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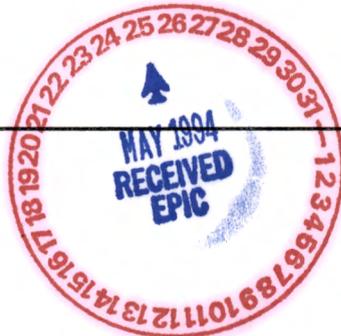
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7. Abstract

This Functions and Requirements document (FRD) establishes the basic performance criteria for Project W-314, in accordance with the guidance outlined in the letter from R. W. Brown, RL, to President, WHC, "Tank Waste Remediation System (TWRS) Project Documentation Methodology," 94-PRJ-018, dated 3/18/94. The FRD replaces the Functional Design Criteria (FDC) as the project technical baseline documentation.

Project W-314 will improve the reliability of safety related systems, minimize onsite health and safety hazards, and support waste retrieval and disposal activities by restoring and/or upgrading existing Tank Farm facilities and systems. The scope of Project W-314 encompasses the necessary restoration upgrades of the Tank Farms' instrumentation, ventilation, electrical distribution, and waste transfer systems.

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FUNCTIONS AND REQUIREMENTS FOR
TANK FARM RESTORATION AND SAFE OPERATIONS
PROJECT W-314

Issued by:

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- APPENDIX D: FUNCTIONS AND REQUIREMENTS FOR TANK FARM ELECTRICAL UPGRADE

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1.0 INTRODUCTION

1.1 PURPOSE

The mission of the Tank Waste Remediation System (TWRS) program is to store, treat, and immobilize highly radioactive tank waste in an environmentally sound, safe, and cost-effective manner. The U.S. Department of Energy (DOE) established this program to manage the 177 underground waste storage tanks at the Hanford site. The TWRS program includes all activities related to receiving, storing, operating and maintaining, treating, and disposing of all liquid wastes.

Numerous external audits and internal self-assessments of Hanford's Tank Farms have revealed that they require extensive restoration to meet the overall TWRS mission goals and support safe operation and maintenance activities. Because of their age and years of little or no upkeep, many Tank Farm infrastructure systems and components:

have exceeded their useful service life and can be expected to fail in the near-term;

have deteriorated beyond repair and must be replaced to ensure continued reliable operation;

have already failed;

or operate outside current environmental, health, and safety regulations.

Deteriorating infrastructure and a poorly defined physical baseline are expected to increase long-term operation and support costs and possibly limit the number of viable alternatives for retrieval, pretreatment and disposal of tank waste.

To help correct the Tank Farm deficiencies, the Tank Farm Restoration and Safe Operations effort (Project W-314) has been established as a key part of the overall TWRS program. The goal of this project is to improve the reliability of safety related systems, minimize onsite health and safety hazards, and support waste retrieval and disposal activities by restoring and/or upgrading existing Tank Farm facilities and systems. The following upgrades have been defined within the overall scope of Project W-314 to accomplish the necessary restoration of the Tank Farms' infrastructure systems.

Tank Farm Integrated Instrumentation Upgrade (formerly Project W-314A, Tank Farm Integrated Instrumentation Upgrades)

Ventilation System Upgrade (formerly Project W-314B, Double Shell Tank Ventilation Upgrades)

Transfer System Upgrade (formerly Project W-314C, Transfer System Upgrade)

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Tank Farm Electrical Upgrade (formerly Project W-314D, Tank Farm Electrical Upgrades)

The purpose of this document is to define the functions and requirements for Project W-314, by application of the Systems Engineering process. A function is a definition of what a system or subsystem must accomplish to meet the overall mission; a requirement is a qualitative or quantitative statement of how well a function must be performed. Within TWRS, requirements may be one of two types: constraints and performance requirements. Constraints are imposed upon the function by the external environment (e.g., U.S. Congress, Washington EPA, DOE Orders). Performance requirements are imposed upon the function by the TWRS Program itself and therefore may be traded with respect to other performance requirements to optimize overall performance. The document also identifies the interfaces between project functions, and between the project and the external environment.

The functions and requirements will serve as a basis for the project technical baseline, as directed by DOE Richland Operations Office (RL) (reference DOE-RL Letter 94-PRJ-018, R. W. Brown, RL, to President, WHC, "Tank Waste Remediation System (TWRS) Project Documentation Methodology," dated March 17, 1994). The Appendices to this document provide details of the functions and their associated requirements identified for each upgrades area. See Section 2.0 of this document for details about the functions and requirements development process.

1.2 SCOPE

The Tank Farm Restoration and Safe Operations project includes upgrades to the instrumentation, ventilation, waste transfer, and electrical distribution systems for Tank Farms, as described below. The various aspects of the project will be integrated to support overall TWRS program objectives.

The objective of the Tank Farm Integrated Instrumentation Upgrade is to provide the instrumentation and data acquisition/analysis equipment necessary for safe and efficient operation of the Tank Farms. Additional instrumentation systems must be developed to accurately monitor tank conditions and provide timely analysis of physical and chemical anomalies.

The objective of the Ventilation System Upgrade is to restore active tank ventilation systems to an acceptable design basis as required to support the TWRS mission, and to resolve environmental, health, and safety concerns. The scope of the upgrade is focused primarily on the double-shell tanks (DSTs), but includes selected single-shell tanks (SSTs), and any double-contained receiver tanks (DCRTs) that will not be isolated or replaced by the Transfer System Upgrade.

The objective of the Transfer System Upgrade is to provide regulatory compliant pipelines from SST farms to the cross-site transfer lines. These new waste transfer lines will comply with state and federal regulations requiring secondary containment, leak detection, and cathodic protection, and will support future waste retrieval and disposal missions. The scope of Project W-314 includes five new Waste Receiver Facilities (WRFs) in the 200 Areas, and upgrades of the waste transfer pipelines in the A complex (Tank Farms 241-A, -AN, -AP, -AW, -AX, -AY, and -AZ). The upgraded system will

connect with the transfer lines provided by Project W-058, Replacement of the Cross-Site Transfer System, and Project W-028, Aging Waste Transfer System. It will interface with the Retrieval Program at the WRFs.

The objective of the Tank Farm Electrical Upgrade is to restore the Tank Farms power distribution systems to an acceptable design basis, and to support the added power demands expected from other restored/upgraded systems (ventilation, instrumentation, etc.) and future cleanup activities. The scope of the upgrade includes primary, alternate, and backup power supplies to all existing and future essential loads. Equipment to be upgraded includes selected substations, transformers, switchgear, motor control centers, distribution panels, and cable runs to the loads.

The appendices provide further details of the scopes of the various upgrades.

1.3 JUSTIFICATION

1.3.1 Basis of Need

The Tank Farms Restoration and Safe Operations project will help ensure that the Hanford Tank Farm infrastructure will be able to support safe near-term storage, and subsequent retrieval for treatment and disposal, of liquid wastes. The capital improvements provided by this project will improve the margin of safety for the Tank Farms operations and bring affected Tank Farm systems into closer compliance with applicable Federal, state, and local regulations. Secondary benefits of the project include reduced down-time as well as reduced risk of personnel and environmental exposure to radioactive and hazardous releases.

The project directly supports the first two Environmental Management Program Goals established by the DOE's Assistant Secretary for Environmental Restoration and Waste Management, i.e., "manage and eliminate urgent risks and inherent threats", and "provide a safe workplace free from accidents, injuries and adverse health effects". It also supports the Secretary of Energy's TWRS Safety Initiatives "infrastructure upgrades" and "improved worker safety/conduct of operations".

Project W-314 is an important element in the renegotiated *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement), which establishes legally enforceable milestones, including major Milestone "M-43-00, Complete Tank Farm Upgrades, June 2005" which addresses a broad range of upgrades that will be provided by the project. In addition, Project W-314 supports Milestone "M-40-00, Mitigate/Resolve Tank Safety Issues for High Priority Watch List Tanks," since the resolution of some of these issues depend upon the upgrades included in this project.

Upgrade of selected ventilation system components is necessary for compliance with the Clean Air Act and 40 CFR 61, *National Emission Standards for Hazardous Air Pollutants*, as detailed in WHC Incoming Correspondence No. 9401181, *NESHAPS Federal Facility Compliance Agreement*. This Agreement between RL and Region 10 of the EPA constitutes a plan to achieve and maintain

compliance at the Hanford Site with applicable requirements under the Clean Air Act, as amended, its implementing regulations, and Executive Order 12088.

Details of the justification for the specific upgrades are discussed in the Engineering Studies and related documents listed below.

1.3.2 References Supporting the Basis of Need

- 10 CFR 835 (Released Draft), *Occupational Radiation Protection*. This regulation supports the Environmental Management Program Goals and the TWRS Safety Initiatives cited above.
- DOE Memorandum PRJ:MLR/94-PRJ-013, "Tank Farm Restoration and Safe Operations (TFRSO) Major Systems Acquisition (MSA, 96-D-XXX), Request for Key Decision (KD) 0 and Submittal of the Justification of Mission Need (JMN)," dated February 18, 1994. The JMN fully describes the programmatic and technical justification for initiating Conceptual Design for Project W-314, Tank Farm Restoration and Safe Operations.
- DOE Order 5480.19, *Conduct of Operations*. This order supports the TWRS Safety Initiative "improved worker safety/conduct of operations".
- *Hanford Federal Facility Agreement and Consent Order*. This is the Tri-Party Agreement, between the Washington State Department of Ecology, the U.S. Environmental Protection Agency (EPA), and the DOE. Project W-314 is necessary to meet TPA Milestone M-43-00, and to support TPA Milestone M-40-00.
- Los Alamos Technical Associates, Inc., *An Engineering Review of Tank Farm Ventilation Systems*, March 1993. This document describes the current condition of the ventilation systems, and establishes the need for replacement of these ventilation systems based on component age, safety, and future needs.
- WHC Incoming Correspondence No. 9401181, *NESHAPS Federal Facility Compliance Agreement*. The agreement designates the stacks that are required to have radionuclide emission measurements made in accordance with the requirements of 40 CFR 61.93(b).
- WHC-EP-0392 Rev. 1, *Tank Farms Restoration and Upgrades Program Plan*. This document provides an overview of planned Tank Farm Upgrades, including descriptions, justifications, and interfaces between the various tasks.
- WHC-SD-W314A-ES-001 Rev. 0, *Project W-314A Tank Farm Integrated Instrumentation System Upgrade Engineering Study*. This document provides specific and detailed information on the issues driving the instrumentation system upgrade.
- WHC-SD-W314B-DA-001 Rev. 0, *Tank Vapor Mitigation Requirements for Selected Tank Farms*. This document provides tank vapor characterization information, including the identification of the

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regulatory requirements governing mitigation of each identified vapor constituent.

- WHC-SD-W314C-ES-001 Rev. 0, *Project W-314C Transfer System Upgrades Engineering Study*. This document provides specific and detailed information on the issues driving the transfer system upgrade.
- WHC-SD-WM-ES-284 Rev. 0, *Engineering Study, Double-Shell Tank Ventilation Upgrades, Project W-314B*. This document provides specific and detailed information on the issues driving the upgrades, including mitigation of tank safety issues, support of the tank waste retrieval and disposal mission, compliance with state and federal laws, and deterioration due to aging of the existing systems.

2.0 APPLICATION OF SYSTEMS ENGINEERING APPROACH

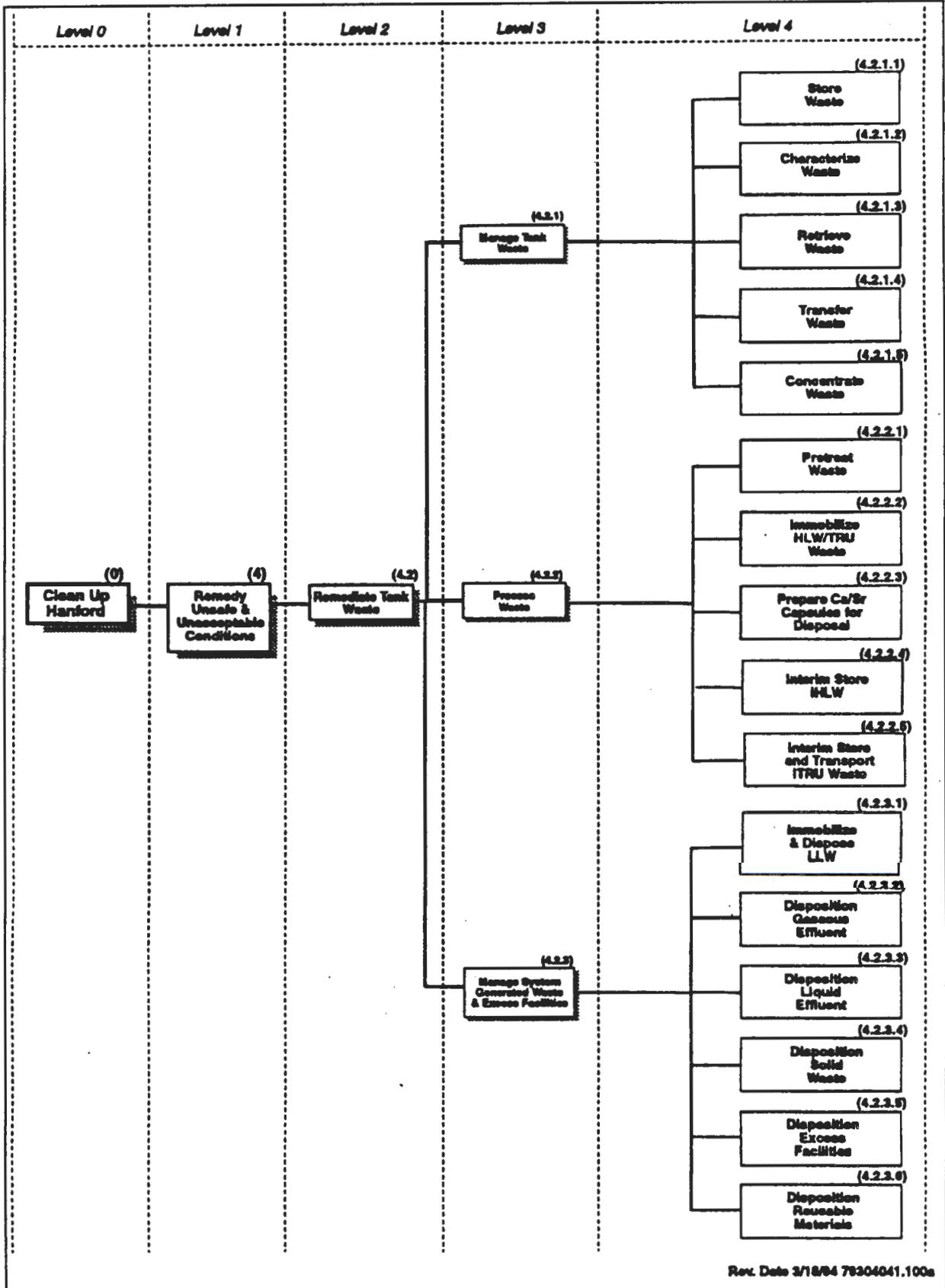
In November 1992 the TWRS Program Leadership Council directed that systems engineering be applied in the development and management of the TWRS program. Systems engineering is an iterative process consisting of four activities: functional analysis, synthesis, evaluation, and a description of system elements. This document provides the functional analysis for Project W-314, as directed by DOE-RL.

