium Hydroxide, solid
02-02-99	Other alkalis
03 Waste containing hazardous substances	
03-01 Mine tailings	
03-01-01	Mine tailings from aluminum manufacturing processes
03-01-02	Mine tailings from lead heat treatment and refining processes
03-01-03	Mine tailings from zinc heat treatment processes
03-01-04	Mine tailings from iron manufacturing processes excluding blast furnace slag resulting from the use of iron ore
03-01-99	Other mine tailings
03-02-00 Dust	
03-03 Waste foundry and blasting sands	
03-03-01	foundry sands from clay coking and caking
03-03-02	foundry sands from chemical coking and caking
03-03-03	Blasting sands

Table O-8. Types of ROK designated waste and waste numbers

ROK waste no.	Types of ROK designated waste
03-03-99	Other foundry and blasting sands
03-04 Waste refractory materials and waste ceramic pieces	
03-04-01	Refractory materials
03-04-02	Ceramic pieces
03-05 Incineration ash	
03-05-01	Fly ash generated at household waste incineration facility
03-05-02	Fly ash generated at industrial waste incineration facility
03-05-03	Bottom ash generated at household waste incineration facility
03-05-04	Bottom ash generated at industrial waste incineration facility
03-05-05	Mixed ash generated at household waste incineration facility
03-05-06	Mixed ash generated at industrial waste incineration facility
03-05-07	Incineration ash from natural radioactive products
03-06 Stabilized or solidified wastes	
03-06-01	Stabilized wastes
03-06-02	Cement solidified wastes
03-06-03	Solidified wastes
03-06-04	Chelate-treated wastes
03-06-05	Solidified wastes containing 1% or more of asbestos
03-06-99	Other stabilized or solidified wastes
03-07 Waste catalysts	
03-07-01	Metallic catalysts
03-07-02	Non-metallic catalysts
03-08 Waste sorbents	
03-08-01	Adsorbent
03-08-02	Absorbent
04 Waste organic solvents	
04-01-00	Halogenated solvents
04-02-00	Other waste organic solvents
05 Waste paints and lacquers	
05-01-00	Oil-based paints

Table O-8. Types of ROK designated waste and waste numbers

ROK waste no.	Types of ROK designated waste
05-02-00	Water-based paints
05-03-00	Lacquers
06 Waste oils	
06-01 Waste mineral oils	
06-01-01	Lubricating oils
06-01-02	Grinding, polishing, abrasion, cutting and heat treatment oils
06-01-03	Machine and hydraulic oils
06-01-04	Waste fuels
06-01-05	Waste oil filters
06-01-06	Waste electrical wires and cables containing oil
06-01-07	Insulating oils excluding PCB containing oil
06-01-99	Other mineral oils
06-02-00	Animal and vegetable oils
06-03-00	Other waste oils
07 Waste Asbestos Containing Materials (ACMs)	
07-01	ACMs generated from building demolition
07-01-01	ACMs generated from building demolition, non-friable
07-01-02	ACMs generated from building demolition, friable
07-02-00	Debris and dusts generated from grinding, polishing, abrasion and cutting process of ACM
07-03-00	Items used for asbestos abatement (e.g., vinyl floor sheet, respirator, and workwear)
08 Waste containing Polychlorinated Biphenyls (PCBs)	
08-01-00	Oils containing PCBs
08-02-00	Organic solvents containing PCBs
08-03-00	Other wastes containing PCBs in liquid state
08-04-00	Other wastes containing PCBs not in liquid state
09 Waste toxic substances	
09-01-00	Forbidden substances under Article 2, Item 5 of the ROK Chemical Substances Control Act
09-02-00	Reagents used for research and testing

Table O-8. Types of ROK designated waste and waste numbers

ROK waste no.	Types of ROK designated waste
09-03-00	Other waste toxic substances
10 Medical Wastes [a]	
11 Waste Mercury	
11-01 Waste containing Mercury	
11-01-01	Lamps containing Mercury
11-01-02	Measuring instruments containing Mercury
11-01-03	Batteries containing Mercury
11-02-00	Waste consisting of Mercury
11-03-00	Waste treatment residues containing Mercury
12-00-00 Waste natural radioactive products	
30-00-00 Other wastes prescribed and notified by the ROK Minister of the Environment	
[a] See Enclosure P.	

ENCLOSURE P

MEDICAL WASTE

1. INTRODUCTION

This enclosure contains standards on the safe handling, storage, treatment, and dispose 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 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 enclosure. Standards for solid waste are provided in Enclosure N. Standards for radiological wastes are covered in DoDI 4715.27.

2. TRAINING

Installations must:

a. Ensure that all employees are adequately trained to perform their duties.

b. 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.

3. GENERATION

Installations must:

a. Separate infectious medical waste, if practical, from other solid waste at the point of origin.

(1) Handle mixtures of infectious medical wastes and hazardous wastes as infectious hazardous waste in accordance with Volume 4 of DoDM 4160.21.

(a) These mixtures are the responsibility of the generating DoD Component, with priority given to the hazard that presents the greatest risk.

(b) 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.

(2) Handle mixtures of other solid waste and infectious medical waste as infectious medical waste.

