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TWRS TECHNICAL BASELINE DATABASE MANAGER DEFINITION DOCUMENT

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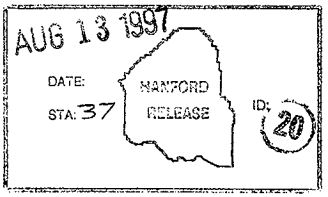

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TWRS TECHNICAL BASELINE
DATABASE MANAGER DEFINITION DOCUMENT

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August 06, 1997

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1.0 INTRODUCTION

1.1 PURPOSE

This document serves as a guide for using the TWRS Technical Baseline Database Management Systems Engineering (SE) support tool in performing SE activities for the Tank Waste Remediation System (TWRS). This document will provide a consistent interpretation of the relationships between the TWRS Technical Baseline Database Management software and the present TWRS SE practices. The Database Manager currently utilized is the RDD-100© System manufactured by the Ascent Logic Corporation. In other documents, the term "RDD-100©" may be used interchangeably with TWRS Technical Baseline Database Manager.

1.2 SCOPE

Section 2 of this document will explain how the results of the "Functions-Requirements-Architecture-Test" (FRAT) Systems Engineering analysis process are captured by the appropriate TWRS Technical Baseline Database Manager elements and how information from the TWRS Technical Baseline Database Manager is used in TWRS SE practices. Section 3 is intended to be used as a quick reference for TWRS Technical Baseline Database Manager element definitions and relationships used by TWRS. More detailed information on the TWRS Elements, Relationships and Attributes (ERA) can be found in the TWRS User's Guide (WHC 1996b).

The intended users of this document are TWRS Engineers involved in preparation of information pertaining to the TWRS Technical Baseline. This document will provide TWRS Engineers with sufficient knowledge of the TWRS Technical Baseline database and its relationships to the SE process so that they may effectively communicate with the Technical Baseline database administrators and generate database change requests.

This document is consistent with the SE practices documented in the TWRS SEMP (WHC 1996a) and the *RDD-100© Users Guide for TWRS*. This document merges the SE process from the *TWRS SEMP* with the RDD-100© ERAs from the *Users Guide* in order to document how the SE process in TWRS is captured within the TWRS Technical Baseline Database Manager Database.

1.3 BACKGROUND

The TWRS Technical Baseline Database Manager software is a database and modeling tool for the SE process. TWRS Technical Baseline Database Manager allows the user to establish specific rules for modeling and capturing the SE process. The results of the TWRS SE process are captured in the TWRS Technical Baseline Database Manager database elements (see Section 3). The main product of the SE process supported by the TWRS Technical Baseline Database Manager is the development and maintenance of the TWRS Technical Baseline throughout TWRS facilities' life-cycle. This information system provides traceability throughout the development of the TWRS Technical Baseline and provides a basis for assuring

compliant operations. See the TWRS Systems Engineering Management Plan (SEMP)for a description of the TWRS Technical Baseline and its evolution.

The TWRS Technical Baseline Database Manager stores key information developed from the following activities performed during the development and change of the TWRS Technical Baseline:

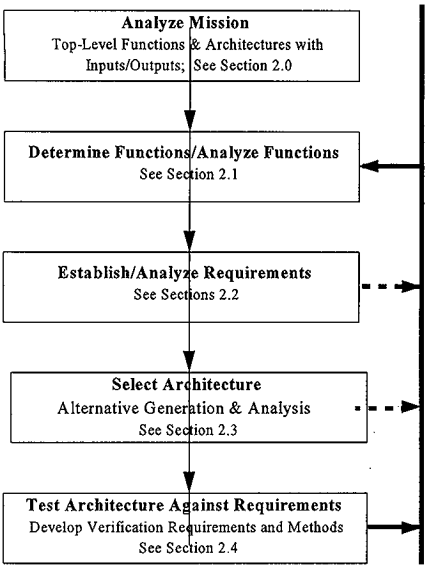
- Functional Analysis & Decomposition,
- Requirements Analysis & Allocation,
- Development of Derived Requirements,
- Allocation of Requirements to Functions & Requirements,
- Development of a System Architecture ,
- and Refinement of the Architecture & it's Functionality into an Operating TWRS.

The intent of this document is to clarify the relationships between the TWRS Systems Engineering Process and the TWRS Technical Baseline Database Manager and its data structures.

1.4 TWRS FRAT PROCESS

The TWRS application of the "Functions-Requirements-Architecture-Test" (FRAT) development process, illustrated in Figure 2.0-1, and the representation of the results of this process in the database will be discussed. This section will also describe how the TWRS SE process fits into the Hanford Site SE practices.

The TWRS FRAT process begins with the functions, requirements and architectures which are defined at the top level by the Systems Engineering efforts for the Hanford Site. Site Systems Engineering performs functional analysis by decomposing the Site Environmental Management Mission until functions are obtained that can be uniquely allocated to a TWRS Major Facility on the Hanford Site architectural decomposition.



Notes

The mission analysis occurs only once at the beginning of the FRAT process.

Each succeeding complete loop (solid lines) represents one level of decomposition in the system definition process.

The dotted lines represent subloops of the complete loop. The process may go through several subloops within a complete loop. This represents the iterative nature of the FRAT process.

Figure 2.0-1. FRAT Development Process.

1.4.1 Function Development

The functions allocated to each Major Facility are associated with a major life cycle phase of the facility. The life cycle of each Major Facility is represented in terms of a RLID 430.1 life cycle phase flow, from program planning to facility close out. These phases are:

- Program Planning,
- Pre-Conceptual,
- Conceptual,
- Design,
- Construction,
- Turnover,
- Operations & Maintenance (O&M),
- Post Operations,
- and Decontamination & Decommissioning (D&D).

During the development (and subsequent change) of the TWRS Technical Baseline and the preparation of Systems Engineering Analysis for a Facility, its Systems and Components, functions are generally only assigned to the O&M, Post Operations and D&D life-cycle phases. The earlier phases have administrative functions which are not captured in the TWRS Technical Baseline.

Each Major Facility life-cycle phase has all the functions associated with it in a collection called a "Scenario". These functions are connected together in "logical" way so as to show precedence of operation and the interrelationship of functions. These Scenarios are represented by Functional Flow Block Diagrams (FFBDs) and do not show the inputs or output upon which a function operates.

Figure 2.0-2 shows a sample Functional Flow Block Diagram (FFBD) Scenario for the Single Shell Tank System (a Major Facility) as an example of this collection of functions in the Operations & Maintenance (O&M) life-cycle phase at the Facility level. FFBDs may be used to define the functionality of Systems, Sub-systems and Components if needed. A hierarchy of Scenarios may be used to show how functions are collected. Most of the major functions for a Facility, System or Component show up in the O&M life-cycle phase.

Since functions can be decomposed into subfunctions and subfunctions into sub-subfunctions, etc., it is useful to also use FFBDs to show the relations between the children of a parent function and, if needed, between the children of other parent functions. These FFBDs are not Scenarios.

Another SE Analysis tool frequently used (after FFBDs are developed) is the Behavioral Diagram. The Behavioral Diagram is also associated with a major life-cycle phase of a Facility, System or Component. The Behavioral Diagram basically adds the inputs and outputs to the FFBD. Behavioral Diagrams are also used to show the Input and Output connections between the children of a parent function and, if required, the children of other parent functions.

When the Behavioral Diagram is viewed for a top-level Scenario or top-level parent function it can be very complicated and busy because of all the Input and Output connections between functions. Behavioral Diagrams are usually used to confirm the functionality depicted in FFBDs.

Figure 2.0-3 is a Behavior Diagram of the SST System O&M life-cycle phase generated by the TWRS Technical Baseline Database Manager. Figure 2.0-3 is given as an example of what a Behavior Diagram looks like. A database operator will be able to provide a larger version if one is needed. Even though the O&M phase is illustrated in Figure 2.0-2 and 2.0-3, the same process is followed for the development of information in the other major life-cycle phases.

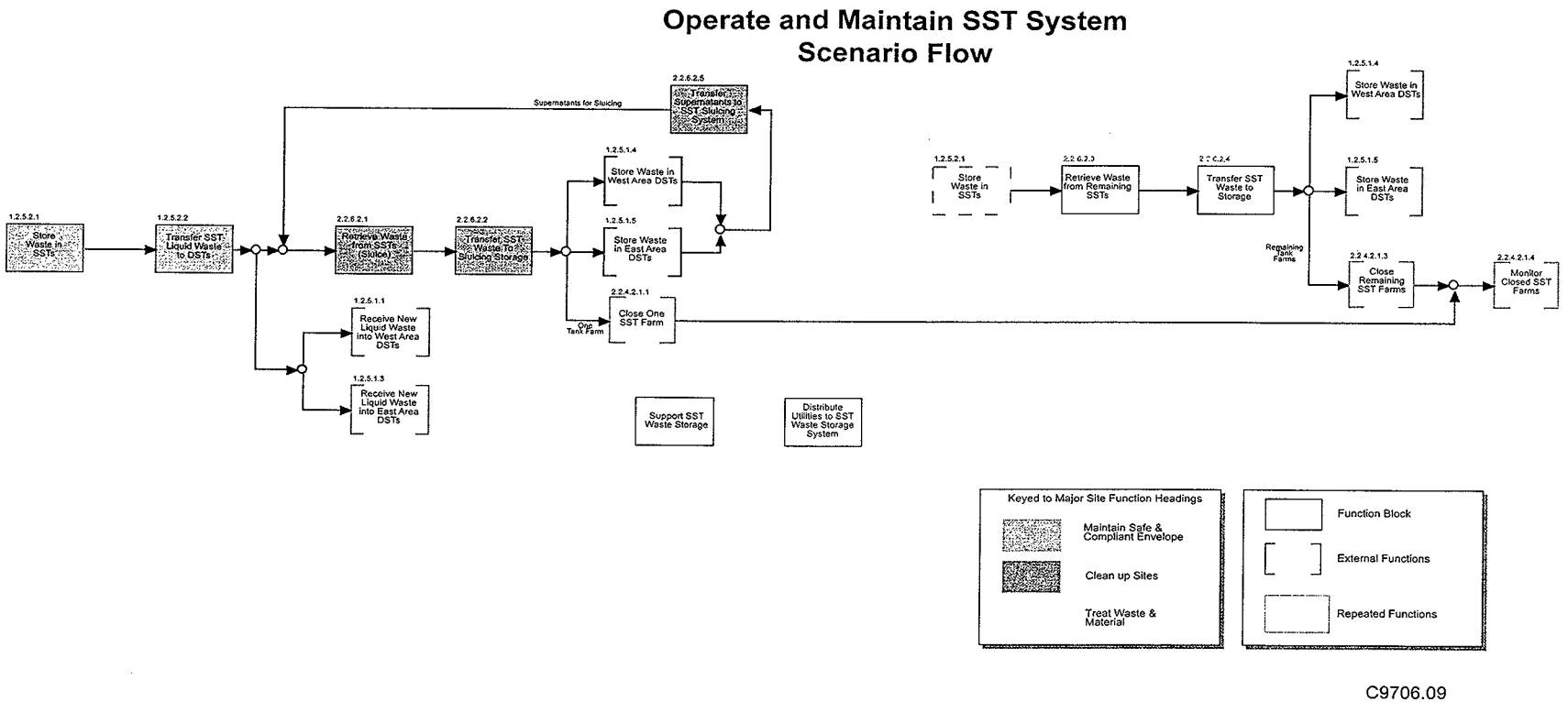


Figure 2.0-2 Single Shell Tank (SST) System Scenario FFBD - O&M Phase

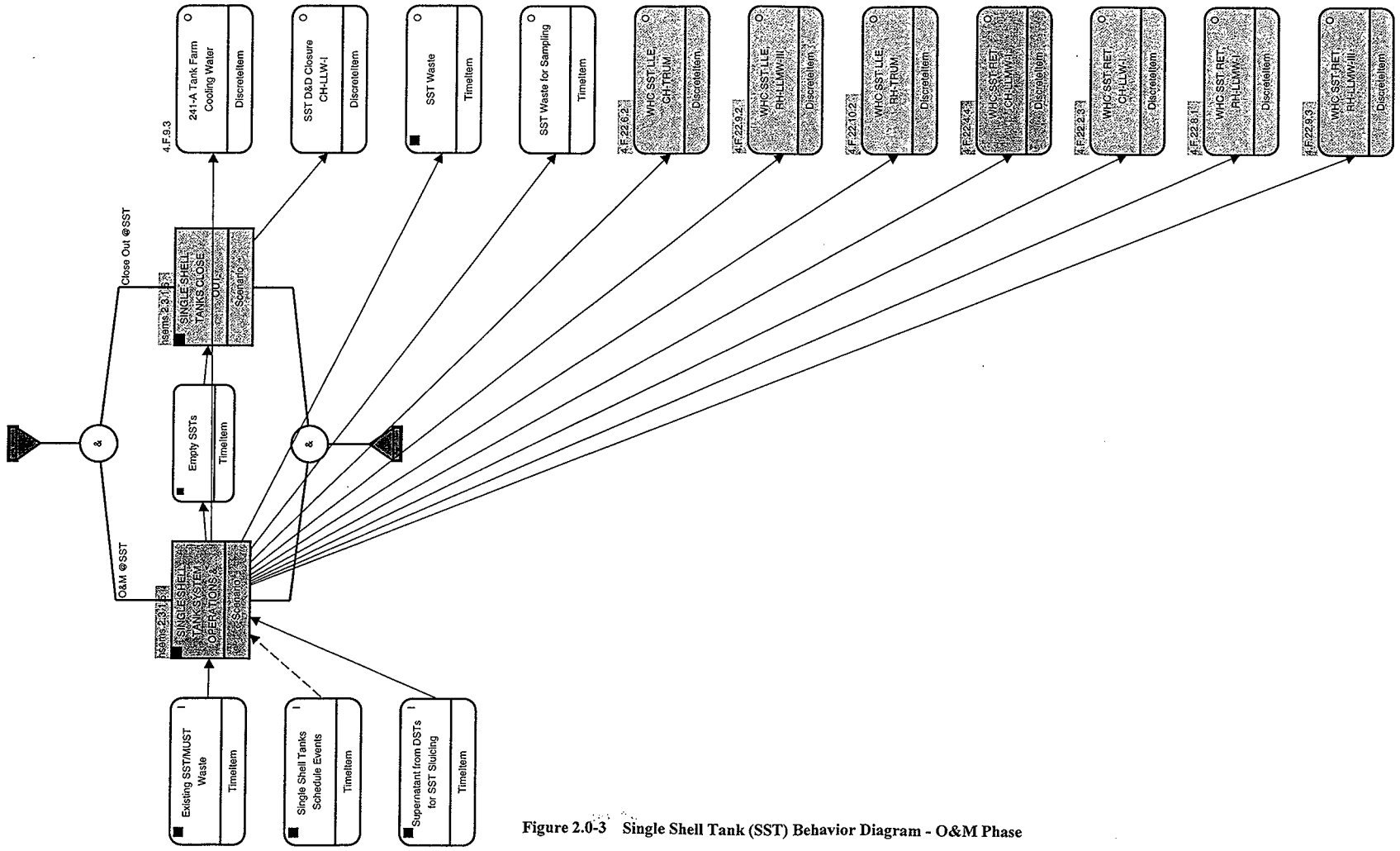


Figure 2.0-3 Single Shell Tank (SST) Behavior Diagram - O&M Phase

1.4.2 Site Architecture Development

The process by which the Site assigns responsibility for functions and requirements to architectures is illustrated in Figure 2.0-4 and is described below. The Site SE groups all Hanford Facilities first by "Geographical Areas". Then it divides the Facilities under a particular Geographical Area by a "Facility Type". The Major facilities are grouped under the appropriate "Facility Type" grouping.

The *TWRS Mission Analysis Report* (MAR) (WHC 1997) and the Project Hanford Breakdown Structure (PHBS) scope statements aid in determining which facilities on the Site architecture tree will be needed to accomplish the TWRS mission. Responsibility for the various life-cycle phases (e.g., Development, Construction, O&M and D&D) of these Facilities may be assigned to one or more TWRS Projects. TWRS has responsibility for the following ten (10) Major Facilities:

- Single Shell Tank (SST) System
- Double Shell Tank (DST) System
- LAW Plant, Phase I
- LAW/HLW Plant, Phase I
- LAW Treatment Facility, Phase II
- HLW Treatment Facility, Phase II
- TWRS CSB Modules Facility, Phase I
- IHLW Storage Modules, Phase II
- Immobilized LAW Storage Facility
- Immobilized LAW Disposal Facility

1.4.3 Site Functions Development

All Hanford Site Functions (including TWRS) are initially grouped under one of five (5) major function groups. These are:

- Maintain Safe & Compliant Envelope
- Clean Up Site
- Treat Waste and Material
- Store Waste and Material
- Disposition Waste and Material

The next major grouping of functionality for the "Maintain Safe & Compliant Envelope" and the "Clean Up Site" functions is by Geography, e.g. Central Plateau, Central Core, Reactors on the River, etc. The next major grouping of functionalaity for the "Treat Waste and Material", "Store Waste and Material", and "Disposition Waste and Material" is by Waste Type, e.g. dangerous waste, hazardous waste, radioactive waste, etc.