Functional analysis defines a baseline of functions and function performance requirements which must be met in order to adequately accomplish the operation, support, test, and production requirements of the system. The process begins with the identification of top level functions and ends with the allocation of those functions to lower level elements within the system. Functional analysis is a method for analyzing performance requirements and dividing them into discrete tasks or activities. It involves identifying the system's primary functions, and decomposing those functions into subfunctions at ever-increasing levels of detail. Interfaces between functions and with the outside environment are also identified. More information about systems engineering can be found in the *Systems Engineering Management Guide*, prepared by the Defense Systems Management College, January 1990.

The top four levels of functions, requirements, and system architecture necessary to perform the TWRS mission are defined in DOE/RL-92-60 Rev. 1, *Tank Waste Remediation System Functions and Requirements*. Figure 2-1 shows the hierarchy of the top four TWRS functions. The TWRS systems engineering process is described in DOE/RL-93-0106, Annex 2, *TWRS Systems Engineering Management Plan*. The process will continue by further decomposition of the functions, requirements, and system architecture.

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FIGURE 2-1. TWRS FUNCTION HIERARCHY



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Specific functions and requirements were developed for Project W-314. These project-specific functions are several levels below the current TWRS baseline definition, which is based on fourth-level functions. Therefore, certain enabling assumptions were made to bridge the gap and allow the identification of the highest level project-specific functions. The Appendices to this document provide details of the project-specific functions, and their associated requirements, as follows.

- Appendix A: Functions and Requirements for Tank Farm Integrated Instrumentation Upgrade (to be provided)
- Appendix B: Functions and Requirements for Ventilation System Upgrade
- Appendix C: Functions and Requirements for Transfer System Upgrade (to be provided)
- Appendix D: Functions and Requirements for Tank Farm Electrical Upgrade (to be provided)

Each Appendix identifies the TWRS fourth-level functions supported by the respective upgrade, and the assumptions enabling the decomposition of those functions to the project level. Also provided in each Appendix are details of the project-specific function hierarchy, the requirements allocated to each function, and the interfaces (inputs and outputs) of each function.

The functions, requirements, and interfaces identified in the appendices will be used to develop an integrated project design concept. The functions, requirements, and interfaces will then be further refined to provide a basis for detailed design.

As the TWRS baseline continues to evolve by the identification of lower-level functions and requirements, the functions and requirements identified for Project W-314 will be periodically evaluated, and revised if necessary, to maintain continuity with the TWRS functions and requirements.

3.0 GENERAL REQUIREMENTS

In addition to the requirements allocated to specific functions, as identified in the appendices, the following requirements shall apply to MSA Project W-314.

The project must recognize and address all requirements listed below and in the appendices. Each requirement shall be met, or shall be waived or exempted using the appropriate process.

Any requirement meeting one or more of the following criteria must be reviewed for possible waiver or exemption.

- Compliance with the requirement adds little value to the final product but significantly increases the project cost.
- The requirement mandates activities, reports, analysis, design features, or physical features which exceed sound technical or managerial judgement.

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- The requirement exceeds managerial or technical requirements for comparable for-profit industrial waste storage and cleanup sites.

3.1 DESIGN REQUIREMENTS

The design of systems, structures, and components provided by this project shall be in accordance with DOE Order 6430.1A, *General Design Criteria*, except where formal criteria deviations are approved by the cognizant DOE authority. The requirements of the "-99" Sections and of Division 13 of that order, as applied to nonreactor nuclear facilities and radioactive liquid waste facilities, are applicable to this project.

The design of systems, structures, and components shall comply with the requirements of RL Implementing Procedure (RLIP) 6430.1C, *Hanford Plant Standards (HPS) Program*, including but not limited to Standard Design Criteria specifically referenced in this document.

Systems, structures, and components important to safety shall be designed to withstand the effects of natural phenomena, including seismic, wind, and missile events. A graded approach to applying natural phenomena criteria shall be employed as described in DOE Order 5480.28, *Natural Phenomena Hazards Mitigation*, and Hanford Plant Standards, Standard Design Criteria HPS-SDC-4.1, Revision 11, *Design Loads for Facilities*.

Structures provided by this project are not required to include provisions for accessibility and usability by the physically handicapped, in accordance with DOE Order 6430.1A Section 1300-13.

Energy conservation shall be considered in the selection of components using the criteria given in DOE Order 6430.1A, with the objective to minimize consumption of nonrenewable energy sources and to encourage the use of renewable energy sources.

Systems, facilities, and services provided by this project shall be designed for year-round operation.

Existing site utilities shall be used to the maximum extent practicable.

3.2 SAFETY REQUIREMENTS

Structures, systems, and components are categorized into safety classes, as defined in WHC-CM-1-3, *Management Requirements and Procedures*, MRP 5.46, "Safety Classification of Systems, Components and Structures." The safety classes for systems, structures, and components provided by this project will be determined during the project's Hazard Analysis and Preliminary Safety Evaluation activities. The highest safety classification anticipated for any system, structure, or component to be provided by the Ventilation System Upgrade is Safety Class 2 (reference WHC-SD-W314B-HC-001 Rev. 0, *Hazard Classification for Double-Shell Tank Ventilation Upgrades, Project W-314B*). Hazard classification for the other upgrades of Project W-314 has not been completed.

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The design of systems, structures, and components shall ensure that a single failure does not result in the loss of capability of a safety class system to accomplish its required safety functions. To protect against single failures, the design shall include appropriate redundancy and shall consider diversity to minimize the possibility of concurrent common-mode failures of redundant items.

Personnel exposure to radiation and hazardous substances shall be mitigated by employing the As Low As Reasonably Achievable (ALARA) process, which incorporates shielding and design configuration. Shielding shall be provided in accordance with the exposure limits of DOE Orders 5400.5, *Radiation Protection of the Public and the Environment*, and 5480.11, *Radiation Protection for Occupational Workers*.

Equipment and facilities shall be designed in accordance with the safety requirements of the following:

10 CFR 835, *Occupational Radiation Protection*

29 CFR 1910, *Occupational Safety and Health Standards*

RL Order 5480.1A, *Environmental, Safety, and Health Program for Department of Energy Operations for Richland Operations*

DOE Order 5480.4, *Environmental Protection, Safety, and Health Protection Standards*

RL Order 5480.4C, *Environmental Protection, Safety, and Health Protection Standards for RL*

DOE Order 5480.7A, *Fire Protection*

RL Implementing Directive (RLID) 5480.7, *Fire Protection*

DOE Order 5480.10, *Contractor Industrial Hygiene Program*

RLIP 5480.10, *Industrial Hygiene Program*

3.3 QUALITY ASSURANCE REQUIREMENTS

A project-specific Quality Assurance Program Plan (QAPP) shall be developed during Conceptual Design and approved/released prior to definitive design. The QAPP implements the quality criteria of DOE Order 5700.6C, *Quality Assurance*, through the selective and judicious use of ASME NQA-1, *Quality Assurance Program Requirements for Nuclear Facilities*. The quality program shall provide for a graded approach to the selective application of those active requirements. The basis for establishing that graded approach is the safety classification assigned to systems, structures, and components as described in Section 3.2 above.

Quality Assurance (QA)/Quality Control (QC) activities for all contractors involved in design, construction, inspection, testing and acceptance shall be executed in accordance with the QAPP. The QAPP shall be used by the design contractor to develop verification criteria in design

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documents, (drawings, specifications, test procedures), and to define quality assurance interfaces for specific requirements and responsibilities on the project.

3.4 ENVIRONMENTAL REQUIREMENTS

The project shall comply with the requirements of DOE Order 5400.1, *General Environmental Protection Program*, as implemented by RLIP 5400.1, *General Environmental Protection Program*, and with the requirements of WHC-CM-7-5, *Environmental Compliance*.

The Ventilation System Upgrade shall comply with the requirements of WAC 173-401, *Operating Permit Regulation*.

3.5 DECONTAMINATION AND DECOMMISSIONING

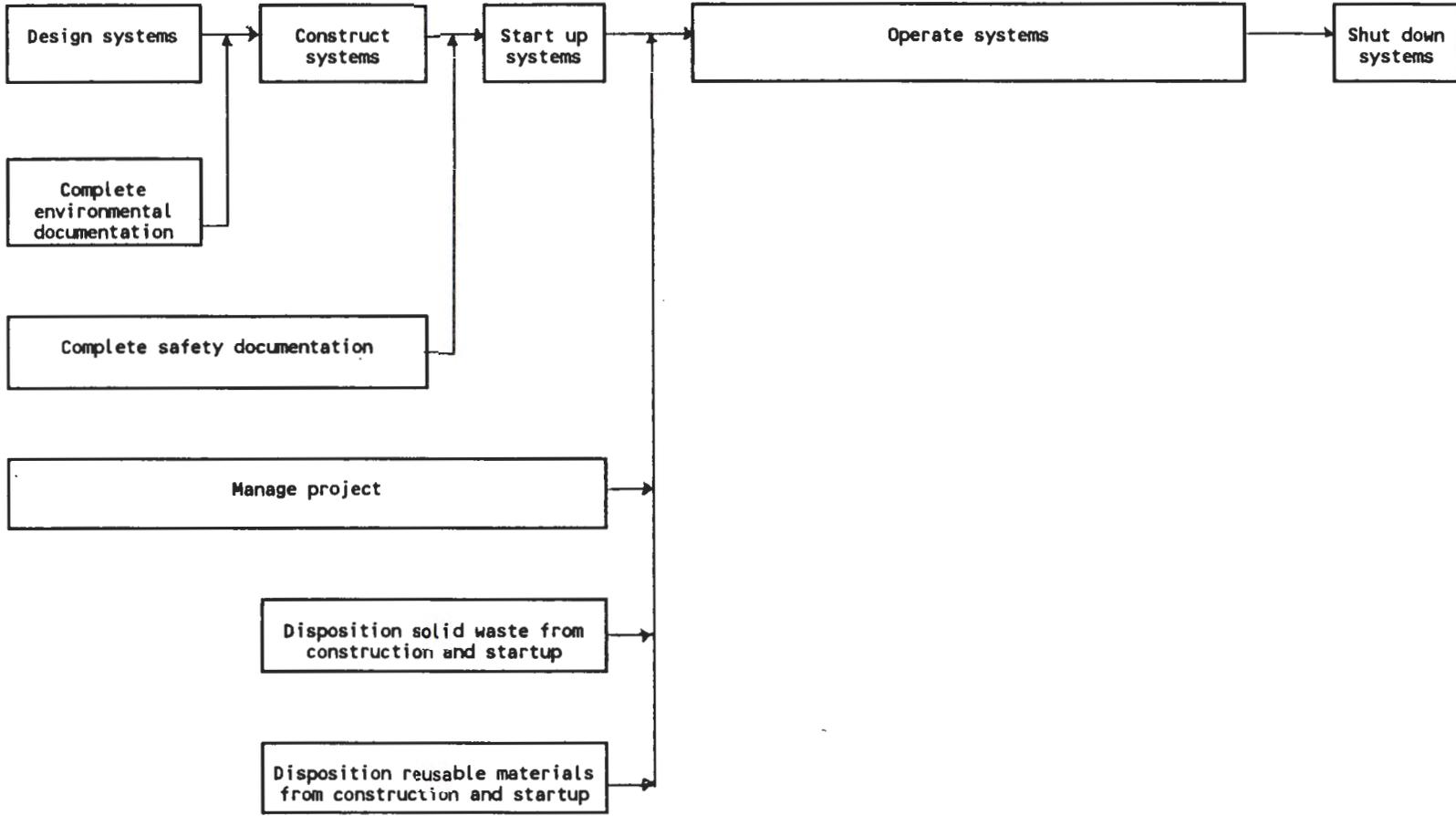
Existing equipment that is being replaced shall be decommissioned as necessary after the new systems are operational. Abandonment of equipment in place is permissible when that option can be shown to be the best economic and technical approach. Equipment and facilities provided by this project shall be designed to facilitate decontamination and ultimate decommissioning in accordance with DOE Order 6430.1A.