(3) Segregate and manage mixtures of infectious medical waste and radioactive waste in accordance with DoD Component guidance.

b. 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 ROK and the International Air Transport Association.

c. Segregate, transport, and store infectious medical waste in red bags or receptacles that are a minimum of 3 mils [0.0762 millimeters] thick and have durability, puncture resistance, and burst strength as to prevent rupture or leaks during ordinary use.

d. Clearly mark all bags or receptacles used to segregate, transport, or store infectious medical waste with:

(1) The universal biohazard symbol.

(2) The word “BIOHAZARD” in English and Korean.

(3) Markings or a label that identify the generator, date of generation, and contents.

e. Segregate and store sharps in upright and stable heavy-duty plastic containers with tight- fitting, puncture-resistant, leak-resistant lids. Discard sharps in rigid receptacles. Do not clip, cut, bend, or recap needles before disposal. Close sharps containers and remove them when they are three-fourths full.

f. Place all anatomical pathology waste (e.g., large body parts) in containers lined with plastic bags in accordance with Paragraph 3.b.

g. Ensure all receptacles can be closed and are kept closed, except when the container is actively being.

4. HANDLING WITHIN FACILITY

Installations must:

a. Transportation infectious medical waste to minimize human exposure. Do not place in chutes or dumpsters.

b. Avoid compacting infectious medical waste unless first converted to noninfectious medical waste by the treatment described in Paragraph 6. Do not compact containers holding sharps.

c. 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.

5. STORAGE

Installations must:

a. Manage infectious waste when stored on-site.

(1) Store infectious medical waste in a manner that prevent decay, spoilage, or becoming putrid. Refrigeration is required for pathology waste.

(2) Infectious medical waste must not be placed in hallways.

(3) Infectious medical waste with multiple hazards (e.g., infectious hazardous waste or infectious radiological waste) must be segregated from the general infectious waste stream when additional or alternate treatment and disposal is required.

b. Ensure storage sites:

(1) Are specifically designated for such use.

(2) Are constructed to prevent entry of insects, rodents, and other pests.

(3) Prevent access by unauthorized personnel.

(4) Are marked on the outside with the universal biohazard symbol and the word "BIOHAZARD" in both English and Korean.

c. Post signage that:

(1) Identifies any special requirements for entering the site, and the name and telephone number of the person responsible for the storage site.

(2) Is fluorescent orange-red in color, or predominately so, with lettering and symbols in contrasting color, and easily visible to workers.

d. Remove waste from:

(1) Interim storage sites (e.g., soiled utility rooms) daily.

(2) The final storage site at least every seven (7) calendar days unless refrigerated. If refrigerated, the infectious medical waste may remain in the final storage site for thirty (30) calendar days. Infectious medical waste is typically refrigerated at temperatures between 0-4 ºC [32-39.2 ºF].

6. TREATMENT AND DISPOSAL

Installations must:

a. Treat and dispose of blood, blood products, and other liquid infectious wastes only through incineration or sterilization shredding without dismantlement of the container, and incinerate sterilization shredding residues and dispose of incineration residues in a landfill.

b. Before disposal, treat infectious medical waste in accordance with Table P-1 and:

(1) Ensure sterilizers maintain their temperature at 121 ºC [250 ºF] for at least 30 minutes at 103.4 kPa [15 psi].

(2) Check the effectiveness of sterilizers at least weekly using Bacillus stearothermophilus spore strips or an equivalent biological performance test.

(3) 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 Paragraph 4 of Enclosure C.

(4) Assess ash or residue from the incineration of infectious medical waste for classification as hazardous waste in accordance with Paragraph 3 of Enclosure O.

(a) Manage ash that is determined to be hazardous waste in accordance with Enclosure O.

(b) Dispose of all other residue in a landfill that complies with the standards in Enclosure N.

(5) Conduct chemical disinfection using procedures and compounds approved by the appropriate DoD medical authority for use on any pathogen or infectious agent suspect to be present in the waste.

Table P-1. Treatment and Disposal Methods for Infectious Medical Waste

TYPE OF MEDICAL WASTE	METHOD	
	TREATMENT	DISPOSAL
Microbiological	Steam sterilization [a]	MSWLF [b]
	Chemical disinfection	
	Incineration	
Pathology	Incineration [c]	MSWLF
	Cremation [c]	Burial
	Chemical sterilization [d]	Domestic wastewater treatment plant (DWTP) [e]
	Steam sterilization [d]	DWTP

Table P-1. Treatment and Disposal Methods for Infectious Medical Waste

<table>
<tr><th rowspan="2">TYPE OF MEDICAL WASTE</th><th colspan="2">METHOD</th></tr>
<tr><th>TREATMENT</th><th>DISPOSAL</th></tr>
<tr><td rowspan="2">Bulk blood and suction canister waste</td><td>Steam sterilization [f]
Chemical disinfection</td><td>DWTP</td></tr>
<tr><td>Incineration [f]</td><td>MSWLF</td></tr>
<tr><td rowspan="2">Sharps in sharps containers</td><td>Steam sterilization</td><td>MSWLF</td></tr>
<tr><td>Incineration</td><td>MSWLF</td></tr>
<tr><td colspan="3">a Preferred method for cultures and stocks because they can be treated at point of generation.
b See Enclosure N for solid waste landfill standards.
c Treat anatomical pathology waste (e.g., large body parts) either by incineration or cremation before disposal. Enclosure C 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 Enclosure H for wastewater standards.
f Treat bulk blood or suction canister waste known to be infectious by incineration or steam sterilization before disposal.</td></tr>
</table>

c. For the disposal of non-contaminated animal carcasses, consider and appropriately address ROK requirements that may vary from the standards in this enclosure.

