



U.S. Department of Energy
Office of River Protection

P.O. Box 450
Richland, Washington 99352

01-OSR-0492

Mr. Ron F. Naventi, Project Manager
Bechtel National, Inc.
3000 George Washington Way
Richland, Washington 99352

Dear Mr. Naventi:

CONTRACT NO. DE-AC27-01RV14136 – DESIGN PROCESS ASSESSMENT REPORT,
IR-01-009

From October 29 through November 6, 2001, the U.S. Department of Energy, Office of River Protection, Office of Safety Regulation (OSR) inspected the Bechtel National, Inc. (BNI) design process. Details of the inspection are documented in the enclosed inspection report (Enclosure 2).

The inspectors identified two Findings, documented in the Notice of Findings (Enclosure 1). The first Finding, failure to follow procedures, was comprised of three examples in which BNI failed to follow document review request procedures for Interface Control Documents, failed to document delegation of authority to approve Standards Identification Process Database entries, and failed to complete verification and validation testing on software prior to its entry onto the approved section of the Software Designation List. The second Finding was a failure to appropriately prescribe requirements for documenting calculation assumptions in procedures.

Notwithstanding the Findings cited above, the important-to-safety design process was controlled by, and conducted in accordance with documented instructions, procedures, and drawings.

If you have any comments concerning the inspection report, you may contact me or Pat Carrier of my staff, (509) 376-3574. Nothing in this letter should be construed as changing the Contract, DE-AC27-01RV14136.

If, in my capacity as the Safety Regulation Official, I provide any direction that your company believes exceeds my authority or constitutes a change to the Contract, you will immediately notify the Contracting Officer and request clarification prior to complying with the direction.

Sincerely,

Robert C. Barr
Safety Regulation Official
Office of Safety Regulation

OSR:RAG

Enclosures

NOTICE OF FINDING

Standard 7, "Environment, Safety, Quality, and Health," of Contract DE-AC27-01RV14136, dated December 11, 2000, between Bechtel National, Inc. (the Contractor) and the U.S. Department of Energy (DOE), defined the Contractor's responsibilities under the Contract as they related to conventional non-radiological worker safety and health; radiological, nuclear, and process safety; environmental protection; and quality assurance.

Standard 7, Section (e)(2)(ii) of the Contract required the Contractor to comply with the specific nuclear regulations defined in the effective rules of the 10 CFR 800 series of nuclear requirements.

Title 10 of the Code of Federal Regulations, Part 830, "Nuclear Safety Management," Subpart A, "Quality Assurance Requirements," required the Contractor to conduct work in accordance with the requirements of Subpart A and to develop a Quality Assurance (QA) Program that reflected the requirements of Subpart A.

The Contractor's QA Program was defined in 24590-WTP-QAM-QA-01-001, "Quality Assurance Manual," Rev. 0, dated August 2001 (QAM).

During performance of an inspection of the Design Process conducted October 29 through November 6, 2001, at the Contractor's offices, the OSR identified the following:

1. The QAM contained the policies that established the QA requirements for the project. QAM Policy Q-05.1, "Instructions, Procedures, and Drawings," Section 3.1.1 stated "Activities affecting quality shall be prescribed by and performed in accordance with documented instructions, procedures, and drawings of the type appropriate to the circumstance that include or reference appropriate quantitative or qualitative acceptance criteria for determining that prescribed activities have been satisfactorily accomplished."
 - a. Procedure K13P023_0, "Internal Review and Approval of Documents," Rev. 0, dated December 13, 2000, required document approval to include Document Review Request (DRR) documentation for required reviewers and the resolution of DRR comments to be indicated by the reviewer's signature or marked "Editorial Comments Only."

Contrary to the above, several Interface Control Documents (ICDs) approved on July 16, 2001, were missing DRR documentation for required reviewers or DRR comment resolution was not indicated by the reviewer's signature and/or marked "Editorial Comments Only." (Section 1.4, IR-01-009-01a-FIN)
 - b. Procedure 24590-WTP-GPP-PADC-002A, "Project Records Management," Section 3.3.3.3, stated, "Managers may communicate the Delegation of Authority through a memorandum or electronic mail."

Contrary to the above, as of November 1, 2001, the Environmental, Safety and Health Manager had not documented the delegation of authority to approve SIPD safety information. (Section 1.5, IR-01-009-01b-FIN)

- c. Procedure 24590-WTP-GPP-IT-001, Rev. 0, "Use of Quality Affecting Software Applications," stated, "Before release for use, Quality Affecting software is adequately validated and verified, controlled and documented such that comparable results can be obtained through independent replication of the process, and Quality Affecting Software is added to the Approved section of the Software Designation List prior to use."

Contrary to the above, the procedure was not adhered to in that the software entitled, "CFD – Fluent, FIDAP, Airpak," was not verified and validated (V&V) tested and approved for CSA use prior to its entry onto the approved section of the Software Designation List. (Section 1.10, IR-01-009-01c-FIN)

These three examples of failure to follow procedures, as described above, were considered a Finding.

2. The QAM contained the policies that established the QA requirements for the project. QAM Policy Q-05.1, "Instructions, Procedures, and Drawings," Section 3.1.1 stated "Activities affecting quality shall be prescribed by and performed in accordance with documented instructions, procedures, and drawings of the type appropriate to the circumstance that include or reference appropriate quantitative or qualitative acceptance criteria for determining that prescribed activities have been satisfactorily accomplished."

Contrary to the above, although QAM Policy Q-03.1 "Design Control," Section 3.5.5 stated "Documentation of design analysis shall include: ...D. Identification of assumptions and those that must be verified as the design proceeds," procedure 24590-WTP-3DP-G04B-00037A, "Engineering Calculations," took a less restrictive form in that these requirements were specified as "should" be included rather than "shall" be included. (Section 1.6, IR-01-009-02-FIN)

Failure to have an adequately prescribed procedure that reflects the QAM requirement was considered an inspection Finding.

The Office of Safety Regulation (OSR) requests that the Contractor provide, within 30 days of the date of the cover letter that transmitted this Notice, a reply to the Findings above. The reply should include: (1) admission or denial of the Findings, (2) the reason for the Findings, if admitted, and if denied, the reason why; (3) the corrective steps that have been taken and the results achieved, (4) the corrective steps that will be taken to avoid further Findings, and (5) the date when full compliance with the applicable commitments in your authorization bases will be achieved. Where good cause is shown, consideration will be given to extending the requested response time.

U.S. DEPARTMENT OF ENERGY
Office of River Protection
Office of Safety Regulation

INSPECTION: DESIGN PROCESS ASSESSMENT

REPORT NO: IR-01-009

FACILITY: Bechtel National Inc., River Protection Project – Waste Treatment Plant

LOCATION: 3000 George Washington Way
Richland, Washington 99352

DATES: October 29 through November 6, 2001

INSPECTORS: N. Hunemuller (Lead), Senior Regulatory Technical Advisor
R. Gilbert (Lead under instruction), Senior Regulatory Technical Advisor
C. Blanchard, Office of River Protection Interface Manager
R. Pate, Office of Safety Regulation Consultant
R. Cooper, Office of Safety Regulation Consultant
J. Panchison, Office of Safety Regulation Consultant

APPROVED BY: P. Carier, Verification and Confirmation Official
Office of Safety Regulation of the RPP-WTP Contractor

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EXECUTIVE SUMMARY
Design Process Assessment
Inspection Report Number IR-01-009

INTRODUCTION

This inspection of the Bechtel National, Inc. (the Contractor) design process covered implementation of authorization basis commitments in the following specific areas:

- Design Procedures
- Design Input
- Interface Control
- Design Process
- Design Analysis
- Design Verification
- Qualification Tests
- Design Change Control
- Software Design Control
- Audits.

SIGNIFICANT OBSERVATIONS AND CONCLUSIONS

On October 8, 2001, the Contractor implemented new procedures for controlling the design process. Limited design products produced with the new procedures were available for Office of Safety Regulation (OSR) inspection. Accordingly, the inspectors evaluated products generated to older transitioned procedures used prior to October 8, and a limited number of products generated to the new procedures.