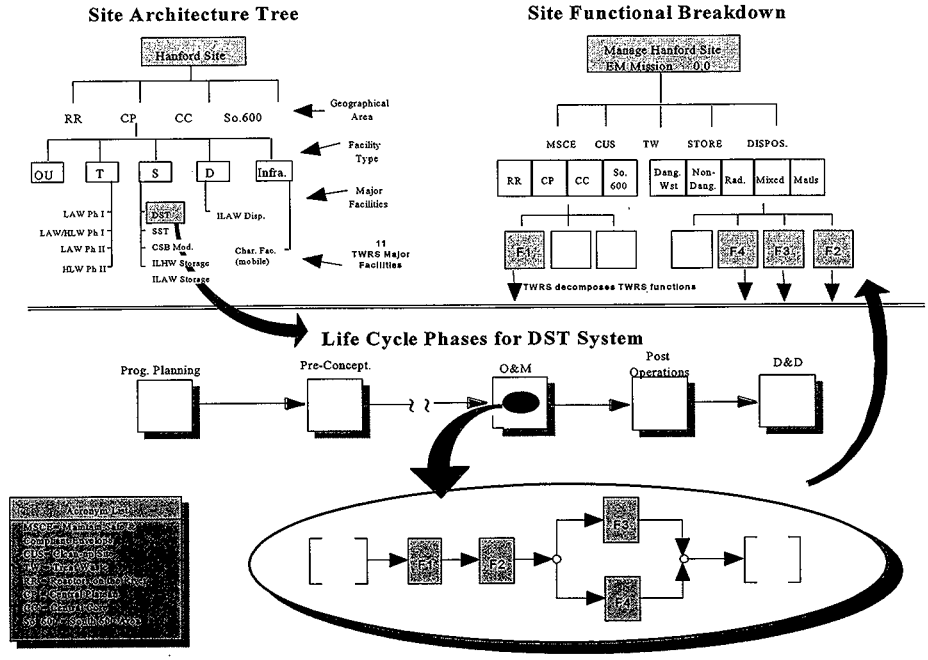


Figure 2.0-4. TWRS Linkage to Site.

2.0 USAGE

This section of this document will describe the implementation of TWRS Technical Baseline Database Manager *Elements, Relationships, and Attributes* (ERAs) in the context of the Systems Engineering practices used in TWRS Project. Elements are the containers for the information generated from the SE analysis process. An element's attributes are the locations within the element that hold specific information about that element. Each element's attributes are typed (e.g. Title, Description, etc.) so that information can be grouped. Elements are then linked together through specific relationships. These relations are uniquely named and numbered in the database.

Seventeen elements of the TWRS Technical Baseline Database Manager database have been identified as those applying to the systems engineering practices of TWRS. Section 4.0 provides detailed definitions for those elements and their applicable relationships.

During the development (or subsequent change) of the TWRS Technical Baseline, the Systems Engineer must map (relate) tangible objects (structure, systems, components), procedures, and requirements to the TWRS Technical Baseline Database Manager elements. Each element in the TWRS Technical Baseline Database Manager has a unique name associated with its attributes and relationships. The data that is developed from the SE analysis constitutes the information that makes up the TWRS Technical Baseline. Table 2.0 - 1. Illustrates some of the more frequently utilized mappings (relations).

Table 2.0 - 1. Relations Between Engineering & the Technical Baseline Database Elements

Engineering Realm		Technical Baseline Database Realm
• architecture, IE Facilities, Systems, Structures, Components (SSC)	--->	*Component* element
• interfaces between architectures	--->	*Interface* element
• the allocated functions	--->	*TimeFunction* element
• the allocated requirements	--->	*SystemRequirement* element
• the function inputs and outputs	--->	*TimeItem* element

Many of the elements in the TWRS Technical Baseline database will have one or more relationships with each other. Relations between elements in the database are uniquely named (e.g., traces_to, performed_by, etc). The nature of the allowed relations will be discussed in detail later in this chapter and in the next section.

2.1 TWRS TECHNICAL BASELINE - FUNCTIONAL ANALYSIS

TWRS begins its SE process by taking the functions for each of its Major Facilities and performing a functional analysis on them. This functional analysis produces the following:

- Functions and their definitions
- Logical Relationships between Functions
- Hierarchial (Parent - Child) Relationships between Functions

- Data/Material/Energy flow between Functions, called inputs and outputs
- Allocation of the Functions to appropriate Architectures or components

The functions and their relationships are captured in the TWRS Technical Baseline database by creating a change request with both narrative and graphical (FFBD & BD) information. See Appendix A for preferred data input guidelines and Appendix B for an example of the body of a data input Change Request.

2.2 TWRS TECHNICAL BASELINE - REQUIREMENTS ANALYSIS

The TWRS requirements analysis process consists of identifying and developing requirements (design-to, safety, constraint, etc.) and allocating the developed requirements to either of the architectural elements, architectural interface elements, or the function elements. This section will discuss how requirements development, traceability, and allocation is captured in the TWRS portion of the TWRS Technical Baseline Database Manager.

Requirements development for TWRS consists of three integral efforts:

1. Appropriate identification and development of requirements that are imposed on TWRS from outside agencies (e.g., Federal Government - CFRs; State Government - WACs; and other federal agencies - DOE Orders); and

2. Analysis which assimilates many constraining requirements and conditions to quantify system performance.

3. Performing the "good requirements" test. This test checks if a requirement is:

   a. Verifiable (i.e., measurable) by a test, demonstration, inspection or analysis.
   b. Stated concisely and accurately to avoid ambiguity.
   c. Stated using the word "shall" to show need for compliance.

TWRS Systems Engineering has defined a usage of the TWRS Technical Baseline Database Manager elements to provide requirements traceability for the TWRS requirements set as explained in the following sections. Requirements and their relationships are captured in the TWRS Technical Baseline database by creating a change request with narrative information. See Appendix A for preferred data input guidelines and Appendix B for an example of the body of a data input Change Request.

2.2.1 Requirements Allocation

Requirements in the TWRS database are categorized as "Constraints", "Functional Requirements", "Performance Requirements", or "Design Constraints." Categorization is the process whereby a database element is tagged with a keyword which is later used for sorting or element extraction (e.g., for reports). Except for Constraint requirements, requirements falling under these categories can be allocated (related) to *TimeFunctions, Components, Interfaces,* and *ItemLinks*. Table 2.2.1-1 shows the possible allocations of the different categories of requirements to these four database elements.

Table 2.2.1-1. Allocation of Requirements to Database Elements.
An X in the boxes means requirement allocation is possible.

	Database Elements			
Category	*TimeFunction*	*Component*	*Interface*	*ItemLink*
Constraints	-	-	-	-
Design Constraints		X	X	
Functional	X			
Performance	X			X

Functional Requirements

Requirements categorized as "Functional Requirements" quantify the system behavior and are allocated to the functions, because they state how the system must perform. Functional requirements state what the function must do and are generally a rewrite of the function definition using the "good requirements test".

In TWRS Technical Baseline Database Manager terms, *SystemRequirement* elements that are categorized as "Functional" or "Performance" are related to a *Category* element. The "Functional Requirement" or "Performance Requirements," are also related to a *TimeFunction* element. *TimeFunctions* are then allocated/related to *Component* (Architecture) elements.

Figure 2.2.1-1 shows the database element, illustrated as the named box, and its relationships, illustrated as lines, for the functional requirements or performance requirements allocation process. Within a box, the specific instance of the named box is displayed in parenthesis. Relation names are indicated in parenthesis near the lines (which represent relations) connecting the boxes. When reading the diagram, the verb phrase closest to the box is applicable.

To determine the relations between elements, start with a box that has an element of interest, trace the line (relation) to another box. Read the Box name and specific instance of the named element then read the verb phrase closest to the box on the relation line. For instance, read the illustration for Figure 2.2.1-1 as "SystemRequirements (X) **categorized_by** Category: Functional, **traces_to** a TimeFunction (Y) which is **performed_by** Component (Z).

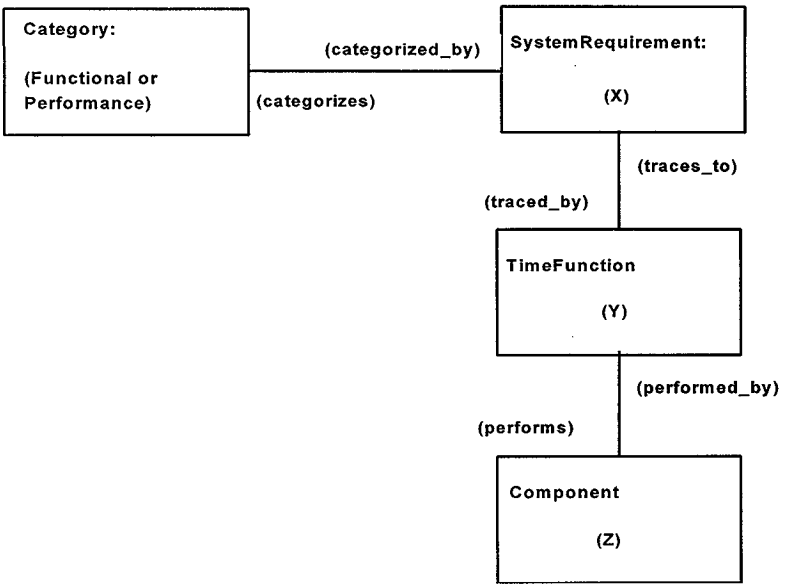


Figure 2.2.1-1. "Functional" or "Performance" Requirements Allocation.

Performance Requirements

SystemRequirements categorized as "Performance Requirements"also quantify behavior and can be allocated to TimeFunctions or to Itemlinks. Performance requirements state how well the function must perform. Performance Requirements can be allocated directly to the *ItemLink* element via the "traces_to" relationship. The *ItemLink* element usage is described in Section 2.4.

The *ItemLink* element is used to describe the channel which transports TimeItems between two architectures through the interface. Only requirements that quantify how well the *ItemLink* must perform can be allocated against it (i.e., Performance Requirements).

Design Constraint Requirements

Requirements that are "design constraints" limit the design or design approach to the system and are allocated directly to architecture. Design constraints are only allocated to architectural elements (components), if they impact its design. In the database, *SystemRequirements* categorized by the *Category*

element "Design Constraint", are allocated to the appropriate *Component* element. Figure 2.2.1-2 shows the database elements and their relationships for allocation of design constraints to *Components*.

SystemRequirements categorized as "Design Constraints" are allocated directly to the *Interface* element via the "traces_to" relationship. The usage of the *Interface* element is described in Section 2.5. The *Interface* element describes the physical interface between two *Components*.

Constraints" are allocated to *Interface* elements because they limit the design or design approach taken when designing the physical interface.

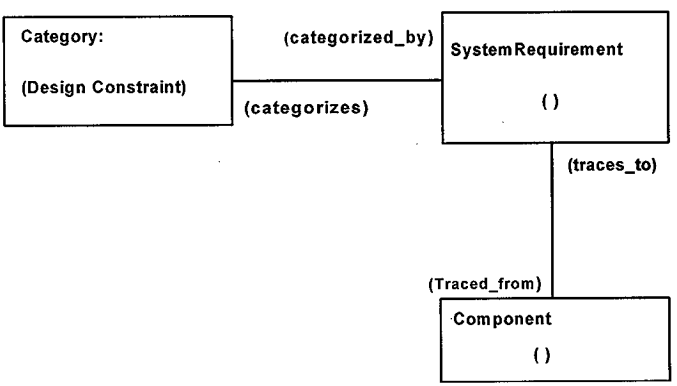


Figure 2.2.1-2. "Design Constraint" Requirements Allocation

Constraint Requirements

Verbatim text requirements are categorized as "Constraints" and are typically left unallocated. Difficulties associated with improper allocation of "Constraint" *System Requirements* are discussed in Section 2.2.2.1.

2.2.2 Traceability for Requirements Developed from Imposed Source Documents

Requirements imposed on TWRS from outside sources are captured in the TWRS Mission Analysis Report (MAR), TWRS Standards/Requirements Identification Documents (S/RIDs) and the PHMC Contract. Additional imposed requirements are handed down to TWRS from the Site SE Analysis effort. Imposed requirements are brought into the TWRS Technical Baseline Database Manager via creation of a TWRS Mission Analysis requirement and a TWRS S/RID requirement. The TWRS Mission Analysis and S/RID requirements are worded to invoke all requirements and imposed source documents called-out in the MAR

and S/RID. These requirements plus those imposed by the Site constitute the top-level requirements directly allocable to TWRS Major Facilities.

A new requirements developed from a TWRS Mission Analysis requirement depends on the applicability of the imposed source document referenced in the MAR. If the imposed source document referenced in the MAR can be levied on a TWRS major facility as a document for a major category of requirement (e.g., Personnel Safety--Occupational radiation protection), then a requirement is generated that levies that imposed source document on the applicable major facility. Otherwise, the imposed source document, as invoked by the TWRS Mission Analysis requirement, is parsed into an individual applicable requirement that is then interpreted and applied to the TWRS major facility (see Figure 2.2.2-1).

When an entire imposed source document can be written and levied as a requirement at the TWRS major facility level, the imposed source document, as invoked by the new requirement statement, can then be parsed into individual verbatim requirements for further, more detailed requirements derivation and allocation to components below the major facility level (see Figure 2.2.2-1).

It is through proper use of the "incorporates" relationship that requirement traceability to the MAR is achieved (See Figure 2.2.2-1). Notice also from Figure 2.2.2-1 that the MAR, as represented in the *Source* element, possesses a sourceType attribute of "Originating Requirement". This designates that the MAR (as well as other documents with this type attribute) is a top-level source document for the TWRS requirements set. That is, a requirement documented by a source that has its sourceType attribute set to "Originating Requirement" designates the top of the requirements hierarchy.

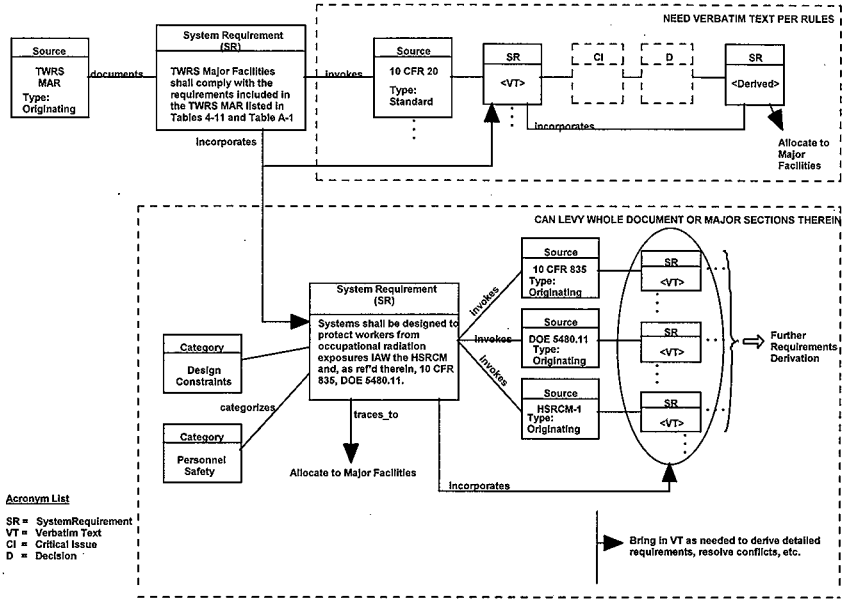


Figure 2.2.2-1. Requirement Traceability from Imposed Source Documents.

2.2.2.1 Traceability to Verbatim Text Requirement

Requirements parsed verbatim from imposed sources such as Code of Federal Regulations (CFRs), Washington Administrative Code (WAC), DOE Orders, DOE-RL Directives, and Control Manuals usually need some interpretation/re-wording because such requirements often do not pass the "good requirements" test. This test checks these criteria:

- The requirement is verifiable (i.e., measurable) by a test, demonstration, inspection or analysis.
- The requirement is stated concisely and accurately to avoid ambiguity.
- The requirement is stated using the word "shall" to show need for compliance.

