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PLAN

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# Cross-Site Transfer System Startup Plan

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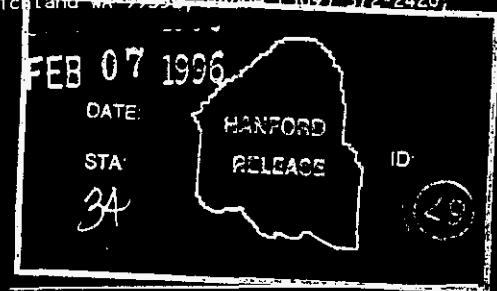
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Abstract: This Startup Plan provides a discussion of organizational responsibilities, work planning, quality assurance (QA), personnel qualifications, and testing requirements for the Cross-Site Transfer System.

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Revision 0

**REPLACEMENT OF CROSS-SITE TRANSFER SYSTEM  
STARTUP PLAN  
PROJECT W058**

Issued by:

**WESTINGHOUSE HANFORD COMPANY**

January 1996

Prepared for the U.S. DEPARTMENT OF ENERGY  
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REPLACEMENT OF CROSS-SITE TRANSFER SYSTEM  
STARTUP PLAN

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**WESTINGHOUSE HANFORD COMPANY  
REPLACEMENT OF CROSS-SITE TRANSFER SYSTEM  
PROJECT STARTUP PLAN**

**1.0 INTRODUCTION, PURPOSE, SCOPE, AND DESCRIPTION**

The Westinghouse Hanford Company (WHC) Replacement of Cross-Site Transfer System (CSTS) Startup Plan provides guidance to WHC CSTS Project activities related to construction turnover, testing, and initial operation of CSTS Structures, Systems and Components (SSC). The Startup Plan provides discussion of the CSTS Startup organizational responsibilities, work planning, integration of startup activities with other CSTS Project organizations, startup management systems, and integration with the CSTS Plant Readiness Review and initial facility operations. The plan augments and is an extension of the CSTS Management Plan, WHC-SD-W058-MP-001, and fulfills the Management Plan, Annex II, "Test and Evaluation Plan" requirement in U.S. Department of Energy (DOE) Order 4700.1, "Project Management System."

WHC recognizes that safety, quality, and cost effectiveness in Startup is achieved through a planned systematic approach to testing activities. To that end, this Startup Plan embodies the following purpose and scope of application for the CSTS Project.

**1.1 PURPOSE**

The Startup Plan identifies and plans testing strategies and activities required to confirm CSTS SSC satisfy their functional requirements. The Startup Plan establishes a beneficial cost effective sequence of test support activities deemed necessary to provide confidence all testing, (acceptance, Pre-Operational, and Operational) will be successful. In addition to providing a plan for testing and test support activities, the Startup Plan outlines organizations responsible for managing and performing testing activities. This includes describing the participating organization's management responsibilities, interfaces, lines of authority, accountability, qualification, and independent verification. Finally, this Startup Plan establishes the rationale for the type, amount, and schedule for CSTS testing activities and includes review of Lessons Learned from other project startups that are relevant to the CSTS as required by DOE Order 4700.1, "Project Management System."



## 1.2 SCOPE OF APPLICATION

The Startup Plan considers and addresses Factory Acceptance Testing (FAT), Construction Acceptance Testing (CAT), post-maintenance verifications and/or testing, component checkout, Pre-Operational Testing, and Operational Testing of the CSTS SSC.

This Startup Plan also considers and addresses other organizationally integrated activities such as spare parts procurement and warehousing, provision of measuring and test equipment and other support materials, acquiring vendor services, and procedure development and implementation for instrumentation calibrations, preventative and corrective maintenance, and system and equipment operation.

Startup activities begin during acceptance testing, continue with Pre-Operational Testing and operational demonstrations before the Start of Initial Operations, and are completed during Operational Testing after the Start of Initial Operations. The flowchart shown in Figure 1-1 depicts testing-related activities, their general timing, and the responsible organization for each activity.

## 1.3 STARTUP PLAN OVERVIEW

The CSTS Startup Program is an engineered multi-phase sequence of activities culminating in successful startup and initial operation of the CSTS. Startup activities physically begin during CAT, continue with Pre-Operational Testing, and are completed during Operational Testing. The flowchart shown in Figure 1-1 depicts testing-related activities, their general timing, and the responsible organization for each activity. The CSTS Startup Plan is described in detail by its Work Breakdown Structure (WBS) Element Descriptions (see Appendix B).

### Construction Acceptance Testing

Construction testing activities are comprised of the vendor Factory Acceptance Tests (FAT) and CATs that demonstrate compliance with procurement and construction specifications. Satisfactory completion of these tests are required to allow transition into startup testing activities, which are comprised of Pre-Operational and Operational Testing.

The Architect-Engineer (A-E) will prepare test requirements and acceptance criteria for FATs and CATs for inclusion in procurement and construction specifications. Detailed test plans and/or Acceptance Test Procedures (ATP) may be prepared by the A-E, construction contractor, or vendors/subcontractors in accordance with requirements of procurement and construction specifications and vendor data. These detailed test plans and/or

Acceptance Test Procedures (ATP) will be reviewed and approved by the A-E and WHC/ICF Kaiser Hanford Company (ICF KH). The FATs and CATs will be performed by the responsible organization (i.e., construction contractor or vendor/subcontractor). The tests will be witnessed by the U.S. Department of Energy, Richland Operations Office (RL) and WHC/ICF KH as required to ensure test requirements are met. The test data will be included in the SSC turnover package.

The CATs culminate with turnover of individual SSC segments to WHC/ICF KH for Pre-Operational Testing. The scope of the SSC segment, and its turnover sequence, will be determined by WHC/ICF KH. All test data and reports will be transferred to WHC/ICF KH along with the SSC segment. The construction contractor is responsible for controlling the vendor and construction test data until that time. Information copies of the vendor data sheets will be provided to WHC/ICF KH as requested to support Pre-Operational Testing.

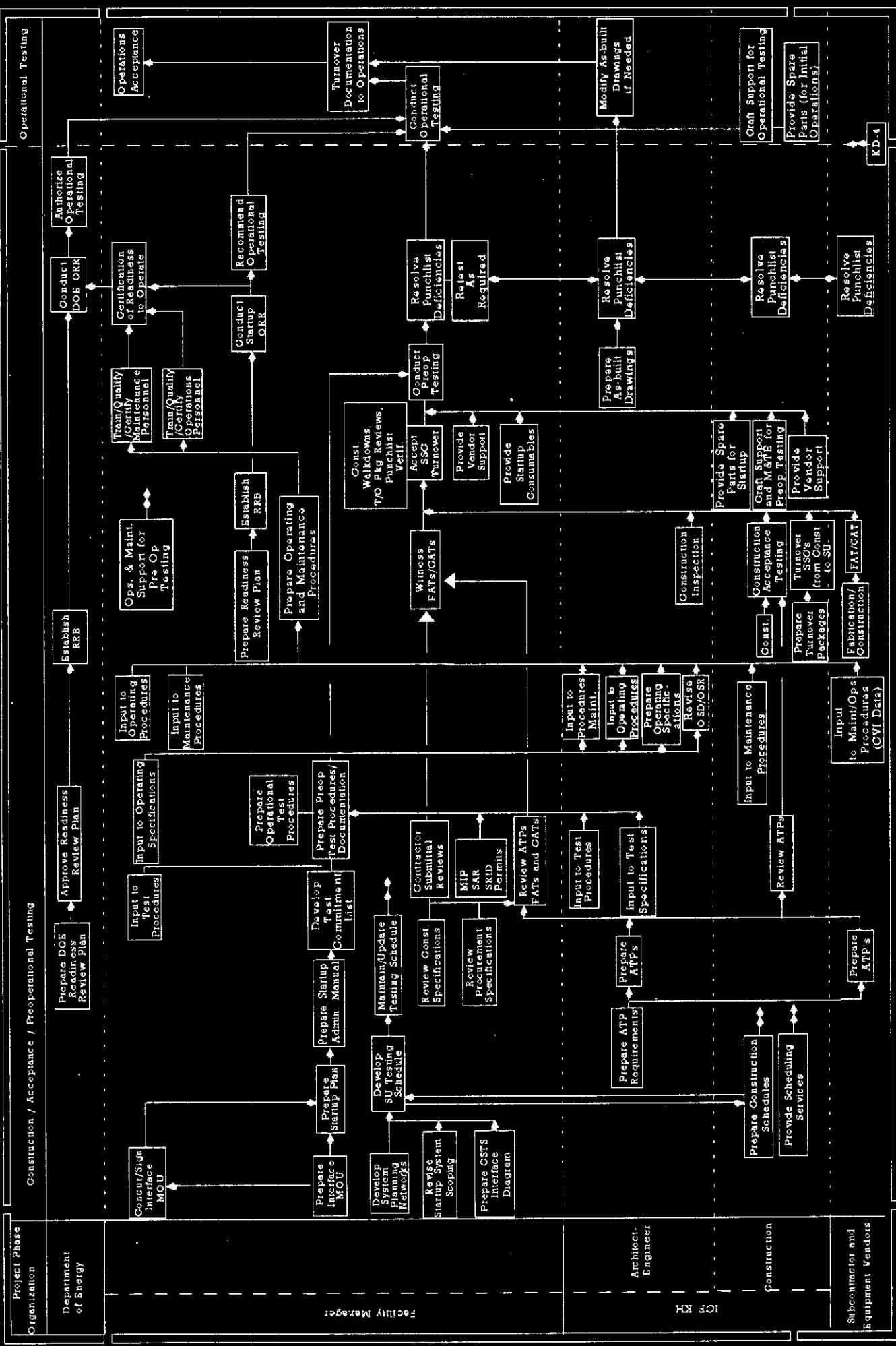
Although Startup is not responsible for acceptance testing, it may take administrative control of equipment and portions of systems before completion of acceptance testing in order to begin Pre-Operational Testing as soon as possible to meet project milestones. The need to maintain custody control while allowing both acceptance testing and Pre-Operational Testing to proceed simultaneously is by use of a "blue tag" system, which passes jurisdictional control of the SSC, or portion of the SSC, to Startup.

#### Pre-Operational Testing

Pre-Operational Testing is performed on individual segments of SSC to demonstrate that plant systems or subsystems perform as designed. The A-E will prepare test specifications for Pre-Operational Tests which contain test requirements and acceptance criteria. The CSTS Startup Organization will prepare test procedures from these specifications which provide instructions for conduct of the tests. These procedures will include requirements and instructions from the vendors for specific items of equipment. The procedures will be reviewed and approved by CSTS Project Test Review Board (TRB) prior to conduct of testing.

#### Operational Testing

Operational Testing is performed to demonstrate integration of the entire facility. All systems are brought on-line and operated under anticipated standard operating conditions and off-normal conditions using simulated, non-radioactive tank waste. Operational Testing is performed with actual plant equipment, operating procedures, and personnel. To ensure correct performance of the operational testing, all testing activities will be performed in accordance with the requirements of detailed test procedures. These procedures will be prepared by CSTS Startup and approved by CSTS TRB. Operational Testing will be planned and scheduled to follow completion of Pre-Operational Testing.



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 Figure 1-1, Replacement of Cross-Site Transfer System Testing Activity Flow Chart  
 MOU = Memorandum of Understanding  
 I-4

## 2.0 GOALS AND OBJECTIVES

The goals of the CSTS Startup Plan are to ensure the integrity and operability of CSTS SSC is in accordance with their functional design criteria and to demonstrate readiness of the facility's personnel and management to safely and efficiently transfer radioactive hot tank waste from 241-SY Tank Farm to 200 East Area Tank Farms, and from 200 East Area Tanks Farms to 241-SY Tank Farm.

Six objectives must be successfully accomplished to attain these goals:

- Effective Administrative Management of Startup activities
- Effective Work Management of Startup activities
- Effective Support Management for Startup activities
- Effective Engineering Management of Startup activities
- Effective Plant Readiness Review Preparations
- Effective Operational Testing and Operations Support

The following summaries detail the requirements for each of these objectives and provide a brief discussion of how Startup plans to implement them.

### 2.1 ADMINISTRATIVE MANAGEMENT

Startup activities must be administratively managed in an effective manner to ensure that all Startup activities are performed to a high degree of quality. This includes activities to provide proper levels of appropriately trained and experienced staff, ensure quality test procedure development and technical review, ensure quality test documentation and records management, and frequent evaluations/actions to maintain the Test Program performance at quality levels.

Startup's Planning and Support, and Turnover and Testing Schedules will be fully resource loaded to permit identification of all necessary personnel required to support the Test Program. Startup Test Engineers, Operations support personnel, and related support personnel will be selected and trained in accordance with the requirements of the Training Implementation Matrix (TIM) for Tank Farms, which implements the requirements of DOE Order 5480.20A - Personnel Selection, Qualification, Training, and Staffing Requirements at DOE Reactor and Non-Reactor Nuclear Facilities.

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In order to ensure quality test procedure preparation, all test procedures that WHC prepares, will be developed in accordance with WHC-CM-6-1, "Standard Engineering Practices, EP-4.2, Testing Requirements."

Test reviews will be conducted before, during, and after testing to confirm identified test requirements, ensure proper test performance, and verify the results of the conducted tests. Test reviews are conducted to:

1. Ensure understanding of the pretest documentation and material requirements before testing and clearly define the system test boundaries.
2. Ensure lead time to prepare for special equipment, instrumentation and other needed materials, and development of applicable documents.
3. Ensure that tests in progress follow established test procedures.
4. Ensure that sufficient data have been obtained to proceed with the next phase of the Project.
5. Confirm test results and that the test meets established requirements, and ensure acceptability of the tested items.

Test procedure reviews will be conducted by Startup Engineers and representatives from CSTS Process Engineering and Operations, A-E, CSTS Project Engineering, Safety, Quality Assurance, and DOE, as requested. A TRB will be formed to facilitate review of Startup procedures. It will consist of representatives from Startup, Operations, A-E, CSTS Project Engineering, CSTS Safety, CSTS Quality Assurance. The TRB is described in more detail in Appendix B.

Test documentation shall be controlled so that information and requirements are approved, issued in a timely manner, retrievable, and maintained.

1. This Startup Plan, the Startup Procedures, and the Plant Readiness Review (PRR) Plan will be approved and released in accordance with WHC-CM-6-1, "Standard Engineering Practices," EP-1.12, "Supporting Documents Requirements."
2. Test specifications, test procedures, and test reports shall be controlled, approved, and released by approved administrative procedures, see Appendix A.

The above Startup administrative activities are identified and accounted for in the Startup WBS as element 1.5.1, "Startup Administrative Management" (see Appendix B).

## 2.2 WORK MANAGEMENT

Test Program work must be planned, controlled, and managed in an effective manner to ensure that all work is performed to a high degree of quality, efficiency, and cost effectiveness. This Plan includes four (4) activities that develop and implement processes and procedures that ensure effective planning, scheduling, punchlisting, and work control.