d. Place bags and receptables containing infections medical waste in right or semi-rigid, leak-proof containers before being transported off-site.

e. Package and document the transport of infectious medical waste off-site for disposal in accordance with transportation regulations of the ROK and the International Air Transport Association. At a minimum, the transporter must be appropriately credentialed by ROK to transport the waste and must provide a receipt for transport to the installation.

f. Comply with the ROK requirements for off-installation disposal of medical waste as follows:

(1) Medical waste destined for disposal at a ROK disposal facility will be identified as Quarantine Medical Waste, Harmful Medical Waste, or General Medical Waste, as appropriate, upon leaving the installation.

(2) Medical waste must be sealed in the exclusive container at the point of generation. Exclusive containers are divided into bag-type containers and box-type containers, and the material of the bag-type container is synthetic resin and the material of the box-type container is corrugated cardboard or synthetic resin.

(3) Exclusive containers must be used for each type of medical waste as classified in Table P-2.

Table P-2. Types of Exclusive Container

TYPES OF EXCLUSIVE CONTAINER	TYPES OF MEDICAL WASTE
Synthetic resin box-type containers	Quarantine medical waste, waste tissue excluding teeth, sharps, and liquid medical waste
Bag-type container or corrugated carboard box-type container	Other medical wastes

(4) The medical waste containers must be labeled as Figure P-1 and marked with medical waste symbol as Figure P-2 and Table P-3.

<table>
<tr><td colspan="4">Handle with special caution because contagious wastes may be in the container.
이 폐기물은 감염의 위험성이 있으므로 주의하여 취급하시기 바랍니다.</td></tr>
<tr><td>Generator
배출자</td><td></td><td>Type, characteristic and state
종류 및 성질과 상태</td><td></td></tr>
<tr><td>Collection starting date
사용개시 연월일</td><td></td><td>Collector
수거자</td><td></td></tr>
</table>

Figure P-1. Medical Waste Caution Label

Figure P-2. Medical Waste Symbol

Table P-3. Color of Medical Waste Symbol

Type of Medical Waste	Color of Symbol
Quarantine medical waste	Red
Harmful medical waste excluding placenta for recycling and general medical waste	Black for bag-type container
	Yellow for box-type container
Placenta for recycling	Green

(5) The color of the envelope-type container and inner pocket must be marked with orange color, and the outer color of the box-type container must be white. The inner pouch used to contain the placenta for recycling must be white and transparent.

7. <u>CONTINGENCY PLANNING</u>

Installations must:

a. Develop contingency plans for treatment or disposal of infectious medical waste in case the primary means become inoperable.

b. Include alternate storage sites or alternate means of treatment and disposal in the contingency plans.

8. <u>SPILLS</u>

Installation must:

a. Clean up spills of infectious medical waste as soon as possible.

b. Comply with personal protection equipment requirements in Paragraph 4.c.

c. Remove blood, body fluid, and other infectious fluid spills with an absorbent material that must then be managed as infectious medical waste.

d. Wash surfaces contacted by infectious medical waste with soap and water and chemically decontaminate the surfaces in accordance with Paragraph 6.b.(5).

9. RECORDKEEPING

Installations must keep records of the following information concerning infectious medical waste for at least 3 years after the date of disposal:

a. Type of waste.

b. Amount of waste (volume or weight).

c. Treatment method, including date of treatment.

d. Disposition, including:

(1) Date of disposition.

(2) If the waste was transferred to ROK facilities.

(3) Receipts acknowledging Paragraphs 9.a. through 9.c. for each transfer.

ENCLOSURE Q
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GLOSSARY

PART 1-ACRONYMS

Acronym	**Meaning**
ACM	asbestos containing material
AFPMB	Armed Forces Pest Management Board
API	American Petroleum Institute
BMP	best management practices
BOD	biochemical oxygen demand
°C	degrees Celsius
CAS	Chemical Abstracts Service
CBOD	carbonaceous biochemical oxygen demand
CEMS	continuous emission monitoring system
CFR	Code of Federal Regulations
cm	centimeter
cm^2	square centimeter
CO	carbon monoxide
CO_2	carbon dioxide
CPE	comprehensive performance evaluation
CT	residual disinfectant concentration formula
CWS	community water system
DDBP	disinfectant/disinfection byproducts
DLA	Defense Logistics Agency
DLAI	Defense Logistics Agency Instruction
DoDD	DoD Directive
DoDI	DoD Instruction
DoDM	DoD Manual
dscm	dry standard cubic meter
DTR	Defense Transportation Regulations
DWTP	domestic wastewater treatment plant
DWTS	domestic wastewater treatment system
EGS	Environmental Governing Standards
E.O.	Executive Order
EPA	Environmental Protection Agency
ESP	electrostatic precipitator
°F	degrees Fahrenheit
FCT	field constructed tank
FGS	final governing standard
FIC	facility incident commander