The most common problem with verbatim text requirements is that there are several different requirements embedded within one paragraph. These requirements are not suitable to be allocated to a function or architecture. In order for this allocation to take place, the verbatim text requirements must be interpreted or reworded so that they meet the three criteria listed above. Depending on the complexity of the interpretation, the verbatim text requirement is transformed into an allocable requirement through either: a) a formal decision that requires supporting documentation; or b) a simple interpretation or re-wording without a formal decision process.

2.2.2.1.1 Informal Decision Process

A formal decision process is not required when the allocable requirement is a simple re-wording or separation of requirements from the verbatim text requirement. The verbatim text requirement is captured in a *SystemRequirement* element. The verbatim text SystemRequirement is "categorized_by" the "Constraint" *Category* element. The allocable requirement is also captured by a *SystemRequirement* element and is categorized by a *Category* element as described in Section 2.2.1.

In order to show the hierarchical relationship and traceability between the verbatim text *SystemRequirement* and the allocable *SystemRequirement*, the two *SystemRequirements* are related to each other via the "incorporates" or "incorporated_by" relationship. The elements and relationships for this structure are shown in Figure 2.2.2.1.1-1.

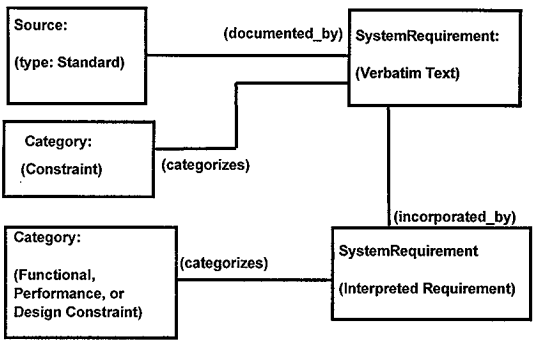


Figure 2.2.2.1.1-1. Traceability for Requirements Derived Directly from Verbatim Text Requirements with Direct Interpretation.

2.2.2.1.2 Fully Documented Formal Decision

The database uses the following procedure to capture the formal decision process for translating a verbatim text requirement into one that can be allocated to a function or architecture:

The verbatim text requirement, as parsed, is captured in a *SystemRequirement* element. This element is related to the *Category* element named "Constraint." The *SystemRequirement's* source is captured in a *Source* element that is also related to the *SystemRequirement*. The *Source* element is typed as a "Standard."

A *CriticalIssue* element is related to the *SystemRequirement* element that contains the verbatim text requirement. The *CriticalIssue* related to the verbatim text *SystemRequirement* contains an explanation of the problems associated with the verbatim text requirement (e.g., it is not concise, is ambiguous, conflicts with other verbatim text requirements). The *CriticalIssue* is related to an *Organization* element that states which organization is responsible for resolving the raised *CriticalIssue*.

The *CriticalIssue* is then resolved by a related *Decision* element which has its attributes filled to document resolution of the *CriticalIssue*. Refer to the TWRS Users' Guide for the *Decision* element's attributes. The *Decision* element is related to a *Source* element which is a pointer to the formal documentation detailing the basis for the Choice documented in the *Decision* element. The *Decision* element also has an *Organization* element related to it in order to capture which organization is responsible for making the final decision.

The result of the decision process captured by the *Decision* element is a new allocable *SystemRequirement* which is generated and related to the *Decision* element that captures the results of the decision process. The allocable *SystemRequirement* is then categorized by a *Category* element as described in Section 2.2.1. The allocable *SystemRequirement* is related to the verbatim text *SystemRequirement* (via the "incorporated_by" relationship) to show the hierarchial relationship between the two requirements.

This documents and maintains the decision making process and the traceability of the verbatim text requirement to the allocated requirement. The relationships between these database elements are shown in Figure 2.2.2.1.2-1.

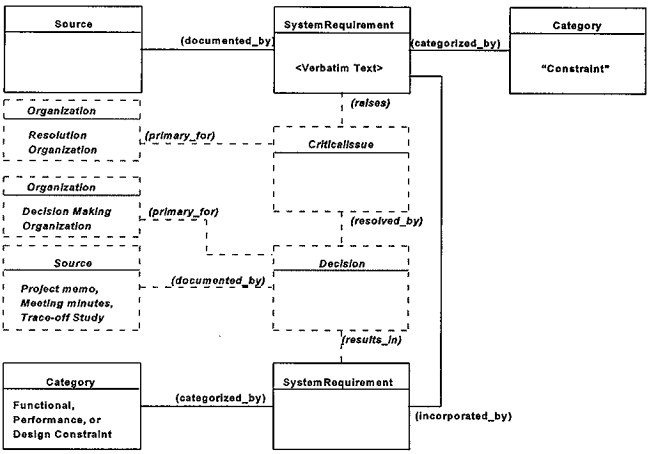


Figure 2.2.2.1.2-1. Traceability for Requirements Derived Directly from Verbatim Text Requirements Requiring a Formal Decision.

2.2.2.1.3 Multiple Verbatim Text Requirements

In cases where there exists several verbatim text requirements (from different sources) that state the same requirement, a single allocable requirement can be derived using the following database relations. The derivation to a single, allocable requirement is similar those as discussed in Sections 2.2.2.1.1 and 2.2.2.1.2. The only difference is that each verbatim text requirement is related to either a *CriticalIssue-Decision* element construct (Section 2.2.2.1.2) or directly to the interpreted requirement (Section 2.2.2.1.1), depending on the required decision process.

The "incorporated_by" relationship still exists, but in this instance, it is between the interpreted requirement and each of the verbatim text requirements. The decision process can be seen in Figure 2.2.2.3-1, where the "dashed" elements and relationships are in place when a formal decision process is need. The verbatim text *SystemRequirements* are still related to *Source* and *Category* (named "Constraint") elements, even though they are not shown on Figure 2.2.2.1.3-1.

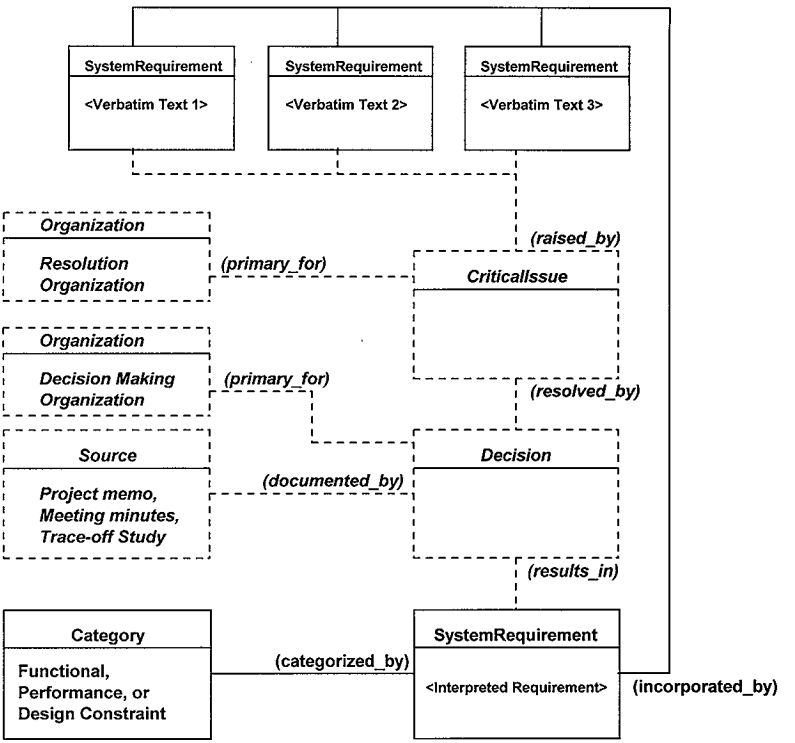


Figure 2.2.2.1.3-1. Traceability for Requirements Derived from Multiple Verbatim Text Requirements.

2.2.3 Traceability to an Analysis Document

It is not always practical to show direct traceability from all verbatim text requirements that lead to the development of a lower-level allocable requirements. Some lower-level requirements must be derived from several verbatim text requirements. This is most common when deriving performance requirements to be allocated to functions. An analysis must be performed to integrate the multiple verbatim text requirements and derive a new lower-level requirement.

Engineering assumptions and analysis to derive the requirement are usually documented in controlled, numbered reports or project memos. This documentation serves as the source for the derived requirement. The derived *SystemRequirement* is related to a *Source* element which is the document (report or project memo) that contains the analysis for the derived requirement. The derived *SystemRequirement* is also categorized by a *Category* element as described in Section 2.2.1. The database implementation for this case of derived requirements is shown in Figure 2.2.3-1.

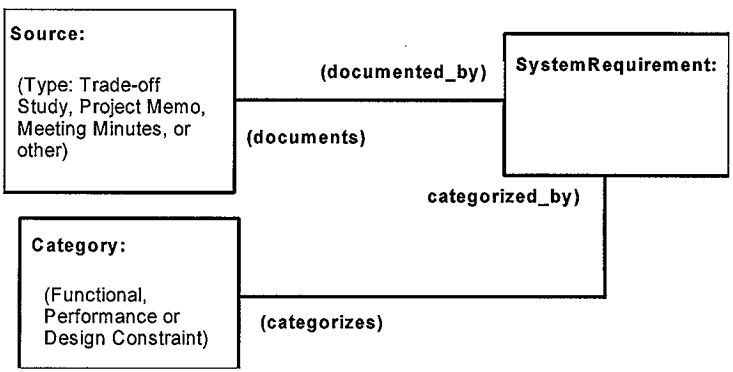


Figure 2.2.3-1. Traceability for Requirements Derived by Engineering Analysis.

2.2.4 Methodology for Categorization of RDD-100 Elements

2.2.4.1 Overview

The TWRS Technical Baseline Dataset will be a subset of the Hanford Site Technical Baseline Database (HSTD). The HSTD will contain a very comprehensive set of information on the Hanford Site Environmental Management System (HSEMS). This data set is intended to be used for a wide range of purposes. The HSTD will be queried for output in numerous documents, each with a specific purpose requiring different types of information to be selected.

The Tank Waste Remediation System (TWRS) is currently developing System Specifications for its Major Facilities which require a subset of the information applicable to the TWRS Major Facilities. These Specifications are intended to be utilized for the acquisition and subsequent design of the required facilities, systems, subsystems and components.

Since structurally much of the data used for program management, modeling, and services are entered into the

database with the same type of elements in the database (e.g., SystemRequirements, Interfaces, ItemLinks, etc.), a methodology is required to allow selection of only the information that is intended to be printed in the system specification.

The following methodology is used for categorizing the information in the HSTD to allow reports to be written which can selectively choose the data which will be printed in a given document. Several categories are used in the HSTD to distinguish between different types of information that are being entered into the database. Table 2.2.4.1-1 contains a list of Category elements and examples of the types of documents where this data might be printed using the associated categorization.

The Category elements listed in Table 2.2.4.1-1 allow for the differentiation of the various types of requirements that comprise the technical baseline. Categorization will allow the separtion of technical requirements that go into the system specifications, programmatic requirements such as TPA milestones which go into businees planning documents, and service requirements which are utilized by the site infrastructure and on-site labs for forecasting reports, etc. As the HSTD is developed, additional Category elements may be necessary. This methodology will allow for indefinite expansion. Any unique set of information that is desired can be selected by categorizing the elements without any impact on the data in the HSTD.

Table 2.2.4.1-1 Special HSTD Categories

Category	Description	**Printed In**
Technical	Elements categorized by this element are intended to describe the physical systems and physical and technical requirements associated with design and development of the system.	System / Subsystem / Component Specifications
Programmatic	Elements categorized by this element are intended for use in the program management of the associated system. This includes cost schedule, and milestone information.	Program Management Plans
Service	Elements categorized by this element are intended to describe the relationship between systems relating to services provided such as janitorial services, laboratory services, etc. This is intended for the non-physical areas of these relationships.	Service Agreements, Service Forecasting Reports
<TBD>	Other categories may be developed to allow more flexibility in development of other documents.	ICDs (for facility, privatization, project), Modeling, etc

2.2.4.2 Methodology for Data Categorization

This section illustrates how the data should be entered into the HSTD. The figures show the suggested method for entering the data, however, a single element may be related to more than one category. If a single element is related to multiple categories, the data will print verbatim in both documents, but all changes must be coordinated and may require revision of existing documents in order to remain current with the data in the HSTD.

Figure 2.2.4.2-1 shows the suggested methodology for input of the *Interface* and *Itemlink* elements and associated requirements. A separate *Interface* is created for each of the different categories, if that type of interface exists. *ItemLinks* are categorized the same as the *Interface* they are contained in. *SystemRequirements* are then allocated to the *Interfaces* and *ItemLinks* of the same type.

Figure 2.2.4.2-2 shows the suggested methodology for input of the *SystemRequirements* which **traces to** the functions. All *SystemRequirements* which are related to the behavior of the system has the **traces to** relation with the appropriate function and **categorized by** the appropriate *Category*. TWRS currently uses this methodology to distinguish Functional Requirements from Performance Requirements. The Functional Requirement is a *System Requirement* **categorized** by a Category "Functional ".

Figure 2.2.4.2-3 shows the suggested methodology for input of the *SystemRequirements* which trace to the *Component*. All *SystemRequirements* which constrain the design **traces to** the *Component* and is **categorized** by the appropriate *Category*.

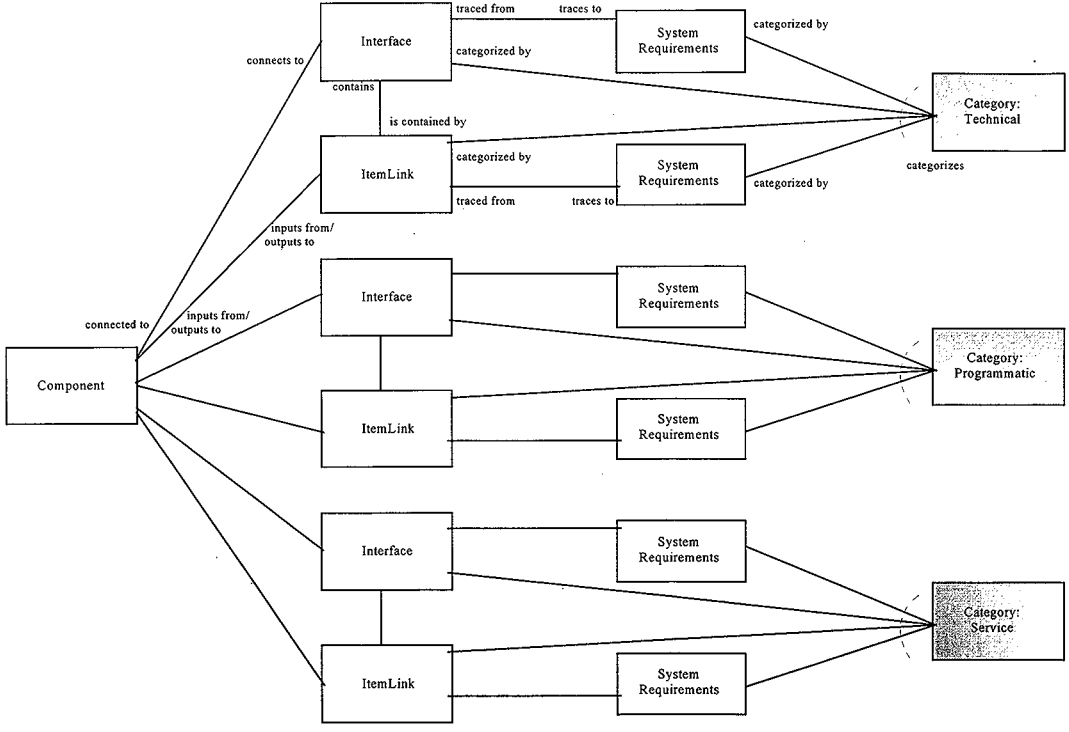


Figure 2.2.4.2-1 Methodology for System Interfaces

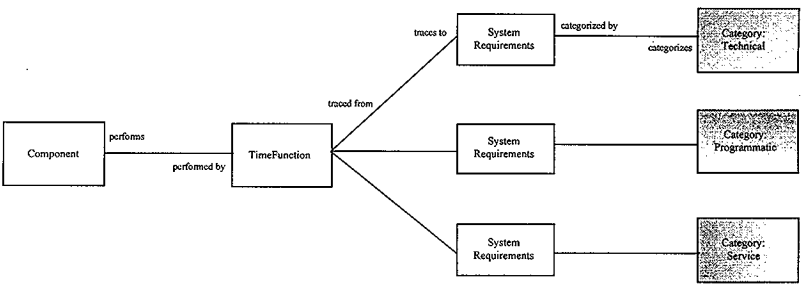


Figure 2.2.4.2-2 Methodology for Behavioral Requirements

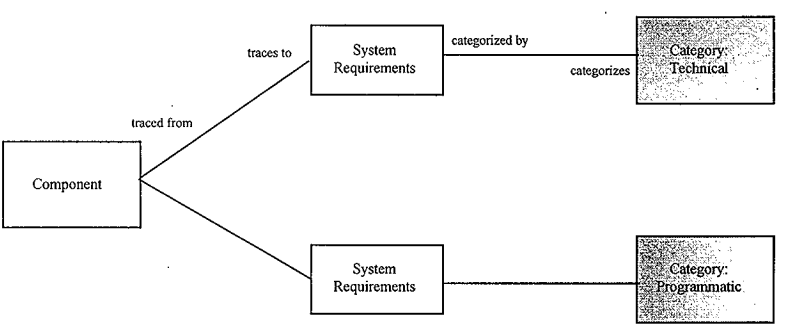


Figure 2.2.4.2-3. Methodology for Design Constraints

2.2.4.3 Naming Conventions

There will be multiple *Interfaces* and *ItemLinks* between Components because the relationship may have physical, programmatic, and/or service constituents. A naming convention will be adopted to distinguish them. Each element must have a unique name within a given element type (e.g., Interface ItemLink etc.). Adoption of a naming convention will prevent conflicts and allow the data to be entered consistently throughout the HSTD.