3.6 PROJECT MANAGEMENT AND INTERFACE CONTROL

The MSA shall be managed as a project in accordance with DOE Order 4700.1, *Project Management System*, as implemented by RLIP 4700.1A, *Project Management System*. See Figure 3-1 for a diagram showing the life cycle of the upgraded systems provided by the MSA.

Close coordination between Project W-314 and other planned/ongoing projects and activities shall be maintained throughout the definition, design, and construction phases.

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TIMELINE:
 Begin project _____ Turn systems over to operations _____ End of system mission

FIGURE 3-1. MSA W-314 UPGRADES LIFE CYCLE

4.0 REFERENCES

The following list is not intended as a stand-alone list of requirements to be met by Project W-314. Each reference listed below is cited in the main body of this document and/or in one or more of the Appendices.

4.1 REGULATIONS, ORDERS, CODES, AND STANDARDS

10 CFR 835 (Released Draft), *Occupational Radiation Protection*

29 CFR 1910, *Occupational Safety and Health Standards*

40 CFR 61, *National Emission Standards for Hazardous Air Pollutants*

40 CFR 191, *Environmental Radiation Protection Standards for Management and Disposal of Spent Nuclear Fuel, High Level and Transuranic Radioactive Wastes*

40 CFR 260, *Hazardous Waste Management System: General*

40 CFR 261, *Identification and Listing of Hazardous Waste*

40 CFR 262, *Standards Applicable to Generators of Hazardous Waste*

40 CFR 264, *Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities*

40 CFR 265, *Interim Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities*

ASME NQA-1, *Quality Assurance Program Requirements for Nuclear Facilities*

DOE/EH-0135, *Performance Objectives and Criteria for Technical Safety Appraisals at DOE Facilities and Sites*

DOE/EH-0173T, *Environmental Regulatory Guide for Radiological Effluent Monitoring and Environmental Surveillance*

DOE Order 4700.1, *Project Management System*

DOE Order 5400.1, *General Environmental Protection Program*

DOE Order 5400.5, *Radiation Protection of the Public and the Environment*

DOE Order 5480.4, *Environmental Protection, Safety, and Health Protection Standards*

DOE Order 5480.7A, *Fire Protection*

DOE Order 5480.10, *Contractor Industrial Hygiene Program*

DOE Order 5480.11, *Radiation Protection for Occupational Workers.*

DOE Order 5480.28, *Natural Phenomena Hazards Mitigation*

DOE Order 5484.1, *Environmental Protection, Safety, and Health Protection Information Reporting Requirements*

DOE Order 5700.6C, *Quality Assurance*

DOE Order 5820.2A, *Radioactive Waste Management*

DOE Order 6430.1A, *General Design Criteria*

HPS-SDC-4.1, *Revision 11, Design Loads for Facilities*

NRC 4.15, *Quality Assurance for Radiation Monitoring (Normal Operations) - Effluent Streams and the Environment*

RL Order 5480.1A, *Environmental, Safety, and Health Program for Department of Energy Operations for Richland Operations*

RL Order 5480.4C, *Environmental Protection, Safety, and Health Protection Standards for RL*

RLID 5480.7, *Fire Protection*

RLIP 4700.1A, *Project Management System*

RLIP 5400.1, *General Environmental Protection Program*

RLIP 5480.10, *Industrial Hygiene Program*

RLIP 5480.11, *Radiation Protection for Occupational Workers*

RLIP 6430.1C, *Hanford Plant Standards (HPS) Program*

WAC-173-303, *Dangerous Waste Regulations*

WAC 173-360, *Underground Storage Tank Regulations*

WAC 173-400, *General Regulations for Air Pollution Sources*

WAC 173-401, *Operating Permit Regulation*

WAC-173-460, *Controls for New Sources of Toxic Air Pollutants*

WAC 173-470, *Ambient Air Quality Standards for Particulate Matter*

WAC-173-480, *Ambient Air Quality Standards and Emission Limits for Radionuclides*

WAC 246-247, *Radiation Protection - Air Emissions*

WHC-CM-1-3, *Management Requirements and Procedures, MRP 5.46, "Safety Classification of Systems, Components and Structures"*

WHC-CM-7-5, *Environmental Compliance*

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4.2 SUPPORTING INFORMATION

Defense Systems Management College, *Systems Engineering Management Guide*, January 1990

DOE-RL Letter 94-PRJ-018, R. W. Brown, RL, to President, WHC, "Tank Waste Remediation System (TWRS) Project Documentation Methodology," dated March 17, 1994

DOE-RL Memorandum PRJ:MLR/94-PRJ-013, "Tank Farm Restoration and Safe Operations (TFRSO) Major Systems Acquisition (MSA, 96-D-XXX), Request for Key Decision (KD) 0 and Submittal of the Justification of Mission Need (JMN)," dated February 18, 1994

DOE/RL-92-60 Rev. 1, *Tank Waste Remediation System Functions and Requirements*

DOE/RL-93-0106, Annex 2, *TWRS Systems Engineering Management Plan*

Los Alamos Technical Associates, Inc., *An Engineering Review of Tank Farm Ventilation Systems*, March 1993

S/RID, *Tank Farms Standards/Requirements Identification Document*, Draft dated September 30, 1993

WHC-EP-0392 Rev. 1, *Tank Farms Restoration and Upgrades Program Plan*

WHC-SD-W314A-ES-001 Rev. 0, *Project W-314A Tank Farm Integrated Instrumentation System Upgrade Engineering Study*

WHC-SD-W314B-DA-001, *Tank Vapor Mitigation Requirements for Selected Tank Farms*

WHC-SD-W314B-HC-001 Rev. 0, *Hazard Classification for Double-Shell Tank Ventilation Upgrades, Project W-314B*

WHC-SD-W314C-ES-001 Rev. 0, *Project W-314C Transfer System Upgrades Engineering Study*

WHC-SD-WM-ES-284 Rev. 0, *Engineering Study, Double-Shell Tank Ventilation Upgrades, Project W-314B*

WHC-SD-WM-RPT-075 Rev. 0, *Recommendation on Need for an Exhauster on 241-A-105 Hanford Federal Facility Agreement and Consent Order*

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GLOSSARY

ABBREVIATIONS, ACRONYMS, AND INITIALISMS

ALARA	As Low as Reasonably Achievable
ASME	American Society of Mechanical Engineers
CFR	Code of Federal Regulations
DCRT	Double-Contained Receiver Tank
DOE	U.S. Department of Energy
DOE-HQ	DOE Headquarters
DOE-RL	DOE Richland Operations Office
DST	Double-Shell Tank
EPA	U.S. Environmental Protection Agency
FAST	Function Analysis System Technique
FFBD	Functional Flow Block Diagram
RL	DOE Richland Operations Office
RLIP	RL Implementing Procedure
S/RID	Tank Farms Standards/Requirements Identification Document
SST	Single-Shell Tank
TPA	Tri-Party Agreement
TWRS	Tank Waste Remediation System
WAC	Washington Administrative Code
WHC	Westinghouse Hanford Company
WHC-CM	WHC Controlled Manual
WRF	Waste Receiver Facility

DEFINITIONS OF TERMS

Confinement System. The barrier and its associated systems (including ventilation) between areas containing hazardous materials and the environment or other areas in the facility that are normally expected to have levels of hazardous materials lower than allowable concentration limits.

Constraint. A requirement imposed on a function by the external environment (e.g., U.S. Congress, Washington Department of Ecology, DOE Orders).

Decomposition. The process of breaking down functions, requirements, and architectural concepts into sub-elements at increasing levels of detail. An integral part of Functional Analysis.

Function. A primary statement of purpose; a definition of what a system or subsystem must accomplish to meet the overall mission.

Function Analysis System Technique (FAST) Diagram. A diagram illustrating the sequential and hierarchical relationships of functions. An element of the Value Engineering process.

Functional Analysis. A method for analyzing performance requirements and dividing them into discrete tasks or activities. The first step of the Systems Engineering process.

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Functional Flow Block Diagram. A diagram illustrating the sequential relationship of all functions that must be accomplished by a system. An element of the Systems Engineering process.

Interface. An input or an output.

Input. Anything that is acted upon by a function to produce desired outputs. Inputs can be classified as either internal or external, depending on whether they originate from within TWRS or from the outside environment, respectively.

Output. Anything that leaves a function after it has been acted upon by that function.

Performance Requirement. A requirement imposed on a function by the TWRS program itself, which therefore may be traded with respect to other performance requirements to optimize overall performance.

Requirement. A qualitative or quantitative statement of how well a function must be performed. Requirements may be one of two types: constraints and performance requirements.

System. A set or arrangement of things that are related and form an organic whole. Relationships tie the system together.

Systems Engineering. A process that transforms an operational need into a description of system parameters and integrates those parameters to optimize the overall system effectiveness.

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APPENDIX A

FUNCTIONS AND REQUIREMENTS FOR
TANK FARM INTEGRATED INSTRUMENTATION UPGRADE

(TO BE PROVIDED AT A LATER DATE)

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APPENDIX B
FUNCTIONS AND REQUIREMENTS FOR
VENTILATION SYSTEM UPGRADE

NOTE: The requirements presented in this appendix are binding.

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1.0 INTRODUCTION

1.1 PURPOSE

The objective of the Ventilation System Upgrade is to restore the tank ventilation systems to an acceptable design basis and to resolve environmental, health, and safety concerns.

The purpose of this document is to identify the functions that must be performed by the upgraded ventilation systems, and the requirements that define how well the systems must perform each function. The functions and requirements will be used to develop a system design concept per the Systems Engineering process. The document also identifies interfaces between the functions of the ventilation system, and with the outside environment. (Interfaces with the other upgrades provided by Project W-314 will be identified as the functions and requirements for those upgrades are developed.) More information on the process is provided in Section 2.0 below.

1.2 SCOPE

This portion of Project W-314 will upgrade existing active Tank Farm ventilation systems as needed to support the TWRS mission. Specifically, the scope includes upgrades of the following systems.

- Primary ventilation systems in tank farms 241-AN, -AP, -AW, and -SY.
- Annulus ventilation systems in tank farms 241-AN, -AP, -AW, -AY, -AZ, and -SY.
- Ventilation system in SST Farm 241-SX. (The need for continuing ventilation of the tanks in 241-SX is currently being evaluated. If it is concluded that the system is no longer needed, this upgrade will be deleted from the project scope.)
- Primary and annulus ventilation system for DCRT 244-A. (Current planning for the Transfer System Upgrade described in Appendix C includes continuing use of DCRT 244-A. If the scope of the Transfer System Upgrade is changed, the need for ventilation of this DCRT will be reevaluated.)

The scope of this project does not include upgrades of the following active ventilation systems.

- Primary ventilation systems in tank farms 241-AY and -AZ, which are being replaced by ongoing Project W-030, Tank Farm Ventilation Upgrades.
- Ventilation of SST 241-A-105, which has been evaluated and found to be unnecessary (WHC-SD-WM-RPT-075, *Recommendation on Need for an Exhauster on 241-A-105*).

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- Ventilation system in SST Farm 241-C, which is being addressed by Project W-320, 241-C-106 Sluicing, and by the Waste Tank Safety Program.
- Primary and annulus ventilation of DCRTs 244-BX, -S, -TX, and -U, which will be isolated as part of the Transfer System Upgrade described in Appendix C. If the scope of the Transfer System Upgrade is changed, the need for ventilation of these DCRTs will be reevaluated.

The scope of the ventilation system upgrade extends from the ventilation inlets to the tanks, to the point of discharge where the exhaust air is released to the atmosphere. The scope includes all ductwork, filtration and air cleaning devices, fans, drains and seal pots, and stacks that lie between those points.

All local instrumentation required to monitor and operate the ventilation system will be provided as part of the ventilation system upgrade. The scope also includes all new instrumentation necessary for monitoring the exhaust air, local readouts and alarms, and local instrumentation enclosures. The local instrumentation systems will interface with the integrated instrumentation system upgrade described in Appendix A.

The scope also includes routing electrical power and other required utilities to ventilation and instrumentation system components, using existing sources where possible. The electrical scope of the ventilation upgrade interfaces with the electrical upgrade described in Appendix D.

Shelter will be provided, as required, for selected components and for personnel operating and maintaining the systems. Removal and disposition of existing equipment, as necessary, is also included in the scope.

Interfaces with the other upgrades provided by Project W-314 will be identified as the functions and requirements for those upgrades become available. In addition to those interfaces, the upgraded ventilation systems shall interface with existing systems and facilities, including the 242-A Evaporator and the 242-S Evaporator.

2.0 VENTILATION SYSTEM UPGRADE FUNCTIONS AND REQUIREMENTS

Specific functions and requirements were developed for the Ventilation System Upgrade to meet the requirements of DOE/RL-93-0106, Annex 2, *TWRS Systems Engineering Management Plan*. Each function is decomposed from a TWRS fourth-level function as identified in DOE/RL-92-60 Rev. 1, *Tank Waste Remediation System Functions and Requirements*.