Conclusions from review of the 10 specific areas evaluated follow:

- Design Procedures – Notwithstanding the Findings cited in other sections of this inspection report, the important-to-safety (ITS) design process was controlled by and conducted in accordance with documented instructions, procedures, and drawings. Design activities affecting quality were prescribed by and performed in accordance with documented instructions, procedures, and drawings of the type appropriate to the circumstances that included or referenced appropriate quantitative or qualitative acceptance criteria for determining that prescribed activities had been satisfactorily accomplished. (Section 1.2)
- Design Input – Design inputs were identified and documented, and their selection reviewed and approved by the responsible engineering group. Design inputs were specified and approved on a timely basis to permit design activities to be carried out appropriately. The facility was being designed for a set of events that include normal operations, anticipated operational occurrences, maintenance, testing, external events, natural phenomena, and postulated accident conditions. The human factors specialist was identifying opportunities early in the design phase for design improvements and

providing recommendations to address human factors principles and processes. (Section 1.3)

- Interface Control – Design staff were effectively communicating between organizations, using computer aided design platforms to build in system integration, and using databases to capture and share design criteria. Management was engaged in developing clear guidance for managing external interface activities. However, the inspectors identified an example of a Finding (IR-01-009-01a-FIN) for failure to follow procedures pertaining to Interface Control Document (ICD) reviews performed in violation of project document review requirements. (Section 1.4)
- Design Process – The Contractor used the Integrated Safety Management (ISM) process to effectively implement the design process to identify and document appropriate standards for ITS structures, systems, and components (SSCs). Procedures required appropriate review and approval of the selected standards. An example of a Finding (IR-01-009-01b) was identified for failure to follow procedures regarding the Contractor not documenting the delegation of authority for approval of Standard Identification Process Database (SIPD) safety information as required by the applicable procedure. (Section 1.5)
- Design Analysis – The design analyses reviewed were controlled and retrievable, generally comprehensive, well organized, and contained the required objectives and inputs. A Finding (IR-01-009-02-FIN) was identified for inadequate procedures in that the procedure for calculations was revised such that it no longer met the QAM requirement to identify unverified assumptions. Discussions with project personnel revealed they had a sound knowledge of procedural requirements relative to design analysis preparations. (Section 1.6)
- Design Verification – At the time of this assessment, design analyses selected for review by the inspectors were classified as "preliminary" and were not design verified. However procedural requirements in place for design verification adequately provided for design verification utilizing multi-discipline or group review, independent off-project review, or individual critical review. Additionally, the procedure required that design verification be performed when the basic design is substantially completed which is generally prior to issuing the design document as Revision 0 but no later than turnover of the SSC for commissioning. (Section 1.7)
- Qualification Tests – Qualification tests were not planned to verify design adequacy at the time of the inspection. Contractor management stated, if qualification tests were determined to be required in the future, they would be performed in accordance with the approved procedure. The inspectors concluded that the Contractor was cognizant of qualification testing requirements. (Section 1.8)
- Design Change Control – Design control procedures applicable to engineering sketches, drawings, and specifications were adequate to control design changes to ITS SSCs. Based on review of a sample of design change applications (DCAs) and design change notices (DCNs), the inspectors concluded that the Contractor was properly implementing

the applicable procedures. The inspectors also determined that the procedures prescribed a process adequate to identify status and communicated design changes consistent with configuration control through the design organization. (Section 1.9)

- Software Design Control – Procedures controlling software used in quality affecting applications adequately aligned with the requirements of the QAM. In general, Quality Affecting Software (QAS) was being adequately controlled in accordance with project procedures. However, a Finding (IR-01-009-01c-FIN) was identified for failure to follow procedures in that one instance of not following the approval process for entering software on the Software Designation List (SDL) was identified. (Section 1.10)
- Audits – The scope and frequency of surveillance of the design process was adequate. In general, surveillance reports that identified problems accurately characterized and rated results, and deficiency reports (DRs) were initiated for "unsatisfactory" ratings. Associated DRs, with one exception, provided an auditable trail of actions planned or taken to resolve the conditions adverse to quality. (Section 1.11)

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DESIGN PROCESS ASSESSMENT

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DESIGN PROCESS ASSESSMENT INSPECTION REPORT

1.0 REPORT DETAILS

1.1 Introduction

The River Protection Project – Waste Treatment Plant (RPP-WTP) Contract,¹ Section C.6, Standard 7, "Environment, Safety, Quality, and Health," Table S7-1, item 1, committed the Contractor to implement the requirements of the authorization basis which included the requirements of an approved Quality Assurance Manual (QAM) and an approved Integrated Safety Management Plan (ISMP).

Policy Q-02.1 of the QAM described the Quality Levels applied to the structures, systems, and components (SSCs) of the RPP-WTP. Safety Design Class (the highest level of quality) had the requirements of Quality Level 1 (QL-1) applied to provide added assurance that the SSCs will perform their specified safety function. Safety Design Significant (the second highest level of quality) had the requirements of Quality Level 2 (QL-2) applied to provide adequate assurance that the SSCs will perform their specified function. Safety Design Class and Safety Design Significant SSC's were collectively termed "Important-to-Safety (ITS)." This inspection was part of the Office of Safety Regulation's (OSR's) overall effort to evaluate the Contractor's design program and assess the adequacy of the Contractor's design process and the implementation of the design procedures applied to ITS SSCs.

The inspectors reviewed the Contractor's design process as it related to implementation of authorization basis commitments. Specifically, the inspectors assessed:

- Design Procedures
- Design Input
- Interface Control
- Design Process
- Design Analysis
- Design Verification
- Qualification Tests
- Design Change Control
- Software Design Control
- Audits.

The inspectors reviewed records, interviewed staff, and observed related activities to determine if the Contractor was adequately establishing, implementing, and maintaining the design process in accordance with Contract requirements.

¹ Contract DE-AC27-01RV14136 between DOE and Bechtel National, Inc., dated December 11, 2000.

During the inspection of Contractor's activities associated with the design process, the inspectors interviewed the staff listed in Section 3.1 and reviewed the documents listed in Section 3.4 of this report.

1.2 Design Procedures (Inspection Technical Procedure [ITP] I-104)

1.2.1 Inspection Scope

The inspectors assessed the Contractor's procedures for controlling and conducting the ITS design process. To perform this assessment, the inspectors interviewed Contractor staff and reviewed design implementing procedures.

1.2.2 Observations and Assessments

The inspectors reviewed the Contractor's design procedures and a sample of other design documents (see Section 3.4 for the complete list). The inspectors also interviewed Contractor personnel who were implementing the procedures. The Contractor had recently replaced the bulk of the previous engineering design procedures with a new set of "Engineering Department Project Instructions" (EDPIs). The Contractor was in the process of transitioning other policies, procedures, instructions, drawings, and computer programs from those inherited from previous Contractors to a set reflecting the present Contractor's design process. The EDPIs adequately established a documented system to control and conduct engineering design activities. Based on interviews, including observation of design documents being prepared, Contractor personnel were following the EDPIs.

1.2.3 Conclusions

Notwithstanding the Findings cited in other sections of this inspection report, the ITS design process was controlled by and conducted in accordance with documented instructions, procedures, and drawings. Design activities affecting quality were prescribed by and performed in accordance with documented instructions, procedures, and drawings of the type appropriate to the circumstances that included or referenced appropriate quantitative or qualitative acceptance criteria for determining that prescribed activities had been satisfactorily accomplished.

1.3 Design Input (ITP I-104)

1.3.1 Inspection Scope

The inspectors assessed whether design inputs were identified and documented, and their selection reviewed and approved by the responsible engineering group. The inspectors assessed whether the facility was being designed for a set of events that include normal operations, anticipated operational occurrences, maintenance, testing, external events, natural phenomena, and postulated accident conditions. The inspectors assessed whether human factors specialists

were identifying opportunities early in the design phase for design improvements and providing recommendations to address human factors principles and processes.

1.3.2 Observations and Assessments

The inspectors reviewed EDPI, 24590-WTP-3DP-G04B-00001, Rev. 0, "Design Criteria," dated October 2001 to assess procedures for identifying, documenting, and approving design inputs. The inspectors reviewed seven drawings and associated design input memoranda to evaluate compliance with the Design Criteria procedure. Interviews were conducted with managers and engineers to determine the process used to identify design inputs.