2.3 ALTERNATIVE GENERATION ANALYSIS (AGA)

TWRS is responsible for developing the sub-architectures for the Major Facilities designated by the Site. In TWRS, most of the architecture is already designed and in place. If new architectures are being developed, an AGA process is used to identify and analyze alternative designs for the new architecture. The results of the AGA are used in a decision process that results in the final design selection. The AGA - decision process for developing new architecture is documented in the TWRS database as shown in Figure 2.3-1 and as described below:

1. A *CriticalIssue* element is raised against the *Component* from which architectural development is going to take place. The *CriticalIssue* describes what further development is needed for the *Component* and its sub-systems.

2. A *Decision* element then resolves the *CriticalIssue* raised against the *Component*. The *Decision* attributes are used to briefly describe the resolution of the *CriticalIssue*. The *Decision* element is documented by a *Source* element, which is the AGA developed for the architecture.

3. New sub-architectures, *Component* elements, are related to the *Decision* element that resolved the *CriticalIssue*. The parent *Component* is then related to the new *Components* via the "built_in" relationship.

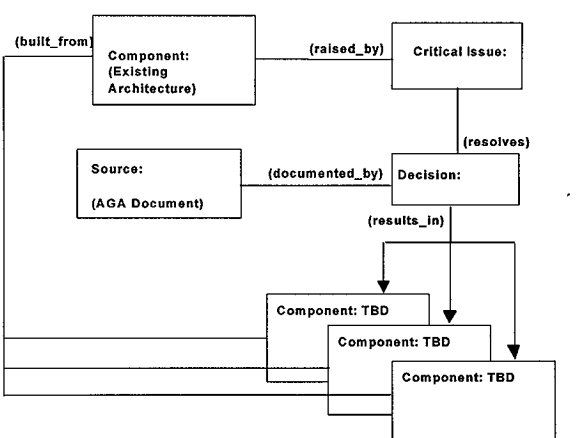


Figure 2.3-1. Alternative Generation for Developing Architecture.

Another need for the application of the AGA process arises when the current architecture can no longer fulfill the mission needs. When this occurs, the architecture needs to be upgraded. As with new architecture development, an AGA is used to identify and analyze alternative designs to upgrade existing system architecture. This process is documented in the TWRS database as shown in Figure 2.3-2 and as described below:

1. A *CriticalIssue* element is raised against the *Component* element that can no longer perform its mission and must be upgraded. The *CriticalIssue* describes this problem and the need for an upgrade.

2. A *Decision* element then resolves the *CriticalIssue* raised against the *Component* element. As before, the *Decision* element describes the resolution of the *CriticalIssue*. The AGA serves as the basis document (*Source* element) for this *Decision*.

3. The upgraded architecture, *Component* element, is then related to the *Decision* element that resolved the *CriticalIssue*. The old *Component* element is then unlinked from its parent *Component*. The parent *Component* is related to the new, upgraded Components via the "built_from" relationship.

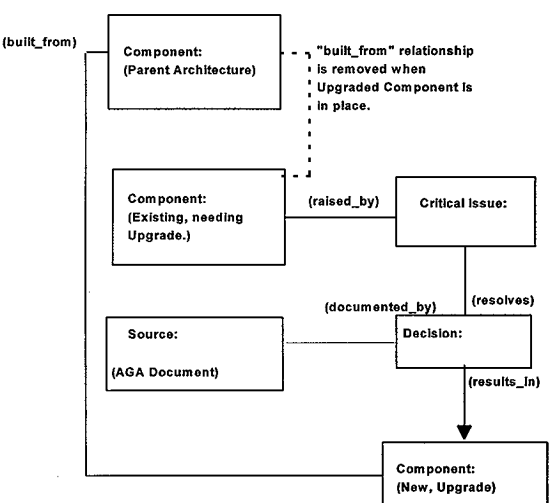


Figure 2.3-2. Alternative Generation for Upgrading Existing Architecture.

2.4 VERIFICATION REQUIREMENTS AND METHODS

Verification requirements and methods to be used in the TWRS data set will be based on the guidance and direction given in the TWRS Test & Evaluation Plan. The Test & Evaluation Plan will:

- Summarizes the objectives, responsibilities, logic, resources, and schedules for planned test and evaluation.
- Describes the system-level tests to be performed, test rationale, relationships to other tests in the integrated sequence, and the contribution each makes to verification of the system.
- Describes the evaluation process to be followed to ensure performance compliance and verification of the TWRS Program.
- Outlines each participant's role in the Test and Evaluation effort.

The verification requirements and methods information is used to build the Quality Conformance Matrix (QCM) included in the system's specification and provides the basis for other test and evaluation documentation (e.g., Test Plans).

Figure 2.4-1 shows how verification requirements and verification methods are implemented in the database. Each allocated *SystemRequirement* is related to a *VerificationRequirement* via the "verified_by" relationship. The *VerificationRequirement* element contains any special requirements or criteria associated with verifying the related requirement. If none exist, the element Description and Acceptance Criteria attributes are left blank.

Each allocated *SystemRequirement* also has an associated *VerificationMethod*. It is related to the *SystemRequirement* through the *VerificationRequirement* element via the "verification_method_for" relationship. The *VerificationMethod* element contains the method by which the *SystemRequirement* will be verified, e.g., Analysis, Demonstration, Test and/or Examination. Each *VerificationRequirement* and *VerificationMethod* will be documented by a *Source* which contains the basis for the verification criteria and method described in these elements.

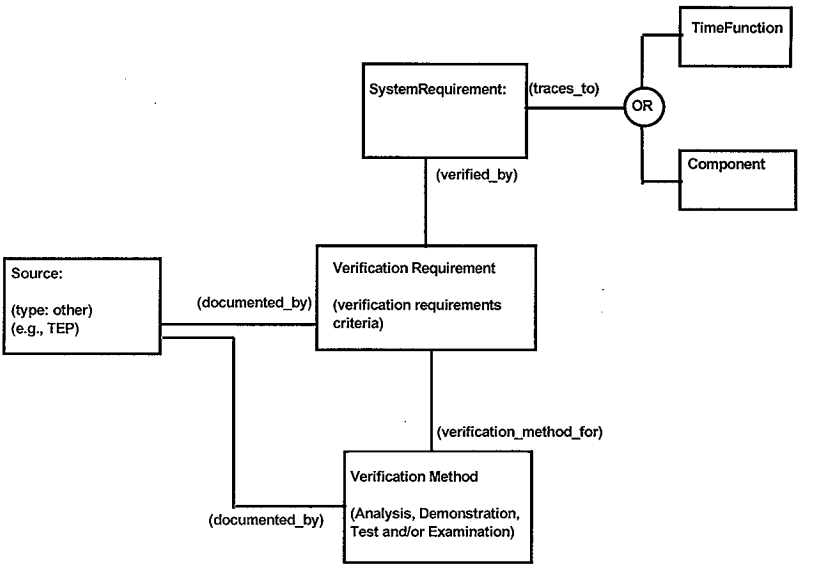


Figure 2.4-1. Verification Requirements Methods.

2.5 INTERFACE DEVELOPMENT

The TWRS Project becomes responsible for interface development when the TWRS Major Facilities are identified. Interfaces are used to describe the static physical connection between two systems. There is a shared responsibility between the owners of the Major Facilities in developing interfaces. By describing the connection between two systems, the boundary of those two systems is also defined. The description of this connection is agreed upon by the owners of the Major Facilities and is depicted in an Interface Control Document (ICD).

The TWRS Technical Baseline Database Manager is capable of producing ICD scope sheets (refer to the TWRS Interface Control Procedure). In the TWRS Technical Baseline Database Manager, the interface between two systems and the functional inputs/outputs are captured using the elements below:

- *Interface*. Physical connection between two systems, in the case of the TWRS Technical Baseline Database Manager, it is where one *Component* connects with another *Component*. Examples of interfaces are flanges, or connectors.

- *TimeItem*. The output or input of a function. *TimeItems* are objects such as water, waste, or data (signals) that flow out of one *TimeFunction* and into another *TimeFunction*. *TimeItems* themselves do not have control over their behavior or design, so *SystemRequirements* should not be allocated to them. Instead, those *SystemRequirements* should be related to the *TimeFunctions* that output or input that *TimeItem*.

- *ItemLink*. The physical item or motive force that carries the *TimeItem* through the interface. An example is pumps causing fluid transport through a pipe from one facility to another. *ItemLinks* only allow *TimeItems* to move in one direction between *Components*. The *ItemLink* is contained by the Interface and the *ItemLinks* carry the *TimeItem*.

Figure 2.5-1 shows these elements and how they are related to each other and other elements in order to describe the interface within the database.

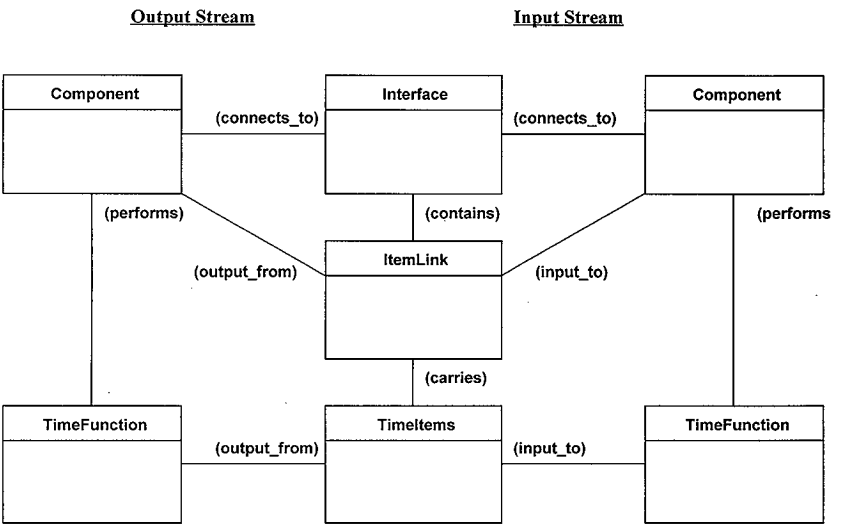


Figure 2.5-1. Interfaces and Related Elements.

The movement of high level waste (HLW) from a production facility to a treatment facility can be used as an example of how an interface is captured within the database. The top level system is composed of three sub-systems: (1) HLW Production Facility; (2) Waste Treatment Facility; and (3) Railcar System. The Railcar System connects the HLW Production facility to the Waste Treatment Facility. The Railcar System is considered to be a major component because its behavior is significant in the overall system behavior. Therefore, two upper level interfaces exists: (1) between the HLW Production Facility and the Railcar System; and (2) between the Railcar System and the Waste Treatment Facility. See Figure 2.5-2.

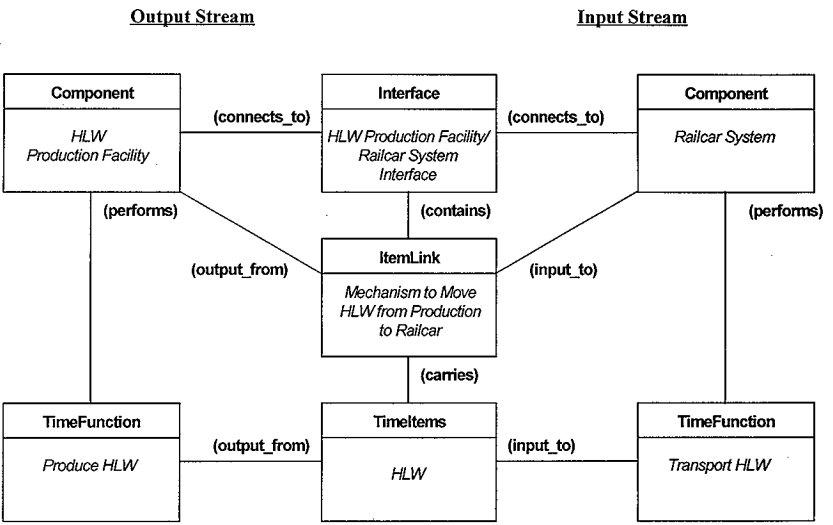


Figure 2.5-2. Interface Example.

The purpose of defining interfaces at the top level is to get an overall view of what interfaces exist between *Components* within the system and external to the system. The interfaces between *Components* become more specific as the system is defined.

Interfaces Definition

Taking the example given above and the database structure in Figure 2.5-1, the interface between the HLW Production Facility and the Railcar System is shown in Figure 2.5-2 and would be captured in the database as follows:

1. The HLW Production Facility would be the *Component* element on the left while the Railcar System would be the *Component* on the right.

2. The *Interface* element would capture the information that the Railcar System connects with the HLW Production Facility at some location. At this level of detail, it would be named "HLW Production Facility/Railcar System Interface." The description for this interface would be: "The point at which the HLW Production Facility system is connected to the Railcar System." The definition is general because the interface exists at such a high level within the system. As the system develops, the lower level interfaces will be defined with more details.

3. The *TimeFunction* allocated to the HLW Production Facility is related to its *Component* and is shown on the left. This *TimeFunction* would be named "Produce HLW."

4. The output of that function, "HLW", would be described in the *TimeItem* element.

5. The *TimeItem* element then inputs to the *TimeFunction* element related to the Railcar System *Component* on the right. This *TimeFunction* would be named along the lines of "Transport HLW."

6. The *ItemLink* element is used to describe the mechanism by which the *TimeItem* "HLW" moves across the interface from the HLW Treatment Facility to the Railcar System. The *ItemLink* would be named, "Mechanism to Move HLW from Production to Railcar." A definition would be: "A mechanism to move the HLW from the HLW Production Facility to the Railcar System through the HLW Production Facility/Railcar System Interface." Just as in Item 2, the *ItemLink* is defined in general terms until further system definition takes place.

Components Decomposition

The hierarchial breakdown of *Interfaces, TimeItems*, and *ItemLinks* is dependent on the breakdown of their two associated *Components*. As *Components* are decomposed, lower level *TimeFunctions* are allocated to them. Each decomposition of the *Interface* and related elements further defines the boundaries of each system and where those boundaries lie. The interface definition becomes more specific as the interface is decomposed. This hierarchical decomposition can be described by further decomposing the elements in the previous example as shown in Figure 2.5-3 and described below:

1. A sub-component of the HLW Production Facility would be the HLW Staging Area. This sub-component would fill the *Component* element on the left.

2. The Railcar System sub-component that interfaces with the HLW Staging Area would be a Railcar. That *Component* would appear as the element on the right.

3. The *Interface* between the HLW Production Facility and the Railcar System can be decomposed into the "Loading Dock" where the Railcar connects with the HLW Storage Area. The Interface's definition would be: "The HLW Staging Area meets up with the Railcars at the loading dock."

4. The *TimeFunction* which is performed by the HLW Storage Area would "Prepare HLW for Shipment." The Railcar would perform a function of "Accepting HLW onto Railcars."

5. The *TimeItem*, HLW, can be decomposed into specific type of HLW. For this example, "HLW Canisters" would be passed from the HLW Staging Area to the Railcar. Other types of HLW would also fall into the *TimeItem* "HLW" decomposition.

6. The decomposition of the *ItemLink*, "Mechanism to Move HLW from Production to Railcar", would result in a "Crane" to move the waste from the HLW Staging Area to the Railcar. Other *ItemLinks* would be forktrucks, pipes and pumps, or handtrucks. The description of the *ItemLink* "Crane" would be: "A crane moves the HLW Canisters from the HLW Staging Area onto the Railcar at the loading dock."