The first component of effective Work Management is thorough and detailed planning. The planning phase of The CSTS Test Program includes the following activities:

1. Identification of SSC testing requirements. SSC testing requirements will be extracted from all applicable documents to CSTS such as FDC, Preliminary Safety Analysis Report (PSAR), Title II Design documents, including A-E generated test specifications, and DOE Orders. Test requirements will be summarized in the CSTS Test Commitment List. The Test Commitment List will identify the test procedures that will accomplish each of the listed testing requirements.
2. Refinement of System Scoping Boundaries to accurately define testable packages of equipment and systems that will be the building blocks for development of Fragmented Networks (FRAGNETS) and preparation of turnover packages by construction contractors. The scoping will be identified with, and be consistent with, CSTS Contractor's WBS.
3. Development of the CSTS Testing Activity Interface Diagram. This diagram delineates testing organizational responsibilities on a detailed level for all CSTS Project participants.
4. Test Sequence Planning. Tests will be sequenced and scheduled to minimize use of temporary equipment and to maximize the use of in-place tested equipment. Detailed testing sequence logic diagrams, or "Fragnets," will be developed based on knowledge of System Scoping Boundaries, system testing requirements, the testing activity interfaces, or other non-testing project activities, such as construction turnover and Readiness Review processes.
5. Uploading the Startup schedule data to the CSTS Project Schedule and refinement as required.

The second component of effective Work Management is continuous on-line scheduling of Startup activities. All activities addressed in this Startup Plan will be scheduled on a CPM scheduling system and fully integrated with the project construction schedules. Care will be taken to schedule those activities necessary to support the PRR and the Start of Initial Operations.

The Startup schedule consists of two major parts:

- TESTING SUPPORT SCHEDULE - This schedule maps out all support work for the Startup Program. This includes planning and support activities by Startup and other CSTS participants such as WHC matrixed organizations, Hanford contractors and CSTS A-E, construction contractors and vendors. This schedule is integrated with the CSTS Project/Construction Schedule to assure that Startup Support is budgeted for, and included in, project activities.
- TESTING SCHEDULE - This schedule is a detailed system-by-system sequence of activities that is integrated into the CSTS Project/Construction Schedule. This schedule establishes SSC turnover dates and maps out logical and sequential test activities to assure that CSTS SSC meet their functional requirements.

Startup Scheduling Management consists of continuously gathering construction turnover and startup progress information and updating their relevant schedules. This includes development of schedule "work arounds" to minimize overall project and cost impacts and providing continuous feedback via appropriate schedule and punchlist media to all affected project participants.

The third component of effective testing Work Management is pro-active punchlist management. Punchlist Management is a work activity that gathers outstanding bits and pieces of work scope, consolidates them into meaningful integrated work packages, and schedules and expedites their completion. The bits and pieces of work scope usually are unfinished remains of construction turnover packages, test deficiencies requiring resolution, or any other item, of whatever origin, that restrains successful conclusion of the CSTS Project.

The fourth component of effective testing Work Management is efficient work control. Startup work control will include implementation of a formal responsibility Interface Diagram. The Interface Diagram will identify specific testing activities by system, their associated test program phase, and the responsible organization for performance. An example Interface Diagram is displayed in Appendix C. To ensure that Startup work is performed safely and efficiently, all work will be conducted in conformance with the requirements of WHC-CM-6-1, "Standard Engineering Practices," EP-4.2, Testing Requirements, and WHC-CM-1-8, "Work Management." Appendix A presents a summary of startup procedure classifications.

The above Startup Work Management activities are identified and accounted for in The Startup WBS as element 1.5.2, "Startup Work Management" (see Appendix B).

## 2.3 STARTUP SUPPORT

Startup activities require effective support from other CSTS Project participants in order to succeed. This includes activities that provide Equipment and Material Support, Construction Craft Support, Operations and Maintenance Support, Vendor Service Support, Procedure Development Support, and Startup Services Support including Safety, Quality Assurance, and environmental support. Startup will negotiate/establish working arrangements with respective Project participants to ensure that support services essential for successful and timely startup of CSTS are provided. Startup Support activities are identified and accounted for in the Startup WBS as element #1.5.3, "Startup Support Management" (see Appendix B).

## 2.4 STARTUP ENGINEERING

Startup Engineering activities must be executed in an effective manner to ensure a safe, technically competent, and expeditious startup of the CSTS facility. These activities include:

1. Preparation, approval, and issuance of appropriate Test Specifications by the Project A-E.
2. Implementation of specific testing method(s) identified in the Test Plan/Test Specifications.
3. Rigorous adherence to testing controls identified in Appendix A of this Startup Plan.
4. Development of test sequences and schedules that allow testing to proceed in logical steps that build on each others foundations.
5. Preparation, approval, and issuance of test procedures in a controlled and timely manner.
6. Identification and control of test equipment, instrumentation, and other materials required to support testing activities to assure appropriate and accurate data collection.
7. Test performance that is conducted by appropriately trained and experienced Startup Engineers.
8. Post-test review and analysis of test results by CSTS TRB to verify acceptability of the tested SSC.
9. Proper documentation of test results and documentation reviews conducted to verify acceptability of the test results.



10. Transmittal of documentation associated with testing program to Information Resource Management for storage in a WHC records storage facility in accordance with WHC-CM-3-5, "Document Control and Record Management Manual."

These Startup Engineering activities and others will be performed in accordance with WHC-CM-6-1, "Standard Engineering Practices," EP-4.2. See WBS element 1.5.4, *Startup Engineering Management, Appendix B*, of this plan for a full accounting of Startup Engineering activities.

## 2.5 PLANT READINESS REVIEW PREPARATIONS

Plant Readiness Review preparations must be managed in an effective manner to provide a high degree of confidence that the CSTS management, systems, personnel, and physical systems and equipment are ready to safely and efficiently receive and transfer radioactive waste. This includes providing the Readiness Review preparation team(s) with quality documentation so they may ascertain facility readiness, prepare timely and complete pre/post-start Punchlist resolutions and respond to all action items generated by the Readiness Review process. It is absolutely essential that all aspects of tank waste receipt and transferring operations be physically demonstrated. This will require numerous "Dry-Runs" using mockup tank waste (water) and in-situ CSTS equipment and systems. The Dry-Runs will permit certification of procedures and operational staff and demonstrate that the CSTS is ready to safely receive and handle the tank waste. Readiness Review is described in the Startup WBS as element #1.5.4.5.

## 2.6 OPERATIONAL TESTING AND OPERATIONS SUPPORT

Initial CSTS Operations will require effective support from Startup to assure successful and smooth Initial Operations. Startup Engineering personnel will continue in their assigned positions as necessary to support CSTS Operations. This will assure timely recovery from any unanticipated equipment failure and provide a smooth transition into initial hot tank waste handling. Initial Hot Operations Support is described in the Startup WBS as element #1.5.6.3.

### 3.0 ORGANIZATION AND RESPONSIBILITIES

The CSTS Startup Organization is a member of the CSTS Project Office. Startup's role and responsibilities within the CSTS Project are defined in the Project's Management Plan, WHC-SD-W058-MP-001. The Startup organizational structure is depicted in Figure 3-1.

The following sections describe Startup's role and responsibilities in greater detail and identify the various organizations participating in CSTS Startup Plan and their responsibilities. Table 3-1 details the responsibilities for each testing related activity. Figure 1-1 depicts testing related activities, their general timing, and the responsible organization for each activity.

#### 3.1 ORGANIZATIONAL ROLES AND RESPONSIBILITIES

The following subsections describe those organizations having direct participation in the Startup Plan.

##### 3.1.1 WHC/ICF KH CSTS Project Office .

The organizational role of the CSTS Project Office as both the integrating contractor and Project participant is described in detail in the CSTS Management Plan.

##### 3.1.1.1 WHC/ICF KH CSTS Startup

As an integral part of the CSTS Project Office, Startup assists the integrating and participant roles of the CSTS Project Office, as described in the CSTS Management Plan, through implementation of Startup activities. In its integrating role, Startup will provide Startup related technical direction, cost and schedule management, control, integration, applied technology, and safety/regulatory compliance support. In its participant role, Startup will develop, coordinate, and implement CSTS Project's Pre-Operational and Operational Test Program. This includes identification, development, and implementation of Pre-Operational and Operational Test Procedures, detailed test schedule development and implementation, maintenance and trouble shooting of system/component problems and coordination of their resolution, and coordination of testing support activities.

### 3.1.2 CSTS Startup Manager

The CSTS Project Startup Manager has the responsibility to support the Startup Test Plan as follows:

- Review and comment on the A-E's design basis documentation for all major systems.
- Review and comment on the A-E's system operating descriptions to be used in developing test procedures.
- Prepare Startup System Boundary identification documentation.
- Manage planning, scheduling, work force allocation, and budgeting for Startup Test Plan activities.
- Prepare test procedures, ensure Startup personnel are trained, and direct performance of Startup tests.
- Prepare and submit Startup Test documentation generated during testing activities in support of preparations for the PRR.
- Develop and implement necessary mock-up testing for Structures, Systems and Components (SSC) before receipt of the hot tank waste.
- Function as the Cost Account Manager for Project Startup accounts.
- Include applicable elements of the project safety basis and regulatory documentation into operator training, operating and maintenance procedures and test procedures.
- Prepare operating, surveillance procedures and assure that they incorporate all applicable technical operational safety requirements.
- Prepare calibrator and maintenance procedures.

### 3.1.3 WHC/ICF KH CSTS Operations

CSTS Operations will provide input and participate in technical reviews of ATPs and conduct of Factory Acceptance Testing, Construction Acceptance Testing, Pre-Operational Testing, and Operational Testing. CSTS Operations will provide Maintenance and Operations Support during the Pre-Operational phase of the Project for equipment and systems that are in Startup's custody. CSTS Operations will provide input and support to the PRR process as required.

Specific areas of responsibility include the following:

- ~ Assign an Operations representative to TRB.
- ~ Assign a Maintenance representative to TRB.
- ~ Participate in the preparation and review of Technical and Operating Specifications.
- ~ Participate in the preparation and review of Operating Procedures.
- ~ Participate in the preparation and review of Maintenance Procedures.
- ~ Participate in the preparation and review of Test Procedures.
- ~ Train and qualify operational personnel in accordance with the Tank Farms TIM.
- ~ Validate operational test procedures.

#### 3.1.4 Design Agent

The Design Agent services for Startup activities will include providing design media to support procedure development, participation on the TRB, resolution of deficiency punchlist items and preparation of as-built drawings.

Specific Startup Test Plan-related responsibilities include the following:

- ~ Prepare ATP.
- ~ Provide Test Specifications that define test requirements for Structures, Systems and Components (SSC), including acceptance criteria, that can be used to verify that design requirements and assumptions and construction installation requirements are met.
- ~ Review and approve design change requests originating as a result of Startup Test Plan activities.
- ~ Prepare system operating characteristics and descriptions to be used by Startup and Operations in development of SSC Startup and Operating Procedures.

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- Review and approve Construction Acceptance Procedures and Operational Test Procedures for consistency with the system operational design basis.
- Maintain design configuration control and records through completion of CAT and turnover to Integrating Contractor.

### 3.1.5 Construction Management (CM)

Construction Management services for Startup activities will include providing scheduling services for the testing activities, assembling an integrated construction turnover to Startup schedule, preparation of SSC Turnover packages, participation in SSC turnover walkdowns/punchlisting deficiencies, performance of CATs integrated with Startup witness and verification requirements, spare parts warehousing, and providing Construction Craft Support and Project contracted Vendor Support as requested.

Specific Startup Test Plan-related responsibilities include the following:

- Perform the ATP and acceptance of completed facilities.
- Review vendor FAT procedures and witness vendor FATs.
- Perform CATs on equipment and systems, as required, in accordance with approved Test Procedures. Report on Test Procedures and results of tests as required.
- Provide qualified supervision and Construction Craft Support to testing activities as required.
- Support mock-up testing of CSTS systems and equipment.

#### 3.1.5.1 Subcontractors

Subcontractors to CM will provide support services to Startup via CM coordination/delegation. Those services may include any of those that are specified above in Section 3.1.5 for CM responsibility.

#### 3.1.6 WHC/ICF KH Matrix Support

Additional support and expertise will be required and is available from a variety of other WHC/ICF KH Organizations as noted in the CSTS Management Plan.

### 3.2. Qualification and Training

Startup Test Engineers, Operations personnel and related support personnel will be selected and trained in accordance with the requirements of the Training Implementation Matrix (TIM) for Tank Farms which implements the requirements of DOE Order 5480.20A - Personnel Selection, Qualification, Training and Staffing Requirements at DOE Reactor and Non-Reactor Nuclear Facilities.

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Figure 3-1. STARTUP ORGANIZATION  
W-058 CROSS-SITE TRANSFER SYSTEM

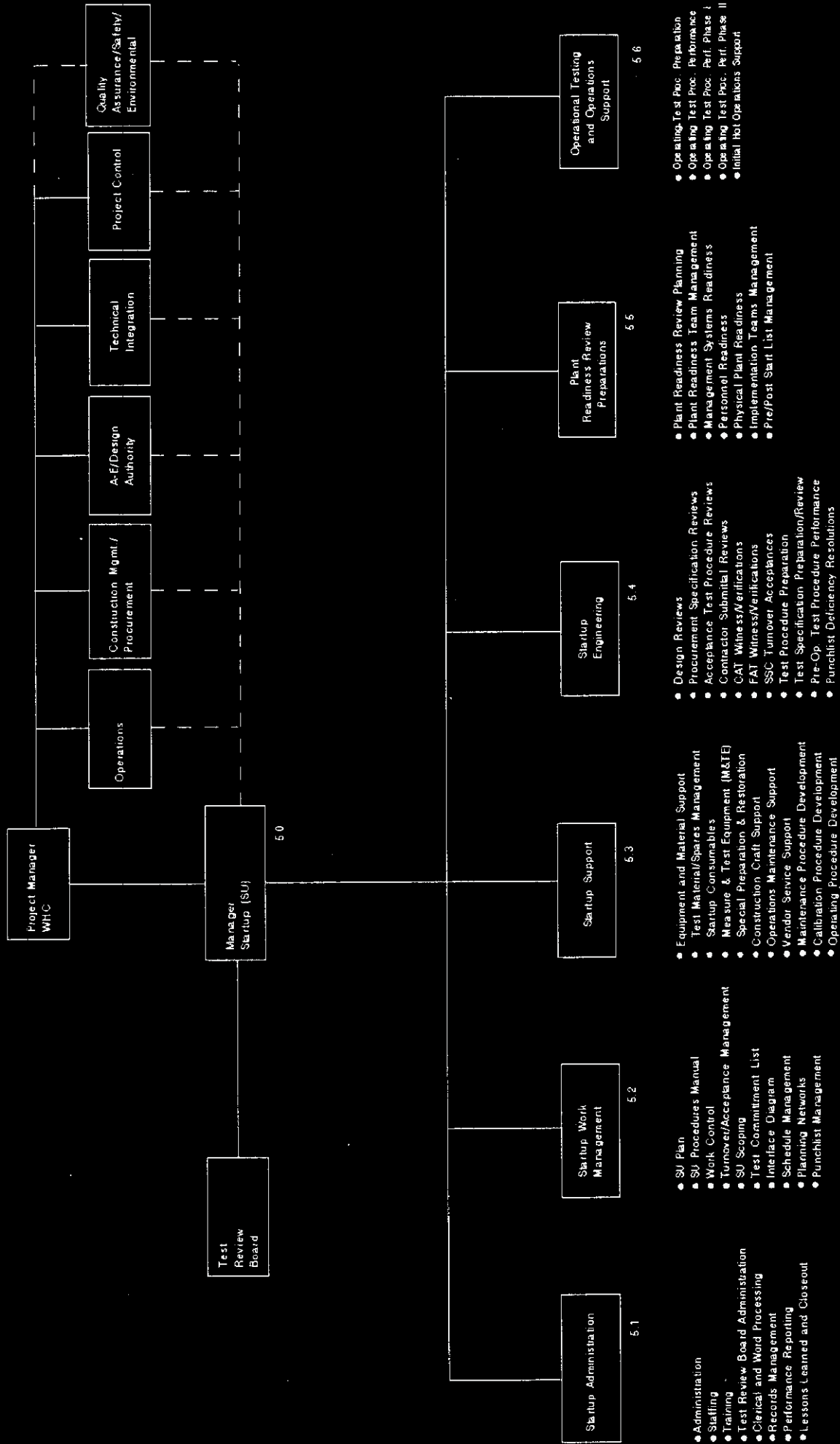


Table 3-1. Project W058, Cross-Site Transfer System - RESPONSIBILITY ASSIGNMENT MATRIX

Activity, task, product, description	Design Agent	Construction Management	Design Authority	DOE-Owner	Comments
<b>Design</b>					
Document basis for design	P, A	--	S, C	--	This includes requirements for the safety basis documentation, regulatory permitting and approved DOE General Design Criteria.
Identify additional verification testing required	P	--	R, A	--	--
Factory acceptance test specification	P, A	R	R	--	--
Construction acceptance test specification	P, A	R	R	--	--
Pre-Operational test specification	P	--	C, R, A	R	Design Agent prepares the pre-operational specification acceptance criteria.
Operational test specification	P	--	C, R, A	R	Design Agent prepares the operational specification acceptance criteria.
<b>Construction</b>					
Factory acceptance testing	--	A	S	S	Subcontractor/vendor performs factory acceptance testing. WHC will witness hold points, as appropriate.