The Design Criteria procedure required designers to consider design criteria from the Design Criteria Database (DCD), Basis of Design (BOD), Contract, Authorization Basis, Standards Identification Process Database (SIPD), and 25 other listed sources. Design Input Memoranda (DIM) were required for specifications and drawings including Process Flow Diagrams (PFDs), Piping and Instrumentation Diagrams (P&IDs), Mechanical Flow Diagrams (MFDs), Mechanical Handling Diagrams (MHDs), Ventilation Flow Diagrams (VFDs), Ventilation and Instrumentation Diagrams (V&IDs), Single-line Diagrams, General Arrangements, and Site Plot Plans to provide a record of design inputs actually used in preparation of design media. Both alpha (preliminary) and numeric (final) revisions of the above listed design media were required to have an associated DIM. The preparer, checker, and approver of a DIM were required to be trained in authorization basis maintenance. DIM were required to be approved by the Deputy Engineering Manager. The inspectors concluded the procedure conformed to the QAM requirements to identify, document, and have design inputs approved by the responsible engineering group.

Based on review of seven drawings, associated DIMs, and Document Review Requests (DRRs), the reviewers observed that appropriate design inputs were identified. The DIMs included entries for drawings, calculations, design criteria, SIPD requirements, engineering studies, design changes, and other inputs as sources of design inputs. DIMs were prepared, checked, and approved by engineers and management in the responsible engineering group. The DIMs were approved by Discipline Managers. The Melter Systems Engineering Manager and the Mechanical System Manager (both discipline managers) were asked how they were designated to approve DIMs. Both produced E-mail messages from the Deputy Engineering Manager delegating this authority to them. DRRs were reviewed for their associated drawings and DIMs and found to be completed appropriately with all mandatory reviewers returning comments and comment dispositions recorded and signed off as resolved by the reviewers. The inspectors concluded the process for identifying, documenting, and approving design inputs were properly followed based on assessment of the seven drawings and associated DIMs and DRRs. One exception was identified for the Interface Control Documents (ICDs) planned for use as design input discussed in Section 1.4 of this report.

Interviews were conducted with two Discipline Managers, one System Engineering Manager, one Engineer, and two Hazard and Safety Analysis (HSA) Leads to understand the specific process used to identify design inputs. All interviewees provided a consistent explanation of the process used to obtain design inputs that conformed to the Design Criteria procedure. The interviewees stated design inputs were obtained from the DCD through the use of keyword

searches, from SIPD by either contacting safety personnel or directly accessing the SIPD database, obtaining inputs based on system interfaces, and obtaining inputs based on discipline expertise. DIMs were prepared for all design drawings and specifications and Design Review Records were completed for all drawings, specifications, and associated DIMs.

The design process was observed to be iterative. The Design Criteria procedure required design inputs to be reviewed and updated with each alpha and numeric revision of drawings and specifications. Discipline Managers were required to determine and resolve the impact of design criteria revisions on existing design. The reviewers concluded that design inputs were specified and approved on a timely basis permitting design activities to be carried out appropriately.

The Design Criteria procedure stated that alpha revisions of a drawing or specification shall list applicable authorization basis criteria on the DIM; however, the preliminary design was not required to align with the authorization basis. Numeric revisions were required to either conform to the authorization basis or have an Authorization Basis Change Notice (ABCN) in process. Regulatory submittals such as the Partial Construction Authorization Request (PCAR) and Preliminary Safety Analysis Report (PSAR) may include preliminary design media, which was not required to conform with the authorization basis; however, the information supporting the PCAR and PSAR must be consistent with the associated (requested) authorization basis. This issue was discussed with the Contractor at the exit briefing and the Engineering Manager stated the Contractor would be cautious in managing this issue as they prepare regulatory submittals.

The inspectors assessed whether the facility was being designed for a set of events that included normal operations, anticipated operational occurrences, maintenance, testing, external events, natural phenomena, and postulated accident conditions. Interviews with two Discipline Managers and two HSA Leads indicated design for the above conditions was accomplished through the ISM process where these environmental conditions were identified as initiators for potential hazardous conditions that were addressed through development of Safety Case Requirements (SCRs). SCRs were documented in SIPD and used as design inputs. The BOD also provided design inputs for seismic, wind, dust, temperature, and other environmental design criteria.

The inspectors reviewed Contractor documents that addressed the manner in which human factor considerations were incorporated into the design process. The inspectors also interviewed the Contractor's human factors specialist and Contractor personnel carrying out the design process. The inspectors observed the Contractor's design criteria database cited human factors design criteria from the authorization basis and the BOD. The Operations Requirements Document also addressed human factors engineering design requirements.

The current ISMP (Section 3.12 of 24590-WTP-ISMP-ESH-01-001, Rev. 0b, dated October 4, 2001) stated, "Human factors specialists conduct human factors reviews of . . . the design of the Safety Design Class and Safety Design Significant SSCs and functions that are judged to be critical to facility performance and that have a high potential for human error." The current ISMP also stated, "During the early design phase, the specialists identify opportunities for design improvement and provide recommendations to address human factors principles and processes." The inspectors determined, based on interviews, these activities were being conducted in a consultative manner. The Contractor's human factors specialist attended various design review meetings, identified design improvement opportunities, and provided recommendations to

address human factors issues. On an informal basis, design engineering personnel consulted the human factors specialist for human engineering problems and solutions.

The Contractor's proposed revised Integrated Safety Management Plan submitted for OSR review under ABCN-24590-01-00008, Revision 0, stated, "HFE [human factors engineering] is applied as a formal part of the RPP-WTP design process and the RPP-WTP design verification process." The proposed ISMP also refers to a "HFE plan" and a "systematic program." The inspectors observed the Contractor did not yet have a formal human factors plan or program.

1.3.3 Conclusions

Based on review of procedures, design media, and interviews with management and engineers, the inspector concluded:

- Design inputs were identified and documented, and their selection reviewed and approved by the responsible engineering group
- Design inputs were specified and approved on a timely basis to permit design activities to be carried out appropriately
- The facility was being designed for a set of events that included normal operations, anticipated operational occurrences, maintenance, testing, external events, natural phenomena, and postulated accident conditions
- The human factors specialist was identifying opportunities early in the design phase for design improvements and providing recommendations to address human factors principles and processes. However, no formal human factors plan or program addressed the manner in which human factor considerations were reviewed, incorporated into the design process, and verified. Rather, human factor considerations were being addressed in an informal, consultative manner. While the present manner of addressing human factors considerations met existing requirements, it was not consistent with proposed commitments for formal application of human factors engineering contained in the Integrated Safety Management Plan submitted for OSR review and approval under ABCN-24590-01-00008, Revision 0.

1.4 Interface Control (ITP I-104)

1.4.1 Inspection Scope

The inspectors assessed the process used to control design interfaces between organizations. The inspectors verified that procedures addressed coordination of design inputs among participating organizations. Discussions were held with lead engineers and reviews of ongoing design activities were assessed for compliance with procedural requirements.

The inspectors assessed the processes used to control the interface activities between external organizations. The inspectors interviewed staff to assess compliance with the review and approval of ICDs.

1.4.2 Observations and Assessments

Internal Interfaces

The inspectors reviewed procedures used to integrate internal design activities. Integration of design criteria was documented on DIM per Procedure 24590-WTP-3DP-G04B-00001, "Design Criteria," dated October 8, 2001, and recorded in the DCD per Procedure 24590-WTP-3DP-G04T-00904, "Design Criteria Database," dated October 8, 2001. The inspectors reviewed the pretreatment building's heating, ventilation, and air conditioning (HVAC) and structural design activities and noted the appropriate design criteria were recorded in the DCD. The coordination of design inputs between internal organizations was controlled by Procedure 24590-WTP-GPP-PADC-003, "Internal Review and Approval of Documents," dated September 5, 2001. Procedure 24590-WTP-GPP-PADC-003 defined the minimum requirements for the review and approval of WTP project documents. In discussion with the inspectors, the Pretreatment Lead HVAC and Structural Engineers explained the document review process including the processing of DRRs. Specifically, these engineers explained Procedure 24590-WTP-GPP-PADC-003 allowed them to choose not to resolve comments received after the DRR due date, but both lead engineers stated that this was not their practice. Both lead engineers showed examples of DRRs with comment resolution confirmed by the reviewer's signature on the DRR.

The inspectors discussed how internal interfaces were managed for the WTP with the Area Project Engineers (APEs), Process Lead Engineers, and Functional Design Managers. The Pretreatment APE explained that continual and effective communication was the primary method used to integrate the project. Specifically, the Pretreatment APE explained that three weekly meetings were conducted:

- Area Project Engineers and Lead Facility Engineers for applicable areas met to ensure that interfaces between all engineering groups were coordinated. The Pretreatment APE explained that this meeting allowed engineers to address design issues including engineered safety controls.
- The Project Manager Meeting, which included representation from Operations, Engineering, Environmental, Safety and Health (ES&H), Construction, Office of River Protection (ORP), Research and Technology, Process Technology, Procurement, Quality Assurance (QA), Commissioning, APEs, and others, ensured interface between all disciplines.
- Deputy Engineering Managers and APEs met to evaluate cross coordination between projects. Specifically, the Pretreatment APE explained that this meeting's focus included addressing engineering techniques to be used for the WTP.