The functions, requirements, and interfaces identified below will be used to develop a project design concept. The functions, requirements, and interfaces will then be further refined to provide a basis for detailed design.

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The TWRS Systems Engineering process will continue as described in DOE/RL-93-0106, Annex 2. As each step in the process is completed, the functions and requirements identified for the Ventilation System Upgrade will be evaluated, and revised if necessary, to maintain continuity with the TWRS functions and requirements.

Section 2.3 of this appendix identifies the interfaces between the upgrade-specific functions, between the upgrade and the TWRS program, and between the upgrade and the external environment. Section 2.4 lists the requirements allocated to the functions and interfaces of the upgrade.

2.1 FUNCTION HIERARCHY

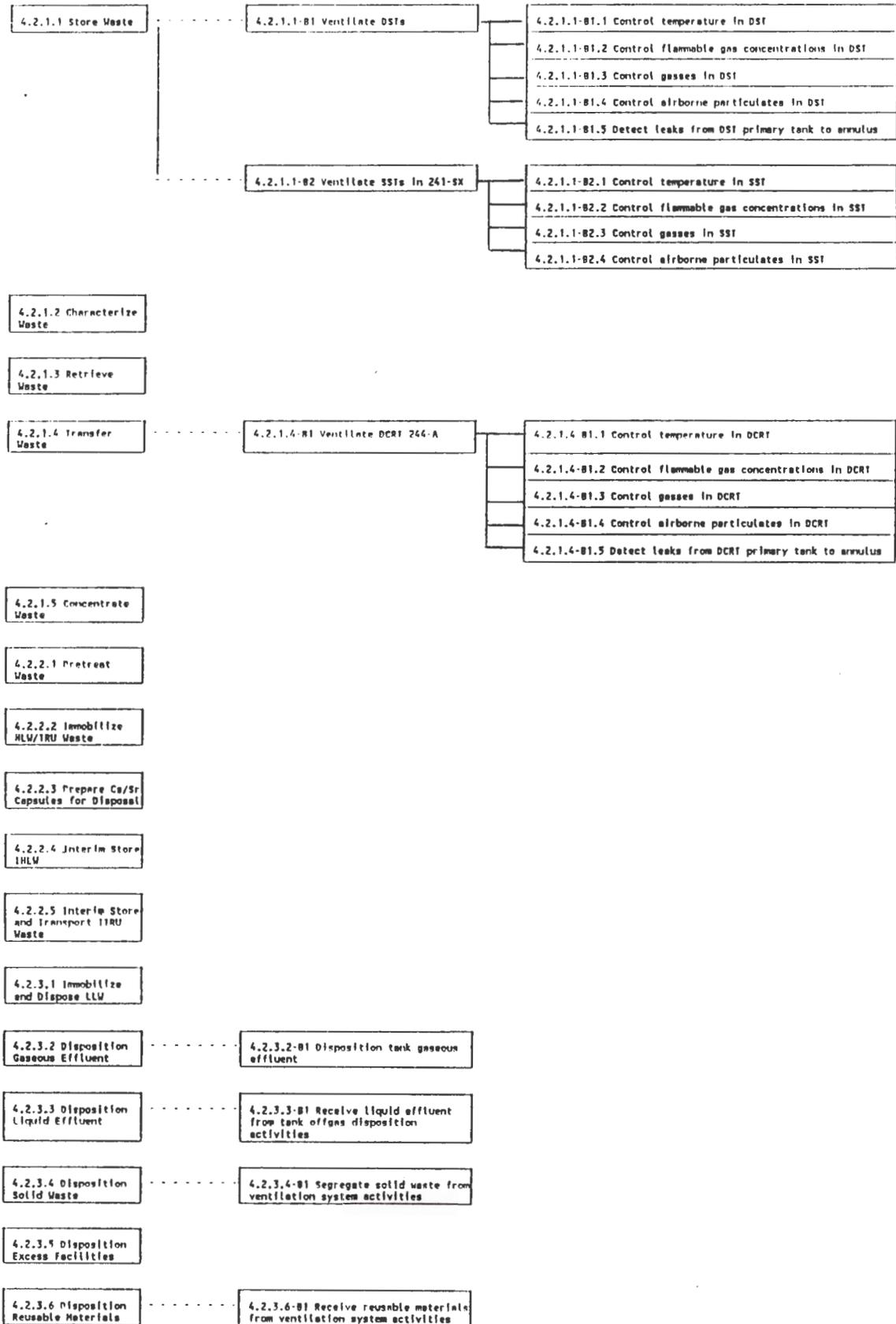
Each function identified for the Ventilation System Upgrade is given a number of the format 4.2.i.j-Bx or -Bx.y. The first part of the number, 4.2.i.j, is the number of the TWRS fourth-level function from which the project-level function was decomposed. The "-B" indicates that it is a function allocated to the Ventilation System Upgrade, defined in Appendix B. The "x" or "x.y" completes the unique number within each "4.2.i.j" group. For example, 4.2.1.1-B1 indicates a function decomposed from TWRS function 4.2.1.1 and allocated to the upgraded ventilation system; and 4.2.1.1-B1.1 indicates a subfunction of 4.2.1.1-B1.

Figure B2-1 illustrates the hierarchy of the Ventilation System Upgrade functions, as decomposed from the TWRS fourth-level functions. The dotted lines between the fourth-level functions and the project-level functions represent several missing levels. Those levels will be developed as the TWRS systems engineering effort continues. The Function Description Sheets in Section 2.2 of this appendix define the assumptions that enabled the decomposition of each TWRS function to the project level.

Figure 2-1 in the main body of this document shows the hierarchy of the TWRS functions to the fourth level.

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FIGURE B2-1. VENTILATION SYSTEM UPGRADE FUNCTION HIERARCHY



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2.2 FUNCTION DESCRIPTION SHEETS

A Function Description Sheet is provided for each of the functions identified for the Ventilation System Upgrade. The Function Description Sheets provide the function definitions, enabling assumptions, interfaces, function requirements, and interface requirements. The sheets were prepared according to the format used in DOE/RL-92-60, as shown below.

I. FUNCTION ID NUMBER:

II. FUNCTION TITLE: Short description; verb followed by noun or noun phrase.

III. FUNCTION DEFINITION:

Primary statement of purpose. Brief description of what this function must accomplish to meet the overall mission, often including the scope of applicability.

IV. ENABLING ASSUMPTIONS:

Assumed interfaces, end states, and criteria that were made to further define the function, constrain the limits of applicability, or interpret system requirements. These assumptions necessitate additional analyses to determine impacts on the program.

V. INTERFACES

A. INPUTS

Anything that is acted upon by a function to produce desired outputs. Inputs can be classified as either internal or external, depending on whether they originate from within TWRS or from the outside environment, respectively.

B. OUTPUTS

Anything that leaves the function after it has been acted upon by that function.

VI. FUNCTION REQUIREMENTS

A qualitative or quantitative statement of how well a function must be performed. Function requirements may be one of two types: Constraints or Performance Requirements.

Constraints:

Requirements imposed upon the function by the external environment (e.g., U.S. Congress, Washington EPA, DOE Orders).

Performance Requirements:

Requirements imposed upon the function by the TWRS Program itself and, hence, may be traded with respect to other performance requirements to optimize overall performance.

The numbering convention used for the identification of requirements in these tables is as follows:

- 4.2.1 C1 is the first constraint (C) allocated to function 4.2.1;
- 4.2.1 P1 is the first performance requirement (P) allocated to function 4.2.1;
- 4.2.1 I3 C1 is the first constraint allocated to input number I3 to function 4.2.1; and
- 4.2.1. 01 P1 is the first performance requirement allocated to output number 01 from function 4.2.1.

VII. INTERFACE REQUIREMENTS

A requirement that applies to the inputs to, or outputs from, a function. Interface requirements are either constraints or performance requirements.

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I. FUNCTION ID NUMBER: 4.2.1.1-B1

II. FUNCTION TITLE: Ventilate DSTs.

III. FUNCTION DEFINITION:

Ventilate the DST. This includes the control of temperature, flammable gas concentrations, and airborne contaminants in the tanks. It also includes the detection of leaks from the primary tank to the annulus.

The scope of this function includes ventilation of the following.

*All DST primary tanks in tank farms 241-AN, -AP, -AW, and -SY
All DST annuli in tank farms 241-AN, -AP, -AW, -AY, -AZ, and -SY*

IV. ENABLING ASSUMPTIONS:

Existing waste will continue to be stored in existing tanks. Decomposition of Function 4.2.1.1 will include the fifth-level function "Store DST waste." The DSTs will continue to require ventilation until closure.

V. INTERFACES

A. INPUTS

4.2.1.1-B1 I1 Air From: External

Air entering the DST ventilation system from the atmosphere.

4.2.1.1-B1 I2 Heat From: TWRS 4.2.1.1
TWRS 4.2.1.3

Heat generated by the waste in the tank, and heat generated by the operation of mitigation and/or retrieval equipment.

4.2.1.1-B1 I3 Vapor Characterization Data From: TWRS 4.2.1.2

Information about the constituents of the gasses in the vapor space of each tank.

4.2.1.1-B1 I3 Waste Characterization Data From: TWRS 4.2.1.2

Information about the constituents of the waste in each tank.

4.2.1.1-B1 I4 DST Integrity Data From: TWRS 4.2.1.1

Information about the structural integrity of the DST, including maximum and minimum allowable temperatures and heat load limits.

4.2.1.1-B1 I5 Gasses From: TWRS 4.2.1.1

Gasses generated by the waste in the tank.

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4.2.1.1-B1 I6 Airborne Particulates From: TWRS 4.2.1.1

Airborne particulates generated by the waste in the tank.

B. OUTPUTS

4.2.1.1-B1 01 DST Gaseous Effluent To: 4.2.3.2-B1

DST offgas streams for treatment and release.

4.2.1.1-B1 02 Solid Waste To: 4.2.3.4-B1

Solid waste generated from tank ventilation system operation.

4.2.1.1-B1 03 Excess Equipment/Facilities To: TWRS 4.2.3.5

DST ventilation system components, once they are no longer needed in fulfillment of the TWRS mission.

4.2.1.1-B1 04 Reusable Materials To: 4.2.3.6-B1

Materials economically suitable for reuse by TWRS or other programs.

VI. FUNCTION REQUIREMENTS

See Table B2-2 for requirements allocated to this function.

VII. INTERFACE REQUIREMENTS

See Table B2-2 for requirements allocated to the interfaces of this function.

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I. FUNCTION ID NUMBER: 4.2.1.1-B1.1

II. FUNCTION TITLE: Control temperature in DST.

III. FUNCTION DEFINITION:

Maintain the temperature in the DST vapor space and annulus within acceptable limits, based on analysis of the tank contents and the tank structure.

IV. ENABLING ASSUMPTIONS:

Temperature control is an integral part of environmentally sound, safe storage of waste within the DST, and is a function allocated to the ventilation system.

V. INTERFACES

A. INPUTS

4.2.1.1-B1.1 I1 Air From: External

Air entering the DST ventilation system from the atmosphere.

4.2.1.1-B1.1 I2 Heat From: TWRS 4.2.1.1
TWRS 4.2.1.3

Heat generated by the waste in the tank, and heat generated by the operation of mitigation and/or retrieval equipment.

4.2.1.1-B1.1 I3 Vapor Characterization Data From: TWRS 4.2.1.2

Information about the constituents of the gasses in the vapor space of each tank.

4.2.1.1-B1.1 I4 Waste Characterization Data From: TWRS 4.2.1.2

Information about the constituents of the waste in each tank.

4.2.1.1-B1.1 I5 DST Integrity Data From: TWRS 4.2.1.1

Information about the structural integrity of the DST, including maximum and minimum allowable temperatures and heat load limits.

B. OUTPUTS

4.2.1.1-B1.1 O1 DST Gaseous Effluent To: 4.2.3.2-B1

DST offgas streams for treatment and release.

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4.2.1.1-B1.1 02 Solid Waste

To: 4.2.3.4-B1

Solid waste generated from DST ventilation system operation.

4.2.1.1-B1.1 03 Excess Equipment/Facilities

To: TWRS 4.2.3.5

DST ventilation system components, once they are no longer needed in fulfillment of the TWRS mission.

4.2.1.1-B1.1 04 Reusable Materials

To: 4.2.3.6-B1

Materials economically suitable for reuse by TWRS or other programs.

VI. FUNCTION REQUIREMENTS

See Table B2-2 for requirements allocated to this function.

VII. INTERFACE REQUIREMENTS

See Table B2-2 for requirements allocated to the interfaces of this function.

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I. **FUNCTION ID NUMBER:** 4.2.1.1-B1.2

II. **FUNCTION TITLE:** Control flammable gas concentrations in DST vapor space.

III. **FUNCTION DEFINITION:**

Maintain the concentration of flammable gasses in the DST vapor space below the lower flammability level (LFL).

IV. **ENABLING ASSUMPTIONS:**

Flammable gas concentration control is an integral part of environmentally sound, safe storage of waste within the DST, and is a function allocated to the ventilation system.

V. **INTERFACES**

A. **INPUTS**

4.2.1.1-B1.2 I1 Air From: External

Air entering the DST ventilation system from the atmosphere.

4.2.1.1-B1.2 I2 Vapor Characterization Data From: TWRS 4.2.1.2

Information about the constituents of the gasses in the vapor space of each tank.