FRT	facility response team
ft	foot or feet
ft^2	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
GPD	gallons per day
GDF	gasoline dispensing facility
GWUDI	groundwater under the direct influence
HAA5	haloacetic acids (five)
HAP	hazardous air pollution
HC	hydrocarbon
HCFC	hydrochlorofluorocarbon
HFC	hydrofluorocarbon
Hg	mercury
HHV	higher heating value
HIMWI	hospital and infectious medical waste incinerator
HMIRS	Hazardous Material Information Resource System
HN	host nation
HP	horsepower
hr	hour
HW No.	hazardous waste number
HWAP	hazardous waste accumulation point
HWPS	hazardous waste profile sheet
HWSA	hazardous waste storage area
IPM	integrated pest management
IPR	industrial process refrigeration
J	joule
kg	kilogram
kg/GJ	kilogram per gigajoules
kPa	kilopascal
kW	kilowatt
L	liter
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
LPD	liter per day

LPG	liquefied petroleum gas
LRAA	locational running annual average
LRV	log removal value
μg	microgram
$\mu g/ft^2$	microgram per square foot
$\mu g/m^2$	microgram per square meter
m^2	square meter
MCL	maximum containment level
MCO	Marine Corps Order
mg	milligram
mg/dscm	milligram per dry standard cubic meter
mg/L	milligram per liter
mg·min/L	milligram x minute per liter
MGD	million gallons per day
mJ/cm^2	millijoules per square centimeter
mL	millileter
MMBtu/hr	million British thermal units per hour
MOE	Ministry of Environment
MRDL	maximum residual disinfectant level
Mrem/year	millirem per year
MSW	municipal solid waste
MSWL	municipal solid waste landfill
Mton	metric ton
MW	megawatt
MWC	municipal waste combustion
MWh	megawatt-hour
NAVSUP PUB	Naval Supply Systems Command publication
NCWS	non-community water system
ng	nanogram
ng/dscm	nanogram per dry standard cubic meter
ng/J	nanograms per joule
NMHC	nonmethane hydrocarbons
NO_x	nitrogen oxide
NPWS	non-public water system
NTNCWS	non-transient, non-community water system
NTU	nephelometric turbidity unit
O&M	operations and maintenance
O_2	oxygen
ODS	ozone-depleting substances
OEL	operational evaluation level
oocysts/L	oocysts per liter
OSWI	other solid waste incinerator

PCB	polychlorinated biphenyls
PCE	Perchloroethylene
pCi/L	picoCuries per liter
PM	particulate matter
POL	petroleum, oil, and lubricants
ppm	parts per million
ppmv	parts per million by volume
ppmvd	parts per million by volume, dry basis
PSIA	pounds per square inch absolute
PWS	public water system
RDF	refuse-derived fuel
RICE	reciprocating internal combustion engines
ROK	Republic of Korea
RQ	reportable quantity
SAR	species at risk
SDS	space data sheet
SLB	stroke lean burn
SO_2	sulfur dioxide
SOC	synthetic organic chemical
SRB	stroke rich burn
STI	Steel Tank Institute
SWPPP	stormwater pollution prevention plan
TBtu/yr	trillion British thermal units per year
TCE	Trichloroethylene
TEQ	toxic equivalency factor
TM	technical manual
TNCWS	transient, non-community water system
TOC	total organic carbon
TSS	total suspended solids
TTHM	total trihalomethanes
TTO	total toxic organics
UDMH	1, 1-dimethylhydrazine
UFC	United Facilities Criteria
U.S.	United States of America
UST	underground storage tank
UV	ultraviolet
VOC	volatile organic compound

PART 2-DEFINITIONS

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

Term	Definition
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.
Abatement	In the context of LBP in Enclosure B, Section 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.
Above-ground 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 Enclosure J, this includes any mobile or fixed structures or tanks.
Action level	The concentration of a substance in water that establishes appropriate treatment for a water system.
Acute hazardous waste.	Wastes listed in Enclosure O, Table O-3 with a waste number with the “P” designator, or hazardous wastes in Enclosure O, Table O-5 with the Hazard Code “H.”

Term	Definition
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.
Adverse effect	Changes that diminish the integrity or significance of historic and cultural resources.
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.
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.
Applicable ROK environmental standards	Defined in DoDI 4715.05.
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.
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.

Term	Definition
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.
Asbestos	Generic term used to describe six distinctive varieties of fibrous mineral silicates, including chrysotile, amosite, crocidolite, tremolite asbestos, anthophyllite asbestos, actinolite asbestos, and any other of these materials that have been chemically treated or altered.
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
Automatic tank gauging	Equipment that tests for the loss of POL or hazardous substance and conducts inventory control.
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.

Term	Definition
Below ground storage container	A type of POL storage container that is completely buried, including deferred USTs, that are exempt from all standards in Enclosure J, 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, only below ground storage containers that are exempt from the UST requirements of Enclosure K are counted toward the aggregate thresholds defined under "POL facility."
Best Management Practices (BMP)	Mandatory schedule of activities, prohibition of practices, maintenance procedure, or other management practices to prevent or reduce the pollution of waters of the HN. 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.
Biochemical Oxygen Demand (BOD)	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).
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.
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.
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 gallons] per day.
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.