In a discussion with the inspectors, pretreatment lead engineers stated that these meetings facilitated project development and gave them and APEs the required interaction to effectively address engineering controls and safety design features in their design. Additionally, they stated

that the three-dimensional computer aided design system electronically integrated the design products among engineering disciplines.

External Interfaces

The inspectors noted that interface interaction between ORP, CH2M Hill Hanford Group (CHG), and the Contractor had been hindered because 24590-WTP-PL-MG-01-001, "Interface Management Plan (IMP)," and the most current version of the ICDs were not issued. Senior Management was working to resolve the issues keeping these documents from being issued. However, the inspector noted three documents developed by the Interface Management Team had been issued in October 2001 to implement the IMP. Specifically, three guidance checklists were issued to ensure that ICDs were updated and maintained in a consistent manner, describe the activities necessary to complete an interface change form (ICF), and ensure interface issue management is approached in a consistent manner. The inspectors noted that the checklists were informative and provided detailed guidance for implementing the IMP requirements. The Interface Manager explained that the guidance checklists would become part of the interface procedure under development.

The inspectors reviewed the DRR packages for five ICDs. On November 1, the DRR packages for ICD 3, "Radioactive Solid Waste," ICD 14, "Immobilized High-Level Waste," ICD 15, "Immobilized Low-Activity Waste," ICD 19, "Low-Activity Waste Feed," and ICD 20, "High-Level Waste Feed," were requested from Project Document Control (PDC). PDC staff stated that they had received the DRRs for ICD 3 but not for the other four ICDs. The inspectors discussed the missing DRRs with the Interface Manager. The Interface Manager stated that all of the DRRs should have been issued to PDC when Revision A to the 17 ICDs was submitted to ORP on July 16, 2001. Following the discussion with inspectors, the Interface Manager submitted an e-mail to all ICD Team Leads and Integration Group Leaders requesting they submit the DRRs for ICD Revision A to PDC. On November 6, the inspectors did a detailed review of the DRRs available at PDC and identified the following:

- ICD 1, "Raw Water," ICD 2, "Potable Water," ICD 4, "Dangerous Waste," ICD 5, "Non-Radioactive, Non-Dangerous Liquid Effluents," ICD 9, "Land for Siting," ICD 12, "Roads," ICD 14, ICD 19, and ICD 20, were available and no issues were identified.
- For ICD 3, 13 groups were sent DRRs for required review and comment. PDC was missing several DRRs from the 13 groups that received the DRRs. The inspectors noted two of the DRRs contained technical comments but the reviewers comment resolution block was not signed. A review of ICD 3 Revision A identified that some technical comments had not been addressed.
- For ICD 15, "Immobilized Low-Activity Waste," no DRRs were found for 11 of the 13 groups who received DRRs for required review, and comments from the two groups that did respond were not incorporated.
- For ICD 16, "Low Activity Waste Feed," DRRs were not available.
- For ICD 23, "Waste Treatability Samples," two of the eight DRRs were not included in the package.
- The remaining ICDs were not reviewed.

Procedure K13P023_0, "Internal Review and Approval of Documents," required document approvals to include DRR documentation for required reviewers and the resolution of DRR comments to be indicated by the reviewer's signature or marked "Editorial Comments Only." Contrary to this procedural requirement, several ICDs, as described above, approved on July 16, 2001, were missing the DRR documentation for required reviewers or DRR comment resolution was not indicated by the reviewer's signature or marked, "Editorial Comments Only." Additionally, as of November 1, 2001, only one of the five DRR packages requested by the inspectors was issued to PDC as required by Procedure K13P023_0. The failure to perform the required DRR process in accordance with Procedure K13P023_0 was considered an example of an inspection Finding (IR-01-009-01a-FIN) for failure to follow procedures as required by QAM, Policy Q-05.1, Section 3.1.

1.4.3 Conclusions

Inspectors identified that the design staff were effectively communicating between organizations. Weekly meetings were conducted to facilitate integration; computer aided design platforms were used to build in system integration; and databases were used to capture and share design criteria. The Contractor was developing guidance for performing external interface activities.

The inspectors identified an example of a finding for failure to perform required project document reviews in accordance with procedural requirements (IR-01-009-01a-FIN).

1.5 Design Process (ITP I-104)

1.5.1 Inspection Scope

The inspectors assessed the Contractor's design process for the identification and documentation of appropriate standards for ITS SSCs and for their selection, review, and approval. The inspectors also assessed the Contractor's selection and review for suitability of materials, parts, equipment, and processes essential to the function of ITS SSCs. To perform this assessment, the inspectors interviewed the Contractor staff, reviewed design implementing procedures, and observed design work in progress.

1.5.2 Observations and Assessments

The Contractor used the ISM system as required by DOE/RL-96-0004, "Process for Establishing a Set of Radiological, Nuclear, and Process Safety Standards" to implement the design process for identifying and documenting safety standards and for reviewing and approving the selected standards. The inspectors reviewed the following procedures that implement the ISM process.

- 24590-WTP-GPP-SANA-002, Rev. 0, "Hazards Analysis, Development of Hazards Control Strategies, and Identification of Standards," dated September 28, 2001
- 24590-WTP-GPP-SANA-003, Rev. 0, "Standards Identification Process Database," dated

September 28, 2001

- 24590-WTP-GPG-SANA-001, Rev. 0, "Standards Identification Process Database," dated September 28, 2001.

These procedures properly implemented the ISM process. However, there was one issue regarding the review of work performed to these procedures. Procedure 24590-WTP-GPP-SANA-003, "Definitions" stated "The Environmental, Safety and Health (ES&H) Program Manager or designee will review changes to the SIPD and will approve SIPD safety information." The Contractor's procedure 24590-WTP-GPP-PADC-002A, Rev.0, Project Records Management, Section 3.3.3.3, "Delegation of Authority," stated "Managers may communicate the Delegation of Authority through a memorandum or electronic mail." The inspectors interviewed the ES&H manager and were informed that one of the ES&H lead engineers was the designee for review and approval of SIPD information since the Contractor took over the Contract and there was no documentation of the delegation. This was contrary to the requirements of procedure 24590-WTP-GPP-PADC-002A. Failure to document the delegation of authority as required by this procedure was an example of a Finding for failure to follow procedures as required by QAM Policy Q-05.1, Section 3.1 (IR-01-009-01b-FIN).

The following three drawings and associated design input memorandum (DIM) were selected for review from a list of issued documents:

- 24590-HLW-M5-V17T-00002, "Process Flow Diagram HLW Vitrification Melter (System 211)," Rev. 0
- 24590-HLW-M5-V17T-00004, "Process Flow Diagram HLW Secondary Offgas (System 231)," Rev. 0
- 24590-HLW-M8-750-00002001, "HLW Vitrification Building, System 750, Volumetric V&ID, C5 Cascade System EL (-)21'-0," Rev. A

The inspectors reviewed each of the above design drawings and the associated DIM and verified that the safety standards identified by the ISM process were included on the DIM.

The inspectors interviewed the three design engineers responsible for the preparation of the three drawings listed above and interviewed two engineers responsible for checking two of the above listed drawings. The engineers interviewed were knowledgeable of the design process. However, none of the engineers that prepared the drawings and DIMs knew how to directly access SIPD. For one of the drawings, the checker had directly accessed SIPD and confirmed that appropriate safety requirements were included on the DIM. For the other two drawings, the SIPD information used for the design drawing and the DIM was obtained from the Lead Engineer. The inspectors considered these approaches acceptable.

The inspectors interviewed the Manager of Engineering Technology and were advised that the procedures for selection and review for suitability of materials (cement, rebar, electric cable, etc.), parts (including spare parts), and processes (welding, heat treatment, etc.) were being developed and were not available for inspection.

1.5.3 Conclusions

The inspectors verified the Contractor used the ISM system to effectively implement the design process to identify and document appropriate standards for ITS SSCs. Also, the inspectors verified procedures included appropriate review and approval of the selected standards.

A Finding (IR-01-009-01b-FIN) was identified for the failure of the Contractor to follow procedures regarding delegation of authority for approval of SIPD safety information.