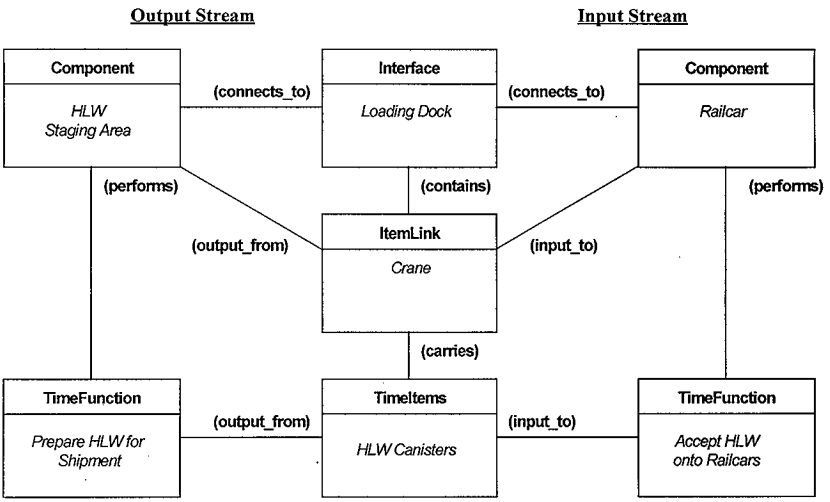


Figure 2.5-3. Decomposition of Interface Example in Figure 2.5-2.

2.6 ENABLING ASSUMPTIONS

Enabling assumptions are used to document unsubstantiated decisions so that work can continue. Enabling assumption usage should be limited to low risk situations, so that unnecessary risk is not incurred in the development process. A *Decision* element of type "Enabling Assumption" is used to document the unofficial decision for a *CriticalIssue* element raised against a *SystemRequirement* or *Component* element. The basis for the "Enabling Assumption" is documented in a related *Source* element. The responsible organization for making the decision is documented in the related *Organization* element. The database structure of this type of *Decision* element is the same as that of an "official" *Decision* element and is seen in Figure 2.6-1.

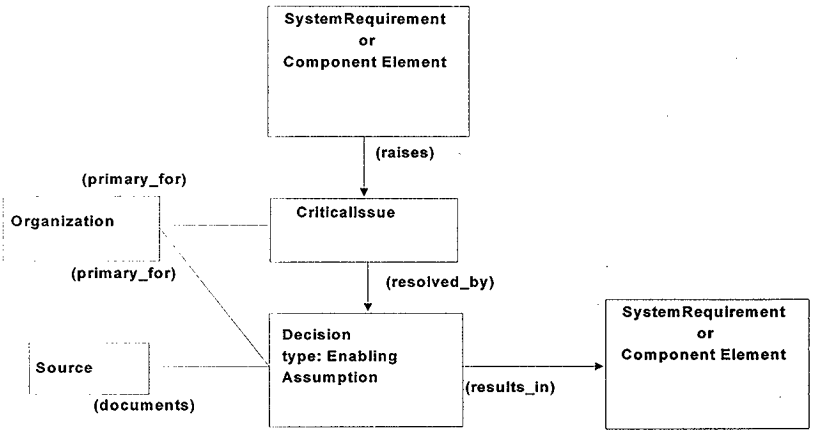


Figure 2.6-1. Enabling Assumption.

When an official decision has been made, both the "official" *Decision* element and the "Enabling Assumption" *Decision* element reside in the database for problem-resolution traceability. The database structure to accomplish this is shown in Figure 2.6-2.

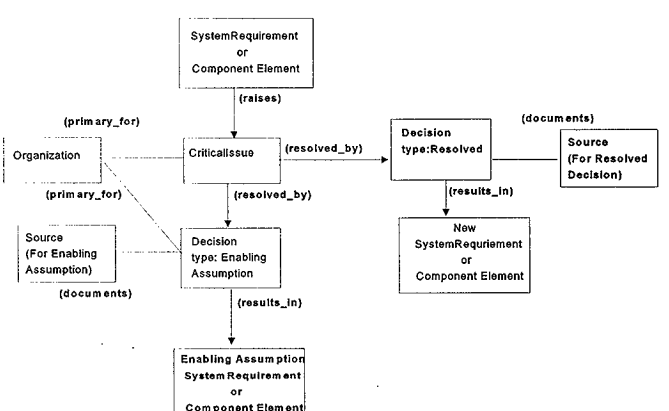


Figure 2.6-2. Resolution of an Enabling Assumption.

3.0 MAJOR REPORTS FROM THE TWRS TECHNICAL BASELINE DATABASE MANAGER

Several major reports can be produced from the TWRS Technical Baseline Database Manager. The most significant is the System Specification. The System Specification is based on the RDD-100© Design Guide A Schema and is currently implemented in the TWRS Technical Baseline Database (as indicated in sections 2 and 4). The Type A System Specification is written around a TWRS Major Facility or a Major System. The System Specification Report collects information from the Technical Baseline Database and presents it in a format which adheres to the requirements listed in the "TWRS Systems Engineering Procedures - Functional Requirements and Technical Criteria - Appendix A". See Appendix A of that procedure for more details on what goes in each section of the report.

A Type B Specification, as outlined in Appendix B of the TWRS Systems Engineering Procedures - Functional Requirements and Technical Criteria, is used to specify major components or sub-systems of the Facility.

Other types of reports include: 1) listings of Issues associated with a component, function or requirement, 2) Decisions required/made concerning the corresponding issues, 3) Interface Control Document reports, and 4) Functions & Requirements Reports. Special reports can be created to extract information for particular purposes.

The following Exhibit 3.0-1 is an example of the general format for a Type A System Specification that will be used by TWRS. If a section has no data printed in it, it is because there is no corresponding data in the database. This either because the data is missing or there is no applicable requirement.

Exhibit 3.0-1 Major Facility Specification Report

1.0 Scope *(section is generated from text blocks)*

2.0 Applicable Documents *(section is auto-generated)*

2.1 Government Sources

2.2 Non-government Sources

3.0 System Requirements

3.1 System Definition *(Major Facility Component description)*

3.2 Characteristics *(Header)*

3.2.1 Performance Characteristics *(Header)*

3.1.1.**v** Functional Requirements

*(Named Requirement **Title**, categorized as functional, allocated to the functions performed by the component.)*
*(**Description** of Named Requirement.)*

v = 1 to M, where M = the number of functions allocated to the component that the database manager find in the dataset.

3.1.1.**v.a** Performance Requirements

*(Named **Requirement Title**, categorized as performance, allocated to the functions performed by the component.)*
*(**Description** of Named Requirement.)*

a = 1 to K, where K = the number of Performance Requirements allocated to the specific function.

3.2.2 Reserved

3.2.3 External Interface Requirements

3.2.3.**x** External Interface

*(Named **Interface Title**, connected to the Component.)*
*(**Description** of Named Interface.)*

x = 1 to N, where N = the number of connected components.

3.2.3.**x.b** Interface Requirements

*(Named **Requirement Title**, traced from or to the Interface or ItemLink described in 3.2.3.x . Prints out if the ItemLink is input_to the component.)*
*(**Description** of Named Requirement.)*

b = 1 to L, where L = the number of requirements allocated to the **x**th Interface or ItemLink.

3.2.4 Physical Characteristics

(Requirements allocated to the component, categorized as Physical Characteristics.)

3.2.5 System Quality Factors (RAM) *(Header)*

3.2.5.1 Reliability

(Requirements allocated to the component, categorized as Reliability.)

3.2.5.2 Maintainability

(Requirements allocated to the component, categorized as Maintainability.)

3.2.5.3 Avalability

(Requirements allocated to the component, categorized as Availability.)

3.2.5.4 Additional Quality Factors

(Requirements allocated to the component, categorized as Additional Quality Factors.)

3.2.6 Environmental Conditions

(Requirements allocated to the component, categorized as Environmental Conditions.)

3.2.7 Transportability

(Requirements allocated to the component, categorized as Transportability.)

3.2.8 Flexibility and Expansion

(Requirements allocated to the component, categorized as Flexibility and Expansion.)

3.2.9 Portability

(Requirements allocated to the component, categorized as Portability.)

3.3 Design and Construction

(Requirements allocated to the component, categorized as Design and Construction.)

3.3.1 Materials

(Requirements allocated to the component, categorized as Materials.)

e.g., Restricted Materials

3.3.2 Electromagnetic Radiation

(Requirements allocated to the component, categorized as Electromagnetic Radiation.)

3.3.3 Nameplates and Product Markings

(Requirements allocated to the component, categorized as Nameplates and Product Markings.)

3.3.4 Workmanship

(Requirements allocated to the component, categorized as Workmanship.)

3.3.5 Interchangeability

(Requirements allocated to the component, categorized as Interchangeability.)

3.3.6 Safety

(Requirements allocated to the component, categorized as Safety.)

e.g., Environmental Protection, safety and Health Protection Standards

3.3.6.1 Personnel Safety

(Requirements allocated to the component, categorized as Personnel Safety.)

e.g.,
Occupational Radiological Protection
Occupational Safety & Health Standards (OSHA)

3.3.6.2 System Safety

(Requirements allocated to the component, categorized as System Safety.)

e.g.,
Fire Protection
Nuclear Criticality Safety
Secondary Containment and Leak Detection
Spill Prevention and Control
Incompatible/Ignitable Wastes

3.3.6.3 Environmentatl Safety

(Requirements allocated to the component, categorized as Environmental Safety.)

e.g.,
Access Controls
Radiation Protection of the Public and the Environment
Land Disposal of Radioactive Wastes
Solid Waste Acceptance Criteria
Liquid Effluent Discharges to the Effluent Treatment Facility
Monitoring of Liquid Effluent Discharges to the Environment
Liquid Effluent Discharges to the Environment
Radioactive Airborne Emissions
Non-radioactivive Airborne Emissions

3.3.7 Human Engineering

(Requirements allocated to the component, categorized as Human Engineering.)

3.3.8 Nuclear Control

(Requirements allocated to the component, categorized as Nuclear Control.)

e.g.,
High Level Waste Criticality Safety

3.3.9 System Security

(Requirements allocated to the component, categorized as System Security.)

3.2.10 Government Furnished Property Usage

(Requirements allocated to the component, categorized as Government Furnished Property Usage.)

3.2.11 Computer Resource Reserve Capacity

(Requirements allocated to the component, categorized as Computer Resource Reserve Capacity.)

3.4 Documentation

(Requirements allocated to the component, categorized as Documentation.)

3.5 Logistics

(Requirements allocated to the component, categorized as Logistics.)

e.g.,
Packaging and Transport of Hazardous Materials
High-Level Waste Product Packaging
Polychlorinated Biphenyls (PCSs)
Used Oil

3.6 Personnel and Training

(Requirements allocated to the component, categorized as Personnel and Training)

3.6.1 Personnel

(Requirements allocated to the component, categorized as Personnel.)

3.6.2 Training

(Requirements allocated to the component, categorized as Training.)

3.7 Characteristics of Sub-Elements *(Header)*

3.7.**z** Sub-Element Name

*(Named Sub-element **Title**, categorized as functional, built in the component.)*
*(**Description** of Named Sub-element.)*

z = 1 to P, where P = the number of subcomponents built in the component.

3.8 Precedence

(Requirements allocated to the component, categorized as Precedence.)

3.9 Qualification

(Requirements allocated to the component, categorized as Qualification.)

3.10 Standard Sample

(Requirements allocated to the component, categorized as Standard Sample.)

3.11 Preproduction Standard

(Requirements allocated to the component, categorized as Preproduction Standard.)

4.0 Quality Assurance Provisions ***(Header)***

4.1 Responsibility for Inspection *(Boiler Plate Text Block for All Specs)*

4.2 Special Test and Examinations *(Boiler Plate Text Block for All Specs)*

4.3 Requirements Cross Reference *(Boiler Plate Text Block + auto-generated QCM)*

5.0 Preparation for Delivery

6.0 Notes ***(Text Blocks)***

7.0 References

4.0 DEFINITIONS AND RELATIONSHIPS OF TWRS TECHNICAL BASELINE DATABASE MANAGER ELEMENTS USED IN TWRS

This section will define the TWRS Technical Baseline Database Manager elements, the type of information contained in their attributes, and the relationships between the different element types. In the TWRS Technical Baseline Database Manager, elements are the containers for the information generated from the SE process. Data is organized in the element under named attributes and named relations. An element's attributes hold specific information for that element which is organized by the type of named attribute, e.g. Description, Title, etc. Refer to the TWRS Users Guide [WHC1996b] for a complete listing of attributes. Elements are then linked together through specific relationships.

Seventeen elements of the TWRS Technical Baseline Database Manager database have been identified as those applying to the Systems Engineering practices of TWRS. This section will define the elements and the relationships between them. Items marked with a "#" are infrequently utilized. Database elements in this document are written in italics.

The TWRS Users Guide (WHC 1996b) and the RDD-100© *Product Family Schema Reference* (ALC 1994) provide further information on the elements of the TWRS Technical Baseline Database Manager discussed in this document.

LIST OF ELEMENTS

4.1 CATEGORY

This element is used to group *SystemRequirement* elements (Section 4.13), *Interface* elements (Section 4.7), and *ItemLink* elements (Section 4.8). These elements may be generally classified as:

Technical
Programmatic
Service.

These three instances of *Category* may be arranged as hierarchies, using the "incorporates" relationship. For instance the "Technical" category may incorporate the "Design Constraint" category.

SystemRequirement elements (Section 4.13) are further categorized under one of the following *Category* titles:

Constraint
Design Constraint
Functional Requirement
Performance Requirement

Usage of these *SystemRequirement* categories is discussed in subsections of Section 2.2.

SystemRequirements categorized as "Design Constraints" are further categorized by one of the following *Category* elements:

Physical Characteristics	Interchangeability
Reliability	Safety
Maintainability	Human Engineering
Natural Environmental	Documentation
Transportability	Maintainability
Materials	Personnel safety
Electromagnetic Radiation	Personnel and Training
Name Plate and Product Marking	
Workmanship	

Note: The "Design Constraint" *SystemRequirements* appear in the section of a TWRS Technical Baseline Database Manager generated specification based on this secondary categorization. For example, *SystemRequirements* categorized by the *Category* "Reliability" will appear in section "3.2.3 Reliability" of a TWRS Technical Baseline Database Manager generated System Specification.

A single element may be related to more than one category. If a single element is related to multiple categories, the data will print verbatim in all documents.

A separate *Interface* should be created for each of the different categories, technical, programmatic, or service, if that type of interface exists. *ItemLinks* are categorized the same as the *Interface* they are contained in.

All *SystemRequirements* which are related to the behavior of the system has the **traces to** relation with the appropriate function and **categorized by** the appropriate *Category*. TWRS currently uses this methodology to distinguish Functional Requirements from Performance Requirements. The Functional Requirement is a *System Requirement* **categorized** by a Category "Functional".

All *SystemRequirements* which constrain the design **traces to** the *Component* and is **categorized** by the appropriate *Category*.

Attributes

Abbreviation:	TWRS (Abbr. Is currently used to identify TWRS owned elements for sorting purposes.)
Title:	Description (A title is required which is more definitive than the Element Name and may be used in special reports.)

Relationships

categorizes:	SystemRequirement (Section 4.13)
categorizes:	Interface (Section 4.7)
categorizes:	ItemLink(Section 4.8)
incorporates:	Category
incorporated_by:	Category

4.2 COMPONENT

This element is used to describe the architecture of a system. Architectures are physical items which perform the functions (*TimeFunction*, Section 4.15) of a system. An entire system architecture can be described on a general level by one *Component* element. In order to describe the architecture in more detail, a *Component* is further decomposed (Section 2.3) down to the desired level of detail.

An architecture may need some modification or development to improve its effectiveness or extend its applicability. This need raises an issue which is described by the *CriticalIssue* element (Section 4.3) and is related to the *Component* element.

Architectures are developed or modified after a trade study or an Alternatives Generation Analysis (AGA). Based on the results of the AGA, a decision is made to select one of the alternatives. This decision is described by the *Decision* element (Section 4.4) which is then related to the *Component* element that describes the new architecture.

The physical connection between *Components* of the same level of detail is described by the *Interface* element (Section 4.7). Physical entities which transport physical items or information between two architectures of the same level of detail are described by the *ItemLink* element (Section 4.8).

The group or organization which is responsible or has ownership of a *Component* is described by the *Organization* element (Section 4.9).

The *Components* must adhere to certain requirements (Section 2.2.1 and 4.1) that are described by the *SystemRequirement* element (Section 4.13).