Term	Definition
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 less than 1.36kg [3lbs] of dielectric fluid. Large high-voltage capacitor: A capacitor that contains 1.36kg [3lbs] 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 1.36kg [3lbs.] or more of dielectric fluid and that operates below 2,000 volts (alternating current or direct current).
Carbon Biochemical Oxygen Demand (CBOD)	The 5-day measure of the pollutant parameter, CBOD, used as an alternative to BOD5. 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.
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.
Category I nonfriable ACM	See definition of “asbestos containing material (ACM).”
Category II nonfriable ACM	See definition of “asbestos containing material (ACM).”
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.
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 the ROK in accordance with Volumes 1 through 3 of DoDM 4150.07 (which accepts ROK certification in appropriate circumstances).
Cesspool	A drywell that receives untreated sanitary waste and sometimes has an open bottom or perforated sides.

Term	Definition
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.
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.
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.

Term	Definition
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.
Collection	In the context of solid waste management in Enclosure N, the act of consolidating solid wastes, or materials that have been separated for the purpose of recycling, from various locations.
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 “Municipal Solid Waste.”
Commercial RICE	See definition of “stationary RICE.”
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.
Community Water System (CWS)	See the definition of “Public Water System (PWS).”
Conservation	Planned management, use, and protection; continued benefit for present and future generations; and prevention of exploitation, destruction, and neglect.
Construction	Defined in Section 60.2 of Title 40, CFR.

Term	Definition
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.
Consumer confidence report	An annual water quality report that a CWS is required to provide to its customers.
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).
Cover material	Material that is used to cover compacted solid wastes in a land disposal site.
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 Enclosure G, Table G-12, or from tracer surveys. CT values appear in Enclosure G, Tables G-13 through 29.
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.

Term	Definition
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.
Decontamination waste	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.
Designated waste	Industrial wastes specifically enumerated by the ROK Enforcement Decree of the Waste Control Act as harmful substances, such as waste oil and waste acid which may contaminate the surrounding environment, or medical wastes which may cause harm to human bodies.
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.
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 waters of the HN 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.

Term	Definition
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.
Disposal	In the context of hazardous waste management in Enclosure O, the discharge, deposit, injection, dumping, spilling, leaking, or placing of any hazardous waste into or on any land or water that would allow the waste or constituent to enter the environment. Proper disposal effectively mitigates hazards to human health and the environment.
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).
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.
Domestic Wastewater Treatment System (DWTS)	Any DoD or HN facility designed to treat wastewater before its discharge to waters of the HN 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.
Dust-lead hazard	See definition of “Lead Based Paint (LBP) hazard.”

Term	Definition
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.
Ecosystem and Landscape Conservation Areas	Refers to areas, listed in Enclosure B, Table B-3, "Ecosystem and Landscape Conservation Areas," which fall under one of following areas. (1) An area that is worthy of scientific research since it keeps the originality of natural ecosystems or has abundant natural resources. (2) An area that requires preservation for scientific research or natural scenery since its topographic or geological features are unique. (3) An area that is worthy of preservation, where endangered species or Korean native species grow. (4) An area that represents diverse ecosystems or a sample of a diverse ecosystem. (5) An area that requires special protection of other natural ecosystems
Effluent limitation	Any restriction imposed on quantities, discharge rates, and concentrations of pollutants that are ultimately discharged from point sources into waters of the HN.
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.
Emergency combustion turbine	Defined in Section 60.331 of Title 40, CFR.

Term	Definition
Emergency compression ignition or emergency spark ignition RICE	See definition of "stationary RICE."
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.
Endangered Species Class I	Wildlife threatened with extinction as the population has decreased substantially due to natural or artificial threats
Endangered Species Class II	Wildlife that are feared to be threatened with imminent extinction where present threats are not eliminated or alleviated as the population has decreased substantially due to natural or artificial threats
Enduring location	Defined in DoDI 4715.05.
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.
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.
Evaluation	In the context of LBP in Enclosure E, 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.
Excluded UST systems	UST systems that are not subject to the requirements in Enclosure K.

Term	Definition
Existing UST systems	UST systems where installation began on or before April 11, 2016.
Facility Response Team (FRT)	(Also known as installation response team). A team performing emergency functions as defined and directed by the FIC.
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)	Defined in 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.
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.
Food waste	The organic residues generated by the handling, storage, sale, preparation, cooking, and serving of foods, commonly called garbage.
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.
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.

Term	Definition
General secondary containment	Containment and diversionary structures intended to prevent a most likely discharge into waters of the ROK. This can be either active or passive and needs to consider the typical failure mode and most likely discharge quantity.
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.
General medical waste	ROK designated waste produced by medical facilities that is specially managed because it has the potential for causing disease in humans including Cotton wool, bandages, gauze, disposable diapers, sanitary napkins, disposable syringes, and infusion sets containing blood, body fluids, secretions, excrement, pathology laboratory wastes, and used dental amalgam.
General secondary containment	Containment and diversionary structures intended to prevent a most likely discharge into waters of the ROK. 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.
Groundwater Under the Direct Influence (GWUDI)	Any water below the surface of the ground with significant occurrence of insects or other microorganisms, algae, or large diameter pathogens, such as *Giardia lamblia*; 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.
Haloacetic Acid (five) (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.
Halogenated solvent	Solvents that contain a halogen such as chlorine, bromine, or iodine.