1.6 Design Analysis (ITP I-104)

1.6.1 Inspection Scope

The inspectors assessed the effectiveness of the Contractor's design process in the area of design analyses. To perform this assessment, inspectors interviewed design management and staff, reviewed related procedures, and evaluated the Contractor's implementation of commitments and program requirements. At the time of this assessment, there were minimal design documents issued using the new EDPIs. The inspectors reviewed EDPIs to assure they were in compliance with the QAM. Additionally, a sampling of calculations were selected and reviewed against the requirements of the engineering procedures in effect at the time of calculation approval and issuance.

1.6.2 Observations and Assessments

Procedures were reviewed which established requirements for engineering calculations and design verification. Procedure 24590-WTP-3DP-G04B-00037A, "Engineering Calculations," Rev. 0, dated October 8, 2001, and 24590-WTP-3DP-G04B-00027, "Design Verification," Rev. 0, dated October 8, 2001, were reviewed against the requirements of the QAM. QAM Policy Q-03.1, Section 3.5.5 specifies that documentation of design analyses "shall" include key sections in the calculation body, such as objective, design inputs, identification of assumptions and those that must be verified as the design proceeds, identification of computer calculation, etc. However when these requirements were translated to the calculation procedure, the QAM requirements took a less prescriptive form in that these requirements were specified as "should" be included rather than "shall" be included. It should be noted that calculation requirements documented in superseded procedure K70C518C, "Code of Practice for Engineering Calculations," required incorporation of the attributes noted above. QAM Policy Q-05.1 requires the Contractor to have procedures that are of the type appropriate to the circumstances. Failure to appropriately prescribe requirements for documenting calculation assumptions is considered a Finding (IR-01-009-02-FIN).

Eight calculations were selected and reviewed against the Quality Assurance Plan (QAP) and the "Engineering Calculations" and "Design Verification" procedures in effect at the time of calculation preparation. The calculations reviewed all contained a documented objective, inputs, assumptions, and identification of the originator, reviewer, and approver. The calculations were sufficient in that a technically qualified person could verify the results without recourse to the originator. However, several calculations did not have documented technical justifications for

some assumptions. Additionally, there were some assumptions in the calculations that appear to be unverified and were not identified in the body of the calculation as such. Procedures in effect prior to October 8, 2001, including the QAP, required that an assumption that must be verified as the design proceeds be identified within the body of the calculation. All engineering disciplines interviewed by the inspectors noted that all calculations were designated preliminary and by procedure, for the calculation to become final (confirmed), no unverified assumptions were permitted. The Contractor identified this issue in DR 24590-WTP-DR-QA-01-006, dated June 26, 2001, and performed several surveillances assessing progress in correcting this issue (Section 1.11). The OSR will assess the handling of assumptions in calculations as part of a future inspection.

The inspectors also reviewed calculations to assure that computer programs were, when used in the calculation, identified with applicable software information as required by the QAM Policy Q-03.1 Section 3.5.5, 24590-WTP-3DP-G04B-00037A paragraphs 3.3.1 and 3.3.2, and procedure K70C518C paragraph 3.7.1. The inspectors observed that some software packages used in calculations were not identified. Examples of software packages not identified were Excel and MathCad in calculations 24590-HLW-NLC-H93T-0001 and 24590-HLW-MEC-231-00001. The Contractor had previously identified this and prepared DR 24590-WTP-DR-QA-01-028, dated October 15, 2001, to address this issue. Corrective actions included issuing simplified EDPIs and conducting training. The inspectors considered these actions appropriate.

1.6.3 Conclusions

Design analyses reviewed were controlled and retrievable, generally comprehensive, well organized, and contained the required sections covering objectives, and inputs. Based on discussions with project engineers, the inspectors concluded project personnel had a sound knowledge of procedural requirements relative to design analysis preparation. However, as noted above, analyses generally did not identify in the body of the calculation assumptions requiring verification and in some cases software applications used. The Contractor documented these two issues in DRs and was implementing appropriate corrective actions.

A Finding (IR-01-009-02-FIN) was identified for failure to appropriately prescribe requirements for documenting calculation assumptions.

1.7 Design Verification (ITP I-104)

1.7.1 Inspection Scope

The inspectors assessed the Contractor's design verification process by reviewing procedures governing design verification, review, and approval of work, and engineering calculation preparation, checking, and approval. The inspectors also reviewed calculations, and interviewed Contractor staff.

1.7.2 Observations and Assessments

The inspectors reviewed selected calculations to assure design verification had been performed prior to releasing the design to another organization for other design activities. These calculations were considered to be "preliminary" and not "confirmed" and therefore, had not been design verified.

Design verification procedure 24590-WTP-3DP-G04B-00027 was reviewed for compliance with the QAM. The procedure provided for design verification utilizing multi-discipline or group review, independent off-project review, or individual critical review. The procedure required that design verification be performed when the basic design is substantially completed which is prior to issuing the design document as Revision 0 but no later than turnover of the SSC for commissioning. The procedure also provided for alternative qualification testing or alternate calculations to satisfy design verification. The inspectors concluded that the procedure met the requirements of the QAM.

1.7.3 Conclusions

Procedural requirements in place for final design verification provided for design verification utilizing multi-discipline or group review, independent off-project review, or individual critical review. The inspectors concluded that procedural requirements were consistent with QAM requirements.

1.8 Qualification Tests (ITP I-104)

1.8.1 Inspection Scope

The inspectors discussed with the Deputy Mechanical Engineering Manager the use of qualification testing for design adequacy.

1.8.2 Observations and Assessments

In discussions with the inspectors, the Deputy Mechanical Engineering Manager identified when a qualification test would be used to qualify a system or component. The Deputy Mechanical Engineering Manager stated that qualification testing would be implemented on a case-by-case basis using engineering judgment, and there were not any documented criteria to determine when a system or component qualification was required. The inspectors confirmed that the approach explained to perform qualification testing was in accordance with the requirements of QAM Policy Q-03.1. Specifically, the Deputy Mechanical Engineering Manager explained that a qualification test would be required to demonstrate the adequacy of performance under conditions that simulate the most adverse design conditions. The Deputy Mechanical Engineering Manager stated there was no qualification testing planned to verify design adequacy at the time of the inspection but if required, would be performed in accordance with Procedure 24590-WTP-3DP-G04B-00027, "Design Verification."

1.8.3 Conclusions

No qualification tests were planned to verify design adequacy at the time of the inspection. If determined to be required in the future, the Deputy Mechanical Engineering Manager stated qualification tests would be performed in accordance with the approved procedure. The inspectors concluded that the Contractor was cognizant of qualification testing requirements.

1.9 Design Change Control (ITP I-104)

1.9.1 Inspection Scope

The inspectors assessed the Contractor's design control program and procedures related to ITS SSCs. Specifically, the inspectors assessed how well the Contractor's design control procedures and procedure implementation ensured all changes to the design of ITS SSCs were controlled. This assessment included the review of changes to the design or design documents created by DCAs, DCNs, construction field changes, nonconforming items, and procurement originated changes. The inspectors also assessed the design change procedures to determine whether the procedures prescribed the process needed to identify, control, status, and communicate ongoing design changes to provide consistent system integration and configuration control through the design organization. To perform this assessment, the inspectors interviewed the contractor staff, reviewed design change implementing procedures, observed work in progress, and reviewed a limited number of design change documents.

1.9.2 Observations and Assessments

The inspectors were advised that, because no items had been procured nor had construction started, there were no design change documents created by construction field changes, nonconforming items, or procurement oriented changes. Therefore, this inspection was focused on the design change control of engineering sketches, design drawings, and specifications. The inspectors reviewed the procedures for design change control of engineering sketches, drawing and specifications. The procedures reviewed were as follows:

- 24590-WTP-3DP-G04B-00046, "Engineering Drawings," Rev. 0, dated October 8, 2001
- 24590-WTP-3DP-G04B-00049, "Engineering Specifications," Rev. 0, dated October 8, 2001
- 24590-WTP-3DP-G04T-00901, "Design Change Control," Rev. 0, dated October 8, 2001
- 24590-WTP-PL-MG-01-002, "RPP-WTP Configuration Management Plan," Rev. 0, dated October 8, 2001
- 24590-WTP-3DP-G04B-00063, "Disposition of Nonconformance Reports," Rev. 0, dated September 28, 2001

- 24590-WTP-GPP-PADC-002A, "Project Records Management," Rev.0, dated September 15, 2001.