Table 3-1. Project W058, Cross-Site Transfer System - RESPONSIBILITY ASSIGNMENT MATRIX

Activity, task, product, description	Design Agent	Construction Management	Design Authority	DOE-Owner	Comments
Construction acceptance test procedures	R	P, A	R	--	Subcontractor may prepare procedure.
Perform construction acceptance testing	--	P, A	S	S	Subcontractor may perform construction acceptance testing. WHC will use test results as one of the bases for system/component acceptance. WHC will witness hold points as appropriate.
Systems turnover	--	P	A	S	--
Construction completion report	--	P, C	P, A	A	RL Project and Program approvals required on "Official Acceptance of Construction."
Startup and Operations					
Individual test plans	C	--	P, A	--	--
Care and maintenance instructions	--	--	P, A	--	--
Pre-operational test procedures	R		P, A		--
Operational test procedures	R, C	C	P, A	R	
Pre-operational test performance	--	--	P, A	R, S	--

Table 3-1. Project W058, Cross-Site Transfer System - RESPONSIBILITY ASSIGNMENT MATRIX

Activity, task, product, description	Design Agent	Construction Management	Design Authority	DOE-Owner	Comments
Operational test performance	--	--	P, A	R, S	
Test Reports	--	--	P, A	--	--
Plant Readiness Review Plan	C	--	P, RA	P, A	--
Plant Readiness Review	C	--	P, RA	P, A	--
Operator training	--	--	P	--	--
Startup and operations documentation	--	--	P, A	R	--

A = Approval  
 C = Contributes input  
 IC = Integrating Contractor (WHC/ICF KH and CSTS Project)  
 PRR = Plant Readiness Review  
 P = Prepares/provides  
 R = Reviews/comments  
 RL = U.S. Department of Energy, Richland Operation Office  
 S = Selected technical surveillance, verification and/or witness  
 WHC = Westinghouse Hanford Company  
 W = Witness

Table 3-1. Project W058, Cross-Site Transfer System - RESPONSIBILITY ASSIGNMENT MATRIX

Table 3-2. Project W-058 - RESPONSIBILITY MATRIX FOR TESTING

Activity	Vendor/construction responsibilities	CSTS STARTUP Pre-Operational responsibilities	CSTS STARTUP Post-PRR responsibilities	CSTS Operations responsibilities
Testing phase	Acceptance testing: factory acceptance tests, construction acceptance tests	Pre-operational testing	Operational testing	Operations acceptance
Testing objectives	Demonstrates compliance with procurement and construction contract requirements	Demonstrates functional integration of system components using distributed control system	Demonstrates integrated operation of the facility's systems	Demonstrates compliance with appropriate Operations procedures and readiness for operation
Testing performer	Conducted by CM, subcontractors and equipment vendors	Conducted by IC CSTS SU	Conducted by IC CSTS SU	Operated by IC Operations

CM = Construction Manager  
 IC = Integrating Contractor  
 CSTS = Cross-Site Transfer System  
 SU = Startup

#### 4.0 MANAGEMENT AND CONTROL

The primary goal of Startup Management and Control is to ensure that Startup activities have sound technical, cost and schedule basis, and that a formal system is in place to authorize and control Startup work. This section describes how Startup plans to establish and control testing work scope, cost, and schedule and measure and report work performance. In addition, this section discusses Startup plans for management of test records and compilation of Startup history for Lessons Learned benefit.

##### 4.1 STARTUP WORK BREAKDOWN STRUCTURE

The Startup WBS is designed to successfully attain Startup's management goal by defining work scope, assigning responsibilities for it's performance, and its associated budget and schedule. The WBS Index for Startup is displayed on Table 4-1 and its associated WBS Elements are defined in Appendix B.

The Startup WBS consists of six main elements:

- Administrative Management
- Work Management
- Support Management
- Engineering Management
- Readiness Review Support
- Initial Operations Support

Each of these elements represents a divisible scope of work that is:

- Manageable, in that specific authority and responsibility can be assigned within each element with minimal overlap in areas of scope, cost and schedule.
- Integratable with each of the other elements.
- Measurable in terms of progress.

Startup WBS describes and integrates seven areas of Startup. Those areas are:

- Goals and Objectives
- Work Scope Baseline and Control
- Cost Baseline and Control
- Schedule Baseline and Control
- Organizational Structure
- Performance Measurement and Reporting
- Filing and Records Management

Each of the above seven areas is organized by the Startup WBS. Each is related to the other via Startup WBS. The following sections discuss each of these Startup areas and their relationship to Startup WBS and each other.

#### 4.1.1 WBS SUMMARY DESCRIPTIONS

The following are summary descriptions of the six main Startup WBS elements:

##### Startup Administrative Management (WBS 1.5.1.1)

This WBS element provides overall Administrative Management of Startup activities. This includes work activities required to provide for test procedure technical review and editing, Staffing and Training, Performance Evaluations and Management Reporting, Records Management, and establishment and closeout of the Startup Plan including documentation of Lessons Learned.

##### Startup Work Management (WBS 1.5.1.2)

This WBS element consists of all activities necessary to manage and control Startup's scope of work. This includes identification and control of Startup's work scope, establishment and implementation of work controls, planning, scheduling, and management of all Startup work.

##### Startup Support Management (WBS 1.5.1.3)

This WBS element consists of Support activities necessary for Startup to carry out its responsibilities. This includes activities that provide Equipment and Materials Support, Construction Craft Support, Operations and Maintenance Support, Vendor Service Support, Procedure Development Support, Test Specification Development, and Startup Services Support. Each of these support functions is described in the following WBS breakdowns. It is intended that these support activities will be coordinated through a single organizational unit within Startup to provide a single point of contact within Startup for organizations that provide the services.

##### Startup Engineering Management (WBS 1.5.1.4)

This WBS element encompasses all essential activities of Startup Engineering. It spans the following activities:

- Reviews of Design, Procurement Specifications, Acceptance Test Procedures, and Contractor Submittals.
- Witnessing and/or Verification of FAT and CAT.
- Participation in SSC construction to Startup turnover process. This includes SSC walkdowns and deficiency punchlist generation, Turnover Package reviews, and SSC acceptance into Startup custody.
- Pre-Operational Test Procedure Development, performance, and test deficiency resolution.

- Maintenance and trouble shooting SSC while in Startup custody.
- Supporting the Readiness Review process.
- Operational Test Procedure Development, performance, and deficiency resolution during initial receipt of hot tank waste.
- Incorporate input from Safety, Quality Assurance and Environmental Compliance.

**Plant Readiness Review Preparations** (WBS 1.5.1.5)

This WBS element includes support for PRR preparations and execution. The emphasis of this support is expected to concentrate on Physical Plant Readiness, i.e., verification that all required design, construction, inspection, testing, and documentation is complete and that SSC are fully operable, emphasis on Personnel Readiness, i.e., Operator Training and Management Systems Readiness, Operating and Maintenance Procedure validations and Dry-Run demonstrations with simulated tank waste, and emphasis on Management Systems Readiness, i.e., organizational and administrative systems.

**Operational Testing and Operations Support** (WBS 1.5.1.6)

This WBS element covers Startup support for Operations and Maintenance during Initial Operations and Operational Testing. CSTS Operations will be responsible for all facility Operations and Maintenance. Startup support is essential during this phase due to potential for infant mortality of new systems and equipment and provides a smooth transition from the startup phase to the operational phase of CSTS. Startup and CSTS Operations will coordinate the utilization of CSTS personnel through appropriate approved work control procedures.

**4.2 GOALS AND OBJECTIVES**

The goals and objectives of The CSTS Startup Plan are discussed in Section 2.0. Each of the six objectives of The Startup Plan is a major element of the Startup WBS. This establishes a solid one-for-one relationship of Startup goals and objectives to the other six areas of CSTS Startup.

**4.3 WORK SCOPE BASELINE AND CONTROL**

Test Engineering includes Test Engineer activities to review CSTS participant design and acceptance test media, Verify/Witness Acceptance Testing, participate in Construction Turnover Walkdowns, oversee walkdown deficiency resolutions, preparing and executing Pre-Operational Test Procedures, supporting Readiness Reviews for Initial Hot Operations, and supporting CSTS during Initial Hot Operations.

#### 4.3.1 Startup Work Scope Control

Startup Work Scope will be established and controlled by the CSTS Startup Plan (this Plan) and two other complimentary documents, CSTS "Test Commitment List," and CSTS "Testing Interface Diagram." The Test Commitment List describes the testing requirements for the CSTS Project and the Testing Interface Diagram specifies the CSTS organizational entity responsible for performing the testing.

##### 4.3.1.1 Test Commitment List

The CSTS Test Commitment List (TCL) is compiled of testing requirements deemed necessary to verify CSTS SSC, satisfy their functional requirements, and to ensure compliance to numerous DOE and Code requirements for testing. The testing requirements are extracted from all applicable documents to CSTS such as "The Staging and Storage Functions and Requirements," PSAR, Title II Design documents and DOE Orders. The TCL is generated from applicable source documents by qualified CSTS technical staff then reviewed and approved by the CSTS Test Review Board (Note: The Test Review Board is described in Appendix B of this plan).

The TCL presents a columnar listing of each testing requirement, the requirement's source document, and test procedure that invokes the required testing. The TCL will be revised and re-approved by the Test Review Board as necessary to update.

##### 4.3.1.2 Testing Interface Diagram

The CSTS Testing Interface Diagram (TID) identifies specific testing activities, test program phases, and corresponding performing organization assignments. A copy of the TID is presented in Appendix C. The TID will be revised as necessary to reflect changes in the CSTS Organization. The TID and subsequent revisions will be reviewed and approved by the Test and Review Board.

##### 4.3.1.3 Startup Plan Scope of Work

The CSTS Startup Plan supplements the work scope defined by TCL and TID by establishing Startup's Management, Administrative and Support requirements as noted in Startup WBS element descriptions in Appendix B. This Plan, together with the TCL and TID, fully describes all work that is anticipated for Startup throughout the course of the CSTS Project.

#### 4.4 COST BASELINE CONTROL

All Startup budget allocations and cost distributions will be broken down into the six major Startup WBS elements. This establishes a one-for-one relationship of Startup budget/cost activity to the other six areas of CSTS Startup.

A Startup Cost Baseline will be developed and maintained for the CSTS Project. The baseline will consist of time-phased cost profiles derived from resource-loaded Startup schedules. This work will be performed in a manner consistent with WHC-CM-2-5, "Management Control System."

The Startup Cost Baseline will be derived on a monthly basis and presented by appropriate Startup WBS element by:

- Multiplying appropriate labor rates and markups times the exempt and non-exempt FTE profiles taken from the Startup Resource Loaded Planning and Support Schedule and Detailed Startup Testing Schedule,
- Adding in anticipated equipment and material costs, and
- Adding in anticipated costs for both on-site and off-site support services.

Estimating methodology for the Startup Cost Baseline will be approved by the CSTS Project.

#### 4.5 SCHEDULE BASELINE AND CONTROL

A Startup Schedule Baseline will be developed and maintained for the CSTS Project Office. The schedule will consist of two integrated but distinct schedules: (1) Startup Planning and Support Schedule, and (2) Startup Turnover and Testing Schedule. Each of these schedules, their development and relation to the Startup WBS and maintenance is discussed in Appendix B (see WBS element 1.5.1.2.6).

##### 4.5.1 Startup Planning and Support Schedule

The Startup Planning and Support Schedule covers each of the four major Startup WBS elements thus establishing a one-to-one relationship of Startup Planning and Support Scheduled activities to the other six areas of CSTS Startup. The Startup Planning and Support Schedule is presented on Figure 4-1.



#### 4.5.2 Startup Turnover and Testing Schedule

The Turnover and Testing Schedule will establish construction SSC Turnover package dates. This detailed schedule is a subset of the Startup Planning and Support Schedule (see Appendix B - WBS 1.5.1.2.6).

#### 4.5.3 WBS and Startup Schedule Hierarchy

Figure 4-2 depicts the relationship between the Startup WBS and Schedule Hierarchy. An example of its application is:

For the WBS element 1.5.1.4.4. (Pre-Op Testing):

- The PSWBS level is not applicable.
- The CWBS level is 2.
- The schedule level is III.