Term	Definition
Harmful medical waste	ROK designated waste produced by medical facilities that is specially managed because it has the potential for causing disease in humans as follows: • Waste tissue, including human or animal tissue, organ, part of the body, cadaver of animal, blood, pus and blood product (serum, plasma, blood product). • Pathological waste, including culture medium culture vessel, storage strain, waste test tube, slide, cover glass, waste medium, and waste glove used for testing. • Sharps, including, waste vaccine, waste anticancer drug, waste chemotherapy drug. • Biological and chemical waste, including culture medium culture vessel, storage strain, waste test tube, slide, cover glass, waste medium, and waste glove used for testing. • Blood contaminated waste, waste blood bag, waste used in hemodialysis, and other waste that require special management because they contain enough blood to leak.
Harmful wild animal	Wild animals that harm the life and property of people, the species of which are prescribed by ordinance of the Ministry of Environment
Hazardous constituent	A chemical compound listed by name in Enclosure O, Table O-2 of Appendix A or that possesses the characteristics described in Appendix A to Enclosure O, Paragraph 1.
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 ROK regulated. See Enclosure I, Table I-1.

Term	Definition
Hazardous Material Information Resource System (HMIRS)	The computer-based information system developed to accumulate, maintain, and disseminate important information on hazardous materials.
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.
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.
Hazardous substance	Any substance having the potential to do serious harm to human health or the environment if spilled or released in RQ. A list of these substances and the corresponding RQs is provided in Enclosure O, Table O-2 of Appendix A. 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 Enclosure O, Table O-2 of Appendix A 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).
Hazardous substance UST system	An UST system that contains a hazardous substance (not including hazardous waste as defined in Enclosure O) or any mixture of such hazardous substances and POL, and which is not a POL UST system.

Term	Definition
Hazardous waste	A waste that may be solid, semi-solid, liquid, or contained gas, and either exhibits a characteristic of a hazardous waste as detailed in Appendix A to Enclosure O, Paragraph 1. or is listed as a hazardous waste in Enclosure O, Tables O-2 through O-6. 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.
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.
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 Republic of Korea (ROK) cultural properties list approved by the SOFA Cultural Properties Protection Subcommittee is considered a historic and cultural resource.

Term	Definition
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.
Hospital and Infectious Medical Waste Incinerator (HIMWI)	Any device that combusts any amount of hospital waste or infectious medical waste, as defined in Enclosure P. <u>Large HIMWI units:</u> 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. 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. <u>Small HIMWI units:</u> 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.
Host Nation-protected species	Any species of flora or fauna listed or designated by the HN 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.

Term	Definition
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.
Impact surface	An interior or exterior surface that is subject to damage by repeated sudden force, such as certain parts of doorframes.
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.
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 ft] of a non- industrial, non-substation building.
Incinerator	In the context of: PCB disposal in Enclosure F: 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 Enclosure C: 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.

Term	Definition
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.
Indirect discharge	An introduction of pollutants in process wastewater to a DWTS.
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.
Industrial solid waste	Solid waste generated by industrial processes and manufacturing that is not characterized as hazardous waste in accordance with Enclosure O
Industrial waste	Any wastes generated from places of business with discharge or emission facilities installed and managed in accordance with the ROK laws and regulations.
Industrial wastewater treatment system	Any DoD facility other than a DWTS designed to treat process wastewater before its discharge to waters of the HN.
Industry standards	Applicable or recognized standards and practices relevant to the design, construction, installation, operation and maintenance, inspection, and repair of facilities and equipment.
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.

Term	Definition
Infectious medical 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, anybody 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.

Term	Definition
Installation	Defined in DoDI 4715.05.
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.
Institutional RICE	See definition of “stationary RICE.”
Institutional waste and solid waste	See definition of “municipal solid waste (MSW).”
Institutional waste incinerator	See definition of “municipal solid waste landfill (MSWLF) units.”
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.
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	Defined in DoDI 4715.05.
Interstitial monitoring	Monitoring between the UST system and a secondary barrier immediately around or beneath it.
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.

Term	Definition
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.
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.
Large high-voltage capacitor	See definition of “capacitor.”
Large HIMWI	See definition of “hospital and infectious medical waste incinerator (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.

Term	Definition
Lead based paint 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 $\mu g/ft^2$ on floors or 250 $\mu g/ft^2$ 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.
Lead-free	Containing a maximum lead content of 0.2 percent for solder and flux, and a weighted average of not more than 0.25 percent lead when used with respect to wetted surface material.

Term	Definition
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.
Leak	In the context of PCBs in Enclosure F, 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.
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.
Location Running Annual Average (LRAA)	The average of sample analytical results for samples taken at a particular monitoring location during the previous 4 calendar quarters.
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-percent reduction, a 2.0-log reduction relates to a 99-percent reduction, a 3.0-log reduction relates to a 99.9-percent reduction).
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.
Major construction	Building construction: area of more than 1,000 m^2, civil works: a constructed space is more than 1,000m^3, an area of more than 1,000 m^2 or a length of more than 200m, landscape construction: an area of more than 5,000m^2, demolition: an area of more than 3,000 m^2.
Malfunction	Defined in Section 63.1101 of Title 40, CFR.

Term	Definition
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.
Maximum Containment 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.
Maximum daily discharge limit	The highest allowable daily discharge based on volume as well as concentration.
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.
Medium HIMWI	See definition of "hospital and infectious medical waste incinerator (HIMWI)."
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.
Mitigation	Specific steps designed to lessen or offset the adverse effects of a DoD action on a historic or cultural resource.
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.