The inspectors determined procedures were adequate to ensure design changes were controlled for changes to engineering sketches, drawings, and specifications and that the procedures required measures commensurate with the original design. The inspectors determined procedures adequately controlled the status of design changes by document revision numbers, revision approval controls, and requirements for making changes between revisions. Also the inspectors found ongoing design changes were communicated to the design organization in accordance with distribution lists for controlled and uncontrolled copies of design documents.

The inspectors reviewed two DCAs and two DCNs as follows:

- DCA-24590-01-00005, "Modification of Mechanical Handling Equipment in the LAW Finishing Line," Rev. 0
- DCA-W375-00-00018, "Engineering Study of Finishing Line Layout," Rev. 0 (DCA issued in support of DCA-24590-01-00005)
- DCN-24590-01-00007, Rev. 0, (Applicable to HLW Vitrification)
- 24590-HLW-DCN-PR-01-004, Rev. 0, (Applicable to HLW Vitrification).

The inspectors verified the DCAs and DCNs listed above were processed in accordance with the procedures, with one exception. For one of the DCNs, there was an administrative omission in completing the DCN form. However, the omission did not affect the proper processing of the DCN. Another DCN was issued to supersede the original DCN to correct the omission.

1.9.3 Conclusions

The inspectors concluded the Contractor's design control procedures applicable to engineering sketches, drawings, and specifications were adequate to control design changes to ITS SSCs. The inspectors determined, by review of a sample of DCAs and DCNs, the Contractor was properly implementing the applicable procedures. Also, the inspectors determined procedures prescribed a process adequate to control status and communicate design changes consistent with configuration control through the design organization.

1.10 Software Design Control (ITP I-104)

1.10.1 Inspection Scope

The inspectors assessed the Contractor's computer software control process and its implementation relative to ITS design activities to determine if the process was adequate to support existing work scope and the long-term needs of the project. To perform this assessment the inspector's review included:

- Alignment of the new procedural requirements with the QAM (Policy Q-03.2, "Software Quality")
- Broad-based controls for software being used on the project in both non-ITS and ITS design applications (the latter termed "Quality Affecting Software" (QAS))
- Implementation of the process for approving and controlling software for application in ITS design activities, including verification and validation (V&V) of selected QAS.

The inspectors also reviewed the assessment of this area as recorded in previous assessment reports (in particular, Inspection Report IR-01-002, "Procurement and Configuration Management")

1.10.2 Observations and Assessments

Alignment of the new procedural requirements with the Contractor's Quality Assurance Manual (Policy Q-03.2, "Software Quality")

The Contractor had recently superseded its previous Code of Practice (COP) for Computer Program Use (K70C515D_2) with new procedure 24590-WTP-GPP-IT-001, "Use of Quality Affecting Software Applications," Rev. 0, dated September 24, 2001. The objectives of this procedure were to ensure compliance with QAM Section Q-03.2 such that (1) before release for use, QAS was adequately V&V tested, controlled, and documented such that comparable results can be obtained through independent replication of the process, (2) QAS was added to the approved section of the Software Designation List (SDL) prior to use, and (3) software errors affecting QAS were identified and appropriately resolved. The procedure applied to all software designated QAS, including software acquired from outside suppliers, but did not cover software development activities. The inspectors confirmed through discussions with project personnel that no WTP custom application software had been developed and placed in use for ITS design activities. The inspectors concluded that this procedure, in concert with other supporting Information Technology (IT) procedures (WTP IT Life Cycle Management Plan, Project IT Change Control Process, etc.) and Engineering Design procedures (Engineering Calculations, Engineering Drawings, etc.) met the requirements of the QAM.

Broad-based controls for software being used on the project in both non-ITS and ITS design applications

Software that was approved for use on the project was listed in the Approved Project IT Software Baseline Report (hereafter referred to as the "Baseline Report"). From a review of the subject report, dated October 19, 2001, there were 177 software applications approved for use on the project. Of these, eight software applications were approved for use as QAS and were resident on the SDL. An additional seven software applications were noted as being considered for use as QAS, or in the process of approval for QAS use.

From a review of the brief descriptions of the software applications in the Baseline Report, the inspectors attempted to discern whether selected non-QAS-approved software might be in use for

ITS design applications. The following were the software applications reviewed with a brief description of their functions:

- Compress – pressure vessel code design software
- HSC Chemistry – thermodynamic calculations done by the VIT process
- Setroute – cable/setroute management
- Infomaker – instrumentation and controls engineering design.

For other than Setroute, discussions with the Project Program Sponsors indicated that the referenced software was not intended for use in ITS design applications and was not being used in that capacity. The inspectors determined that Setroute was in the final stages of being approved for QAS application under the new procedural process. Review of the draft software approval documents and the completed V&V test report revealed that they were complete and consistent with the new procedure.

The inspectors learned that the Chief Information Officer, IT, and the Manager, QA, had recently discussed the accuracy and completeness of the Baseline Report, as well as the SDL, with a similar focus to that taken by the inspectors above. This resulted in the Chief Information Officer issuing a Deficiency Report (DR) (24590-WTP-DR-QA-01-052, Rev. 0, dated October 22, 2001). The DR was based on the known existence of some non-QAS software in use on the project that was not included in the Baseline Report, as well as the suspicion that the SDL may not reflect all QAS in use on the project. The inspectors considered this to be a proactive initiative by Contractor management, particularly in light of the fact that the subject managers had no concrete examples of software being used in quality-affecting applications that was not approved for use via the required process. Through discussions with the Chief Information Officer, the inspectors confirmed that project-wide actions were underway to address the conditions documented in the DR.

The inspectors discussed software design control with a senior quality engineer in the QA organization whose focus and expertise lies in the IT area. Procedure 24590-WTP-GPP-IT-001, "Use of Quality Affecting Software Applications," Rev. 0, dated September 24, 2001, required QAS to be V&V tested prior to being added to the SDL. The inspectors identified that the Computational Fluid Dynamics (CFD) software suite (Fluent, FIDAP, and Airpak) had not yet had its V&V testing completed and approved; however, it was listed in the "approved" section of the current, controlled version of the SDL. To confirm this status, the inspectors reviewed the Computer Application Use Registration Form (24590-WTP-CAF-IT-01-001 referenced in the SDL, dated September 24, 2001) that should have been completed for approving the software for use in ITS design applications. The form was not yet completely processed (marked "planned" in the Contractor's electronic access system), thus confirming that the software was not yet approved for QAS applications. Failure to adhere to the governing procedure for approving software for quality affecting applications was an example of a Finding (IR-01-009-01c-FIN) for failure to follow procedures as required by QAM Policy Q-01.1, Section 3.1.

The Senior Quality Engineer informed the inspectors the Chief Information Officer was taking action to remove the affected software from the "approved" section of the SDL pending completion of its V&V testing. The Senior Quality Engineer also stated that she had confirmed that during the period of time that the software was incorrectly approved for QAS use, it had not been used in ITS design applications. Thus, no adverse consequences resulted from the

condition. Because of this, the senior quality engineer stated that there was no need to initiate a DR. However, the inspectors considered this to be an incorrect decision, given that the identified condition was a condition adverse to quality due to the breakdown of the software control process. At the exit meeting, Contractor management, when questioned whether a DR should have been initiated for this condition, correctly stated that such a condition warrants a DR to assure that the "process breakdown" that allowed the condition to exist was understood and corrected. Contractor management committed to taking action to ensure that project personnel understand the expectation that DR's shall be initiated for identified conditions adverse to quality, regardless of whether an adverse consequence resulted from the condition.

The inspectors reviewed Corrective Action Report (CAR) 24590-WTP-CAR-QA-01-008, Rev. 0, dated November 7, 2001, that documented the above example of a Finding (IR-01-009-01c-FIN). The recommended actions included:

- Immediate removal of software from the SDL whose V&V and QAS approval was in question (CAR included an attached, revised SDL dated November 7, 2001 that removed the CFD software application from the approved section of the list)
- Verification that all software on the SDL had received V&V testing in accordance with BNI processes and procedures
- Familiarization and training of affected personnel to be sensitive to process-related issues which may be indicated by systemic conditions
- Determination of how un-V&V tested software got on the SDL and identification and resolution of process problems
- Determination of whether affected software had been utilized prior to proper V&V testing and any impact to work activities

The inspectors considered the above actions to be comprehensive and appropriate to the circumstances.