#### 4.6 ORGANIZATIONAL STRUCTURE

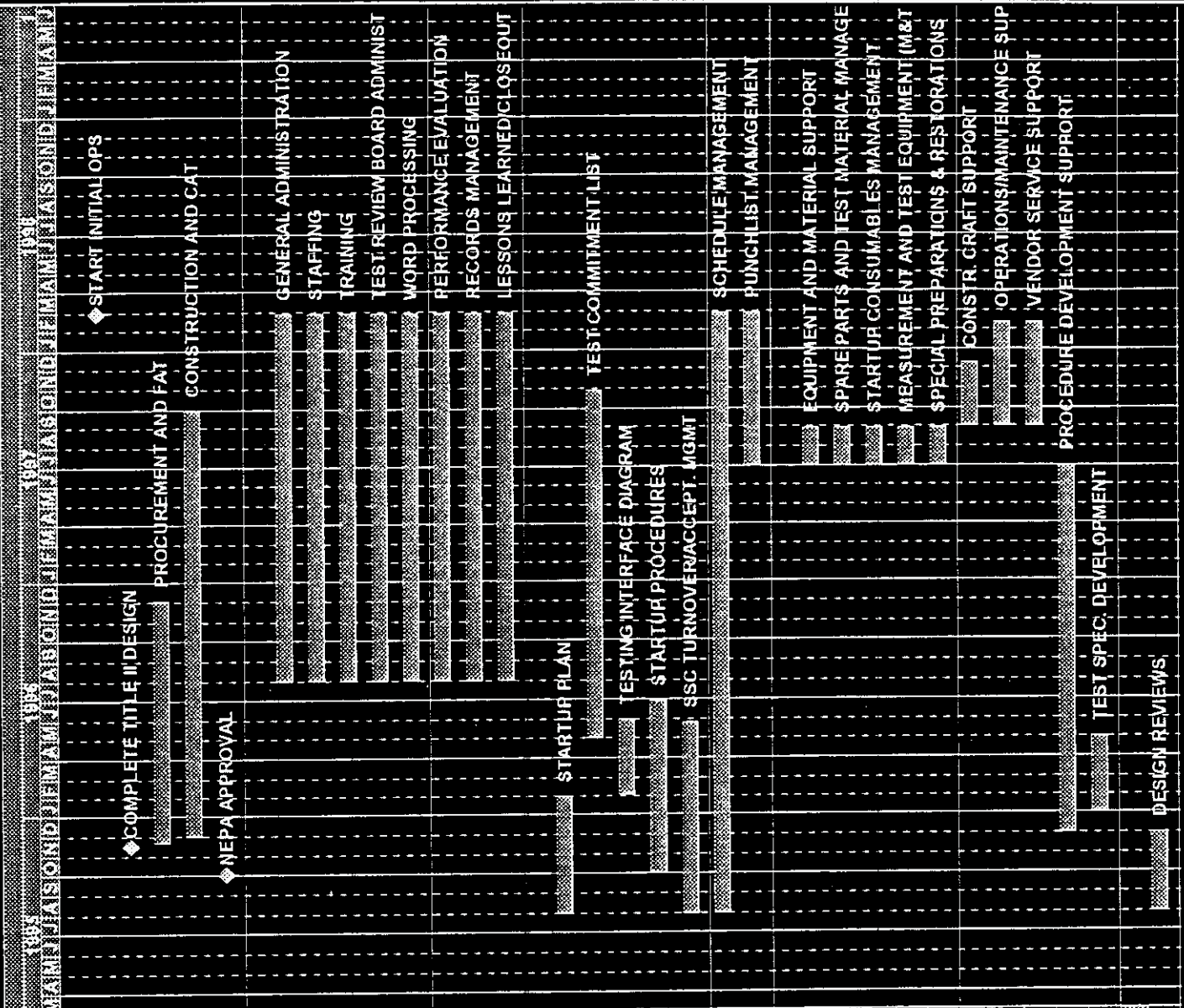
The Organizational Structure of the CSTS Startup Plan is discussed in Section 3.0. Each of the six organizational units of Startup coincides with a major element of the Startup WBS (see Figure 3-1). This establishes a one-for-one relationship of Startup's organizational structure to the other six areas of CSTS Startup.

#### 4.7 PERFORMANCE MEASUREMENT AND REPORTING

This activity includes weekly, monthly, quarterly or as otherwise required measurement, evaluation and reporting of Startup's scope, cost, schedule and technical performance. This will include both internal and external appraisals. All reporting will be structured in accordance with the Startup WBS to maintain a one-for-one relationship to the other six areas of CSTS Startup.

#### 4.8 FILING AND RECORDS MANAGEMENT

This activity includes all work activities required to establish and maintain the Startup file system, all Startup records management systems and Lessons Learned records. The filing and records management systems will be structured in accordance with the Startup WBS to maintain a one-for-one relationship to the other six areas of CSTS Startup.



W-058 CROSS-SITE TRANSFER SYSTEM  
 PLANNING & SUPPORT SCHEDULE  
 FIGURE 4-1

Activity ID	Activity Description	Early Start	Early Finish
SU01	START INITIAL OPS		26FEB98
SU02	COMPLETE TITLE II DESIGN		14NOV95
SU03	PROCUREMENT AND FAT	21NOV95	04DEC96
SU04	CONSTRUCTION AND CAT	01DEC95	29SEP97
SU07	NEPA APPROVAL	03OCT95	
<b>1.5.1 STARTUP ADMINISTRATIVE MANAGEMENT</b>			
SU511000	GENERAL ADMINISTRATION	01AUG96	26FEB98
SU5112000	STAFFING	01AUG96	26FEB98
SU5113000	TRAINING	01AUG96	26FEB98
SU5114000	TEST REVIEW BOARD ADMINISTRATION	01AUG96	26FEB98
SU5115000	WORD PROCESSING	01AUG96	26FEB98
SU5116000	PERFORMANCE EVALUATION	01AUG96	26FEB98
SU5117000	RECORDS MANAGEMENT	01AUG96	26FEB98
SU5118000	LESSONS LEARNED/CLOSEOUT	01AUG96	26FEB98
<b>1.5.2 STARTUP WORK MANAGEMENT</b>			
SU5121000	STARTUP PLAN	01AUG95	29JAN96
SU5122000	TEST COMMITMENT LIST	01MAY96	28OCT97
SU5123000	TESTING INTERFACE DIAGRAM	02FEB96	29MAY96
SU5124000	STARTUP PROCEDURES	02OCT95	28JUN96
SU5125000	SSC TURNOVER/ACCEPT. MGMT	01AUG95	24MAY96
SU5126000	SCHEDULE MANAGEMENT	01AUG95	26FEB98
SU5127000	PUNCHLIST MANAGEMENT	01JUL97	26FEB98
<b>1.5.3 STARTUP SUPPORT MANAGEMENT</b>			
SU5131000	EQUIPMENT AND MATERIAL SUPPORT	01JUL97	29AUG97
SU5131100	SPARE PARTS AND TEST MATERIAL	01JUL97	29AUG97
SU5131200	STARTUP CONSUMABLES MANAGEMENT	01JUL97	29AUG97
SU5131300	MEASUREMENT AND TEST EQUIPMENT	01JUL97	29AUG97
SU5131400	SPECIAL PREPARATIONS &	01JUL97	29AUG97
SU5132000	CONST. CRAFT SUPPORT	02SEP97	10DEC97
SU5133000	OPERATIONS/MAINTENANCE SUPPORT	02SEP97	10FEB98
SU5134000	VENDOR SERVICE SUPPORT	02SEP97	10FEB98
SU5135000	PROCEDURE DEVELOPMENT SUPPORT	01DEC95	30JUN97
SU5136000	TEST SPEC. DEVELOPMENT	02JAN96	30APR96
<b>1.5.4 STARTUP ENGINEERING MANAGEMENT</b>			
SU5141100	DESIGN REVIEWS	01AUG95	30NOV95

300ECR4 10JUL96 01JAN96 02FEB98

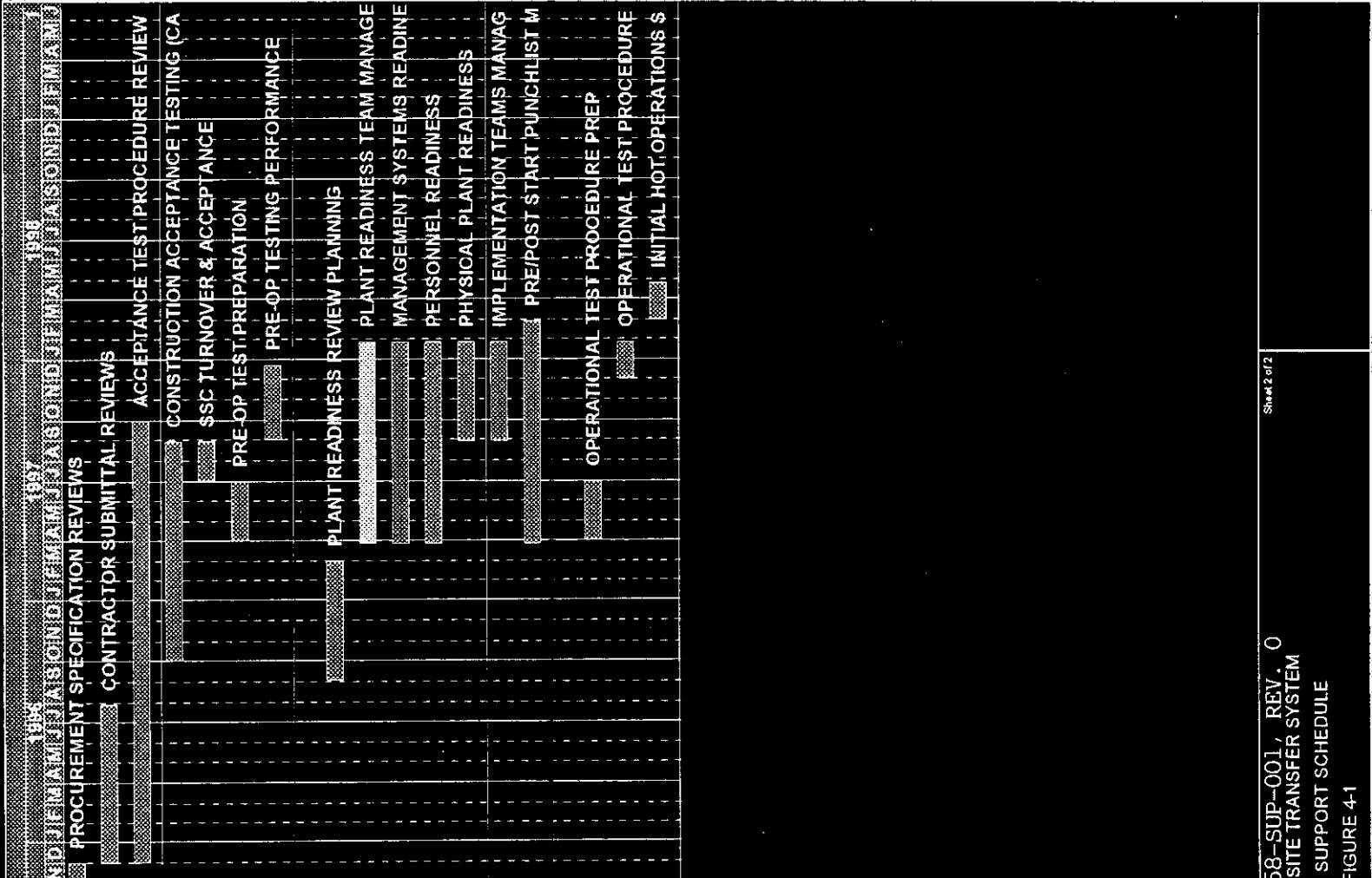
Project Start  
 Project Finish  
 Data Date  
 Pld Date

CSIS

Early Bar  
 Progress Bar  
 Critical Activity

ICI Primavera Systems, Inc.

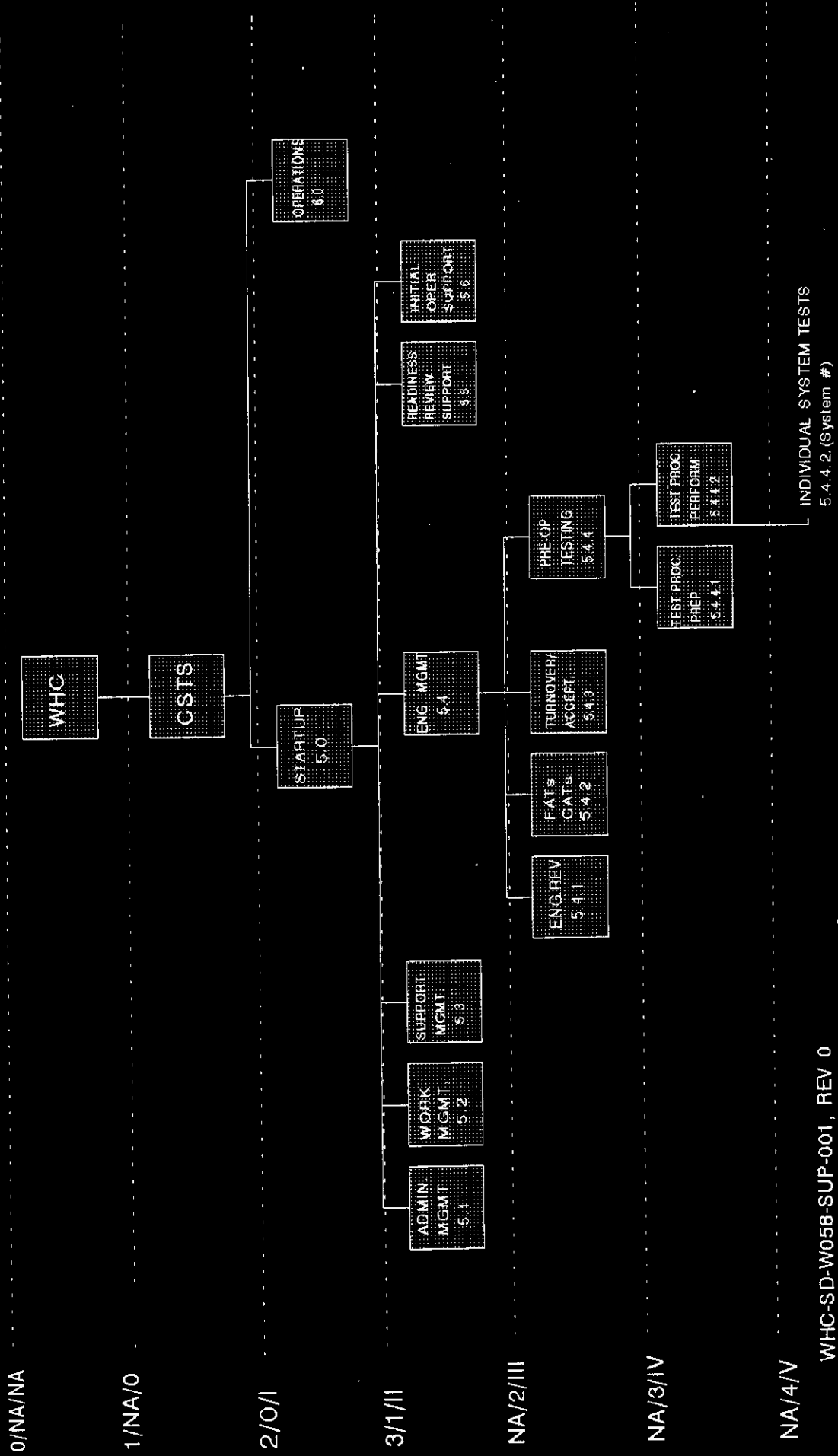
Activity ID	Activity Description	Early Start	Early Finish
SU5141200	PROCUREMENT SPECIFICATION	01AUG95	30NOV95
SU5141300	CONTRACTOR SUBMITTAL REVIEWS	01DEC95	26JUL96
SU5141400	ACCEPTANCE TEST PROCEDURE	01DEC95	30SEP97
SU5142200	CONSTRUCTION ACCEPTANCE TESTING	01OCT96	29AUG97
SU5143000	SSC TURNOVER & ACCEPTANCE	01JUL97	29AUG97
SU5144100	PRE-OP TEST PREPARATION	01APR97	30JUN97
SU5144200	PRE-OP TESTING PERFORMANCE	02SEP97	23DEC97
<b>1.5. PLANT READINESS REVIEW PREP</b>			
SU5151000	PLANT READINESS REVIEW PLANNING	03SEP96	28FEB97
SU5152000	PLANT READINESS TEAM MANAGEMENT	26MAR97	26JAN98
SU5153000	MANAGEMENT SYSTEMS READINESS	26MAR97	26JAN98
SU5154000	PERSONNEL READINESS	26MAR97	26JAN98
SU5155000	PHYSICAL PLANT READINESS	29AUG97	26JAN98
SU5156000	IMPLEMENTATION TEAMS MANAGEMENT	29AUG97	26JAN98
SU5157000	PRE/POST START PUNCHLIST MGMT	26MAR97	26FEB98
<b>1.5. OPER. TESTING/OPERATIONS SUPPORT</b>			
SU5161000	OPERATIONAL TEST PROCEDURE PREP	01APR97	30JUN97
SU5162000	OPERATIONAL TEST PROCEDURE PERF.	01DEC97	26JAN98
SU5163000	INITIAL HOT OPERATIONS SUPPORT	02MAR98	24APR98