Term	Definition
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.
Monthly throughput	For GDFs, the total volume of gasoline loaded into, or dispensed from, all the gasoline storage tanks located at a single GDF.
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. Includes commercial solid waste. 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).

Term	Definition
Municipal Solid Waste Land Fill (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.
Municipal Waste Combustion (MWC) units	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. • <u>Air curtain incinerator</u>: 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. • <u>Institutional waste incinerator</u>: 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. • <u>Other solid waste incinerator (OSWI)</u>: Either a very small MWC unit or an institutional waste incineration unit.
Natural resources	Living and inanimate materials, but not artifacts, existing in nature that are of aesthetic, ecological, educational, historical, recreational, scientific, or other value.

Term	Definition
Natural monument	Animals (including their habitats, breeding grounds, and migratory places), plants (including their habitats), topography, geology, minerals, caves, biological produce, and extraordinary natural phenomena of outstanding historic, scenic, or academic 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.
New dispenser system	A dispenser system where installation began after April 11, 2016.
New UST system	An UST system where installation began after April 11, 2016.
Non-Community Water System (NCWS)	See the definition of "Public Water System (PWS)."
Non-infectious 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 Enclosure N, if local regulations permit.
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 "Public Water System (PWS)."

Term	Definition
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.
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 Enclosure N, Paragraph 6.
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.
Other Solid Waste Incinerator (OSWI)	See definition of “MWC units.”
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.
Ozone Depleting Substance (ODS)	Either a Class I or Class II substance as listed in Enclosure C, Tables C-23, 24, and 25.
Pathology waste	See definition of “infectious medical waste.”

Term	Definition
Paint-lead hazard	See definition of "LBP hazard."
Polychlorinated Biphenyl (PCB)	Any chemical substance that is limited to the biphenyl molecule that has been chlorinated to varying degrees or any combination of substances that contain such substance.
PCB article	Any manufactured article, other than a PCB container, that contains PCBs and whose surface(s) has been in direct contact with PCBs. 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 greater than or equal to 500 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.
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 greater than or equal to 50 ppm.
PCB transformer	Any transformer, whether in use or in storage, that contains greater than or equal to 500 ppm PCBs.
Perchloroethylene (PCE)	Tetrachloroethene.
Permanent	In the context of LBP in Enclosure E, an expected design life of at least 20 years.

Term	Definition
Pest	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.
Pest management consultant	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 U.S. or ROK 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.
Petroleum, Oil, and 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.

Term	Definition
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.
POL facility	An installation with: • An aggregate above ground storage container capacity (excluding below ground storage containers) of 5,000 liters [1,320 gallons] or greater, counting only containers with a capacity of 208 liters [55 gallons] or greater; or • An aggregate below ground storage container capacity of 159,091 liters [42,000 gallons] or greater; or • A pipeline facility.
POL storage container	Containers with capacities greater than or equal to 208 liters [55 gallons]. They include mobile and fixed containers as well as those located above and below ground. In the context of USTs in Enclosure K, USTs required to meet all of the requirements of Enclosure K 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.
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.

Term	Definition
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.
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.
Protection	In the context of historic and cultural resource protection in Enclosure A, 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.
Pyrolysis	Thermochemical decomposition of organic material at elevated temperatures in the absence of O_2 (or any halogen).

Term	Definition
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.
Qualified energy assessor	Someone with the demonstrated background, experience, and abilities to evaluate energy savings opportunities for steam generation and major energy using systems.
Quarantine medical waste	ROK designated waste produced by medical facilities that is specially managed because it has the potential for causing disease in humans, which is wastes generated from medical practices for persons isolated in order to protect others from infectious diseases under Article 2, Subparagraph 1 of the ROK Infectious Disease Control and Prevention Act.
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.

Term	Definition
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.
Refrigerant	Any substance that is used for heat transfer purposes and provides a cooling effect.
Registered pesticide	A pesticide registered and approved for sale or use within the United States or the ROK.
Regulated ACM	See definition for “asbestos-containing material (ACM).”
Regulated facilities	Those facilities with criteria established in Enclosure H, such as DWTS, industrial wastewater treatment systems, or industrial discharges.
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 Enclosure K 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 Enclosure K to replace a tank means to remove and install another tank. To replace piping means to remove 50 percent 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.
Replacement	In the context of LBP in Enclosure E, 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.

Term	Definition
Residential RICE	See definition of “stationary RICE.”
Residential waste and solid waste	See definition of “municipal solid waste (MSW).”
Restricted access area	Area 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.
ROK Cultural Properties	Artificially or naturally formed national, racial, or world heritage of outstanding historic, artistic, academic, or scenic value that includes: <u>Designated Cultural Heritage:</u> Cultural heritage properties and materials designated by the by the Administrator of the Cultural Heritage Administration. Mayors, or Do Governors. <u>Registered Cultural Heritage:</u> Cultural heritage properties and materials registered by the Administrator of the Cultural Heritage Administration. Mayors, or Do Governors other than designated cultural heritage or cultural heritage resource. <u>Buried Cultural Heritage:</u> Tangible cultural heritage buried or distributed underground, underwater, or in the structures, and natural caves and fossils formed and deposited on the ground surface, underground or underwater (including seas, lakes and rivers), etc. and other objects deemed to have outstanding geological values.
Rubbish	A general term for solid waste, excluding food wastes and ashes, taken from residences, commercial establishments, and institutions.