Inspection Report IR-01-002, "Procurement and Configuration Management," performed in July 2001 noted that "the Contractor's position from the January 2001 inspection, that software did not need to be validated and verified until the preparation of final design documents, appeared to be poorly conceived. At the inspection exit, Contractor Senior Management responded that a more aggressive policy for validating and verifying software would be implemented." During this inspection, the inspectors observed that Code of Practice K70C515D_2 Section 5.2.A stated that, "Software verification and validation activities shall be performed prior to release by IT Change Board for project use." Procedure 24590-WTP-GPP-IT-001, Rev. 0, which superseded the aforementioned COP, included as an objective, "Before release for use, QAS is adequately validated and verified, controlled and documented such that comparable results can be obtained through independent replication of the process," and "QAS is added to the Approved section of the Software Designation List prior to use." This new implementing procedure establishes requirements that assured that QAS was V&V tested prior to release to project personnel using the software to perform ITS design activities. From review of the September 24, 2001, Software Designation List, the inspector noted that eight software applications were approved for QAS use

on the project, and (with the exception noted above relative to the CFD software suite) that V&V test reports for each application were completed and approved prior to inclusion of the software in the "approved" section of the SDL. Enhanced procedural requirements relating to V&V testing of software prior to its use in quality affecting applications, as well as the increased number (compared to that existing in the July 2001 time frame) of software applications approved for QAS use, indicate that Contractor management implemented a more aggressive policy for V&V testing of software prior to its use in quality affecting applications, as stated in July 2001.

Implementation of the process for approving and controlling software for application in ITS design activities

The inspectors reviewed the following documents associated with approved QAS:

- CALC-W375LV-NS00029, "Validation of MCNP4C for Photons and Verification for All Applications," dated February 13, 2001
- CALC-24590-NS00003, "Validation of MCNP 4C for RPP-WTP Criticality Calculations," dated June 4, 2001
- RPT-24590-NS00002, "Verification and Validation Report for MCNP 4C," Rev. 0, dated May 29, 2001
- CAF-W375-01-00009, "Computer Application Registration Form for MCNP 4C," Rev. 0, dated February 15, 2001
- CALC-24590-NS00024, "Verification of the Computer Code GXQ, Version 4.0D," Rev. 0, dated June 13, 2001
- RPT-24590-TE-00005, "GXQ, Version 4.0D – Qualified User’s Documentation," Rev. 0, dated June 13, 2001
- 24590-WTP-VV-PS-01-002, "Verification and Validation Report for Bechtel’s Pipe Support Family of Programs (PCFAPPS)," Rev. 0, dated August 30, 2001
- 24590-WTP-VV-E-01-002, "Verification and Validation Report for SETROUTE Version 8.6.0," Rev. 0, dated October 25, 2001.

The inspectors reviewed the V&V test reports for QAS software applications MCNP version 4C (criticality, shielding, and dose calculations), GXQ version 4.0D (atmospheric dispersion coefficient calculations), Setroute version 8.6.0 (electrical cable, raceway, and wiring management program, including design, procurement, and construction), and ME150, version 4.0 (pipe support family of programs) to confirm that the codes were adequately tested. Associated information was reviewed, such as "user lists," training records for selected users, the completed Computer Application Registration Form, software error notifications from suppliers and their processing by the Contractor, and serial numbers of computer platforms running approved QAS applications for comparison with those verified for use in V&V test reports. The

inspectors concluded that the subject QAS software was appropriately tested, used, and controlled in accordance with project procedures.

The inspector observed that the V&V test report for MCNP 4C (RPT-W375-NS00009 and CALC-W375LV-NS00029) was weak in providing justification of test results that fell outside the reference range (acceptance criteria). The test report stated that, "The direct photon results from MCNP 4C are generally within the range of results from the other reference codes in ANS Standard 6.6.1 (1987). Some results are 10% to 30% outside of the range and still deemed acceptable. The reference codes are deterministic in nature and this type of difference when comparing a deterministic result to a Monte Carlo result is reasonable." The Project Program Sponsor discussed the technical rationale for his conclusion that the V&V test was acceptable, given the range of results noted in the report. The inspector concluded that the explanation was acceptable, however, the documented rationale was considered weak.

1.10.3 Conclusions

Procedures controlling software used in quality affecting applications adequately met the requirements of the QAM. QAS was being controlled in accordance with project procedures. However, an example of a Finding concerning failure to follow procedures as required by QAM Policy Q-05.1, Section 3.1 regarding not following the approval process for entering software on the SDL was identified (IR-01-009-01c-FIN).

Contractor management implemented a more aggressive policy for V&V testing of software prior to its use in quality affecting applications, per their comment from the July 2001 Procurement and Configuration Management inspection exit meeting.

1.11 Audits (ITP I-104)

1.11.1 Inspection Scope

The inspectors assessed the Contractor's performance of audits conducted by the Contractor's staff on selected design documents to ensure the effectiveness of the design program. To perform this assessment the inspectors reviewed selected surveillance reports to determine whether the scope and frequency of surveillance of the design process area was adequate. The inspectors also reviewed surveillance results to determine if they were adequately rated as satisfactory or unsatisfactory, with DRs or CARs initiated for unsatisfactory results. For selected DRs, the inspectors evaluated the adequacy and effectiveness of corrective actions.

1.11.2 Observations and Assessments

Because the Contractor EDPIs became effective October 8, 2001, Contractor Quality Assurance (QA) had not yet performed a Design Process Audit. This was planned for January 2002 to allow for a sufficient number of design deliverables produced under the new process to be available for auditing. However, several QA surveillances associated with Engineering Design activities implemented under the pre-October 8, 2001, procedures were reviewed to determine if

these adequately covered the design process area, appropriately rated results, identified significant findings, and documented DR's or CARs for the findings. Surveillance reports selected for review were those relating to the engineering design process performed over the period July through October 2001 (since Inspection Report IR-01-003, "Quality Assurance Assessment," had reviewed and evaluated surveillance reports issued though July 2001).

Contractor Quality Assurance performed 197 surveillances on the Project over the period February 15 to October 8, 2001, of which 74 related to engineering design activities. Results of surveillance were catalogued into "activity categories" for purposes of trending performance. Surveillance "activity categories" relating to the engineering design area included (1) engineering calculations, (2) engineering design, (3) engineering specifications, (4) engineering "other," and (5) ES&H activities. Contractor QA appropriately scheduled and performed additional surveillances to follow-up on the adequacy of corrective actions in activity categories where surveillances resulted in DRs or CARs. The inspectors concluded that the scope and frequency of surveillance of the design process area was adequate. Surveillance reports identified problems accurately, characterized and rated results, and DRs were written for "unsatisfactory" ratings. Associated DRs, with the following exception, provided an auditable trail of actions planned or taken to resolve the conditions adverse to quality.

1. In the "activity category" of Engineering Calculations, the inspectors observed a recurrence of problems related to tracking of unverified assumptions, as well as providing technical justifications for assumptions used in calculations. The inspectors reviewed the Corrective Action Plan (CAP) in the applicable DR (24590-WTP-DR-QA-01-006, Rev. 3) to determine the adequacy and status of corrective action implementation. In addition, results of the inspectors' review of recent preliminary calculations, particularly relative to their treatment of assumptions, were also considered in evaluating the adequacy of Contractor corrective actions. Of the eight calculations reviewed, only one was produced under the new EDPI's. The following facts pertain:
 - Surveillance 24590-WTP-SV-QA-01-006, Rev. 0 dated June 26, 2001, "Assumptions in Calculations," documents the results of a QA surveillance performed to determine the extent to which assumptions in calculations were being identified, technically justified, and unverified assumptions tracked, as required. This was performed, in part, to verify the adequacy of corrective actions taken for a previous DR (DR-W375-01-QA00021) that identified inadequate tracking of unverified assumptions in an engineering calculation. The June 2001 surveillance resulted in identifying continuing problems with logging of unverified assumptions in calculations, as well as a new problem with lack of identification of unverified assumptions in some calculations, and lack of provision of technical bases for some calculation assumptions.
 - DR 24590-WTP-DR-QA-01-006, dated June 26, 2001, documented the latter problem. Remedial action was documented and approved for implementation on August 23, 2001. The description of the remedial action stated in part, "Engineering agrees that additional justification could have been provided for some of the preliminary calculation assumptions, and that some issued preliminary calculations might have been produced using more of the applicable

calculation attributes. It is believed that the complexity of the procedure structure could have been a major contributor to some of these points being overlooked with the calculations." The remedial action also took credit for the issuance of, and training on, the new engineering procedure on calculations, which was planned for implementation in early October 2001. In addition, a memorandum (CCN 021141) was issued in July 2001, to both management and Project personnel, providing specific direction regarding management and use of project technical software and calculations. The CAP was closed out by Engineering and verified closed by QA on October 5, 2001.