# WHC PROJECT W-058 STARTUP

x/y/z where:

- x = PSWBS LEVEL
- y = CWBS LEVEL
- z = SCHEDULE LEVEL
- N/A = NOT APPLICABLE



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 Figure 4-2. Replacement of Cross-Site Transfer System  
 WBS and Schedule Hierarchy

Table 4-1. Westinghouse Hanford Company  
REPLACEMENT OF CROSS-SITE TRANSFER SYSTEM  
Startup Work Breakdown Structure

Work Breakdown Structure Index

STARTUP WBS NUMBER	DESCRIPTION
1.5	<b>FACILITY STARTUP/INITIAL OPERATIONS</b>
1.5.1	<b>Startup Administrative Management</b>
1.5.1.1	General Administration
1.5.1.2	Staffing
1.5.1.3	Training
1.5.1.4	Test Review Board Administration
1.5.1.5	Clerical and Word Processing
1.5.1.6	Performance Evaluation and Reporting
1.5.1.7	Records Management
1.5.1.8	Lessons Learned and Closeout
1.5.2	<b>Startup Work Management</b>
1.5.2.1	Startup Plan
1.5.2.2	Test Commitment List
1.5.2.3	Testing Interface Diagram
1.5.2.4	Startup Procedures Manual
1.5.2.5	SSC Turnover and Acceptance Management
1.5.2.5.1	Startup System Scoping
1.5.2.6	Schedule Management
1.5.2.7	Punchlist Management
1.5.3	<b>Startup Support Management</b>
1.5.3.1	Equipment and Material Support
1.5.3.1.1	Spare Parts and Test Material Management
1.5.3.1.2	Startup Consumables Management
1.5.3.1.3	Measurement and Test Equipment (M&TE)
1.5.3.1.4	Special Preparations and Restorations
1.5.3.2	Construction Craft Support
1.5.3.3	Operations/Maintenance Support
1.5.3.4	Vendor Service Support
1.5.3.5	Procedure Development Support
1.5.3.6	Test Specification Development
1.5.3.7	Startup Services Support

- 1.5.4 Startup Engineering Management**
  - 1.5.4.1 Startup Engineering Reviews
    - 1.5.4.1.1 Design Reviews
    - 1.5.4.1.2 Procurement Specification Reviews
    - 1.5.4.1.3 Contractor Submittal Reviews
    - 1.5.4.1.4 Acceptance Test Procedure Reviews
  - 1.5.4.2 Acceptance Test Witness/Verification
    - 1.5.4.2.1 Construction Acceptance Testing (CAT)
  - 1.5.4.3 SSC Turnover and Acceptance
  - 1.5.4.4 Pre-Operational Testing
    - 1.5.4.4.1 Pre-Operational Test Procedure Preparation
    - 1.5.4.4.2 Pre-Operational Test Procedure Performance
- 1.5.5 Plant Readiness Review Preparation**
  - 1.5.5.1 Plant Readiness Review Planning
  - 1.5.5.2 Plant Readiness Team Management
  - 1.5.5.3 Management Systems Readiness
  - 1.5.5.4 Personnel Readiness
  - 1.5.5.5 Physical Plant Readiness
  - 1.5.5.6 Implementation Teams Management
  - 1.5.5.7 Pre/Post Start Punchlist Management
- 1.5.6 Operational Testing and Operations Support**
  - 1.5.6.1 Operational Test Procedure Preparation
  - 1.5.6.2 Operational Test Procedure Performance
    - 1.5.6.2.1 Operational Test Procedure Performance Phase I
    - 1.5.6.2.2 Operational Test Procedure performance Phase II
  - 1.5.6.3 Initial Hot Operations Support

## 5.0 QUALITY ASSURANCE, SAFETY AND HEALTH AND ENVIRONMENTAL COMPLIANCE

### 5.1 QUALITY ASSURANCE

Startup shall be responsible for managing all Startup activities in accordance with the requirements of the WHC Quality Assurance Manual, WHC-CM-4-2.

### 5.2 SAFETY AND HEALTH

Startup shall be responsible for managing all Startup activities in accordance with the CSTS Management Plan, WHC-SD-W058-MP-001, and the Project Preliminary/Final Safety Analysis Report, and all other applicable Federal, DOE, and State safety codes and requirements.

Startup shall also be responsible for including applicable elements of the project safety basis documentation into operator training, operating, and maintenance procedures and test procedures.

### 5.3 ENVIRONMENTAL

Startup shall be responsible for managing all Startup activities in accordance with the CSTS Management Plan, WHC-SD-W058-MP-001, and all applicable regulatory permits that apply to the CSTS Project.

Startup shall also be responsible for including applicable elements of the project regulatory documentation into operator training, operating and maintenance procedures and test procedures.

## 6.0 REFERENCES

- DOE- Order 5480.19, *Conduct of Operations Requirements For DOE Facilities*, U.S. Department of Energy, Washington, D.C.
- DOE- Order 5480.20A, *Personnel Selection, Qualification, Training and Staffing Requirements at DOE Reactor and Non-Reactor Nuclear Facilities*, U.S. Department of Energy, Washington, D.C.
- DOE- 1987, *Project Management System*, DOE Order 4700.1, U.S. Department of Energy, Washington, D.C.
- WHC- CM-1-5, *Standard Operating Procedures*, Westinghouse Hanford Company, Richland, Washington.
- WHC- CM-1-6, *Radiological Control Manual*, Westinghouse Hanford Company, Richland, Washington.
- WHC- CM-1-8, *Work Management*, Westinghouse Hanford Company, Richland, Washington.
- WHC- CM-1-10, *Safety Manual*, Westinghouse Hanford Company, Richland, Washington.
- WHC- CM-2-5, *Management Control System*, Westinghouse Hanford Company, Richland, Washington.
- WHC- CM-3-5, *Document Control and Records Management*, Westinghouse Hanford Company, Richland, Washington.
- WHC- CM-4-2, *Quality Assurance Manual*, Westinghouse Hanford Company, Richland, Washington.
- WHC- CM-6-1, *Standard Engineering Practices*, Westinghouse Hanford Company, Richland, Washington.
- WHC- CM-6-2, *Project Management*, Westinghouse Hanford Company, Richland, Washington.
- WHC- IP-0842, *Tank Waste Administration*, Westinghouse Hanford Company, Richland, Washington.
- WHC- SD-W058-MP-001, *Management Plan*, Westinghouse Hanford Company, Richland, Washington.



## 7.0 ABBREVIATIONS AND ACRONYMS

A-E	Architect-Engineer
ATP	Acceptance Test Procedure
CAT	Construction Acceptance Testing
CM	Construction Management
CSTS	Cross-Site Transfer System
DCS	Distributed Control System
DOE	U.S. Department of Energy
FAT	Factory Acceptance Testing
GFE	Government-furnished Equipment
HVAC	Heating, Ventilation, and Air Conditioning
ICF KH	ICF Kaiser Hanford Company
MET	Modification/Equipment Turnback
MP	Management Plan
MSA	Management Self-Assessment
M&TE	Measurement and Test Equipment
MTS	Master Tracking System
OTP	Operational Test Procedure
P&ID	Piping and Instrumentation Diagram
POD	Plan of the Day
PRE-OP	Pre-Operational Test(ing)
PRR	Plant Readiness Review
PSAR	Preliminary Safety Analysis Report
RL	U.S. Department of Energy, Richland Operations Office
RTO	Release to Operations
SAR	Safety Analysis Report
SSC	Structures, Systems and Components
SU	Startup
TCL	Test Commitment List
TCR	Test Change Request
TID	Testing Interface Diagram
TIM	Training Implementation Matrix
TRB	Test Review Board
WAD	Work Authorization Document
WBS	Work Breakdown Structure
WHC	Westinghouse Hanford Company

## 8.0 GLOSSARY

### Checkout

Visually inspect and/or manually adjust to ensure correct installation and arrangement.

### Chronological Test Log

A record of events which have transpired during the conduct of testing and during major interruptions of testing.

### Component

A single piece of equipment (such as a run of pipe, valve, protective device, instrument, wire, heat exchanger, pump, turbine, etc.), which will be used with other components to form a system.

### Control Loop Functional Check

Testing to verify that a control loop is acceptable to design requirements and that it has the proper interrelationship and responsive elements.

### Control Room Copy

A test procedure copy stamped "CONTROL ROOM COPY" in red. There shall be only one such stamped copy of each test procedure.

### Electrical Checks

Checks performed for the purpose of verifying that a control circuit or piece of electrical equipment and its associated components are installed and connected correctly and that the control circuit and equipment are functioning in accordance with the design requirements. These checks shall include, but not be limited to, protective relays, transformers, meter calibrations, motor control centers, switchgear, etc.

### Exceptions

A deficiency or other abnormal condition that has been determined acceptable for a proposed operation.

### Hot Run Testing

Tests performed during and following initial operation or restart of systems and facilities using designed operating fluids/solids/gases under various operational plateaus until 100 percent of the design basis is achieved. These

### Hot Run Testing (cont.)

tests confirm the design bases and demonstrate, to the extent practical, that the facility will operate in accordance with design and is capable of responding as designed to anticipated transients and postulated accidents as specified in the Safety Analysis Report (SAR) and design basis documents. These tests should consider operational stability/control of systems at various levels of operations, designed transients, and permit compliance verification.

### Initial Startup Test

Those tests which require process material or simulant (water) of process material which are performed prior to completion of Operation Readiness Evaluation by DOE. Initial Startup Tests are designed to confirm the design basis and demonstrate that the facility is capable of operating under normal and abnormal conditions.

### Intent Change(s)

Any change(s) to an approved test procedure which involve aspects of the test that modify the test objective, intent of the test, invalidate test results, or change acceptance criteria, are intent changes. These intent changes shall be approved prior to implementation. Such changes will be approved and documented on a Test Change Request (TCR).

### Loop Check

Test(s) performed to verify that a control loop is acceptable and has proper interrelationships and responsive loop elements. The test is performed with all loop components in place, individually calibrated and documented, and devices energized by applying simulated inputs and measuring or observing component(s) response.

### Master Tracking System (MTS) - Master Punchlist

The single listing of undone or incomplete "A" and "B" punchlist items. Punchlist items are items that require action by an assigned individual or discipline to complete. This single listing is contained in one comprehensive computer database from the time of turnover from Construction to Startup through completion of the Startup/Restart Program.

### Mechanical Checks

Checks performed for the purpose of verifying that piping and/or components of mechanical equipment (e.g., pump, compressor, blower, etc.) is ready for checkout and Initial Operations. These checks include, but are not limited

to, hydrostatic tests, coupling alignment, cleanliness, lubrication, packing glands, etc., as applicable for the system being readied for release from Construction to Startup.

Minor Changes

Inconsequential editorial corrections which do not add, delete, or modify specified requirements.

Modification/Equipment Turnback (MET)

Work to be performed by Construction on a turnover package that has been previously turned over to Startup. Jurisdictional control of the work to be performed is returned to Construction. The "scope of work" remains within the original turned over project "scope of work" boundaries and construction activities shall be performed and controlled by reference to the original project design requirements.

Monitor

To watch, observe, or check.

N/A

Acronym for "Not Applicable."

Non-Intent Change(s)

Changes to an approved test procedure which does not modify the objectives or intent of the test or invalidate test results. Testing may continue, however such changes will be documented on a TCR and shall be approved within a short period of time after the change has been implemented or testing shall be interrupted until approval is obtained.

Official Copy

A test procedure copy stamped "OFFICIAL COPY" in red on the procedure, data sheets, and appendices which shall be used to document the performance on the test. There shall be only one such stamped copy of each test procedure.

Plan of The Day (POD)

Meetings held at a frequency specified by the Facility Startup Test Manager (usually daily) in which Testing activities are discussed and scheduled. This type of meeting is generally for coordination of testing activities that are currently being tested or for activities that will start in the very near future.

Pre-Operational Test-System Test

Test performed on systems, normally prior to fuel loading or simulant (water) runs, which may be performed without process material, nuclear fuel, or heat. Tests that demonstrate capability of system(s) to meet operational and safety criteria, verify trips, isolations, alarms and parameter indication through the systems full operating range.

Prerequisites List

Items or activities which must be complete prior to starting a test procedure.

Release

A formalized and documented jurisdictional transfer of components, systems or subsystems from one controlling group to another, (e.g., Construction to Startup; Startup to Facility Operations).

Release to Operations (RTO)

The RTO defines the point in time when all Pre-Operational/System Startup Testing Scope of responsibility activities have been completed and the facility/system is released from the Startup Organization to Operations. RTO represents the formal transfer (change) of jurisdiction in responsibility and authority of equipment, components, subsystems, systems, facilities, or portions thereof for the control of a defined scope from Startup to Operations.

Retest

The repetition of all or a portion of an approved test procedure.

S/U

Startup

Scheme Check

Electrical testing to confirm that all wiring is in accordance with schematic drawing.

Scoping

Defining system test boundaries usually by marking piping and instrument diagrams (P&IDs), electrical single line drawings, electrical schematics, and other engineering documents to relate and identify specific mechanical, electrical, and instrument equipment to a system for testing purpose.

Setpoint

Any fixed parameter (limit) alarm, control, or monitoring point in an instrument loop range, or a predetermined value that initiates a functional change of state.

Simulant Testing

Testing during the system testing phase using simulated nonhazardous/nonradioactive operating fluids/solids/gases that replicate, to the extent practical, the normal operating process medium.

Startup

The process of placing or restarting a facility or major modification in operation. The process may start with the checkout, test, calibration, trial, demonstration, and verification steps on individual components of mechanical and electrical equipment and ends with release for normal operation to Facility Operations.

Subsystem

A group of assemblies or components or both combined to perform a single function.

System

A group of components united by some interaction or interdependence but functioning as a single unit.

System Index

A listing of systems which represent the scope of the facility project that are being added new or modified.

System Test Phase

Tests performed before hot run testing of systems and facilities using nonhazardous/nonradioactive operating fluids/solids/gases under various operational plateaus. These tests confirm the design basis and demonstrate, to the extent practical, that the facility will operate in accordance with design and is capable of responding as designed to anticipated transients and postulated accidents as specified in the SAR and design basis documents. These tests should consider operational stability/control of systems at various levels of operation, designed transients, loss of offsite power testing, proper response in emergency scenarios, and permit compliance verification. These tests allow testing without systems being contaminated and simplifying repair and corrections.

### Temporary Modification Log

A sequential listing of all temporary modifications within a particular Startup system which identifies the installed and restored status of the temporary modification.

### Test Change Request (TCR)

The TCR is used to identify, describe, evaluate, and approve test procedure changes and to document resolution of unanticipated conditions that are encountered during the implementation of test procedures.

### Test Change Request Log

A log that provides unique individual sequentially numbered Test Change Requests for each test procedure.

### Test Deficiency

Any condition during which:

- \* Tested equipment or systems fail to operate and require corrective maintenance.
- \* Tested equipment or systems operate in a suspected adverse manner.
- \* Tested equipment or systems operate outside the limits of documented acceptance criteria.
- \* Tested equipment or systems fail a visual inspection.
- \* Tested equipment is NOT available to operate throughout duration of test.
- \* Tested procedure problems were identified in the step(s) being tested.

### Test Deficiency Report

A documented report of identified test deficiencies that effect conducting a test procedure.