Attributes

Abbreviation:	TWRS (Abbr. Is currently used to identify TWRS owned elements for sorting purposes.)
Description:	(narrative)
Component Type:	Facility (Type is currently used to identify buildings that are part of a Major Facility and are collected for printout in the MYWP.)
Component Type:	System/Sub-system/Component (Type is currently used to sort elements for report generation.)
Title:	Description (A title is required which is more definitive than the Element Name and may be used in special reports.)

Relationships

built_from:	Lower-level Components
built_in:	Higher-level Component
categorized by:	Category (Section 4.1)
connected_to:	Interface (Section 4.7)
# entered_by:	ItemLink(Section 4.8)
# exited_by	ItemLink (Section 4.8)
# has_context:	FNet (Element automatically created by TWRS Technical Baseline Database Manager)
inputs_from:	ItemLink (Section 4.8)
outputs_to:	ItemLink (Section 4.8)
performs:	TimeFunction (Section 4.15)
performs:	DiscreteFunction (Section 4.5)
primary_is:	Organization (Section 4.9)
raises:	CriticalIssue (Section 4.3)
resulted_from:	Decision (Section 4.4)
traced_from:	SystemRequirements (Section 4.13)
traced_from:	Decision (Section 4.4)

4.3 CRITICALISSUE

This element describes unresolved issues or problems associated with the system (e.g., Tank Farm Safety Issues, Core Sampler Reliability). Problems described by the *CriticalIssue* element can be raised by any other element in the system.

CriticalIssues can be raised against the contents of the database. For example, a requirement in the database may not conform to the criteria for a valid *SystemRequirement* (described in Section 2.2). This nonconformity raises an issue which is recorded by the *CriticalIssue* element.

The resolution of the problem is described by the *Decision* element. The group or organization which is responsible for resolving the problem is described by the *Organization* element.

Attributes

Abbreviation:	TWRS (Abbr. Is currently used to identify TWRS owned elements for sorting purposes.)
Description:	(narrative)
Title:	Nil, Description (A title is required which is more definitive than the Element Name and may be used in special reports.)

Relationships

Primary_is:	Organization (Section 4.9)
Raised_by:	Any Element
Resolved_by:	Decision (Section 4.4)

4.4 DECISION

This element describes any decisions made to resolve an issue or a problem (*CriticalIssue*). An example of this would be decisions to select architectural items based on a study or an analysis (see AGA in Section 2.3).

The *Decision* element also contains the basis for the derivation of an interpreted *SystemRequirement* from a verbatim text *SystemRequirement*. This is not the same as the relationship between a verbatim text requirement and a derived requirement where one incorporates the other (see Section 2.2).

The group or organization which is responsible for making the decision is described by the *Organization* element. The decision must be traced to a source which documents the basis for the decision. The source is described by the *Source* element.

Attributes

Abbreviation:	TWRS (Abbr. Is currently used to identify TWRS owned elements for sorting purposes.)
Description:	(narrative)
Title:	Description (A title is required which is more definitive than the Element Name and may be used in special reports.)

Relationships

Documented_by:	Source (Section 4.12)
Primary_for:	Organization (Section 4.9)
Resolves:	CriticalIssue (Section 4.3)
Results_in:	Component (Section 4.2)
Results_in:	Interface (Section 4.7)
Results_in:	ItemLink (Section 4.8)
Results_in:	TimeFunction (Section 4.15)
Results_in:	SystemRequirement (Section 4.13)

4.5 DISCRETEFUNCTION

A *DiscreteFunction* element represents a single action from a sequence of actions in a process. When a *TimeFunction* can no longer be decomposed, it is represented as a *DiscreteFunction*. *DiscreteFunctions* may represent either continuous functions or event functions.

Attributes

Abbreviation:	TWRS (Abbr. Is currently used to identify TWRS owned elements for sorting purposes.)
Description:	(narrative)
Duration:	Nil, expression
Title:	Description (A title is required which is more definitive than the Element Name and may be used in special reports.)

Relationships

allocated to:	Component (Section 4.2)
inputs:	DiscreteItem (Section 4.6)
outputs:	DiscreteItem (Section 4.6)
performed_by:	Component (Section 4.2)
primary_is:	Organization (Section 4.9)
# referred_by:	INet (Element automatically created by TWRS Technical Baseline Database Manager)
traced_from:	SystemRequirement (Section 4.13)
traced_from:	Decision (Section 4.4)

4.6 DISCRETEITEM

DiscreteItems are the lowest level of decomposition for inputs and outputs (TimeItems). When a *TimeItem* (Section 4.16) can no longer be decomposed, it is represented as a *DiscreteItem*. *DiscreteItems* may provide information (messaging, semaphores) to functions that receive them as input and may be used to affect conditional behavior of the function. *DiscreteItems* must always be accompanied by a companion *Forecast* element (Section 4.19 - 4.22).

Attributes

Abbreviation:	TWRS (Abbr. Is currently used to identify TWRS owned elements for sorting purposes.)
Description:	(narrative)
Item Type:	nil, physical, data, digital, event
Title:	Description (A title is required which is more definitive than the Element Name and may be used in special reports.)

Relationships

allocated to:	Component (Section 4.2)
input_to:	TimeFunction (Section 4.15)

output_from:	TimeFunction (Section 4.15)
# referred_by:	INet (Element automatically created by TWRS Technical Baseline Database Manager)

4.7 INTERFACE

This element describes the logical boundary between two architectures (*Components*). Transactions or communications occur between architectures through interfaces. The *Interface* element does not describe the dynamic entity which actually performs the transportation or the communication. This entity is described by the *ItemLink* element (Section 2.5 and Section 4.8).

The entities described by the *Interface* elements must adhere to *SystemRequirements* categorized as "Design Constraints" (Section 2.2.3 and Section 4.1).

Attributes

Abbreviation:	TWRS (Abbr. Is currently used to identify TWRS owned elements for sorting purposes.)
Description:	(narrative)
Title:	Nil, Description (A title is required which is more definitive than the Element Name and may be used in special reports.)

Relationships

connects_thru:	Component (Section 4.2)
connects_to:	Component (Section 4.2)
contains:	ItemLink (Section 4.8)
traced_from:	SystemRequirement (Section 4.13)
traced_from:	CriticalIssue (Section 4.3)
traced_from:	Decision (Section 4.4)

4.8 ITEMLINK

This element describes the entity which transports a physical item (*TimeItem*) from one architecture (*Component*) to another using the physical connection between the two architectures (*Interface*). *ItemLinks* transport the *TimeItems* in only one direction. A separate *ItemLink* would be used to describe a *TimeItem's* movement in the opposite direction. Section 2.5 contains examples of the *ItemLink* and its use within the database.

Attributes

Abbreviation:	TWRS (Abbr. Is currently used to identify TWRS owned elements for sorting purposes.)
Description:	(narrative)

Title:	Nil, Description (A title is required which is more definitive than the Element Name and may be used in special reports.)

Relationships

carries:	TimeItem (Section 4.16)
carries:	DiscreteItem (Section 4.5)
enters:	Component (Section 4.3)
exits:	Component (Section 4.3)
input_to:	Component (Section 4.3)
is_contained_by:	Interface (Section 4.7)
output_from:	Component (Section 4.3)
traced_from:	SystemRequirement (Section 4.13)
traced_from:	Decision (Section 4.4)

4.9 ORGANIZATION

This element describes the group or organization which is responsible for resolving a problem described by the *CriticalIssue* element or for making a decision described by the *Decision* element. This element also describes the group or organization which is responsible for or has ownership of an architecture described by the *Component* element.

Attributes

Description:	(narrative)

Relationships

Primary_for:	CriticalIssue (Section 4.3)
Primary_for:	Decision (Section 4.4)
Primary_for:	Component (Section 4.2)
Primary_for:	TimeFunction (Section 4.15)

4.10 SCENARIO

This element is used primarily in the TWRS database to collect the functions related to the different life cycle phases for each TWRS Major Facility. The relationship between the *Scenario* element and associated *TimeFunctions* is shown through a connecting *FNet* element. The *Scenario* element is also used to define/follow a specific thread of behavior through the *TimeFunctions* within the database. When the *Scenario* element pulls in the *TimeFunctions*, all the elements related to the *TimeFunction* remain intact (e.g., *SystemRequirements*, *TimeItems, etc.*).

Attributes

Abbreviation:	TWRS (Abbr. Is currently used to identify TWRS owned elements for sorting purposes.)
Description:	(narrative)
Title:	Description (A title is required which is more definitive than the Element Name and may be used in special reports.)

Relationships

categorizes:	Category (Section 4.1) {typically a lifecycle phase}
inputs:	TimeItem (Section 4.16)
inputs:	DiscreteItem (Section 4.6)
outputs:	TimeItem (Section 4.16)
outputs:	DiscreteItem (Section 4.6)
referred_by:	FNet (Element automatically created by TWRS Technical Baseline Database Manager)

4.11 SECTION

This element makes references to all *SystemRequirement* and *TextBlock* elements which appear in a particular paragraph of a specification generated by the TWRS Technical Baseline Database Manager. The name and number of a *Section* element correspond to the paragraph in a report to which the element refers.

The *Section* element provides traceability from a given paragraph in a TWRS Technical Baseline Database Manager generated specification back to the related database element. This gives the user the ability to trace from the report, output by the TWRS Technical Baseline Database Manager, to the database element and its attributes and relationships.

Attributes

Title:	Nil, Description (A title is required which is more definitive than the Element Name and may be used in special reports.)

Relationships

Describes:	SystemRequirement (Section 4.13)
Describes:	TextBlock (Section 4.14)

4.12 SOURCE

This element describes the documented basis for making a decision (*Decision*) or testing the architecture with respect to a requirement *(VerificationMethod)*.

This element also describes the documented basis for a requirement (*SystemRequirement* or *VerificationRequirement*). The basis in all cases could be a documented study or an external constraint (e.g., DOE order).

A *Source* is "invoked_by" a *SystemRequirement* when the *SystemRequirement* contains that source in its description (e.g., "...retrieval shall be in accordance with 10 CFR...").

The *Source* attribute "Type" has the value "Originating" when the *Source* element is related to *SystemRequirements* that "invokes" other *SystemRequirements* for derivation and allocation. The "Type" attribute is "Standard" when the *Source* element is "invoked_by" an imposed *SystemRequirement*.

Attributes

Abbreviation:	TWRS (Abbr. Is currently used to identify TWRS owned elements for sorting purposes.)
Description:	(narrative)
Source Type:	Nil, Study, Report, Memo, other
Title:	Nil, Description (A title is required which is more definitive than the Element Name and may be used in special reports.)

Relationships

annotated_by:	Comment
documents:	Decision (Section 4.4)
documents:	SystemRequirement (Section 4.13)
documents:	VerificationRequirement (Section 4.18)
documents:	VerificationMethod (Section 4.17)
invoked_by:	SystemRequirement (Section 4.13)

4.13 SYSTEMREQUIREMENT

This element describes the requirements which are imposed on the various parts of a system (*Component, ItemLink, and Interface* elements) or on the functions of a system (*TimeFunction* element). The *SystemRequirements* are categorized by the *Category* element (Section 4.1).

For the purpose of report writing by the TWRS Technical Baseline Database Manager, *SystemRequirement* elements appearing in a particular section of a report are referenced in the database using the *Section* element (Section 4.11).

The basis for *SystemRequirements* that are categorized as "Constraint" or that are from an analysis document are described by the *Source* element (Section 4.12).

Lower-level *SystemRequirement* are derived from more general upper-level requirements *SystemRequirement* (Section 2.2).

SystemRequirement are related to their associated verification requirements (*VerificationRequirement* element) which describe the criteria associated with verifying the requirements (Section 4.18).

A *SystemRequirement* may be invalid or improperly presented in the database. This raises an issue which is described by the *CriticalIssue* element (Section 4.3).

A *SystemRequirement* can result from a decision (*Decision*, Section 4.4) which resolves an issue raised against some element.

A *SystemRequirement* "invokes" a *Source* element when the *SystemRequirement* identifies a source as part of its requirement, (e.g., "...retrieval shall be in accordance with 10 CFR...").

Attributes

Abbreviation:	TWRS (Abbr. Is currently used to identify TWRS owned elements for sorting purposes.)
Description:	(narrative)
Title:	Nil, Description (A title is required which is more definitive than the Element Name and may be used in special reports.)

Relationships

categorized_by:	Category (Section 4.1)
described_by:	Section (Section 4.11)
documented_by:	Source (Section 4.12)
incorporated_by:	Higher-level SystemRequirement (Section 4.13)
incorporates:	Lower-level SystemRequirement (Section 4.13)
invokes:	Source (Section 4.12)
resulted_from:	Decision (Section 4.4)
traces_to:	TimeFunction (Section 4.15)
traces_to:	Interface (Section 4.7)
traces_to:	ItemLink (Section 4.8)
traces_to:	Component (Section 4.2)
traces_from:	CriticalIssue (Section 4.3)
traces_from:	Decision (Section 4.4)
verified_by:	VerificationRequirement (Section 4.18)

4.14 TEXTBLOCK

This element stores the arbitrary text which appears in the paragraphs of documents generated by the TWRS Technical Baseline Database Manager. Each *Section* element is related to a particular paragraph in a report. The paragraph contain arbitrary text (*TextBlock*) in addition to specific references to database elements (such as *SystemRequirements*).

Attributes

Title:	Description (A title is required which is more definitive than the Element Name and may be used in special reports.)
Description:	(narrative)

Relationship

Described_by:	Section (Section 4.11)

4.15 TIMEFUNCTION

This element describes the functions of a system (Section 4.2). *TimeFunctions* are performed by *Component*. The inputs and outputs of *TimeFunctions* are described by the *TimeItem* element (Section 4.16). *TimeFunctions* may be aggregated by *Scenarios* (Section 4.10). Each *TimeFunction* may collect or aggregate *DiscreteFunctions* or other *TimeFunctions*. *Timefunctions* which have no further planned or defined decomposition are treated as *DiscreteFunctions* and should be converted to them, as required.

A *Component* must perform its *TimeFunction* according to requirements described by *SystemRequirement* elements.

Attributes

Abbreviation:	TWRS (Abbr. Is currently used to identify TWRS owned elements for sorting purposes.)
Description:	(narrative)
Title:	Description (A title is required which is more definitive than the Element Name and may be used in special reports.)

Relationships

inputs:	TimeItem (Section 4.16)
inputs:	DiscreteItem (Section 4.6)
outputs:	TimeItem (Section 4.16)
outputs:	DiscreteItem (Section 4.6)
performed_by:	Component (Section 4.2)
primary_is:	Organization (Section 4.9)
traced_from:	SystemRequirement (Section 4.13)
traced_from:	Decision (Section 4.4)

4.16 TIMEITEM

The *TimeItem* describes the inputs and outputs of the functions of the system (*TimeFunction*). It represents a collection of *DiscreteItems*. The input is what a function needs to perform its task, and the output is what the function produces by performing its tasks. The *TimeItem* is transported between two *Components* by a

physical entity described by the *ItemLink* element (Section 4.8).

TimeItem elements are not related to *SystemRequirement* elements because they do not have control over their behavior or design. *SystemRequirements* should then be related to the *TimeFunction* element that the *TimeItem* outputs from/inputs to.

Attributes

Abbreviation:	TWRS (Abbr. Is currently used to identify TWRS owned elements for sorting purposes.)
Description:	(narrative)
Title:	Nil, Description (A title is required which is more definitive than the Element Name and may be used in special reports.)

Relationships

categorized_by:	Category (Section 4.1)
carried_by:	ItemLink (Section 4.8)
forecasted_by:	Forecasting Elements (Section 4.19-4.22)
input_to:	TimeFunction (Section 4.15)
input_to:	Scenario (Section 4.10)
output_from:	TimeFunction (Section 4.15)
output_from:	Scenario (Section 4.10)

4.17 VERIFICATION METHOD

This element describes the method by which a requirement (*SystemRequirement*) is verified. This information is contained in the element's Method attribute. The *VerificationMethod* element is related to the *SystemRequirement* through the *VerificationRequirement* element (Section 4.18).

The basis for the *VerificationMethod* is contained in a related *Source* element.

Attributes

Abbreviation:	Nil, TWRS (Abbr. Is currently used to identify TWRS owned elements for sorting purposes.)
Description:	(narrative)
Method:	Nil, Inspection, Analysis, Demonstration, Test, Simulation
Title:	Nil, Description (A title is required which is more definitive than the Element Name and may be used in special reports.)