4.2.1.1-B1.2 I3 Gasses From: TWRS 4.2.1.1

Gasses generated by the waste in the tank.

B. **OUTPUTS**

4.2.1.1-B1.2 O1 DST Gaseous Effluent To: 4.2.3.2-B1

DST offgas streams for treatment and release.

4.2.1.1-B1.2 O2 Solid Waste To: 4.2.3.4-B1

Solid waste generated from DST ventilation system operation.

4.2.1.1-B1.2 O3 Excess Equipment/Facilities To: TWRS 4.2.3.5

DST ventilation system components, once they are no longer needed in fulfillment of the TWRS mission.

4.2.1.1-B1.2 O4 Reusable Materials To: 4.2.3.6-B1

Materials economically suitable for reuse by TWRS or other programs.

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VI. FUNCTION REQUIREMENTS

See Table B2-2 for requirements allocated to this function.

VII. INTERFACE REQUIREMENTS

See Table B2-2 for requirements allocated to the interfaces of this function.

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I. **FUNCTION ID NUMBER:** 4.2.1.1-B1.3

II. **FUNCTION TITLE:** Control gasses in DST.

III. **FUNCTION DEFINITION:**

Control releases of gasses from the DST.

IV. **ENABLING ASSUMPTIONS:**

The DST ventilation system forms part of the DST confinement system, as defined in DOE Order 6430.1A.

V. **INTERFACES**

A. **INPUTS**

4.2.1.1-B1.3 I1 Air From: External

Air entering the DST ventilation system from the atmosphere.

4.2.1.1-B1.3 I2 Vapor Characterization Data From: TWRS 4.2.1.2

Information about the constituents of the gasses in the vapor space of each tank.

4.2.1.1-B1.3 I3 Gasses From: TWRS 4.2.1.1

Gasses generated by the waste in the tank.

B. **OUTPUTS**

4.2.1.1-B1.3 O1 DST Gaseous Effluent To: 4.2.3.2-B1

DST offgas streams for treatment and release.

4.2.1.1-B1.3 O2 Solid Waste To: 4.2.3.4-B1

Solid waste generated from DST ventilation system operation.

4.2.1.1-B1.3 O3 Excess Equipment/Facilities To: TWRS 4.2.3.5

DST ventilation system components, once they are no longer needed in fulfillment of the TWRS mission.

4.2.1.1-B1.3 O4 Reusable Materials To: 4.2.3.6-B1

Materials economically suitable for reuse by TWRS or other programs.

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VI. FUNCTION REQUIREMENTS

See Table B2-2 for requirements allocated to this function.

VII. INTERFACE REQUIREMENTS

See Table B2-2 for requirements allocated to the interfaces of this function.

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I. **FUNCTION ID NUMBER:** 4.2.1.1-B1.4

II. **FUNCTION TITLE:** Control airborne particulates in DST.

III. **FUNCTION DEFINITION:**

Control releases of airborne particulates from the DST.

IV. **ENABLING ASSUMPTIONS:**

The DST ventilation system forms part of the DST confinement system, as defined in DOE Order 6430.1A.

V. **INTERFACES**

A. **INPUTS**

4.2.1.1-B1.4 I1 Air From: External

Air entering the DST ventilation system from the atmosphere.

4.2.1.1-B1.4 I2 Vapor Characterization Data From: TWRS 4.2.1.2

Information about the constituents of the gasses in the vapor space of each tank.

4.2.1.1-B1.4 I3 Waste Characterization Data From: TWRS 4.2.1.2

Information about the constituents of the waste in each tank.

4.2.1.1-B1.4 I4 Airborne Particulates From: TWRS 4.2.1.1

Airborne particulates generated by the waste in the tank.

B. **OUTPUTS**

4.2.1.1-B1.4 01 DST Gaseous Effluent To: 4.2.3.2-B1

DST offgas streams for treatment and release.

4.2.1.1-B1.4 02 Solid Waste To: 4.2.3.4-B1

Solid waste generated from DST ventilation system operation.

4.2.1.1-B1.4 03 Excess Equipment/Facilities To: TWRS 4.2.3.5

DST ventilation system components, once they are no longer needed in fulfillment of the TWRS mission.

4.2.1.1-B1.4 04 Reusable Materials To: 4.2.3.6-B1

Materials economically suitable for reuse by TWRS or other programs.

9173276.2102

VI. FUNCTION REQUIREMENTS

See Table B2-2 for requirements allocated to this function.

VII. INTERFACE REQUIREMENTS

See Table B2-2 for requirements allocated to the interfaces of this function.

9413276.2103

I. **FUNCTION ID NUMBER:** 4.2.1.1-B1.5

II. **FUNCTION TITLE:** Detect leaks from DST primary tank to annulus.

III. **FUNCTION DEFINITION:**

Detect the presence of radioactive material in the DST annulus offgas stream, indicating leakage from the DST primary tank to the annulus.

IV. **ENABLING ASSUMPTIONS:**

Leak detection is an integral part of environmentally sound, safe storage of waste within the DST, and is a function allocated to the ventilation system.

V. **INTERFACES**

A. **INPUTS**

4.2.1.1-B1.5 I1 Air From: External

Air entering the DST ventilation system from the atmosphere.

4.2.1.1-B1.5 I2 Airborne Particulates From: TWRS 4.2.1.1

Airborne particulates generated by the waste in the tank.

B. **OUTPUTS**

4.2.1.1-B1.5 01 DST Gaseous Effluent To: 4.2.3.2-B1

DST offgas streams for treatment and release.

4.2.1.1-B1.5 02 Solid Waste To: 4.2.3.4-B1

Solid waste generated from DST ventilation system operation.

4.2.1.1-B1.5 03 Excess Equipment/Facilities To: TWRS 4.2.3.5

DST ventilation system components, once they are no longer needed in fulfillment of the TWRS mission.

4.2.1.1-B1.5 04 Reusable Materials To: 4.2.3.6-B1

Materials economically suitable for reuse by TWRS or other programs.

VI. **FUNCTION REQUIREMENTS**

See Table B2-2 for requirements allocated to this function.

9473276.2104

VII. INTERFACE REQUIREMENTS

See Table B2-2 for requirements allocated to the interfaces of this function.

5012-9/25/16
9443276-2105

I. **FUNCTION ID NUMBER:** 4.2.1.1-B2

II. **FUNCTION TITLE:** Ventilate SSTs in 241-SX

III. **FUNCTION DEFINITION:**

Ventilate the SST. This includes the control of temperature, flammable gas concentrations, and airborne contaminants in the tanks.

The scope of this function includes ventilation of all tanks in Tank Farm 241-SX.

IV. **ENABLING ASSUMPTIONS:**

Existing waste will continue to be stored in existing tanks. Decomposition of Function 4.2.1.1 will include the fifth-level function "Store SST waste." The SSTs in 241-SX will continue to require ventilation until closure.

V. **INTERFACES**

A. **INPUTS**

4.2.1.1-B2 I1 Air From: External

Air entering the SST ventilation system from the atmosphere.

4.2.1.1-B2 I2 Heat From: TWRS 4.2.1.1
TWRS 4.2.1.3

Heat generated by the waste in the tank, and heat generated by the operation of mitigation and/or retrieval equipment.

4.2.1.1-B2 I3 Vapor Characterization Data From: TWRS 4.2.1.2

Information about the constituents of the gasses in the vapor space of each tank.

4.2.1.1-B2 I3 Waste Characterization Data From: TWRS 4.2.1.2

Information about the constituents of the waste in each tank.

4.2.1.1-B2 I4 SST Integrity Data From: TWRS 4.2.1.1

Information about the structural integrity of the SST, including maximum and minimum allowable temperatures and heat load limits.

4.2.1.1-B2 I5 Gasses From: TWRS 4.2.1.1

Gasses generated by the waste in the tank.

99122762005

4.2.1.1-B2 I6 Airborne Particulates From: TWRS 4.2.1.1

Airborne particulates generated by the waste in the tank.

B. OUTPUTS

4.2.1.1-B2 01 SST Gaseous Effluent To: 4.2.3.2-B1

SST offgas streams for treatment and release.

4.2.1.1-B2 02 Solid Waste To: 4.2.3.4-B1

Solid waste generated from SST ventilation system operation.

4.2.1.1-B2 03 Excess Equipment/Facilities To: TWRS 4.2.3.5

SST ventilation system components, once they are no longer needed in fulfillment of the TWRS mission.

4.2.1.1-B2 04 Reusable Materials To: 4.2.3.6-B1

Materials economically suitable for reuse by TWRS or other programs.

VI. FUNCTION REQUIREMENTS

See Table B2-2 for requirements allocated to this function.

VII. INTERFACE REQUIREMENTS

See Table B2-2 for requirements allocated to the interfaces of this function.

943276.2107

I. **FUNCTION ID NUMBER:** 4.2.1.1-B2.1

II. **FUNCTION TITLE:** Control temperature in SST.

III. **FUNCTION DEFINITION:**

Maintain the temperature in the SST vapor space within acceptable limits, based on analysis of the tank contents and the tank structure.

IV. **ENABLING ASSUMPTIONS:**

Temperature control is an integral part of environmentally sound, safe storage of waste within the SST, and is a function allocated to the ventilation system.

V. **INTERFACES**

A. **INPUTS**

4.2.1.1-B2.1 I1 Air From: External

Air entering the SST ventilation system from the atmosphere.

4.2.1.1-B2.1 I2 Heat From: TWRS 4.2.1.1
TWRS 4.2.1.3

Heat generated by the waste in the tank, and heat generated by the operation of mitigation and/or retrieval equipment.

4.2.1.1-B2.1 I3 Vapor Characterization Data From: TWRS 4.2.1.2

Information about the constituents of the gasses in the vapor space of each tank.

4.2.1.1-B2.1 I3 Waste Characterization Data From: TWRS 4.2.1.2

Information about the constituents of the waste in each tank.

4.2.1.1-B2.1 I4 SST Integrity Data From: TWRS 4.2.1.1

Information about the structural integrity of the SST, including maximum and minimum allowable temperatures and heat load limits.

B. **OUTPUTS**

4.2.1.1-B2.1 01 SST Gaseous Effluent To: 4.2.3.2-B1

SST offgas streams for treatment and release.

4.2.1.1-B2.1 02 Solid Waste To: 4.2.3.4-B1

Solid waste generated from SST ventilation system operation.

947776.000

4.2.1.1-B2.1 03 Excess Equipment/Facilities To: TWRS 4.2.3.5

SST ventilation system components, once they are no longer needed in fulfillment of the TWRS mission.

4.2.1.1-B2.1 04 Reusable Materials To: 4.2.3.6-B1

Materials economically suitable for reuse by TWRS or other programs.

VI. FUNCTION REQUIREMENTS

See Table B2-2 for requirements allocated to this function.

VII. INTERFACE REQUIREMENTS

See Table B2-2 for requirements allocated to the interfaces of this function.

601292846

I. **FUNCTION ID NUMBER:** 4.2.1.1-B2.2

II. **FUNCTION TITLE:** Control flammable gas concentrations in SST vapor space.

III. **FUNCTION DEFINITION:**

Maintain the concentration of flammable gasses in the SST vapor space below the lower flammability level (LFL).

IV. **ENABLING ASSUMPTIONS:**

Flammable gas concentration control is an integral part of environmentally sound, safe storage of waste within the SST, and is a function allocated to the ventilation system.

V. **INTERFACES**

A. **INPUTS**

4.2.1.1-B2.2 I1 Air From: External

Air entering the SST ventilation system from the atmosphere.

4.2.1.1-B2.2 I2 Vapor Characterization Data From: TWRS 4.2.1.2

Information about the constituents of the gasses in the vapor space of each tank.

4.2.1.1-B2.2 I3 Gasses From: TWRS 4.2.1.1

Gasses generated by the waste in the tank.

B. **OUTPUTS**

4.2.1.1-B2.2 01 SST Gaseous Effluent To: 4.2.3.2-B1

SST offgas streams for treatment and release.

4.2.1.1-B2.2 02 Solid Waste To: 4.2.3.4-B1

Solid waste generated from SST ventilation system operation.

4.2.1.1-B2.2 03 Excess Equipment/Facilities To: TWRS 4.2.3.5

SST ventilation system components, once they are no longer needed in fulfillment of the TWRS mission.

4.2.1.1-B2.2 04 Reusable Materials To: 4.2.3.6-B1

Materials economically suitable for reuse by TWRS or other programs.

94732762100

VI. FUNCTION REQUIREMENTS

See Table B2-2 for requirements allocated to this function.

VII. INTERFACE REQUIREMENTS

See Table B2-2 for requirements allocated to the interfaces of this function.

9413276.2.1

I. **FUNCTION ID NUMBER:** 4.2.1.1-B2.3

II. **FUNCTION TITLE:** Control gasses in SST.

III. **FUNCTION DEFINITION:**

Control releases of gasses from the SST.

IV. **ENABLING ASSUMPTIONS:**

The SST ventilation system forms part of the SST confinement system, as defined in DOE Order 6430.1A.

V. **INTERFACES**

A. **INPUTS**

4.2.1.1-B2.3 I1 Air From: External

Air entering the SST ventilation system from the atmosphere.

4.2.1.1-B2.3 I2 Vapor Characterization Data From: TWRS 4.2.1.2

Information about the constituents of the gasses in the vapor space of each tank.

4.2.1.1-B2.3 I3 Gasses From: TWRS 4.2.1.1

Gasses generated by the waste in the tank.