### Test Director

A Test Director is usually a senior Startup Test Group Supervisor assigned to be in charge of a major Startup testing event. Examples of a typical Test Director would be the person in charge of the Hot Functional Test Procedure. The Test Director may have several Lead Startup Test Engineers assisting him/her during the execution of a major Startup event.

### Test Procedure

All Startup Test Procedures and any Plant Procedures that are being conducted under the Startup Test Program requirements.

### Test Review Board (TRB)

The TRB is responsible for the technical adequacy of the Startup testing program. This group will perform the necessary assessments to ensure testing is adequately completed.

### Test Specifications

Specifications will establish test requirements and parameters for all levels of tests performed on major components, subsystems, or systems as applicable to ensure that essential design, interface, and performance requirements are met.

### Test Summary Reports

A comprehensive summary report of Startup test procedure results that provide final approval of test results.

### Transient Testing

This test confirms that piping systems, restraints, components, and supports have been designed adequately to withstand the flow, induced dynamic loading during operational, transient, and standby state conditions anticipated during service. Transient tests verify systems controls respond as designed or transient operational conditions.

### Turnback

Work to be performed by the Construction Management Department on a Project/Work Authorization Document (WAD) that has been previously turned over to Startup. Jurisdictional control of the work to be performed is returned to Construction. The "scope of work" should remain the same unless approved by the PM/Custodian within the original turned over Project/WAD "scope of work" boundaries and construction work activities shall be performed and controlled by reference to the original Project/WAD design requirements.

### Work Authorization Document (WAD)

The form containing a scope of work and authorized dollar amounts, milestones, and due dates. The document authorizes the performing organization to execute a defined scope of work, establish, change, and charge activity codes. The WAD document accommodates annual and multi-fiscal year definition and authorization of tasks.



Work Package

A collection of documents used to authorize, document, and provide instruction for the performance of maintenance, testing or modification activity. The work package may include, as applicable, design changes, job scope, retest requirements, parts lists, data sheets, applicable procedures, etc.

Working Copy

A copy of the approved original test procedure marked "WORKING COPY (n)" that is used by the Test Engineer(s) in the field.

**APPENDIX A**

**Westinghouse Hanford Company  
Cross-Site Transfer System**

**Startup Administrative Procedures Checklist**

- 1.0 The Startup Administrative Procedures Checklist will be prepared to verify procedures are in place to control the conduct of the W-058 Startup and Test Program activities. The checklist will integrate WHC and W-058 procedures and requirements. The checklist will consist of three sections; Custody Controls, Work Controls and Testing Controls. Each section of the checklist will identify the procedures that direct the conduct of W-058 testing activities. The three sections are:
- CUSTODY CONTROLS - This section consists of procedures that govern the conduct of Startup System Scoping, System Turnover Walkdowns, System Turnover and Acceptance process, master tracking system, turnback to construction, and release to operations activities.
  - WORK CONTROLS - This section consists of procedures that govern the conduct of engineering issues management, requests for construction assistance, requests for operations assistance, control of temporary modifications, control of Measuring and Test Equipment (M&TE), Lock and Tagout, Work Management, and Master Tracking System.
  - TESTING CONTROLS - This section consists of procedures that govern the conduct of test procedure preparation and approval, test procedure implementation, post testing review and approval, and post maintenance testing.

2.0 CUSTODY CONTROLS

2.1 STARTUP SYSTEM SCOPING

This procedure consists of refining existing Project Scoping Boundaries to accurately define testable packages of equipment and systems that will become the basis for preparation of Turnover Packages by construction contractors. The scoping will be identified with, and consistent with, the W-058 Contractor Work Breakdown Structure (CWBS) and the Startup Testing Schedule.

## 2.2 STRUCTURES, SYSTEMS AND COMPONENT (SSC) TURNOVER/TURNBACK FROM/TO CONSTRUCTION

This procedure will provide instructions and establish responsibilities for the transfer of new or modified SSC from construction to CSTS Startup and turnback of the same from Startup to construction. This includes identification of requirements for Turnover Package contents, the Turnover Walkdown process, Turnover/Turnback process documentation and custody tagging. This procedure will apply to new construction, Engineering Change Notices, modifications, and additions to W-058 SSC.

## 2.3 RELEASE TO OPERATIONS

This procedure will provide instructions and establish responsibilities for the transfer of SSC from Startup to Tank Farm Operations. This includes identification of requirements for Turnover Package contents, the Turnover process, dispositioning of any outstanding Punchlist items and interfaces with the Readiness Review process and Initial Hot Operations.

## 3.0 WORK CONTROLS

### 3.1 CONTROLLED ACCESS

This procedure will impose requirements for Startup and W-058 Operations interfaces on Operations controlled SSC and any other designated areas.

### 3.2 LOCKOUT/TAGOUT PROCEDURE

This procedure will provide instructions to Startup Engineers regarding how to implement Lock and Tag Procedures.

### 3.3 DESIGN CHANGE REQUEST

This procedure will provide instructions to Startup Engineers on how to initiate and process a Design Change through ICF Kaiser Hanford Company Engineering. The procedure will include Design Changes to clear Test Deficiency Reports, and design changes considered by Startup as necessary for component or system improvement.

### 3.4 STARTUP TEST PROGRAM PLANNING/SCHEDULING

This procedure will describe the planning and scheduling activities performed by Startup and how these activities interface with ICF Kaiser Hanford Company Construction Management and Tank Farm Operations.

### 3.5 READINESS REVIEW REQUIREMENTS

This procedure will detail the requirements of Startup for complying with DOE Order 5480.31, *Startup and Restart of Nuclear Facilities* (DOE 1993); its companion RLID 5480.31, *Startup and Restart of Facilities Operational Readiness Review and Readiness Assessments*.

### 3.6 STARTUP ORIGINATED WORK ORDERS

This procedure will provide instructions to Startup Engineers on the process for requesting work from ICF Kaiser Hanford Company Construction Management and from Tank Farm Operations.

### 3.7 CONTROL OF TEMPORARY MODIFICATIONS DURING TESTING

This procedure will provide instructions to Startup Engineers on how to document and control temporary modifications to installed SSC that are used to facilitate testing activities.

### 3.8 CONTROL OF MEASUREMENT AND TEST EQUIPMENT (M&TE)

This procedure will provide instructions to Startup Engineers on obtaining and using Project M&TE. The procedures will ensure that Startup utilization of M&TE is in accordance with the WHC Quality Assurance Manual, WHC-CM-4-2.

## 4.0 TESTING CONTROLS

### 4.1 PREPARATION, REVIEW, APPROVAL, AND MODIFICATION OF PRE-OPERATIONAL AND OPERATIONAL TEST PROCEDURES

This procedure will include review and approval, formatting, and controlled distribution requirements. This will include rules for establishment and conduct of the TRB.

4.2 REVIEW AND APPROVAL OF CONSTRUCTION  
ACCEPTANCE TEST PROCEDURES

This procedure will address Startup's interface responsibilities for the review and approval of the Construction Acceptance Test Procedures.

4.3 CONDUCT OF TESTING

This procedure will provide instructions to establish a uniformly controlled methodology for performing Startup tests to ensure that testing activities are executed consistent with high quality "conduct of operations."

4.4 SHIFT TURNOVER

This procedure will provide instructions to Startup Engineers on appropriate shift turnover conduct, and it will include mandatory shift turnover documentation and Test Engineer interface with Tank Farm Operations.

4.5 TEST DEFICIENCY REPORTING AND RESOLUTION

This procedure will provide instructions to Startup Engineers on how to identify, classify, report, and resolve deficiencies identified during the performance of testing activities. The procedure will also establish requirements for post maintenance testing.

4.6 REVIEW, APPROVAL, AND DISPOSITION OF TEST RESULTS

This procedure will provide requirements for the final review, approval and disposition of the test results.

S/U Test Activity	WHC Manual/Document	Implementing Procedure	Comments
2.1 Startup System Scoping	WHC-SD-W058-SUP-001, W-058 Startup Plan		
2.2 SSC Turnover or Turnback From or To Construction	WHC-CM-6-2, Project Management	PM-21, Project Acceptance and Closeout	
2.3 Release To Operations	WHC-CM-6-2, Project Management	PM-21, Project Acceptance and Closeout	
3.1 Controlled Access	WHC-CM-1-6, Radiological Control Manual	WHC-IP-0842, Vol. II, Section 3.1 Access Control For Hazardous Facilities	
3.2 Lockout/Tagout Procedure	WHC-CM-1-10, Safety Manual	WKS 8.1, Operations Lock and Tag Program, WKS 8.2 Construction Lock and Tag, WHC-IP-0842, Vol. II, Section 4.9.1, Lockout/Tagout	
3.3 Design Change Request	WHC-CM-6-1, Standard Engineering Practices.	EP-2.2, Engineering Document Change Control Requirements	
3.4 Startup Test Program Planning and Scheduling	WHC-CM-6-2, Project Management	PM-23, Project Plan.	
3.5 Readiness Review Requirements	WHC-CM-1.5, Standard Operating Procedures	Section 1.2, Operational Readiness Reviews	
3.6 Startup Originated Work Orders	WHC-CM-1-8 Work Management WHC-CM-6-2 Project Management	For WHC use JCS For KEH use LOI per PM-10	
3.7 Control of Temporary Modifications During Testing	WHC-CM-1-8, Work Management	IP-0842, Vol. V, Section 6.1, Temporary System Alteration and Restoration	

S/U Test Activity	WHC Manual/Document	Implementing Procedure	Comments
3.8 Control of. M&TE	WHC-CM-4-2, Quality Assurance Manual, QR 12.0, Control of Instruments	IP-0842, Vol. V, Section 3.8, Control and Calibration of Measuring and Test Equipment	
4.1 Preparation, Review, Approval, and Modification of Pre-Operational and Operational Test Procedures	WHC-CM-6-1 Standard Engineering Practices	IP-0842, Vol. II, SECTION 4.16.2 Preparing, Reviewing and Approving Operating Documents.	
4.2 Review and Approval of Construction Acceptance Test Procedures	WHC-SD-W058-SUP-001, Cross-Site Transfer System Startup Plan.	WHC-SD-W058-MP-001, Cross-Site Transfer System Management Plan.	
4.3 Conduct of Testing	WHC-CM-6-1, Standard Engineering Practices.	EP-4.2, Testing Requirements.	
4.4 Shift Turnover	DOE Order 5480.19, Conduct of Operations Requirements For DOE Facilities, Chapter XII, Operations Turnover.	IP-0842, Vol. II, Section 4.12.1, Turnover of Shift Responsibility	
4.5 Test Deficiency Reporting and Resolution	WHC-CM-4-2 Quality Assurance Manual	SECTION 15 NON CONFORMING ITEMS (NCR)	
4.6 Review, Approval, and Disposition of Test Results	WHC-CM-6-1, Standard Engineering Practices	EP-4.2, Testing Requirements.	

**APPENDIX B**

**PROJECT W058  
Westinghouse Hanford Company  
Replacement of Cross-Site Transfer System**

**Work Breakdown Structure Element Descriptions**

**1.5 FACILITY STARTUP/INITIAL OPERATIONS**

The following are descriptions of the CSTS Startup WBS elements. Major work activities in this WBS element are:

- Startup Administrative Management
- Startup Work Management
- Startup Support Management
- Startup Engineering Management
- Plant Readiness Review Preparation
- Operational Testing/Operations Support

**1.5.1 STARTUP ADMINISTRATIVE MANAGEMENT**

This WBS element provides overall Administrative Management of Startup activities. This includes work activities required to provide for test procedure technical review and editing, Staffing and Training, Performance Evaluations and Management Reporting, Records Management, and establishment and closeout of the Startup Plan including documentation of Lessons Learned.

**1.5.1.1 General Administration**

This WBS element covers all General Administrative work and costs not covered elsewhere in this WBS. This may include, but is not limited to, budget planning, negotiations with contractors, safety and security initiatives, travel, purchases of office supplies, computer maintenance, personal protective equipment, portable radios, cellular phones, etc.



#### 1.5.1.2 Staffing

Costs to identify and acquire test and support personnel, both internal and external to WHC/ICF KH, will be tracked by this element. This will include interviews and related paperwork, contracting costs for vendor supplied test personnel, and associated travel and relocation costs.

#### 1.5.1.3 Training

This includes all training necessary to qualify and document Startup staff to the CSTS Qualification and Training Plan.

#### 1.5.1.4 Test Review Board Administration

The TRB will consist of a Chairman, a TRB Administrative Assistant, and representation from CSTS Startup, Operations, Architect-Engineering, CSTS Project Engineering, CSTS Safety, CSTS Quality Assurance, and others as appropriate. The TRB will perform detailed technical review before and after test execution, and recommend approval of test procedures, major test procedure changes, Test Deficiency Reports and Test Summary Reports to the Manager, CSTS Startup.

#### 1.5.1.5 Clerical and Word Processing

This includes word processing support for test procedure preparation, startup file maintenance, data base management for punchlists, and other startup clerical activity.

#### 1.5.1.6 Performance Evaluation and Reporting

This element includes weekly, monthly, quarterly or as otherwise required, measurement, evaluation, and reporting of Startup's scope, cost, schedule and technical performance. This will include both internal and external appraisals.

#### 1.5.1.7 Records Management

This WBS element includes all work activities required to establish and maintain the startup file system, and a startup records management and document control system that maintains and controls startup turnover documentation, test procedure records, maintenance documentation, and startup system files that are not controlled by other WHC or CSTS Record Management Systems.

#### 1.5.1.8 Lessons Learned and Closeout

This WBS element includes review of Lessons Learned from other project startup(s) that are relevant to CSTS Startup and issuing a report detailing how those lessons are factored into the CSTS Startup Plan. The work required to compile and document Startup's historical record and to closeout Startup's technical and financial documentation. The historical information will be collected and summarized on a periodic basis to benefit on-going CSTS startup work and assist future projects.

#### 1.5.2 STARTUP WORK MANAGEMENT

This element consists of all activities necessary to manage and control Startup's scope of work. This includes identification and control of Startup's work scope, establishment and implementation of work controls, planning, scheduling, and management of all startup work.

##### 1.5.2.1 Startup Plan

This WBS element develops and maintains a plan for all anticipated Startup work activities. The Startup Plan is required for the CSTS Project by DOE Order 4700.1. The Plan describes Startup organizational responsibilities, work planning, integration of Startup activities with other CSTS Project participants, Startup Management Systems, and integration with PRR and Initial Hot Operations.

##### 1.5.2.2 Test Commitment List

The CSTS TCL is a compilation of testing requirements deemed necessary to verify CSTS Structures, Systems and Components (SSC) satisfy their functional requirements and to ensure compliance to numerous DOE and code requirements for testing. In addition, the TCL is formal documentation of the CSTS testing scope of work. Revisions to the TCL represent testing scope of work changes that can be cost estimated and tracked for their impact on the CSTS Project. This WBS element consists of the work scope necessary to compile and maintain the TCL throughout the course of the CSTS Project.

##### 1.5.2.3 Testing Interface Diagram

The TID identifies specific testing activities, their associated test program phase, and the participant organizational responsibilities for their accomplishment. This WBS element consists of the work scope necessary to develop and maintain the TID. Appendix C presents a typical TID format.

#### **1.5.2.4 Startup Procedures**

This WBS element develops and maintains any new Startup Procedures. Approved WHC administrative or engineering procedures will be followed in the preparation of CSTS test procedures. Project specific procedures will be prepared only if needed.