Relationships

Documented_by:	Source (Section 4.12)
Verification_method_for:	VerificationRequirement (Section 4.18)

4.18 VERIFICATION REQUIREMENT

This element contains requirements or criteria associated with verifying a requirement (Performance or Design Constraint) allocated to the system. For example, if the *SystemRequirement* states that, "...shall be designed to operate in temperatures up to 100 degrees F...." and the *VerificationMethod* for that *SystemRequirement* is "Test", a *VerificationRequirement* would be, "The system shall be tested in temperatures of 110 degrees F. for 24 hours."

A *CriticalIssue* element (Section 4.3) can be raised against a *VerificationRequirement.*

The basis for the *VerificationRequirement* is documented by the *Source* element.

Attributes

Abbreviation:	TWRS (Abbr. Is currently used to identify TWRS owned elements for sorting purposes.)
Description:	(narrative)
Title:	Nil, Description (A title is required which is more definitive than the Element Name and may be used in special reports.)

Relationships

described_by:	Section (Section 4.11)
documented_by:	Source (Section 4.12)
has_verification_method_of:	VerificationMethod (Section 4.17)
raises:	CriticalIssue (Section 4.3)
verifies:	SystemRequirement (Section 4.13)

FORECASTING ELEMENTS

Four elements make up the set of Forecasting Elements used in the TWRS Technical Baseline Database Manager. These are:

- WasteForecast
- MaterialForecast
- InfrastructureForecast
- Facility Forecast

The Forecasting elements are used to capture the quantity and flow associated with its related TimeItem/DiscreteItem. For example, the WasteForecast element related to a DiscreteItem representing the T-Plant waste coming into the DST system would capture information regarding the amount and time phasing (at one year intervals) of that waste stream, consistent with the "Thirty Year Forecast."

4.19 FACILITY FORECAST

This element is used to describe the projected requirements for the system architecture / facilities. This forecast element must be supplied with its companion *DiscreteItem.*

Attributes

Abbreviation:	TWRS (Abbr. Is currently used to identify TWRS owned elements for sorting purposes.)
Description:	(narrative)
Title:	Nil, Description (A title is required which is more definitive than the Element Name and may be used in special reports.)

Relationships

forecasts:	DiscreteItem (Section 4.6)
forecasts:	TimeItem (Section 4.16)
primary_is:	Organization (Section 4.9)

4.20 INFRASTRUCTURE FORECAST

This element is used to describe the projected requirements for the system supporting infrastructure, ie roads, railways, etc. This forecast element must be supplied with its companion *DiscreteItem.*

Attributes

Abbreviation:	TWRS (Abbr. Is currently used to identify TWRS owned elements for sorting purposes.)
Description:	(narrative)
Title:	Nil, Description (A title is required which is more definitive than the Element Name and may be used in special reports.)

Relationships

forecasts:	DiscreteItem (Section 4.6)
forecasts:	TimeItem (Section 4.16)
primary_is:	Organization (Section 4.9)

4.21 MATERIAL FORECAST

This element is used to describe the projected requirements for the material (& energy) necessary to support the system function, ie water, air, electricity, petroleum, chemicals, etc. This forecast element must be supplied with its companion *DiscreteItem.*

Attributes

Abbreviation:	TWRS (Abbr. Is currently used to identify TWRS owned elements for sorting purposes.)
Description:	(narrative)
Title:	Nil, Description (A title is required which is more definitive than the Element Name and may be used in special reports.)

Relationships

forecasts:	DiscreteItem (Section 4.6)
forecasts:	TimeItem (Section 4.16)
primary_is:	Organization (Section 4.9)

4.22 WASTE FORECAST

This element is used to describe the projected requirements for the various wastes that will be either produced or processed by the system. This forecast element must be supplied with its companion *DiscreteItem.*

Attributes

Abbreviation:	TWRS (Abbr. Is currently used to identify TWRS owned elements for sorting purposes.)
Description:	(narrative)
Title:	Nil, Description (A title is required which is more definitive than the Element Name and may be used in special reports.)

Relationships

forecasts:	DiscreteItem (Section 4.6)
forecasts:	TimeItem (Section 4.16)
primary_is:	Organization (Section 4.9)

5.0 NOTES

5.1 GLOSSARY

5.1.1 Baseline, Technical - the documented functions, requirements, and configuration from which the program will acquire and operational system. Describes all or part of an Activity's functional, performance, inter-operability, interface and verification requirements necessary to demonstrate the achievement of those specified requirements.

5.1.2 Core attributes and relationships - attributes and relationships common to all TWRS Technical Baseline Database Manager element types (e.g., the Name attribute, used in all element types, is considered to be a core attribute).

5.1.3 Design constraint - a *Category* of *SystemRequirements* that limit the design or design approach for a given *Component* or group of *Components*. Design constraints do not affect the functionality or behavior of the system at the level to which they are applied (e.g., All enclosures containing HLW shall be double contained).

5.1.4 Functional requirement - a Category of SystemRequirements that indicate what the system must do to accomplish a given mission or portion of that mission (e.g., The leak detection system shall monitor for the occurrence of leaks in the waste transfer system).

5.1.5 High-level radioactive waste (see DOE Order 5820.2A) - "The highly radioactive waste material that results from the reprocessing of spent nuclear fuel, including liquid waste produced directly in reprocessing and any solid waste derived from the liquid, that contains a combination of transuranic waste and fission products in concentrations requiring permanent isolation."

5.1.6 Interface - A functional or physical system boundary between two or more sub-systems or end items, across which materials, data, or energy pass.

5.1.7 Interface Control Documents (ICDs) - a document, representing a design agreement between interfacing hardware, or software systems, which fully defines the interface. An ICD is placed under configuration control and is considered part of the technical baseline.

5.1.8 Performance requirement - a Category of SystemRequirements that indicate how well a function must be performed (e.g., The leak detection system shall be capable of detecting and notifying tank farm operations of a leak in the waste transfer system within 1 min.)

5.1.9 Specification - (1) a document prepared to support acquisition and life cycle management that clearly and accurately describes essential technical requirements and verification procedures for items, materials and services. (2) A statement of a set of requirements to be satisfied by a product, material, or process indicating, whenever appropriate, the procedure by which it may be determined whether the requirements given are satisfied.

5.1.10 System - A combination of related components integrated to perform a single activity.

5.1.11 Tank Waste Remediation System - An integrated solution for carrying out the specific activities associated with remediate tank waste.

5.1.12 Transuranic waste (see DOE Order 5820.2A) - "Without regard to source or form, waste that is contaminated with alpha-emitting transuranic radionuclides with half-lives greater than 20 years and concentrations greater than 100 nCi/g at the time of assay."

5.1.13 Verification method - the method by which the Component will be inspected to ensure it meets the levied SystemRequirements. Verification methods include Analysis, Demonstration, Examination and/or Test. These methods are defined below:

a. Analysis is an element of inspection which includes the processing of accumulated results and conclusions, intended to provide proof that verification of a requirement(s) has been accomplished. The analytical results may be comprised of a compilation of interpretation of existing information or derived from lower level examinations, tests, demonstrations, and/or analyses.

b. Demonstration is an element of inspection that is limited to readily observable functional operation to determine compliance with requirements. Demonstration does not require the use of special equipment or sophisticated instrumentation.

c. Examination is an element of inspection consisting of investigation, without the use of special laboratory appliances or procedures to determine compliance with requirements.

d. Tests is an element of inspection that employs technical means including (but not limited to) the evaluation of functional characteristics by use of special equipment or instrumentation, simulation techniques, and the application of established principles and procedures to determine compliance with requirements. The analysis of data derived from test is an integral part of this inspection.

5.1.14 Verification requirement - special requirements or criteria associated with verifying a Component to ensure it meets the levied SystemRequirements. Each verification requirement has an associated verification method that tells how the Component will be inspected.

5.2 ACRONYM LIST

AGA	Alternatives Generation Analysis
BD	Behavior Diagram
CFR	Code of Federal Regulation
D&D	Decontamination & Decommissioning
DOE	Department of Energy
DOE-RL	Department of Energy-Richland Field Office
DST	Double Shell Tank
ERA	Elements, Relationships, Attributes
FFBD	Functional Flow Block Diagram

FRAT	Functions, Requirements Architecture, Test
HLW	High-Level Waste
HSTB	Hanford Site Technical Baseline
ICD	Interface Control Document
LCAM	Life Cycle Asset Management
MA	Mission Analysis
MAR	Mission Analysis Report
O&M	Operations & Maintenance
PHBS	Project Hanford Breakdown Structure
QCM	Quality Conformance Matrix
RDD	Requirements Driven Design
SE	Systems Engineering
SEMP	Systems Engineering Management Plan
TBD	To Be Determined
TEP	Test and Evaluation Plan
TWRS	Tank Waste Remediation System
WAC	Washington Administrative Code

5.3 REFERENCES

ALC 1994, *RDD-100® Product Family Schema Reference*, Release 4.0.3, Ascent Logic Corporation, San Jose, California.

WHC 1996a, *TWRS Systems Engineering Management Plan (SEMP)*, WHC-SD-WM-SEMP-002, Rev. 0, Feb. 1995, Westinghouse Hanford Company, Richland, Washington.

WHC 1996b, *RDD-100® Users' Guide for TWRS*, WHC-SD-WM-CSUD-012, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

WHC 1997, *Tank Waste Remediation System Mission Analysis*, WHC-SD-WM-MAR-008, Rev. 1a, Draft, March 1997, Westinghouse Hanford Company, Richland, Washington.

APPENDIX A - DATA INPUT GUIDELINES

This appendix is to aid the Systems Engineer in creating "change requests" to add, remove, or change an element and its attributes and relationships in the database. Descriptions of database elements and their attributes and relationships can be found in Section 4.0. These guidelines were developed from the TWRS data input guidelines and the Hanford Site Technical Baseline (HSTB) quality metrics.

The following sections of this appendix will guide the systems engineer in creating or modifying the most commonly used database elements.

A.1 TIMEFUNCTIONS TIME/ITEMS

TimeFunctions and *TimeItems* and their relationships are defined in Section 4.0 of this document. The role of *TimeFunctions* and *TimeItems* in functions and requirements analysis is discussed in Section 2.0 of this document. For *TimeFunctions* and *TimeItems*, the following general information is required from the systems engineer when requesting changes:

Element Type (*TimeFunction or TimeItem*)
Element Name
Element Number (if available)

Element Attributes:

Description:

TimeFunctions must define a specific action performed or to be performed by a *Component* of the system. The description of a *TimeFunction* must adhere to the following:

1. State only the specific action(s) the *TimeFunction* performs.
2. State the actions of the *TimeFunction* in sequential order clearly defining the beginning and end.
3. Do not include requirements in the description that state how well the *TimeFunction* should perform.
4. Avoid unnecessary wording, background information, or any other information that does not state an action.

TimeItems must describe either: 1) Inputs - the physical items necessary for a *TimeFunction* to perform its action, or 2) Outputs - the physical items produced by a *Component* as a result of the actions of a *TimeFunction*. Like the *TimeFunction*, the description of the *TimeItem* must be concise and comprehensive.

Element Relationships:

If the element's relationships are affected by the change request, the following is also required:

Relationship (traces_to, inputs, outputs, etc.)
Related Type (type of element to which there is a relationship , e.g. *Component, Interface*, etc)

Related Number (if available)
Related Name

HSTB Metrics for Completeness:

In addition to the items listed above, *TimeFunctions* are to:

- Have Inputs/Outputs (*TimeItems*).
- Have *SystemRequirements* allocated to them.
- Be allocated to a *Component*.

TimeItems are to have both a source (*TimeFunction*) and a destination (*TimeFunction*).
TimeItems that are typed "Physical" are to have one and only one type of Forecasting element related to it.

A.2 SYSTEMREQUIREMENTS

The process of developing *SystemRequirements* is discussed in Section 2.2 of this document. Section 4.11 defines attributes and relationships for the *SystemRequirement*. For *SystemRequirements*, the following general information is required from the systems engineer when requesting changes:

Element Type (*SystemRequirement*)
Element Name
Element Number (if available)

Element Attributes:

Title: A descriptive title for the *SystemRequirement*.

Description:

The description of a *SystemRequirement* must adhere to the following:

1. State only a single requirement in a concise and clear manner. Avoid unnecessary wording or background information.
2. Use simple sentence structure and state in affirmative terms.
3. Do not provide a design solution. The design solution is a response to the requirement.
4. Use quantitative terms as much as possible. Avoid adjectives, adverbs, or ambiguous words because they force interpretation by the reader.

Element Relationships:

If the element's relationships are affected by the change request, the following is also required:

Relationship (traces_to, incorporated_by, documented_by, etc)
Related Type (*TimeFunction Component, Interface*, etc)
Related Number (if available)

Related Name

HSTB Metrics for Completeness:

In addition to the items listed above, *SystemRequirements* are to be traceable to a *Source*.

A.3 COMPONENTS - INTERFACES - ITEMLINKS

The *Component, Interface, and ItemLink* elements are defined in Section 4.2, 4.5, and 4.6 of this document, respectively. For *Components, Interfaces,* and *ItemLinks*, the following general information is required from the systems engineer when requesting changes:

Element Type (*Component, Interface, or ItemLink*)
Element Name
Element Number (if available)

Element Attributes:

Description:

Like the other element descriptions in this appendix, the *Component, Interface,* and *ItemLink* descriptions must be concise and comprehensive. These elements describe physical entities, and therefore their descriptions must provide sufficient detail for the reader to gain a clear understanding of what they look like and what they do. The upper limit on the level of detail depends on the hierarchial level of the elements. Lower-level elements must be described in finer detail, while higher-level elements must be described in more general terms.

Element Relationships:

If the element's relationships are affected by the change request, the following is also required:

Relationship
Related Type (*TimeFunction TimeItem,SystemRequirement* etc)
Related Number (if available)
Related Name

HSTB Metrics for Completeness:

In addition to the items listed above, *Interfaces* are to be connected to two *TimeFunctions* (one as an input, the other as an output).

A.4 CRITICALISSUES

The attributes and relationships for the *CriticalIssue* element is discussed in Section 4.3. For *CriticalIssues,*

the following general information is required from the systems engineer when requesting changes:

Element Type (*CriticalIssue*)
Element Name
Element Number (if available)

Element Attributes:

Description:
Like the other element descriptions in this appendix, the descriptions for *CriticalIssue* should be concise and comprehensive using simple sentence structure and avoiding unnecessary wording. *CriticalIssue* descriptions may need some background information.

Due Date: (deadline for resolution of issue)
Issue Type:
Priority: (very high, high, medium, or low; determined through risk analysis)
Actual Date: (date when issue is actually resolved)
Impact: (elements which will be affected by resolution of issue and which are not currently linked to issue)

Element Relationships:

If the element's relationships are affected by the change request, the following is also required:

Relationship (Raised_by, Resolved_by, etc.)
Related Type (*TimeFunction, Component, Interface*, etc.)
Related Number (if available)
Related Name

HSTB Metrics for Completeness:

In addition to the items listed above, *CriticalIssues* are to be:
- Traceable to a Decision.
- Traced from an element.

A.5 DECISIONS (AGA AND RISK MANAGEMENT)

The relationship between the *Decision* element and an Alternatives Generation Analysis (AGA) is discussed in Section 2.4 of this document. Risk Analysis is used to determine the effects on a system if a *CriticalIssue* is not resolved. Risk Analysis will therefore determine the priority to be assigned to a *CriticalIssue*. The most critical *CriticalIssues* will receive the highest priorities.
For *Decisions*, the following general information is required from the systems engineer when requesting changes:

Element Type (*Decision*)
Element Name

Element Number (if available)

Element Attributes:

Description:

Like the other element descriptions in this appendix, the description for the *Decision* element should be concise and comprehensive using simple sentence structure and avoiding unnecessary wording. For *Decision* element descriptions, background information is not necessary.

Alternatives: (list alternatives considered to resolve problem)
Decision Vehicle: (method used to reach decision, e.g., AGA)
Status: (resolved, open, enabling assumption)
Choice: (what alternative was chosen)

Element Relationships:

If the element's relationships are affected by the change request, the following is also required:

Relationship (Results_in, Resolves, etc)
Related Type (*CriticalIssue, Component*, etc.)
Related Number (if available)
Related Name

APPENDIX B - DATA INPUT EXAMPLE

SITE HSTB LEVEL 4 FUNCTIONS ALLOCATED TO FACILITY

Instructions

1. Shadowed text is for reference only and is not a part of this change.
2. Strike out text should be removed (or replaced) with the redlined text.
3. Redlined text should be inserted.
4. Relations should be added, if non-existent or changed as indicated.
5. << Text>> should not be input to the RDD-100.

==========

(2.3.2 DST System - O & M Phase)

Element Type: *Component*
Element Number: hsem.2.3.2
Element Name: Double Shell Tank (DST) System

Attributes

(No change)

Relations

(Changes are contained later in this change document.)