B. **OUTPUTS**

4.2.1.1-B2.3 01 SST Gaseous Effluent To: 4.2.3.2-B1

SST offgas streams for treatment and release.

4.2.1.1-B2.3 02 Solid Waste To: 4.2.3.4-B1

Solid waste generated from SST ventilation system operation.

4.2.1.1-B2.3 03 Excess Equipment/Facilities To: TWRS 4.2.3.5

SST ventilation system components, once they are no longer needed in fulfillment of the TWRS mission.

4.2.1.1-B2.3 04 Reusable Materials To: 4.2.3.6-B1

Materials economically suitable for reuse by TWRS or other programs.

9413276.2112

VI. FUNCTION REQUIREMENTS

See Table B2-2 for requirements allocated to this function.

VII. INTERFACE REQUIREMENTS

See Table B2-2 for requirements allocated to the interfaces of this function.

9413276.2113

I. **FUNCTION ID NUMBER:** 4.2.1.1-B2.4

II. **FUNCTION TITLE:** Control airborne particulates in SST.

III. **FUNCTION DEFINITION:**

Control releases of airborne particulates from the SST.

IV. **ENABLING ASSUMPTIONS:**

The SST ventilation system forms part of the SST confinement system, as defined in DOE Order 6430.1A.

V. **INTERFACES**

A. **INPUTS**

4.2.1.1-21.4 I1 Air From: External

Air entering the SST ventilation system from the atmosphere.

4.2.1.1-B2.4 I2 Vapor Characterization Data From: TWRS 4.2.1.2

Information about the constituents of the gasses in the vapor space of each tank.

4.2.1.1-B2.4 I3 Waste Characterization Data From: TWRS 4.2.1.2

Information about the constituents of the waste in each tank.

4.2.1.1-B2.4 I4 Airborne Particulates From: TWRS 4.2.1.1

Airborne particulates generated by the waste in the tank.

B. **OUTPUTS**

4.2.1.1-B2.4 01 SST Gaseous Effluent To: 4.2.3.2-B1

SST offgas streams for treatment and release.

4.2.1.1-B2.4 02 Solid Waste To: 4.2.3.4-B1

Solid waste generated from SST ventilation system operation.

4.2.1.1-B2.4 03 Excess Equipment/Facilities To: TWRS 4.2.3.5

SST ventilation system components, once they are no longer needed in fulfillment of the TWRS mission.

4.2.1.1-B2.4 04 Reusable Materials To: 4.2.3.6-B1

Materials economically suitable for reuse by TWRS or other programs.

VI. FUNCTION REQUIREMENTS

See Table B2-2 for requirements allocated to this function.

VII. INTERFACE REQUIREMENTS

See Table B2-2 for requirements allocated to the interfaces of this function.

9478276-2115

I. **FUNCTION ID NUMBER:** 4.2.1.4-B1

II. **FUNCTION TITLE:** Ventilate DCRT 244-A

III. **FUNCTION DEFINITION:**

Ventilate the DCRT. This includes the control of temperature, flammable gas concentrations, and airborne contaminants in the tanks. It also includes the detection of leaks from the primary tank to the annulus.

The scope of this function includes ventilation of the primary tank and the annulus of DCRT 244-A.

IV. **ENABLING ASSUMPTIONS:**

DCRT 244-A will remain in use as part of the upgraded waste transfer system to be provided by Project W-314. Existing DCRTs 244-BX, -S, -TX, and -U will be isolated as part of the Transfer System Upgrade of Project W-314.

V. **INTERFACES**

A. **INPUTS**

4.2.1.4-B1 I1 Air From: External

Air entering the DCRT ventilation system from the atmosphere.

4.2.1.4-B1 I2 Heat From: TWRS 4.2.1.4

Heat generated by the waste in the tank.

4.2.1.4-B1 I3 Vapor Characterization Data From: TWRS 4.2.1.2

Information about the constituents of the gasses in the vapor space of each tank.

4.2.1.4-B1 I4 Waste Characterization Data From: TWRS 4.2.1.2

Information about the constituents of the waste in each tank.

4.2.1.4-B1 I5 DCRT Integrity Data From: TWRS 4.2.1.4

Information about the structural integrity of the DCRT, including maximum and minimum allowable temperatures and heat load limits.

4.2.1.4-B1 I6 Gasses From: TWRS 4.2.1.4

Gasses generated by the waste in the tank.

4.2.1.4-B1 I7 Airborne Particulates From: TWRS 4.2.1.4

Airborne particulates generated by the waste in the tank.

9107927646

B. OUTPUTS

4.2.1.4-B1 01 DCRT Gaseous Effluent To: 4.2.3.2-B1

DCRT offgas streams for treatment and release.

4.2.1.4-B1 02 Solid Waste To: 4.2.3.4-B1

Solid waste generated from DCRT ventilation system operation.

4.2.1.4-B1 03 Excess Equipment/Facilities To: TWRS 4.2.3.5

DCRT ventilation system components, once they are no longer needed in fulfillment of the TWRS mission.

4.2.1.4-B1 04 Reusable Materials To: 4.2.3.6-B1

Materials economically suitable for reuse by TWRS or other programs.

VI. FUNCTION REQUIREMENTS

See Table B2-2 for requirements allocated to this function.

VII. INTERFACE REQUIREMENTS

See Table B2-2 for requirements allocated to the interfaces of this function.

943276217

I. **FUNCTION ID NUMBER:** 4.2.1.4-B1.1

II. **FUNCTION TITLE:** Control temperature in DCRT.

III. **FUNCTION DEFINITION:**

Maintain the temperature in the DCRT vapor space and annulus within acceptable limits, based on analysis of the tank contents and the tank structure.

IV. **ENABLING ASSUMPTIONS:**

Temperature control is an integral part of environmentally sound, safe storage of waste within the DCRT, and is a function allocated to the ventilation system.

V. **INTERFACES**

A. **INPUTS**

4.2.1.4-B1.1 I1 Air From: External

Air entering the DCRT ventilation system from the atmosphere.

4.2.1.4-B1.1 I2 Heat From: TWRS 4.2.1.4

Heat generated by the waste in the tank.

4.2.1.4-B1.1 I3 Vapor Characterization Data From: TWRS 4.2.1.2

Information about the constituents of the gasses in the vapor space of each tank.

4.2.1.4-B1.1 I4 Waste Characterization Data From: TWRS 4.2.1.2

Information about the constituents of the waste in each tank.

4.2.1.4-B1.1 I5 DCRT Integrity Data From: TWRS 4.2.1.4

Information about the structural integrity of the DCRT, including maximum and minimum allowable temperatures and heat load limits.

B. **OUTPUTS**

4.2.1.4-B1.1 01 DCRT Gaseous Effluent To: 4.2.3.2-B1

DCRT offgas streams for treatment and release.

4.2.1.4-B1.1 02 Solid Waste To: 4.2.3.4-B1

Solid waste generated from DCRT ventilation system operation.

2177928766

4.2.1.4-B1.1 03 Excess Equipment/Facilities To: TWRS 4.2.3.5

DCRT ventilation system components, once they are no longer needed in fulfillment of the TWRS mission.

4.2.1.4-B1.1 04 Reusable Materials To: 4.2.3.6-B1

Materials economically suitable for reuse by TWRS or other programs.

VI. FUNCTION REQUIREMENTS

See Table B2-2 for requirements allocated to this function.

VII. INTERFACE REQUIREMENTS

See Table B2-2 for requirements allocated to the interfaces of this function.

61776-219

I. **FUNCTION ID NUMBER:** 4.2.1.4-B1.2

II. **FUNCTION TITLE:** Control flammable gas concentrations in DCRT vapor space.

III. **FUNCTION DEFINITION:**

Maintain the concentration of flammable gasses in the DCRT vapor space below the lower flammability level (LFL).

IV. **ENABLING ASSUMPTIONS:**

Flammable gas concentration control is an integral part of environmentally sound, safe storage of waste within the DCRT, and is a function allocated to the ventilation system.

V. **INTERFACES**

A. **INPUTS**

4.2.1.4-B1.2 I1 Air From: External

Air entering the DCRT ventilation system from the atmosphere.

4.2.1.4-B1.2 I2 Vapor Characterization Data From: TWRS 4.2.1.2

Information about the constituents of the gasses in the vapor space of each tank.

4.2.1.4-B1.2 I3 Gasses From: TWRS 4.2.1.4

Gasses generated by the waste in the tank.

B. **OUTPUTS**

4.2.1.4-B1.2 O1 DCRT Gaseous Effluent To: 4.2.3.2-B1

DCRT offgas streams for treatment and release.

4.2.1.4-B1.2 O2 Solid Waste To: 4.2.3.4-B1

Solid waste generated from DCRT ventilation system operation.

4.2.1.4-B1.2 O3 Excess Equipment/Facilities To: TWRS 4.2.3.5

DCRT ventilation system components, once they are no longer needed in fulfillment of the TWRS mission.

4.2.1.4-B1.2 O4 Reusable Materials To: 4.2.3.6-B1

Materials economically suitable for reuse by TWRS or other programs.

012-92846

VI. FUNCTION REQUIREMENTS

See Table B2-2 for requirements allocated to this function.

VII. INTERFACE REQUIREMENTS

See Table B2-2 for requirements allocated to the interfaces of this function.

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I. **FUNCTION ID NUMBER:** 4.2.1.4-B1.3

II. **FUNCTION TITLE:** Control gasses in DCRT.

III. **FUNCTION DEFINITION:**

Control releases of gasses from DCRT.

IV. **ENABLING ASSUMPTIONS:**

The DCRT ventilation system forms part of the DCRT confinement system, as defined in DOE Order 6430.1A.

V. **INTERFACES**

A. **INPUTS**

4.2.1.4-B1.3 I1 Air From: External

Air entering the DCRT ventilation system from the atmosphere.

4.2.1.4-B1.3 I2 Vapor Characterization Data From: TWRS 4.2.1.2

Information about the constituents of the gasses in the vapor space of each tank.

4.2.1.4-B1.3 I3 Gasses From: TWRS 4.2.1.4

Gasses generated by the waste in the tank.

B. **OUTPUTS**

4.2.1.4-B1.3 01 DCRT Gaseous Effluent To: 4.2.3.2-B1

DCRT offgas streams for treatment and release.

4.2.1.4-B1.3 02 Solid Waste To: 4.2.3.4-B1

Solid waste generated from DCRT ventilation system operation.

4.2.1.4-B1.3 03 Excess Equipment/Facilities To: TWRS 4.2.3.5

DCRT ventilation system components, once they are no longer needed in fulfillment of the TWRS mission.

4.2.1.4-B1.3 04 Reusable Materials To: 4.2.3.6-B1

Materials economically suitable for reuse by TWRS or other programs.

9443276-2122

VI. FUNCTION REQUIREMENTS

See Table B2-2 for requirements allocated to this function.

VII. INTERFACE REQUIREMENTS

See Table B2-2 for requirements allocated to the interfaces of this function.

9473276-2123

I. **FUNCTION ID NUMBER:** 4.2.1.4-B1.4

II. **FUNCTION TITLE:** Control airborne particulates in DCRT.

III. **FUNCTION DEFINITION:**

Control releases of airborne particulates from DCRT.

IV. **ENABLING ASSUMPTIONS:**

The DCRT ventilation system forms part of the DCRT confinement system, as defined in DOE Order 6430.1A.

V. **INTERFACES**

A. **INPUTS**

4.2.1.4-B1.4 I1 **Air** From: External

Air entering the DCRT ventilation system from the atmosphere.

4.2.1.4-B1.4 I2 **Vapor Characterization Data** From: TWRS 4.2.1.2

Information about the constituents of the gasses in the vapor space of each tank.

4.2.1.4-B1.4 I3 **Waste Characterization Data** From: TWRS 4.2.1.2

Information about the constituents of the waste in each tank.

4.2.1.4-B1.4 I4 **Airborne Particulates** From: TWRS 4.2.1.4

Airborne particulates generated by the waste in the tank.

B. **OUTPUTS**

4.2.1.4-B1.4 01 **DCRT Gaseous Effluent** To: 4.2.3.2-B1

DCRT offgas streams for treatment and release.

4.2.1.4-B1.4 02 **Solid Waste** To: 4.2.3.4-B1

Solid waste generated from DCRT ventilation system operation.

4.2.1.4-B1.4 03 **Excess Equipment/Facilities** To: TWRS 4.2.3.5

DCRT ventilation system components, once they are no longer needed in fulfillment of the TWRS mission.

4.2.1.4-B1.4 04 **Reusable Materials** To: 4.2.3.6-B1

Materials economically suitable for reuse by TWRS or other programs.

943276.2124

VI. FUNCTION REQUIREMENTS

See Table B2-2 for requirements allocated to this function.

VII. INTERFACE REQUIREMENTS

See Table B2-2 for requirements allocated to the interfaces of this function.

9113276.2125

I. **FUNCTION ID NUMBER:** 4.2.1.4-B1.5

II. **FUNCTION TITLE:** Detect leaks from DCRT primary tank to annulus.

III. **FUNCTION DEFINITION:**

Detect the presence of radioactive material in the DCRT annulus offgas stream, indicating leakage from the DCRT primary tank to the annulus.

IV. **ENABLING ASSUMPTIONS:**

Leak detection is an integral part of environmentally sound, safe storage of waste within the DCRT, and is a function allocated to the ventilation system.

V. **INTERFACES**

A. **INPUTS**

4.2.1.4-B1.5 I1 Air From: External

Air entering the DCRT ventilation system from the atmosphere.