#### **1.5.2.5 SSC Turnover and Acceptance Management**

This WBS element covers Startup's participation in the process of formal transfer of jurisdictional custody of CSTS SSC between Construction and Startup. The work scope for this element includes establishing construction turnover package scope and boundary definitions, coordinating turnover package reviews and SSC walkdowns for deficiency punchlisting and resolution, coordinating SSC turnback to construction for modifications and deficiency resolutions, and establishing and maintaining custody controls for work management and safety. Startup will assign a lead coordinator to interface with construction for these activities. Startup Test Engineer participation in these activities is described in Section 1.5.4.3.

##### **1.5.2.5.1 Startup System Scoping**

This work scope consists of refinement of System Scoping boundaries to accurately define testable packages of equipment and systems. The refined scoping will serve as a basis for test schedule development, preparation of turnover packages by construction contractors and development of testing and operating procedures.

#### **1.5.2.6 Schedule Management**

This WBS element covers Startup schedule planning, development and implementation activities. The Startup schedule consists of two major parts:

- ^ PLANNING AND SUPPORT SCHEDULE - This schedule maps out all support work for the Startup Plan. This includes planning and support activities by Startup and other CSTS participants such as WHC matrixed organizations, Hanford contractors and the CSTS A-E, construction contractors and vendors. This schedule is integrated with the CSTS Project/Construction Schedule to assure that Startup support is budgeted for, and included in, Project activities.
- ^ TURNOVER AND TESTING SCHEDULE - This schedule is a detailed system by system sequence of activities critical path network that is integrated into the CSTS Project/Construction Schedule. This schedule establishes SSC turnover dates and maps out logical and sequential test activities to assure that CSTS SSC meet their functional requirements. This schedule is a detailed subset of the Planning and Support Schedule.

Planning and Initial Testing Schedule Development consists of developing detailed Startup sequences of work activities arranged into logical progressions of discrete work packages. These are often referred to as Fragmented Networks (FRAGNETS). Startup system FRAGNETS are tied to each other by their respective system and operational interdependencies. FRAGNETS become the Startup testing schedule after they are resource loaded, time constrained, and tied into the CSTS Project/Construction Schedule. FRAGNET logic is also used to define test procedure scope of work boundaries (see Startup System Scoping above).

Startup Scheduling Management consists of continuously gathering construction turnover and Startup progress information and updating their relevant schedules. This includes development of schedule work around to minimize overall project and cost impacts and providing continuous feedback via appropriate schedule and punchlist media to all affected Project participants.

#### **1.5.2.7 Punchlist Management**

Punchlist Management is a WBS work activity that gathers outstanding bits and pieces of work scope, consolidates them into meaningful integrated work packages and schedules, and expedites their completion. The bits and pieces of work scope usually are unfinished remains of construction turnover packages, test deficiencies requiring resolution, or any other item, of whatever origin, that restrains successful conclusion of the CSTS Project.

#### **1.5.3 STARTUP SUPPORT MANAGEMENT**

This WBS element consists of support activities necessary for Startup to carry out its responsibilities. This includes activities that provide Equipment and Materials Support, Construction Craft Support, Operations and Maintenance Support, Vendor Service Support, Procedure Development Support, Test Specification Development and Startup Services Support. Each of these support functions is described in the following WBS breakdowns. It is intended that these support activities will be coordinated through a single organizational unit within Startup to provide a single point of contact within Startup for organizations that provide the services.

##### **1.5.3.1 Equipment and Material Support**

This WBS element includes the activities and associated cost to provide/coordinate Startup Spare Parts, Consumables, M&TE and Special Preparations and Restorations. A Startup Warehouse Coordinator will ensure that Startup testing materials and equipment is ordered, received, appropriately stored at the CSTS warehouse, and expeditiously issued to support Startup test and maintenance activities.

#### **1.5.3.1.1 Spare Parts and Test Material Management**

It is expected that the CSTS Project, through its Construction Manager (CM), will warehouse and control all CSTS Spare Parts that are provided by the project. Spare parts include but are not limited to such items as seals, belts, gears, bearings, special hardware, valves, and instrumentation components. Testing support materials will be specified by Startup and procured, received, stored, and issued by CM to Startup to support testing. Test materials include but are not limited to items such as pipe, blanks, plugs, flanges, signs, tags, gaskets, hardware, and other general purpose commodities as required. The Startup Warehouse Coordinator will interface with CM's Warehouse Management to control spare part and test material inventory and dispersment.

#### **1.5.3.1.2 Startup Consumables Management**

Testing Support Consumables will be specified by Startup and procured, received, stored, and issued by CM to Startup to support testing. Testing Consumables include but are not limited to items such as compressed gases (nitrogen, argon, breathing air, and laboratory calibration gases), simulants, chemicals, rope, tape, vendor recommended lubricants, and other general consumables as required. The Startup Warehouse Coordinator will interface with CM's Warehouse Management to control consumables inventory and dispersment.

#### **1.5.3.1.3 Measurement and Test Equipment (M&TE)**

Measurement and Test Equipment (M&TE) will be procured, received, stored and calibrated, and insured by the CM to Startup to support testing and maintenance of CSTS SSC. All M&TE shall be selected, procured, calibrated and controlled in accordance with the WHC Quality Assurance Program. The Startup Support Management organization will be the interface point of contact for M&TE.

#### **1.5.3.1.4 Special Preparations and Restorations**

Special Preparations and Restorations include engineering, procurement, installation, and removal of special (once-of-a-kind) installations to facilitate testing. This could include temporary piping, power, lighting, access platforms, and special jumpers. Startup shall identify/specify the need for special preparations/restorations as early as practical. Engineering of these installations will be under the direction of Startup. Any of the CSTS participants may perform engineering, procurement, installation and removal of special preparations as appropriate to the specific situation.

#### 1.5.3.2 Construction Craft Support

This WBS element includes activities necessary to maintain, trouble shoot, and support pre-operational testing of equipment and systems after construction turnover to Startup but prior to Start of Initial Operations. Startup intends to utilize CSTS plant maintenance forces to perform these activities to the maximum extent that they can support the work. However, plant forces may not be available to the extent necessary to support the startup schedule especially during the early phases of the test program. In order to avoid any potential delay due to lack of sufficient craft support, Construction Crafts will be provided by the CSTS CM. Startup will provide direction and CM will provide management of the crafts. Startup will designate a Construction Crafts Coordinator to provide single point interface with the CM.

#### 1.5.3.3 Operations/Maintenance Support

This WBS element covers CSTS Operations and Maintenance Support during pre-operational testing. Startup intends to utilize CSTS operators, crafts and technicians to the maximum extent possible for system lineups, equipment and system operations, maintenance, trouble shooting and testing support. Startup will provide direction and CSTS Operations will provide management of the plant personnel. Startup and CSTS Operations will coordinate the utilization of CSTS personnel through appropriate approved work control procedures.

#### 1.5.3.4 Vendor Service Support

This WBS element covers coordination of Vendor Service Support provided by CSTS Project contracts and acquisition of vendor services not covered by project contracts. It is expected that the CSTS Project, through its Construction Manager (CM), will arrange for, and coordinate all vendor services, that are provided by the CSTS Project under the base project contract, its CM and subcontractors. Startup will require the services of some of the same vendors during pre-operational testing. Startup will designate a Vendor Services Coordinator to provide single point interface with the CM for obtaining and coordinating Project provided vendor services to Startup. Acquisition of vendor services for Startup not covered by Project procurement contracts will be managed by the Startup Vendor Services Coordinator. The Startup Vendor Services Coordinator will have the option of contracting for these vendor services separately or requesting the Project CM obtain them for Startup, but in either case will coordinate with the Project CM to maintain consistent communications with the vendor(s).

#### 1.5.3.5 Procedure Development Support

This WBS element provides for development of operating, maintenance, and calibration procedures. These procedures are required for support of the Startup Plan to ensure that SSC are properly maintained, calibrated and operated. Startup will manage (coordinate) the development and approval of the procedures but not necessarily write them. The procedures may be written by CSTS Operations, Startup, CSTS A-E Designers, or other WHC support organizations. Input to the procedures will be provided by CSTS Designers, Startup, CSTS Operations, and equipment vendors. All procedures will be subject to review and approval by CSTS Operations, Startup, Safety, Quality Assurance, Regulatory and, in some cases, by CSTS Designers.

#### 1.5.3.6 Test Specification Development

This WBS element addresses development of Test Specifications by other agencies external to Startup. These documents are typically generated by the Project A-E and consist of a testing outline, prerequisite conditions, limiting conditions and precautions, a generalized methodology and acceptance criteria. Test Specifications normally do not include detailed facility lineup requirements, detailed step by step instructions or component data.

#### 1.5.3.7 Startup Services Support

This WBS element provides for acquisition and management of Startup Services not provided by Startup. Startup may outsource some of its work scope to other organizations depending on availability of CSTS resources and cost effectiveness. This could include outsourcing to other WHC organizations, other Hanford contractors, and contractors external to Hanford. All organizations and their personnel will conduct their business in conformance to the same procedures that Startup and the CSTS Organization are required to adhere to.

#### 1.5.4 STARTUP ENGINEERING MANAGEMENT

This WBS element encompasses all the essential activities of Startup Engineering. It spans the following activities:

- Reviews of Design, Procurement Specifications, Acceptance Test Procedures and Contractor Submittals.
- Witnessing and/or Verification of FAT and CAT.
- Participation in the SSC Construction to Startup turnover process. This includes SSC walkdowns and deficiency Punchlist generation, turnover package reviews and SSC acceptance into Startup custody.

- Pre-Operational Test Procedure development, performance, and test deficiency resolution.
- Maintenance and trouble shooting SSC while in Startup custody.
- Supporting the Readiness Review process.
- Operational Test Procedure development, performance and deficiency resolution during Initial Hot Operations.
- Support for Initial Operations.

#### **1.5.4.1 Startup Engineering Reviews**

This WBS element includes Test Engineering Review of CSTS SSC Designs, Procurement Specifications, Contractor Submittals and ATPs.

##### **1.5.4.1.1 Design Reviews**

This WBS element covers Test Engineering Review of CSTS SSC Designs to determine their testability, assess their testing requirements and determine test equipment/materials and estimate of labor and schedule required to perform Startup. This includes consideration of items such as adequacy of balancing dampers, appropriate instrumentation type and location, adequate piping configuration to support flushes, hydrostatic tests, and system functional test requirements, sufficient isolation capability from other SSC, availability of special tooling, sufficient access provisions to equipment that requires frequent surveillance, provision of adequate local control to permit parallel testing of the Distributed Control System (DCS), and provision for manual override of automatically controlled equipment/systems.

##### **1.5.4.1.2 Procurement Specification Reviews**

This WBS element covers Test Engineering Review of Procurement Specifications to determine what the FAT requirements are, assess the adequacy of the FAT requirements, and factor those requirements into field testing requirements, and determine what, if any, startup witness and/or verification requirements need to be included in the FAT specifications. Procurement Specifications will also be reviewed to see if proper testing codes and standards being required and if adequate startup spare parts, technical manuals, and Operating and Maintenance Procedures/Instructions are specified.



#### 1.5.4.1.3 Contractor Submittal Reviews

This WBS element provides for Test Engineering Review of Contractor Submittals to verify that the testing considerations noted in 1.5.4.1.1 and 1.5.4.1.2 above have been acceptably incorporated.

#### 1.5.4.1.4 Acceptance Test Procedure Reviews

This WBS element addresses Test Engineering Review of ATPs to determine if the testing requirements are necessary and adequate, if the test method is proper, if all or some portion of the ATP should be performed during pre-operational testing by Startup, what, if any Startup witness points need to be included, and what, if any, Startup support requirements might be such as operating permanent plant equipment. The review will ascertain that all necessary testing is accounted for by testing performed at the factory, by construction or by Startup. The review will also verify that the ATP method preserves the SSC integrity, e.g., the method stays within prescribed temperature, pressure, chemistry, voltage, etc., limitations.

#### 1.5.4.2 Acceptance Test Witness/Verification

This WBS element addresses Startup Test Engineer Witness and/or Verification of FAT and CAT. The term "witness" as used here means the Startup Test Engineer will be present to confirm satisfactory performance of a test/checkout as it is being performed by another party. The term "verify," as used here, means that the Startup Test Engineer has the option of confirming satisfactory performance of the test/checkout by either witnessing its performance or by visual and/or document review after its performance.

#### 1.5.4.2.1 Construction Acceptance Testing (CAT)

This WBS element addresses Startup's participation in CAT. Startup will witness selected CATs and verify most others. Responsibilities for performance of CATs and identification of which CATs are to be witnessed and/or verified will be delineated on the CSTS TID (see WBS Description 1.5.2.3). In some cases, Startup Test Engineers will be an integral part of CAT activity. Examples of this include Heating, Ventilation, and Air Conditioning (HVAC) balancing of the support facility, DCS component testing, and CAT that requires operation of permanent plant equipment for support of velocity flushing with in-line pumps. These integrated construction/startup test activities will also be identified on the Testing Interface Diagrams.

#### 1.5.4.3 SSC Turnover and Acceptance

This WBS element describes Startup Test Engineering's participation in the CSTS construction turnover of SSC's to Startup and Startup's acceptance of them. This includes participation in construction walkdowns, turnover package reviews, and deficiency punchlist identification and resolution. Startup Test Engineers will work closely with the Startup Lead Turnover Coordinator and CM to effect an efficient turnover/turnback process by participating in establishing system scoping boundary definitions, reviewing and approving turnover package contents, participating in SSC completion walkdowns to identify punchlist deficiencies, working with the Startup Turnover Coordinator (see WBS 1.5.2.5) to implement CSTS SSC custody controls.

#### 1.5.4.4 Pre-Operational Testing

This WBS element includes Pre-Operational Test Procedure Preparation and Performance, testing deficiency resolution and retest, and SSC maintenance and trouble shooting.

#### **1.5.4.4.1 Pre-Operational Test Procedure Preparation**

This WBS element includes development, review, and approval of Pre-Operational Test Procedures. These approved written procedures specify prerequisites, special equipment, precautions, steps to be followed during conduct of testing, and acceptance criteria. Pre-Operational Test Procedures are developed to provide a sound technical methodology for sequentially testing SSC to verify they perform their intended design function(s) in accordance with CSTS Functional Design Criteria and other relevant design, code and regulation media. Qualified and trained Startup Test Engineers and Operations personnel will prepare Pre-Operational Test Procedures. The CSTS Test Review Board will review and recommend approval of new test procedures or changes to existing test procedures, for implementation, to the Manager, Startup. Pre-Operational Test Procedures will be developed and approved at least three (3) months prior to their scheduled performance date.

#### **1.5.4.4.2 Pre-Operational Test Procedure Performance**

This WBS element includes conduct of pre-operational testing, trouble shooting and test deficiency identification, implementation of deficiency resolution(s) and retesting to verify acceptability of deficiency resolution(s). Pre-operational testing is required to verify SSC conformance to Pre-Operational Test Procedure acceptance criteria. Qualified and trained Startup Test Engineers and Operations personnel will perform testing, identify deficiencies, and resolve and/or assist coordination of their resolution. CSTS Operations and Maintenance, Construction, A-E, vendor or others, as appropriate, may also participate in trouble shooting and test deficiency resolution. Pre-operational testing will begin approximately five (5) months prior to Start of Initial Operations. Some portions may begin sooner on the DCS, HVAC or other significant Structures, Systems and Components (SSC) as necessary. All pre-operational testing will be identified on the Startup Schedule (WBS 1.5.2.6).