***
Element Type: *TimeFunction*
Element Number: tsd.1.2.5.1
Element Name: Maintain Safe And Compliant Waste within the DST System

Attributes

Description: ~~This function is a place holder. Responsibility of the processing of the DST wastes during phase II privitization is TBD. Results of Phase I retrieval, treatment and immobilization efforts will contribute to a processing strategy for the remaining DSTs as well as SSTs. This single function will be replaced by a function set that reflects the best strategy.~~ Store existing tank wastes and accept & store additional waste from specific external waste generators.

This function is in progress. This function continues until sufficient wastes have been removed from the DST System to meet tank farm closure requirements.

Relations

Relation: performed by
Realted Type: Component
Related Number: hsems.2.3.2
Related Name: Double Shell Tank (DST) System

****
Element Type: *SystemRequirement*
Element Name: DST System; Storage Capacity

Attributes

Description: The DST System shall provide TBD cubic meters of waste storage capacity.

Relations

Relation: categorized by
Relation Type: Category
Related Number:
Related Name: Performance Requirement

Relation: documented by source:
Related Type: Source
Related Name: TBD (candidates: "Hanford Defense Waste EIS", DOE/EIS-0212, pg S-5; "Hanford Federal Facility Agreement and Consent Order", 89-10, rev 3, pg D-77, D-79, D-92, D-93, M-42-00, M-46-00, M-46-01; "TWRS EIS",)

Relation: traces to
Related Type: TimeFunction
Related Number: tsd.1.2.5.1
Related Name: Maintain Safe And Compliant Waste within the DST System

****
Element Type: *SystemRequirement*
Element Name: Waste Removal Capacity

Attributes

Description: (no change)

Relations

Relation: (delete relation to)
Related Type: TimeFunction
Related Number: tsd.1.2.5.1
Related Name: Maintain Safe And Compliant Waste within the DST System

****
Element Type: *SystemRequirement*
Element Name: DST System; Waste Storage Period

Attributes

Description: The DST System shall provide the capacity to store waste for a minimum of TBD years.

Relations

Relation: categorized by
Relation Type: Category
Related Number:
Related Name: Performance Requirement

Relation: documented by source
Related Type: Source
Related Number:
Related Name: TWRS Mission Analysis Report

Relation: traces to
Related Type: TimeFunction
Related Number: tsd.1.2.5.1
Related Name: Maintain Safe And Compliant Waste within the DST System

****
Element Type: *SystemRequirement*
Element Name: DST System; Stored Waste Properties & Compatibilities

Attributes

Description: The DST System shall store and transfer wastes that are compatible with the following radiological and chemical properties:

a. Radiological
   Radionuclide composition/concentration - TBD

b. Chemical
   pH - TBD
   Corrosive chemical concentrations - TBD

The DST System shall be able to safely store supernatant, saltcake, and sludge waste types with the following (maximum / minimum) physical properties:

Supernatants

Particle size - TBD
Density - TBD
Viscosity @ TBD Temperature - TBD
Percent Solids - TBD
Temperature - TBD
Specific Gravity - TBD

Saltcakes

Shear Strength - TBD
Yield Stress - TBD
Dissolution - TBD
Density - TBD
Viscosity @ TBD Temperature - TBD
Percent Solids - TBD
Temperature - TBD
Specific Gravity - TBD

Sludges

Shear Strength - TBD
Yield Stress - TBD
Density - TBD
Viscosity @ TBD Temperature - TBD
Percent Solids - TBD
Temperature - TBD
Specific Gravity - TBD

Relations

Relation: categorized by
Relation Type: Category
Related Number:
Related Name: Performance Requirement

Relation: documented by source
Related Type: Source
Related Number:
Related Name: TBD

Relation: traces to
Related Type: TimeFunction
Related Number: tsd.1.2.5.1
Related Name: Maintain Safe And Compliant Waste within the DST System

Relation: Raises

Related Type: CriticalIssue
Related Number:
Related Name: Stored Waste Properties

***
Element Type: *TimeFunction*
Element Number: tsd.2.2.6.1
Element Name: Remove Waste from DSTs, Phase I

Attributes

Description: Characterize and prepare tank waste for transfer and then transfer that waste to either another tank within the DST System or to the 244-A Concentrator for evaporation. This function will be performed repeatedly on the DSTs.

This function begins TBD and continues until Phase I activities are complete.

Relations

Relation: performed by
Realted Type: Component
Related Number: hsems.2.3.2
Related Name: Double Shell Tank (DST) System

****
Element Type: *SystemRequirement*
Element Name: DST System; Waste Removal Capacity, Phase I

Attributes

Description: The DST System shall provide the capacity to remove a minimum of TBD (volume units) of wastes from Double Shell Tanks.

Relations

Relation: categorized by
Relation Type: Category
Related Number:
Related Name: Performance Requirement

Relation: documented by source
Related Type: Source
Related Number:
Related Name: TBD

Relation: traces to

Related Type: TimeFunction
Related Number: tsd.2.2.6.1
Related Name: Remove Waste from DSTs, Phase I

****
Element Type: *SystemRequirement*
Element Name: DST System; Removed Waste Properties & Compatibilities

Attributes

Description: The DST System shall transform stored wastes into retreived wastes with the following properties:

a. Radiological
Radionuclide composition/concentration - TBD

b. Chemical
pH - TBD
Corrosive chemical concentrations - TBD

c. Physical

Particle size - TBD
Density - TBD
Viscosity @ TBD Temperature - TBD
Percent Solids - TBD
Temperature - TBD
Specific Gravity - TBD

Relations

Relation: categorized by
Relation Type: Category
Related Number:
Related Name: Performance Requirement

Relation: documented by source
Related Type: Source
Related Number:
Related Name: TBD

Relation: traces to
Related Type: TimeFunction
Related Number: tsd.2.2.6.1

Related Name: Remove Waste from DSTs, Phase I

Relation: Raises
Related Type: CriticalIssue
Related Number:
Related Name: Removed Waste Properties

***
Element Type: *TimeFunction*
Element Number: tsd.3.4.2.1
Element Name: ~~Receive and Store In-Process Waste~~ LAW Feed for Phase I Treatment

Attributes

DESCRIPTION. ~~Receive, store, monitor, condition, and transfer previously retrieved DST/SST/MUST wastes or pretreated wastes. This includes the mobilization/suspension of tank waste solids and liquid forms of separated radionuclides (Cs, Tc, Sr, and TRU), minor chemical adjustments, in-tank blending and feed staging of wastes, but excludes in-tank waste pretreatment activities (e.g., in-tank sludge washing). This function also includes treatment/preparation of liquid, gaseous, and solid waste generated during storage of in-process wastes.~~

~~Storage of in-process waste will begin when waste is received from waste retrieval and/or transfer activities and retrieval for treatment begins and will continue until all pretreated waste has been transferred for treatment/immobilization.~~

Mix waste from multiple sources, analyze the waste to determine its composition, verify compliance with the LAW Feed requirements, add chemicals as required to meet the LAW Feed requirement and transfer compliant wastes to the LAW Vendor feed tanks. Non-compliant wastes will be transfered elsewhere within the DST System. Multiple batches will be generated for delivery to the LAW Vendor.

This function begins when waste is received into the LAW staging tanks (AP-102 & AP-104). This function completes when the total Phase I order quantities are satisified.

Relations

Relation: performed by
Realted Type: Component
Related Number: hsems.2.3.2
Related Name: Double Shell Tank (DST) System

****
****

(REQUIREMENTS ALLOCATED TO FACILITIES)

****
Element Type: *SystemRequirement*
Element Name: **TWRS Environmental Safety & Health S/RIDS**

Attributes

Description: TWRS Major Facilities shall comply with the Environmental, Safety and Health (ES&H) standards and requirements included in the "High Level Waste Storage Tank Farms/242-A Evaporator Standards / Requirements Identification Document", WHC-SD-MP-SRID-001, Revision 1-A document.

Relations

Relation: categorized_by
Related Type: Category
Related Name: Design Constraint,

Relation: documented by
Related Type: Source
Related Name: "High Level Waste Storage Tank Farms/242-A Evaporator Standards / Requirements Identification Document", WHC-SD-MP-SRID-001, Revision 1-A

Relation: traces to
Related Type: Component
Related Number: hsems.2.3.2
Related Name: Double Shell Tank (DST) System

Relation: traces to
Related Type: Component
Related Number: hsems.2.3.1
Related Name: Single Shell Tank (SST) System

Relation: traces to
Related Type: Component
Related Number: hsems.2.5.6
Related Name:Tank Waste Characterization System

****
Element Type: *Source*
Element Name: Tank Waste Remediation System Mission Analysis Report, WHC-SD-WM-MAR-008, Revision 2

Attributes

Description: TWRS Major Facilities shall derive their Mission, Functionality and Initial Requirements from the Tank Waste Remediation System Mission Analysis Report (TWRS MAR)

Source Type: Originating Requirements

Title: Tank Waste Remediation System Mission Analysis Report (TWRS MAR)

Relations

<< Relations are shown later in this change.>>

****
Element Type: *SystemRequirement*
Element Name: **TWRS Mission Analysis**

Attributes

Description: TWRS Major Facilities shall comply with the requirements listed in Table 1 and Tables 4 through 11 and Appendix A:Table A-1 in the "Tank Waste Remediation System Mission Analysis Report", WHC-SD-WM-MAR-008, Revision 2;

Relations

Relation: categorized_by
Related Type: Category
Related Name: Design Constraint,

Relation: documented by
Related Type: Source
Related Name: "Tank Waste Remediation System Mission Analysis Report", WHC-SD-WM-MAR-008, Revision 2
Relation: traces to
Related Type: Component
Related Number: hsems.2.3.2
Related Name: Double Shell Tank (DST) System

Relation: traces to
Related Type: Component
Related Number: hsems.2.3.1
Related Name: Single Shell Tank (SST) System

Relation: traces to
Related Type: Component
Related Number: hsems.2.5.6
Related Name: Tank Waste Characterization System (Mobile)

Relation: traces to
Related Type: Component

Related Number: hsems.2.2.2
Related Name: LAW/HLW Plant, Phase I

Relation: traces to
Related Type: Component
Related Number: hsems.2.3.12
Related Name: TWRS CSB Modules, Phase I

Relation: traces to
Related Type: Component
Related Number: hsems.2.2.1
Related Name: LAW Plant, Phase I

Relation: traces to
Related Type: Component
Related Number: hsems.2.2.3
Related Name: LAW Treatment Facility, Phase II

Relation: traces to
Related Type: Component
Related Number: hsems.2.2.5
Related Name: HLW Treatment Facility, Phase II

Relation: traces to
Related Type: Component
Related Number: hsems.2.4.5
Related Name: Immobilized LAW Disposal Facility

Relation: traces to
Related Type: Component
Related Number: hsems.2.3.14
Related Name: Immobilized LAW Storage Facility

Relation: traces to
Related Type: Component
Related Number: hsems.2.3.13
Related Name: IHLW Storage Modules, Phase II

****
****

Element Type: *CriticalIssue*
Element Name: Phase I LAW treatment and immobilization: product properties
Element Number:

ATTRIBUTES

Description:

The properties of the immobilized LAW and intermediate waste products produced by the Phase I LAW Plant are not quantified at this time. The requirements set for the Phase I LAW Plant is incomplete without these requirements. The requirements for the properties of the immobilized LAW and intermediate waste products produced by the Phase I LAW Plant will drive needed design features for the system.

Perform and document a technically sound and referenceable analysis that quantifies the properties of the immobilized LAW and intermediate waste products produced by the Phase I LAW Plant. Transform this analysis into performance requirements for the properties of the immobilized LAW and intermediate waste products produced by the Phase I LAW Plant.

Specifically, the requirements analysis should address:

a. The properties of the waste feeding into the Phase I LAW Plant;
b. The product waste properties needed for both short-term storage and long-term disposal of the immobilized LAW; and
c. The byproduct waste properties for intermediate waste products to be delivered back to the DST system (DST system waste property constraints).

Notes:
1) The requirements "Specification 2: Immobilized Low-Activity Waste" and "Glass Formers" in the TWRS 4.2 database give information on the properties of the LAW to be produced by the Phase I LAW Plant. The requirements "Specification 3: Entrained Solids," "Specification 4: 137Cesium," "Specification 5: 99Technetium" "Specification 6: 90Strontium and Transuranics," and "Specification 9: Liquids or Slurries Transferred to DOE by Pipeline or Liquid Transport Cask" in the TWRS 4.2 database give information on the properties of the intermediate waste products to be returned to the DST System. 2) WHC-SD-WM-TI-774, Summary provides information on some of the radiological properties of the LAW packages to be produced by the Phase I LAW Plant. WHC-SD-WM-TI-774, Section 2.2 and Appendix B provide information on some of the chemical, physical, and radiological properties of the ILAW and intermediate waste products to be produced by the Phase I LAW Plant. The TWRS Privatization Request for Proposal, Specification 2 provides information on the properties of immobilized LAW. The TWRS Privatization Request for Proposal, Specifications 3, 4, 5, 6, and 9 and Interface Descriptions 16, 17, and 18 provide information on the properties of the intermediate waste products to be returned to the DST System.

Due Date:

Issue Type: Required Analysis

Priority: A (Very High)

RELATIONS

Relation: raised_by
Related Type: SystemRequirement
Related Number:
Related Name: LAW Plant, Phase I waste properties

Relation: primary_is
Related Type: Organization
Related Number:
Related Name: Privatization Phase I Project

****
Element Type: *CriticalIssue*
Element Name: Phase I LAW treatment and immobilization: capacity and timeframe
Element Number:

ATTRIBUTES

Description:

The capacity and timeframe of operations for the production of both immobilized LAW and intermediate waste products by the Phase I LAW Plant are not quantified at this time. The requirements set for the Phase I LAW Plant is incomplete without these requirements. The requirements for the capacity and timeframe of operations for the Phase I LAW Plant will drive needed design features for the system.

Perform and document a technically sound and referenceable analysis that quantifies the capacity and timeframe of operations for the production of both immobilized LAW and intermediate waste products by the Phase I LAW Plant. Transform this analysis into performance requirements for the capacity and timeframe of operations for the Phase I LAW Plant. Specifically, the requirements analysis should address:

a. The volume and delivery profile for waste being delivered to the plant;
b. The storage capacity of the ILAW Storage Facility (for ILAW) and the DST system (for intermediate waste products); and
c. The operating timeframe and percentage of time the plant operates.

Notes:

1) The requirement "Section C.4 Description of Services and Deliverables" in the TWRS 4.2 database gives information on the required capacity of the Phase I LAW Plant. 2) WHC-SD-WM-TI-774, Summary and "TWRS Waste Disposal Division Planning Guidance," Section 3.4.3 provide information on the amount of LAW packages to be produced by the Phase I LAW Plant. 3) The requirement "Return of Feed Tanks to DOE" in the TWRS 4.2 database gives information on the timeframe for the return of custody of the contractor's DST feed tanks to DOE. The requirement "Schedule, Phase I" in the TWRS 4.2 database gives information on the timeframe for operations of the Phase I LAW Plant. 4) WHC-SD-WM-ER-029, Section 3.18 provides information on the delivery profile for this interface. "TWRS Waste Disposal Division Planning Guidance," Section 3.3.2 provides information on the timeframe for operation of the Phase I LAW Plant. TPA Milestones M-60-00 and M-60-05 provide information on the timeframe for the vitrification of LAW.

Due Date:

Issue Type: Required Analysis

Priority: A (Very High)

RELATIONS

Relation: raised_by
Related Type: SystemRequirement
Related Number:
Related Name: LAW Plant, Phase I waste volume to DST System
Relation: raised_by
Related Type: SystemRequirement
Related Number:
Related Name: LAW Plant, Phase I waste delivery profile

Relation: primary_is
Related Type: Organization
Related Number:
Related Name: Privatization Phase I Project

****
Element Type: *SystemRequirement*
Element Name: Phase I LAW treatment and immobilization: timeframe
Element Number:

ATTRIBUTES

Description: The Phase I LAW Plant shall have the capacity to treat and immobilize waste from the DST System as specified in "Phase I LAW treatment and immobilization: capacity" within a timeframe of TBD years while operating TBD percentage of the specified time.

Title: Phase I LAW treatment and immobilization: timeframe

RELATIONS

Relation: categorized_by
Related Type: Category
Related Number:
Related Name: Performance Requirement

Relation: traces_to
Related Type: TimeFunction
Related Number: tsd.3.4.2.4
Related Name: Treat & Immobilize LAW, Phase I

Relation: raises
Related Type: CriticalIssue
Related Number:
Related Name: Phase I LAW treatment and immobilization: capacity and timeframe

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