4.2.1.4-B1.5 I2 Airborne Particulates From: TWRS 4.2.1.4

Airborne particulates generated by the waste in the tank.

B. **OUTPUTS**

4.2.1.4-B1.5 01 DCRT Gaseous Effluent To: 4.2.3.2-B1

DCRT offgas streams for treatment and release.

4.2.1.4-B1.5 02 Solid Waste To: 4.2.3.4-B1

Solid waste generated from DCRT ventilation system operation.

4.2.1.4-B1.5 03 Excess Equipment/Facilities To: TWRS 4.2.3.5

DCRT ventilation system components, once they are no longer needed in fulfillment of the TWRS mission.

4.2.1.4-B1.5 04 Reusable Materials To: 4.2.3.6-B1

Materials economically suitable for reuse by TWRS or other programs.

VI. **FUNCTION REQUIREMENTS**

See Table B2-2 for requirements allocated to this function.

9473276.2126

VII. INTERFACE REQUIREMENTS

See Table B2-2 for requirements allocated to the interfaces of this function.

9113276-2127

I. **FUNCTION ID NUMBER:** 4.2.3.2-B1

II. **FUNCTION TITLE:** Disposition tank gaseous effluent.

III. **FUNCTION DEFINITION:**

Collect gaseous effluents from the tanks whose ventilation systems are being upgraded by Project W-314B. Remove contaminants from the gaseous effluent streams. Sample filtered off gasses from the tanks, and monitor radioactive, chemical, and physical characteristics of the gasses. Transport and disposition (release) filtered, monitored off gasses to environment.

The scope of this function includes the disposition of gaseous effluent from the following sources.

- All DST primary tanks in tank farms 241-AN, -AP, -AW, and -SY*
- All DST annuli in tank farms 241-AN, -AP, -AW, -AY, -AZ, and -SY*
- All SSTs in Tank Farm 241-SX*
- DCRT 244-A*

IV. **ENABLING ASSUMPTIONS:**

The tanks included in the scope of this upgrade will continue to require ventilation until closure. The tank ventilation systems extend to the point of discharge of treated gases to the environment.

V. **INTERFACES**

A. **INPUTS**

- 4.2.3.2-B1 I1 DST Gaseous Effluent From: 4.2.1.1-B1
DST offgas streams for treatment and release.
- 4.2.3.2-B1 I2 SST Gaseous Effluent From: 4.2.1.1-B2
SST offgas streams for treatment and release.
- 4.2.3.2-B1 I3 DCRT Gaseous Effluent From: 4.2.1.4-B1
DCRT offgas streams for treatment and release.

B. **OUTPUTS**

- 4.2.3.2-B1 O1 Liquid Effluent from Tank DGE To: 4.2.3.3-B1
Liquid effluent streams for treatment and disposition.
- 4.2.3.2-B1 O2 Solid Waste To: 4.2.3.4-B1
Solid waste generated from tank gaseous effluent disposition system operation.

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4.2.3.2-B1 03 Excess Equipment/Facilities To: TWRS 4.2.3.5

Tank gaseous effluent disposition system components, once they are no longer needed in fulfillment of the TWRS mission.

4.2.3.2-B1 04 Reusable Materials To: 4.2.3.6-B1

Materials economically suitable for reuse by TWRS or other programs.

4.2.3.2-B1 05 Dispositioned Gaseous Effluent To: External

Filtered, scrubbed, and monitored gasses released to the atmosphere.

VI. FUNCTION REQUIREMENTS

See Table B2-2 for requirements allocated to this function.

VII. INTERFACE REQUIREMENTS

See Table B2-2 for requirements allocated to the interfaces of this function.

9473276-2129

I. **FUNCTION ID NUMBER:** 4.2.3.3-B1

II. **FUNCTION TITLE:** Receive liquid effluent from tank offgas disposition activities.

III. **FUNCTION DEFINITION:**

Collect and sample liquid effluent generated during tank offgas disposition activities, and route to a compatible Manage Tank Waste function. route for reuse, or route for treatment.

The scope of this function includes the collection and sampling of liquid effluent generated from operation of the exhaust systems provided by Project W-314B.

IV. **ENABLING ASSUMPTIONS:**

Tank offgas disposition activities will produce liquid effluent that must be dispositioned. No other activities within the system scope will produce liquid effluent. Decomposition of Function 4.2.3.3 will include the fifth-level function "Receive Liquid Effluent." The project scope includes collection, sampling, storage, and delivery for treatment of liquid effluent generated by tank offgas disposition activities. It does not include treatment and disposal of the effluent.

V. **INTERFACES**

A. **INPUTS**

4.2.3.3-B1 I1 Liquid Effluent from Tank DGE From: 4.2.3.2-B1

Liquid effluent streams generated from gaseous effluent disposition activities.

B. **OUTPUTS**

4.2.3.3-B1 O1 Liquid Effluent for Disposition To: TWRS 4.2.3.3

Liquid effluent streams collected for treatment and disposition.

VI. **FUNCTION REQUIREMENTS**

See Table B2-2 for requirements allocated to this function.

VII. **INTERFACE REQUIREMENTS**

See Table B2-2 for requirements allocated to the interfaces of this function.

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I. **FUNCTION ID NUMBER:** 4.2.3.4-B1

II. **FUNCTION TITLE:** Segregate solid waste from ventilation system operation activities.

III. **FUNCTION DEFINITION:**

Segregate wastes of differing radioactive classifications and incompatible dangerous waste characteristics to ensure no cross-contamination of wastes and eliminate the potential for reaction of incompatible chemical constituents.

The scope of this function includes the segregation of solid wastes generated from operation of the systems provided by Project W-314B.

IV. **ENABLING ASSUMPTIONS:**

The project scope includes the disposal of displaced equipment and other solid waste produced by project construction and startup activities; however, this is not considered a function of the systems provided by the project. Decomposition of Function 4.2.3.4 will include the fifth-level function "Segregate solid waste." Characterization, packaging, and shipping of segregated solid waste from system operation are outside the project scope.

V. **INTERFACES**

A. **INPUTS**

4.2.3.4-B1 I1 Solid Waste

From: 4.2.1.1-B1
4.2.1.1-B2
4.2.1.4-B1
4.2.3.2-B1

Solid waste generated from tank ventilation system and gaseous effluent disposition system operation.

B. **OUTPUTS**

4.2.3.4-B1 01 Segregated Solid Waste

To: TWRS 4.2.3.4

Segregated solid waste for disposition.

VI. **FUNCTION REQUIREMENTS**

See Table B2-2 for requirements allocated to this function.

VII. **INTERFACE REQUIREMENTS**

See Table B2-2 for requirements allocated to the interfaces of this function.

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I. FUNCTION ID NUMBER: 4.2.3.6-B1

II. FUNCTION TITLE: Receive reusable materials from ventilation system operation activities.

III. FUNCTION DEFINITION:

Accumulate materials that are suitable for reuse or that can be economically treated so that they are suitable for reuse to other functions as they are needed and as they are available. This includes mixing of materials from various sources if they are reusable as a mixture.

The scope of this function includes the accumulation of reusable materials generated from operation of the systems provided by Project W-314B.

IV. ENABLING ASSUMPTIONS:

The project scope includes the disposition of displaced equipment and other reusable materials produced by project construction and startup activities; however, this is not considered a function of the systems provided by the project. Decomposition of Function 4.2.3.6 will include the fifth-level function "Receive reusable materials." Storage, treatment, and delivery to the user of reusable materials from system operation are outside the project scope.

V. INTERFACES

A. INPUTS

4.2.3.6-B1 I1 Reusable Materials	From:	4.2.1.1-B1 4.2.1.1-B2 4.2.1.4-B1 4.2.3.2-B1
----------------------------------	-------	--

Reusable materials generated from tank ventilation system and gaseous effluent disposition system operation.

B. OUTPUTS

4.2.3.6-B1 O1 Accumulated Reusable Materials	To:	TWRS 4.2.3.6
--	-----	--------------

Accumulated reusable materials for disposition.

VI. FUNCTION REQUIREMENTS

See Table B2-2 for requirements allocated to this function.

VII. INTERFACE REQUIREMENTS

See Table B2-2 for requirements allocated to the interfaces of this function.

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2.3 INTERFACE IDENTIFICATION

Table B2-1 below lists the interfaces of the Ventilation System Upgrade functions. Interfaces are inputs and outputs of functions. An input is defined as anything that is acted upon by a function to produce desired outputs; an output is anything that leaves a function after it has been acted upon by that function. Interfaces with the other upgrades provided by Project W-314 will be identified as the functions and requirements for those upgrades become available.

NOTE: Functions designated TWRS 4.2.x.x (for example, TWRS 4.2.1.1) are fourth-level functions from DOE/RL-92-60. See Figure 2-1, in the main body of this document, for the TWRS function hierarchy.

TABLE B2-1. VENTILATION SYSTEM UPGRADE INTERFACES

INTERFACE NAME AND DESCRIPTION	FROM FUNCTION	TO FUNCTION
Air <i>Air entering the tank ventilation system from the atmosphere.</i>	External	4.2.1.1-B1 4.2.1.1-B1.1 4.2.1.1-B1.2 4.2.1.1-B1.3 4.2.1.1-B1.4 4.2.1.1-B1.5 4.2.1.1-B2 4.2.1.1-B2.1 4.2.1.1-B2.2 4.2.1.1-B2.3 4.2.1.1-B2.4 4.2.1.4-B1 4.2.1.4-B1.1 4.2.1.4-B1.2 4.2.1.4-B1.3 4.2.1.4-B1.4 4.2.1.4-B1.5
Heat <i>Heat generated by the waste in the tank, and (in DSTs and SSTs) heat generated by the operation of mitigation and/or retrieval equipment.</i>	TWRS 4.2.1.1 TWRS 4.2.1.3 TWRS 4.2.1.4	4.2.1.1-B1 4.2.1.1-B1.1 4.2.1.1-B2 4.2.1.1-B2.1 4.2.1.4-B1 4.2.1.4-B1.1

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TABLE B2-1. VENTILATION SYSTEM UPGRADE INTERFACES

INTERFACE NAME AND DESCRIPTION	FROM FUNCTION	TO FUNCTION
<p>Vapor Characterization Data <i>Information about the constituents of the gasses in the vapor space of each tank.</i></p>	<p>TWRS 4.2.1.2</p>	<p>4.2.1.1-B1 4.2.1.1-B1.1 4.2.1.1-B1.2 4.2.1.1-B1.3 4.2.1.1-B1.4 4.2.1.1-B2 4.2.1.1-B2.1 4.2.1.1-B2.2 4.2.1.1-B2.3 4.2.1.1-B2.4 4.2.1.4-B1 4.2.1.4-B1.1 4.2.1.4-B1.2 4.2.1.4-B1.3 4.2.1.4-B1.4</p>
<p>Waste Characterization Data <i>Information about the constituents of the waste in each tank.</i></p>	<p>TWRS 4.2.1.2</p>	<p>4.2.1.1-B1 4.2.1.1-B1.1 4.2.1.1-B1.4 4.2.1.1-B2 4.2.1.1-B2.1 4.2.1.1-B2.4 4.2.1.4-B1 4.2.1.4-B1.1 4.2.1.4-B1.4</p>
<p>DST Integrity Data <i>Information about the structural integrity of the DST, including maximum and minimum allowable temperatures and heat load limits.</i></p>	<p>TWRS 4.2.1.1</p>	<p>4.2.1.1-B1 4.2.1.1-B1.1</p>
<p>SST Integrity Data <i>Information about the structural integrity of the SST, including maximum and minimum allowable temperatures and heat load limits.</i></p>	<p>TWRS 4.2.1.1</p>	<p>4.2.1.1-B2 4.2.1.1-B2.1</p>
<p>DCRT Integrity Data <i>Information about the structural integrity of the DCRT, including maximum and minimum allowable temperatures and heat load limits.</i></p>	<p>TWRS 4.2.1.4</p>	<p>4.2.1.4-B1 4.2.1.4-B1.1</p>

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TABLE B2-1. VENTILATION SYSTEM UPGRADE INTERFACES

INTERFACE NAME AND DESCRIPTION	FROM FUNCTION	TO FUNCTION
Gasses <i>Gasses generated by the waste in the tank.</i>	TWRS 4.2.1.1	4.2.1.1-B1 4.2.1.1-B1.2 4.2.1.1-B1.3 4.2.1.1-B2 4.2.1.1-B2.2 4.2.1.1-B2.3
	TWRS 4.2.1.4	4.2.1.4-B1 4.2.1.4-B1.2 4.2.1.4-B1.3
Airborne Particulates <i>Airborne particulates generated by the waste in the tank.</i>	TWRS 4.2.1.1	4.2.1.1-B1 4.2.1.1-B1.4 4.2.1.1-B1.5 4.2.1.1-B2 4.2.1.1-B2.4
	TWRS 4.2.1.4	4.2.1.4-B1 4.2.1.4-B1.4 4.2.1.4-B1.5
DST Gaseous Effluent <i>DST offgas streams for treatment and release.</i>	4.2.1.1-B1 4.2.1.1-B1.1 4.2.1.1-B1.2 4.2.1.1-B1.3 4.2.1.1-B1.4 4.2.1.1-B1.5	4.2.3.2-B1
SST Gaseous Effluent <i>SST offgas streams for treatment and release.</i>	4.2.1.1-B2 4.2.1.1-B2.1 4.2.1.1-B2.2 4.2.1.1-B2.3 4.2.1.1-B2.4	4.2.3.2-B1
DCRT Gaseous Effluent <i>DCRT offgas streams for treatment and release.</i>	4.2.1.4-B1 4.2.1.4-B1.1 4.2.1.4-B1.2 4.2.1.4-B1.3 4.2.1.4-B1.4 4.2.1.4-B1.5	4.2.3.2-B1
Liquid Effluent from Tank DGE <i>Liquid effluent streams generated from gaseous effluent disposition activities.</i>	4.2.3.2-B1	4.2.3.3-B1
Liquid Effluent for Disposition <i>Liquid effluent streams collected for treatment and disposition.</i>	4.2.3.3-B1	TWRS 4.2.3.3