#### **1.5.5 PLANT READINESS REVIEW PREPARATION**

This WBS element includes support for PRR preparations and execution. The emphasis of this support is expected to concentrate on Physical Plant Readiness, i.e., verification that all required design, construction, inspection, testing and documentation is complete and that SSC are fully operable, emphasis on Personnel Readiness, i.e., Operator Training and Management Systems Readiness, Operating and Maintenance Procedure validations and Dry-Run demonstrations with simulated tank waste, and emphasis on Management Systems Readiness, i.e., organizational and administrative systems.

#### **1.5.5.1 Plant Readiness Review Planning**

This WBS element includes preparing a plant readiness plan, establishing the Readiness Review Board and developing the Plant Readiness Review implementation plan. The PRR process should start 18 months prior to the Start of Initial Operations. The PRR Planning process culminates with the start of Management Systems Readiness (WBS #1.5.5.3) and the start of Personnel Readiness (WBS #1.5.5.4).

#### **1.5.5.2 Plant Readiness Team Management**

The Plant Readiness Team Management reviews and validates CSTS readiness certification packages, documents that CSTS is ready for operation and presents certification packages to the Readiness Review Board. The Plant Readiness Team must start upon completion of Plant Readiness Review Planning (WBS #1.5.5.1) and finish coincident with the Start of Initial Operations. This activity will include a Management Self-Assessment (MSA) to verify CSTS Readiness prior to Declaration of Readiness to the DOE. It is expected that readiness review preparations will be a concurrent activity to pre-operational testing and post testing documentation review and approval.

#### **1.5.5.3 Management Systems Readiness**

This WBS element includes initiation and completion of actions necessary to address management systems readiness. Startup will prepare affidavits certifying management systems readiness. Management Systems Readiness starts coincident with the finish of the PRR Planning (WBS # 1.5.5.1) and finishes (1) one month prior to the Start of Initial Operations.

#### **1.5.5.4 Personnel Readiness**

This WBS element includes initiation and completion of actions necessary to address personnel readiness. Startup will prepare affidavits certifying Personnel Readiness. Personnel Readiness starts coincident with the finish of the PRR Planning (WBS # 1.5.5.1) and finishes (1) one month prior to the Start of Initial Operations.

#### **1.5.5.5 Physical Plant Readiness**

This WBS element consists of initiation and completion of actions necessary to address physical plant readiness. Startup will prepare affidavits certifying Physical Plant Readiness. Physical Plant Readiness starts coincident with the start of Pre-Operational Testing Performance (WBS # 1.5.4.4.2) and finishes (1) one month prior to the Start of Initial Operations.

#### **1.5.5.6 Implementation Teams Management**

This WBS element consists of review, status and expedite timely completion of certification packages. CSTS readiness lines of inquiry will be grouped into "Team Topics," assigned Team membership and provided with a designated management sponsor. The Teams will resolve all constraints to satisfactory completion of their assigned certification packages utilizing the collective empowerment of themselves and their management sponsor. Implementation Team starts coincident with the start of Pre-Operational Testing Performance (WBS # 1.5.4.4.2) and finishes (1) one month prior to the Start of Initial Operations.

#### **1.5.5.7 Pre/Post Start Punchlist Management**

This WBS element will consolidate and evaluate outstanding scopes of work, issues, etc., that restrain completion of certification packages and manage the pre-start list to zero items and the post-start list to an acceptable minimum number of items. Pre/Post Start Punchlist Management starts with the start of the Plant Readiness Team Management (WBS # 1.5.5.2) and finishes (1) one month prior to the Start of Initial Operations.

### **1.5.6 OPERATIONAL TESTING AND OPERATIONS SUPPORT**

This WBS element includes work scope to prepare and perform Operational Test Procedures and provide support to CSTS Operations during initial receipt of hot tank waste.

#### **1.5.6.1 Operational Test Procedure Preparation**

This WBS element includes development, review, and approval of Operational Test Procedures. These approved written procedures, specify prerequisites, special equipment, precautions, steps to be followed during conduct of testing, and acceptance criteria. Operational Test Procedures are developed to provide a sound technical methodology to verify CSTS systems and equipment perform their intended design function(s) in accordance with CSTS functional requirements and other relevant design, code and regulation media.

Qualified and trained Startup Test Engineers and Operations personnel will prepare Operational Test Procedures. The CSTS Test Review Board will review and recommend approval of test procedures, for implementation, to the Manager, Startup and the Manager, CSTS Operations. Operational Test Procedures will be developed and approved approximately three (3) months prior to their scheduled performance date.

### 1.5.6.2 Operational Test Procedure Performance

This WBS element includes conduct of operational testing, trouble shooting and test deficiency identification, implementation of deficiency resolution(s) and retesting to verify acceptability of deficiency resolution(s). Operational testing is required to verify CSTS SSC conformance to Operational Test Procedure acceptance criteria which includes operability checks and validation and/or verification of operating procedures. Qualified and trained Startup Test Engineers and Operations personnel will perform testing, identify deficiencies, and resolve and/or assist coordination of their resolution. CSTS Operations and Maintenance, A-E, vendors or others, as appropriate, may also participate in trouble shooting and test deficiency resolution. Operational testing will begin three (3) months prior to receipt of Start of Initial Operations and finish approximately three (3) months after the start of Initial Hot Operations. All operational testing will be identified on the Startup Schedule (WBS 1.5.2.6).

### 1.5.6.3 CSTS Initial Operations Support

This WBS element covers Startup support for Operations and Maintenance during Initial Hot Operations and Operational Testing. CSTS Operations will be responsible for all facility Operations and Maintenance. Startup support is essential during this phase due to the potential for failure of new systems and equipment. This provides a smooth transition from the startup phase to the operational phase of CSTS. Startup and CSTS Operations will coordinate the utilization of CSTS personnel through appropriate approved work control procedures.

APPENDIX C

WESTINGHOUSE HANFORD COMPANY PROJECT W058  
 CROSS-SITE TRANSFER SYSTEM  
 TESTING INTERFACE DIAGRAM

(updated 7/07/95, FTC)

Legend

CONST: Construction - Fabrication and Installation, Inspection, and Strength Integrity Phase

STARTUP: Startup System Testing Phase (Pre-tie-in)

OPERATIONS: Operations - Hot Run Testing Phase (Post-tie-in)

P: Perform. This appears in the column of the responsible party who will perform the test/checkout and the type of test/checkout that is required, e.g., for Loop Calibration, a "P" is in the Construction/Constr. Test column. Thus indicating that it is a Construction Test for Construction to perform.

V: Verify. This appears in the column of the responsible party who will verify the performance of a test/checkout by another party, e.g., again using Loop Calibration as an example, a "V" in the Facility Startup/Startup Test column indicates that Startup will verify the Construction performance of the Loop Calibration. This verification may be after performance and can be either visual or by document review. The verification will most probably be part of prerequisites required by the associated startup test.

W: Witness. This appears in the column of the responsible party who will be present to witness a test/checkout performed by another party. The requirement to witness a test/checkout will imply a hold point on that test checkout. Operations has prime responsibility for performing activity

V/W: Verify/Witness. Where this appears means that the party to which it applies may choose, at their discretion, to verify or witness the performance of another party for that particular test/checkout. In this case the witness choice should not imply a hold point.

S: Support. This appears in the column of the responsible party who will support the performance of a test/checkout by another party, e.g., operations will be expected to provide support (power operators to operate compressors, etc.) to Startup in the performance of Startup tests.

Activity	Program Phase			Clarification Reasons and Remarks
	Const.	Startup	Operations	
<b>ELECTRICAL</b>				
• Install all tray conduit, cable, and electrical equipment				Original Build
• Perform all hi-pot testing on initial installation of power cable				Commodity integrity test
• Perform meggering as needed to support cable installation				Commodity integrity test
• Initial termination of all cables				Original Build
• Point-to-point continuity check of field cables				Commodity integrity test
• Motor bump/run-in/vibration check (uncoupled)				Checks wiring from breaker to motor for proper phasing, checks that motor mounting and installation are proper and adequate, final check that bearings are undamaged from storage and verification of original build.

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Activity	Program Phase			Clarification Reasons and Remarks
	Const.	Startup	Operations	
• Communication system checkout				
• UPS testing				
• Scheme check				Wiring check to "as designed" schematic drawing.
• Weld receptacle checkout				Performed with permanent power
• Lightning protection and grounding systems test				
• Electrical heat trace test				
• Lighting and receptacle circuit verifications				Commodity integrity and configuration test
Circuit Breakers - 480V and Below				
• Install				Original Build
• Alignment check				This testing will identify the manufacturing defects and/or installation damage
• Mechanical trips				
• Calibrate protective relays				
• Electrical trip tests				
• Calibrate electrical meters				
• CT/PT testing involved with breakers				
Transformers (oil filled)				
• Installation, oil fill, and perform vendor test				Commodity integrity test
• Witness vendor tests				
• Initial energization				Performed by site elec. utilities
Initial Energization System - 480V and Below				
Standby Power				
• Install				GFE
• Test auto-transfer				After system energizing
• FAT				After A-E
Cathodic Protection				
• Install				Original build
• Test				ATP/OTP after all excavations re-covered
Motor Operated Valves (MOV's)				



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Activity	Program Phase			Clarification Reasons and Remarks
	Const.	Startup	Operations	
• Stroke - no load				Initial stroke is an integration of check, manual valve check, setting switches, controls and etc. Involves de-bugging of MOVs under no flow conditions.
• Stroke - with load				Must be checked with system conditions established (loaded)
INSTRUMENTATION & CONTROLS				
• Install all instrumentation and controls				Original Build
• Install all piping/tubing to control boards, instruments, etc.				Original Build
• Perform pre-installation check of instruments				
• Initial bench calibration of instruments (both electrical and instrumentation)				Where required by ATP
• Point-to-point verification I&C cable term and tubing				Commodity integrity test
Functional Checks				
• Loop calibration (5-point check)				Check the loop against a known input signal and verify design. Verify scheme and debug loop.
• HVAC instrumentation tube/pipe leak test				Commodity integrity test
• Computer and peripheries checkout				
• Plant security checkout				
• UPS testing				
DCS CHECKOUT				
• Digital/analog peripheral (up D/A cards)				Check the loop against a known input signal and verify design. Verify scheme and de-bug loop.
• Calibration of signal conditioning cards				
• Software verifications				Includes de-bugging. ATP by WHC.
• FAT				GFE, WHC witness.
• SAT				GFE, ATP by vendor & WHC.
• Initially energize and try digital control circuits				
• Initially energize and test analog loops				

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Activity	Program Phase			Clarification Reasons and Remarks
	Const.	Startup	Operations	
• Annunciator response during loop test				
• UPS testing				
PIPING				
• Install all plant pipe				Original Build
• Install all vents, drains, traps, etc.				Original Build
• Perform all pipe alignment				Original Build
• Install all hangers				Original Build
• Clean, inspect all piping to construction cleanliness standards				Original Build
• Perform initial hydros				Commodity integrity test
• Perform air leak test				Commodity integrity test
• Install/remove temporary pipe, equipment, and supports for flushing				
• Install strainers				
• Perform system flushing				Contractor to dispose of flush water. Coordinate permission
• Install and/or remove orifices to support Startup program				If required
• Install all manual valves				Original build
• Test and calibrate relief valves				Relief valves require calibration prior to placing in service
• Operate flushing equipment (non-perm plant)				Construction to operate temp equipment when assigned task. Operations to operate all other times.
• Test backflow prevention devices				Site water purveyor to designate procedures (state-approved)
• Disposal of flushing fluids and miscellaneous consumables				
• Perform in-service lead testing per design requirements				Construction to witness
Fire Protection Systems				
Fire Protection Interface				
• UPS testing				
MECHANICAL				
Rotating Equipment Run-In				

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Activity	Program Phase			Clarification Reasons and Remarks
	Const.	Startup	Operations	
• Align and couple (cold)				If required
• Initial run-in/vibration check				Identifies manufacturing and/or installation deficiencies (i.e., lack of grouting, bad bearing, etc.)
HVAC				
• Install HVAC				Original Build
• Pressure and structural testing of ventilation ducts				Commodity integrity test
• Cycle dampers (no flow)				Identify and resolve/report installation deficiencies/interfaces, original build, obstruction check
• Fan and coil unit testing				Identify and resolve manufacturing and/or installation deficiencies
• Manual stroking of auto and manual dampers				
• Fire damper testing				
• Flow damper testing				
• Isolation damper testing				
• Water balancing to support HVAC				If required
• Initial HVAC balancing				Identify and resolve total HVAC deficiencies
• Final HVAC balancing				Part of system functional test (OTP)
• HVAC systems functional testing				
• Room/zone confinement barrier isolation and integrity testing				Part of system functional test
HEPA & Charcoal Filters				
• Loading				OTP
• Testing				OTP
MAINTENANCE OF EQUIPMENT				
Preventive (prior to turnover)				
• Service/adjust/lube/rotate; check on routine basis				Original Build
Preventive (after turnover)				
• Write PM Procedures				Initiate early in project to support T/O
• Implement PM Program at T/O to Startup				PM Program to begin at T/O to Startup from Construction

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Activity	Program Phase			Clarification Reasons and Remarks
	Const.	Startup	Operations	
<ul style="list-style-type: none"> <li>Obtain equipment nameplate data to support PM Program</li> </ul>				Periodic throughout project phases as required
Corrective Maintenance				
<ul style="list-style-type: none"> <li>Prior to turnover</li> </ul>				Original Build
<ul style="list-style-type: none"> <li>After turnover</li> </ul>				
STARTUP SYSTEM TESTING				Demonstrates that structures, systems, and components will operate in accordance with design in all operating modes and throughout the full design operating range
<ul style="list-style-type: none"> <li>Manual operation</li> </ul>				
<ul style="list-style-type: none"> <li>Automatic operation</li> </ul>				
<ul style="list-style-type: none"> <li>Alternate or secondary mode of control</li> </ul>				Operation & verification test to demonstrate expected operations following loss of power sources and failures of components for which the systems are design to remain in operation
VERIFICATION OF:				
<ul style="list-style-type: none"> <li>Proper functioning of I&amp;C permissive and prohibit interlocks</li> </ul>				
<ul style="list-style-type: none"> <li>Equipment protective devices whose malfunctions or premature actuation may unnecessarily shut down or defeat the operation of systems or equipment</li> </ul>				
<ul style="list-style-type: none"> <li>Integrated system testing</li> </ul>				
Hot Run Test Program				
<ul style="list-style-type: none"> <li>Post-tie-in, design mediums</li> </ul>				Use OTP and Operations procedures for all modes
<ul style="list-style-type: none"> <li>Testing for permit compliance</li> </ul>				OTP as required
Special Tests				
<ul style="list-style-type: none"> <li>Stack monitor</li> </ul>				
<ul style="list-style-type: none"> <li>RAD monitor</li> </ul>				May require rad source (TBD)
Miscellaneous				
<ul style="list-style-type: none"> <li>Initial system chemical loading</li> </ul>				Glycol loading
<ul style="list-style-type: none"> <li>Chemistry lab support</li> </ul>				If required
Schedule Vendors				
<ul style="list-style-type: none"> <li>To support construction</li> </ul>				Original Build - to satisfy original purchase order
<ul style="list-style-type: none"> <li>To support Startup</li> </ul>				

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Activity	Program Phase			Clarification Reasons and Remarks
	Const.	Startup	Operations	
• Provide Startup spare parts				
• Perform safety walkdown (OSHA)				
• Tag/label components				Facility and Project to agree on scope

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