Term	Definition
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.
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.
Scavenging	The uncontrolled and unauthorized removal of materials at any point in the solid waste management system.
Secondary containment or secondarily contained	In the context of POL standards in Enclosure J and spill standards in Enclosure L, 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 Enclosure K, 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.

Term	Definition
Secondary Maximum Containment Level (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.
Shutdown	The cessation of operation of an affected source or equipment. Includes, but is not limited to, periodic maintenance, replacement of equipment, or repair.
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.
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.
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.
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.
Small capacitor	See definition of “capacitor.”
Small HIMWI	See definition of “hospital and infectious medical waste incinerator (HIMWI).”
SOFA Environmental Subcommittee	Subcommittee of the ROK-US Status of Forces Agreement (SOFA) Joint Committee to undertake directed actions and make recommendations to the Joint Committee on matters of mutual environmental concern pertaining to public health and sanitation; to study issues and make recommendations to the Joint Committee concerning environmental matters involving the U.S. armed forces in Korea.

Term	Definition
SOFA Cultural Properties Protection Subcommittee	Subcommittee of the ROK-US Status of Forces Agreement (SOFA) Joint Committee to consult and report findings and recommendations on matters concerning cultural properties protection referred to it and other matters as deemed expedient and proper by the Joint Committee.
Soil-lead hazard	See definition of “LBP hazard.”
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 return flows, 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 Appendix to Enclosure O, Table O-4 or the corresponding P- or U-listed solvents found in in Appendix to Enclosure O, Table O-2; • Exhibits a hazardous characteristic found in Appendix A to Enclosure O, Paragraph 1. when that characteristic results from a solvent listed in Appendix A to Enclosure O, Tables O-2 or O-4; or • Exhibits only the hazardous waste characteristic of ignitability found in Appendix to Enclosure O, Paragraph 1.a, due to the presence of one or more solvents that are not listed in Enclosure O, Tables O-2 or O-4.
Specialty 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.

Term	Definition
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 ROK 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. The ROK SAR list can be found on the website of Republic of Korea National Institute of Biological Resources. https://species.nibr.go.kr/home/mainHome.do?cont_link=002&subMenu=002002&contCd=002002001
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.
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.

Term	Definition
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 Reciprocating Internal Combustion Engine (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.
Storage	The interim containment of waste after generation and before collection for ultimate recovery or disposal.

Term	Definition
Storage site	In the context of medical waste management in Enclosure P, 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.
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.
Storm water	Runoff and drainage from wet weather events such as rain, snow, ice, sleet, and hail.
Substantial contact area	An area that is subject to public access on a routine basis or that could result in skin contact.
Surface water	In the context of drinking water standards in Enclosure G, 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.
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.
Total suspended solids (TSS)	The pollutant parameter total filterable suspended solids.
Total toxic organics (TTO)	The summation of all quantifiable values greater than 0.01 mg/L for the toxic organics.

Term	Definition
Total tri-halomethanes (TTHM)	The sum of the concentration in mg/L of chloroform, bromoform, dibromochloromethane, and bromodichloromethane.
Transient, non-community water system (TNCWS)	See the definition of "PWS."
Transfer area	Also known as loading and unloading area. 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.
Treatment	In the context of hazardous waste management, 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 Enclosure P, 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.
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.

Term	Definition
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 percent 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 Enclosure K 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 Enclosure J for requirements. • Any pipes connected to a tank that is not considered an UST system.
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 but could be another unique identifier. The method for determining the unique identification number is usually specified by the LEC in the FGS.
United States	Defined in DoDI 4715.05.

Term	Definition
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.
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 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.
Vapor monitoring	Testing or monitoring for vapors within the soil gas of the excavation zone.
Vector	A carrier that is capable of transmitting a pathogen from one organism to another.
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.
Wastewater treatment tank	A tank that is designed to receive and treat an influent wastewater through physical, chemical, or biological methods.

Term	Definition
Waters of the ROK	Surface water including the territorial seas recognized under customary international law of the Republic of Korea, 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 waters of the ROK are domestic or industrial waste treatment systems, including treatment ponds or lagoons designed to meet the requirements of Enclosure H. This exclusion applies to only manmade bodies of water that were neither originally waters of the ROK nor resulted from impoundment of waters of the ROK.

Term	Definition
Wetland Protected Areas	A designated wetland that is worthy of protection and conservation due to its authorized values of water supply & quality, aesthetics, and biodiversity maintenance (refer to Enclosure B, Table B-4): A wetland should be considered a "Wetland Protected Area" if any of the following criteria are met: (1) A wetland that is natural or near-natural with high biodiversity. (2) A wetland that supports rare, endangered or threatened species. (3) A wetland that contains unique landscaped, geomorphic or geological values.
Worst case discharge (WCD)	The largest foreseeable discharge from the facility, under adverse weather conditions, as determined using the WCD planning volume standards in Enclosure L, Appendix A as a guide.
Yard waste	Grass and shrubbery clippings, tree limbs, leaves, and similar organic materials commonly generated in residential yard maintenance (also known as green waste).

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