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TABLE B2-1. VENTILATION SYSTEM UPGRADE INTERFACES

INTERFACE NAME AND DESCRIPTION	FROM FUNCTION	TO FUNCTION
<p>Solid Waste <i>Solid waste generated from tank ventilation system and gaseous effluent disposition system operation.</i></p>	<p>4.2.1.1-B1 4.2.1.1-B1.1 4.2.1.1-B1.2 4.2.1.1-B1.3 4.2.1.1-B1.4 4.2.1.1-B1.5 4.2.1.1-B2 4.2.1.1-B2.1 4.2.1.1-B2.2 4.2.1.1-B2.3 4.2.1.1-B2.4 4.2.1.4-B1 4.2.1.4-B1.1 4.2.1.4-B1.2 4.2.1.4-B1.3 4.2.1.4-B1.4 4.2.1.4-B1.5 4.2.3.2-B1</p>	<p>4.2.3.4-B1</p>
<p>Segregated Solid Waste <i>Segregated solid waste for disposition.</i></p>	<p>4.2.3.4-B1</p>	<p>TWRS 4.2.3.4</p>
<p>Excess Equipment/Facilities <i>Ventilation system components, once they are no longer needed in fulfillment of the TWRS mission.</i></p>	<p>4.2.1.1-B1 4.2.1.1-B1.1 4.2.1.1-B1.2 4.2.1.1-B1.3 4.2.1.1-B1.4 4.2.1.1-B1.5 4.2.1.1-B2 4.2.1.1-B2.1 4.2.1.1-B2.2 4.2.1.1-B2.3 4.2.1.1-B2.4 4.2.1.4-B1 4.2.1.4-B1.1 4.2.1.4-B1.2 4.2.1.4-B1.3 4.2.1.4-B1.4 4.2.1.4-B1.5 4.2.3.2-B1</p>	<p>TWRS 4.2.3.5</p>

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TABLE B2-1. VENTILATION SYSTEM UPGRADE INTERFACES

INTERFACE NAME AND DESCRIPTION	FROM FUNCTION	TO FUNCTION
<p>Reusable Materials <i>Materials economically suitable for reuse by TWRS or other programs.</i></p>	<p>4.2.1.1-B1 4.2.1.1-B1.1 4.2.1.1-B1.2 4.2.1.1-B1.3 4.2.1.1-B1.4 4.2.1.1-B1.5 4.2.1.1-B2 4.2.1.1-B2.1 4.2.1.1-B2.2 4.2.1.1-B2.3 4.2.1.1-B2.4 4.2.1.4-B1 4.2.1.4-B1.1 4.2.1.4-B1.2 4.2.1.4-B1.3 4.2.1.4-B1.4 4.2.1.4-B1.5 4.2.3.2-B1</p>	<p>4.2.3.6-B1</p>
<p>Accumulated Reusable Materials <i>Accumulated reusable materials for disposition.</i></p>	<p>4.2.3.6-B1</p>	<p>TWRS 4.2.3.6</p>
<p>Dispositioned Gaseous Effluent <i>Filtered, scrubbed, and monitored gasses released to the atmosphere.</i></p>	<p>4.2.3.2-B1</p>	<p>External</p>

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2.4 FUNCTIONAL AND INTERFACE REQUIREMENTS ALLOCATION

Table B2-2 below lists the constraints that are allocated to the functions and interfaces of the Ventilation System Upgrade. The development of performance requirements for the ventilation system is dependent on characterization of tank vapors, an effort currently underway. The performance requirements will be included in a future revision of this document.

See Section 3.0 in the main body of this document for additional instructions regarding the application of the requirements listed below.

The table also lists the source(s) for each requirement, according to the following key:

- FFCA NESHAPs Federal Facility Compliance Agreement (WHC Incoming Correspondence No. 9401181). Note that the Agreement specifies the stacks that must comply with NESHAPs monitoring requirements. Stacks not specified in the FFCA are not required to comply with NESHAPs monitoring requirements, but are still subject to site total emission limits.
- S/RID Tank Farms Standards/Requirements Identification Document, High Level Waste Storage Tank Farms
- S/RID-EP S/RID, Functional Area "Environmental Protection"
- S/RID-ER&WM S/RID, Functional Area "Environmental Restoration and Waste Management"
- S/RID-RP S/RID, Functional Area "Radiological Protection"
- TWRS 4.2.x.x Fourth-level function to which the requirement is allocated, per DOE/RL-92-60

TABLE B2-2. VENTILATION SYSTEM UPGRADE REQUIREMENTS ALLOCATION

REQUIREMENT	FUNCTIONS (Figure B2-1)	INTERFACES (Table B2-1)	SOURCE
40 CFR 61, <i>National Emission Standards for Hazardous Air Pollutants</i>	4.2.1.1-B1.3 4.2.1.1-B1.4 4.2.1.1-B1.5 4.2.1.1-B2.3 4.2.1.1-B2.4 4.2.1.4-B1.3 4.2.1.4-B1.4 4.2.1.4-B1.5 4.2.3.2-B1	Dispositioned Gaseous Effluent	FFCA S/RID-EP TWRS 4.2.1.1

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TABLE B2-2. VENTILATION SYSTEM UPGRADE REQUIREMENTS ALLOCATION

REQUIREMENT	FUNCTIONS (Figure B2-1)	INTERFACES (Table B2-1)	SOURCE
40 CFR 191, <i>Environmental Radiation Protection Standards for Management and Disposal of Spent Nuclear Fuel, High Level and Transuranic Radioactive Wastes</i>	4.2.1.1-B1.3 4.2.1.1-B1.4 4.2.1.1-B2.3 4.2.1.1-B2.4 4.2.1.4-B1.3 4.2.1.4-B1.4 4.2.3.2-B1		S/RID-EP
40 CFR 260, <i>Hazardous Waste Management System: General</i>	4.2.3.4-B1 4.2.3.6-B1		TWRS 4.2.3.4 TWRS 4.2.3.6
40 CFR 261, <i>Identification and Listing of Hazardous Waste</i>	4.2.3.4-B1		TWRS 4.2.3
40 CFR 262, <i>Standards Applicable to Generators of Hazardous Waste</i>	4.2.3.4-B1	Segregated Solid Waste	TWRS 4.2.3 TWRS 4.2.3.4
40 CFR 264, <i>Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities</i>		Dispositioned Gaseous Effluent	TWRS 4.2.3
40 CFR 265, <i>Interim Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities</i>	4.2.1.1-B1 4.2.1.1-B2 4.2.1.4-B1 4.2.3.2-B1 4.2.3.3-B1	Dispositioned Gaseous Effluent Liquid Effluent for Disposition	S/RID-EP
DOE/EH-0135, <i>Performance Objectives and Criteria for Technical Safety Appraisals at DOE Facilities and Sites</i>	4.2.1.1-B1.5 4.2.1.4-B1.5 4.2.3.2-B1 4.2.3.3-B1	Dispositioned Gaseous Effluent Liquid Effluent for Disposition	S/RID-EP

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TABLE B2-2. VENTILATION SYSTEM UPGRADE REQUIREMENTS ALLOCATION

REQUIREMENT	FUNCTIONS (Figure B2-1)	INTERFACES (Table B2-1)	SOURCE
DOE/EH-0173T, <i>Environmental Regulatory Guide for Radiological Effluent Monitoring and Environmental Surveillance</i>	4.2.1.1-B1 4.2.1.1-B2 4.2.1.4-B1 4.2.3.2-B1 4.2.3.3-B1	Dispositioned Gaseous Effluent Liquid Effluent for Disposition	S/RID-EP
DOE Order 5400.1, <i>General Environmental Protection Program Requirements, Chapter IV</i>	4.2.3.2-B1 4.2.3.3-B1	Dispositioned Gaseous Effluent Liquid Effluent for Disposition	S/RID-EP
DOE Order 5400.5, <i>Radiation Protection of the Public and the Environment</i>	4.2.1.1-B1 4.2.1.1-B2 4.2.1.4-B1 4.2.3.2-B1 4.2.3.3-B1	Dispositioned Gaseous Effluent Liquid Effluent for Disposition Accumulated Reusable Material	S/RID-EP TWRS 4.2 TWRS 4.2.3
DOE Order 5484.1, <i>Environmental Protection, Safety, and Health Protection Information Reporting Requirements, Chapter III</i>	4.2.1.1-B1.5 4.2.1.4-B1.5 4.2.3.2-B1	Dispositioned Gaseous Effluent	S/RID-EP
DOE Order 5820.2A, <i>Radioactive Waste Management, Chapter I, Section 3</i>	4.2.1.1-B1 4.2.1.1-B2 4.2.1.4-B1 4.2.3.2-B1		TWRS 4.2 TWRS 4.2.1 TWRS 4.2.1.1 TWRS 4.2.1.4
DOE Order 5820.2A, <i>Radioactive Waste Management, Chapter III, Section 3</i>	4.2.1.1-B1 4.2.1.1-B2 4.2.1.4-B1 4.2.3.2-B1 4.2.3.4-B1		S/RID ER&WM TWRS 4.2 TWRS 4.2.1.1 TWRS 4.2.3 TWRS 4.2.3.4
DOE Order 5820.2A, <i>Radioactive Waste Management, Chapter V</i>		Excess Equipment/Facilities	TWRS 4.2
DOE-RL Implementing Procedure 5480.11, <i>Radiation Protection for Occupational Workers</i>		Accumulated Reusable Material	TWRS 4.2 TWRS 4.2.3.2

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TABLE B2-2. VENTILATION SYSTEM UPGRADE REQUIREMENTS ALLOCATION

REQUIREMENT	FUNCTIONS (Figure B2-1)	INTERFACES (Table B2-1)	SOURCE
NRC 4.15, <i>Quality Assurance for Radiation Monitoring (Normal Operations) - Effluent Streams and the Environment</i>	4.2.1.1-B1 4.2.1.1-B2 4.2.1.4-B1 4.2.3.2-B1 4.2.3.3-B1	Dispositioned Gaseous Effluent Liquid Effluent for Disposition	S/RID-EP
WAC 173-303, <i>Dangerous Waste Regulations</i>	4.2.1.1-B1 4.2.1.1-B2 4.2.1.4-B1 4.2.3.2-B1 4.2.3.3-B1 4.2.3.4-B1	Segregated Solid Waste Accumulated Reusable Materials DST Integrity Data SST Integrity Data DCRT Integrity Data	S/RID-EP TWRS 4.2.3
WAC 173-360, <i>Underground Storage Tank Regulations</i>	4.2.1.1-B1 4.2.1.1-B2 4.2.1.4-B1 4.2.3.2-B1 4.2.3.3-B1	Dispositioned Gaseous Effluent Liquid Effluent for Disposition	S/RID-EP
WAC 173-400, <i>General Regulations for Air Pollution Sources</i>	4.2.1.1-B1.4 4.2.1.1-B2.4 4.2.1.4-B1.4 4.2.3.2-B1		S/RID-EP
WAC 173-460, <i>Controls for New Sources of Toxic Air Pollutants</i>	4.2.1.1-B1 4.2.1.1-B2 4.2.1.4-B1 4.2.3.2-B1	Dispositioned Gaseous Effluent	
WAC 173-470, <i>Ambient Air Quality Standards for Particulate Matter</i>	4.2.1.1-B1.4 4.2.1.1-B2.4 4.2.1.4-B1.4 4.2.3.2-B1	Dispositioned Gaseous Effluent	S/RID-EP
WAC 173-480, <i>Ambient Air Quality Standards and Emission Limits for Radionuclides</i>	4.2.1.1-B1 4.2.1.1-B2 4.2.1.4-B1 4.2.3.2-B1	Dispositioned Gaseous Effluent	S/RID-EP TWRS 4.2
WAC 246-247, <i>Radiation Protection - Air Emissions</i>	4.2.1.1-B1 4.2.1.1-B2 4.2.1.4-B1 4.2.3.2-B1	Dispositioned Gaseous Effluent Liquid Effluent for Disposition	S/RID-EP TWRS 4.2

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TABLE B2-2. VENTILATION SYSTEM UPGRADE REQUIREMENTS ALLOCATION

REQUIREMENT	FUNCTIONS (Figure B2-1)	INTERFACES (Table B2-1)	SOURCE
WHC-CM-7-5, <i>Environmental Compliance</i>	4.2.1.1-B1 4.2.1.1-B2 4.2.1.4-B1 4.2.3.2-B1	Dispositioned Gaseous Effluent	TWRS 4.2

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APPENDIX C

FUNCTIONS AND REQUIREMENTS FOR
TRANSFER SYSTEM UPGRADE

(TO BE PROVIDED AT A LATER DATE)

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APPENDIX D

FUNCTIONS AND REQUIREMENTS FOR
TANK FARM ELECTRICAL UPGRADE

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