- The memorandum referenced above was focused narrowly on "a potential concern with the use of unverified and unvalidated software for the support of some calculations," and failed to describe the human performance problem that caused the deficiencies to exist, nor did it direct corrective actions to address this cause, namely - (1) the need to rigorously follow Project procedures, (2) the need to consistently log unverified assumptions for tracking purposes, and (3) the need to document technical bases for assumptions noted in calculations. In essence, the memorandum failed to provide broad-based direction for adhering to engineering procedures to assure that unverified assumptions were appropriately identified, with technical bases documented, in design calculations.
- Two additional surveillances were performed by QA to assess the adequacy of corrective actions to address the problem with unverified or unsupported assumptions in calculations in the intervening period between June and October 2001 (24590-WTP-SV-QA-01-045, Rev. 0, dated August 2, 2001, and 24590-WTP-SV-QA-01-051, Rev. 0, dated August 15, 2001). The first surveillance was inconclusive relative to the adequacy of logging unverified assumptions, and recommended that further review by QA occur after the design effort was in full swing. No additional DRs were issued, and the results were marked "sat." The second DR concluded that the HLW unverified assumptions logbook captured the necessary information required by the COP. However, the report also stated that, "The completeness of the log was not addressed in this surveillance, as that would require a review of all calculations pertinent to the HLW group for unverified assumptions." No additional DRs were issued and the results were marked "sat." Notwithstanding ongoing implementation of corrective actions from the June DR at the time that these two surveillances were performed, these surveillances closed the "unverified assumption" issue without providing a clear, supportable basis for doing so.
- Contractor management informed the inspector that all Project personnel were trained on the new QAM in the August/September 2001 timeframe, and the training emphasized the expectation and importance of adhering to procedures when performing quality activities. The inspectors verified this through review of the training lesson plan. However, the documented CAP for the subject DR did not reference this training as a remedial or corrective action to address the "human performance" aspect of the "unverified assumption" problem.

- There was only one calculation performed to the new EDPI available to the inspectors for review during this inspection, and that calculation satisfactorily addressed "assumptions."
- The Contractor, as of October 8, 2001, invoked a policy that required existing project calculations to be marked "preliminary" and only taken to "confirmed" status upon complete review and verification of calculation assumptions.

The inspectors considered the above-mentioned Contractor policy appropriate and representative of a "quality barrier" that, coupled with the new EDPI procedural requirements, if properly implemented should assure all assumptions used in calculations are adequately verified with technical bases documented prior to their being "confirmed." Training of all Project personnel on the QAM reinforced expectations of rigorously adhering to procedures for performing quality activities.

1.11.3 Conclusions

The inspectors concluded that the scope and frequency of surveillance of the design process area was adequate. Surveillance reports identified problems, accurately characterized and rated results, and resulted in the initiation of DRs for "unsatisfactory" ratings. Associated DRs, with one exception, provided an auditable trail of actions planned or taken to resolve the conditions adverse to quality.

1.12 Adequacy of the Closure of Inspection Follow-up Item IR-00-001-04-IFI (IAP A-106)

1.12.1 Inspection Scope

The following inspection follow-up item, identified in a previous inspection report was reviewed to determine if it could be closed. The inspectors reviewed the Contractor's commitments provided in its response to this inspection follow-up item and other information provided. The inspectors verified by work observation, records review, and other means as appropriate, that the corrective actions stated were appropriately completed.

1.12.2 Observations and Assessments

(Closed) IR-00-001-04-IFI, "Lack of procedures or implementation of Quality Assurance Program and Implementation Plan (QAPIP) requirements to define and specify data quality requirements." This item was identified in Inspection Report IR-00-001, Design Process Assessment issued in February 2000. The inspectors for IR-00-001 identified that procedures failed to address how to prescribe data quality requirements for design input provided by research and technology (R&T) development subcontractors, found that the procurement documents did not specify adequate data quality requirements, and identified a lack of procedural guidance for verifying the validity or integrity of data.

In the Contractor's response letter (CCN 021705) to the item dated August 7, 2001, the Contractor stated that procedural changes were being made to ensure that data quality requirements were prescribed in future procurement documents for all design input products. The inspectors observed Procedure 24590-WTP-GPP-RTD-001, "Technology Development," Rev. 1, dated October 12, 2001, had been revised to require, in part, that the subcontractor identify the methodology used to verify and validate test results and the Contractor formally accept the test result methodology prior to its implementation. Through review of four current test specifications, the inspectors observed that the Contractor developed test specifications and required subcontractors to either supply the methodology used or prescribe the method the subcontractor would use to verify and validate test results as required by Procedure 24590-WTP-GPP-RTD-001.

1.12.3 Conclusions

Based on the above, this item was closed.

2.0 EXIT MEETING SUMMARY

The inspectors presented the inspection results to members of Contractor management at an exit meeting on November 6, 2001. The Contractor acknowledged the Findings, observations, and conclusions presented. EDPI procedures reviewed during the inspection were marked Bechtel Confidential. The OSR did not retain copies of these procedures. The Contractor stated information discussed regarding the EDPI design process procedures was not Bechtel Confidential.

3.0 REPORT BACKGROUND INFORMATION

3.1 Partial List of Persons Contacted

J. Hinkley, Hazard and Safety Analysis (HSA) Lead
 C. Winkler, Melter Systems Engineering Manager
 M. Prytherch, Mechanical Handling Deputy Manager
 K. Auclair, System Engineering Manager
 B. Posta, Mechanical System Manager
 P. Lowry, HSA Lead
 S. Arora, Design Criteria Database Maintenance Engineer
 E. Hughes, Deputy Engineering Manager Systems and Projects
 F. Marsh, Engineering Manager
 F. Beranek, Environmental, Safety, and Health Manager
 E. Smith, Safety Programs Engineer
 M. Platt, Safety Programs Lead
 S. Sontag, BOF/LPP HSA Lead
 S. Lynch, Manager of Engineering Technology
 D. Brooks, Operations Lead Specialist
 G. Shell, Quality Assurance Manager

R. Souther, Chief Communications Officer, Information Technology
 B. Bush, Engineering Automation Manager
 M. Perks, Radiological and Fire Safety Manager
 S. Henry, Radiological Operations Lead Engineer
 B. Mallone, Engineer Application CM Lead
 P. Talmage, Senior Quality Engineer
 D. Cresci, Safety Analyst
 J. Ho, Engineer
 B. Roberts, Project Planner/Scheduler
 P. Lowry, HSA Lead
 F. Holgado, Engineer, Mechanical Systems
 D. Skeath, Engineer, Mechanical Systems
 A. Cutrona, Engineer, Mechanical Systems
 D. Scribner, CS&A Manager
 A. Palmquist, Civil-Structural Engineer
 A. Dada, Process Engineering Manager
 C. Tevis, Process Engineer
 D. Klein, Radiological, Nuclear, and Process Safety Manager
 J. Rouse, Senior Lead Engineer HL Vitrification
 G. Grant, Acting QA Manager
 R. Peters, Melter Process Engineer
 G. Clark, HVAC Engineer
 P. Beers, Senior Engineer HVAC
 G. McIntyre, QA Evaluator
 B. Niemi, Safety Programs Engineer
 R. Peterson, PT Technology Manager
 B. Voke, Pretreatment Project Engineer
 T. Valentino, HLW Project Engineer
 G. Duncan, Mechanical Deputy Engineering Manager
 T. Meagher, ES&H Manager
 T. Brown, Interface Management Manager
 S. Ketola, System Engineering Supervisor
 G. Indra, Lead Engineer, Structural
 H. Wong, Senior Electrical Engineer
 K. Yu, Lead Engineer, HVAC

3.2 List of Inspection Procedures Used

Inspection Technical Procedure I-104, "Design Process Assessment"
 Inspection Administrative Procedure A-106, "Verification of Corrective Actions"

3.3 List of Items Opened, Closed, and Discussed

Opened

IR-01-009-01a-FIN	Finding	Failure to follow procedures for completing document review requests. (Section 1.4.2)
IR-01-009-01b-FIN	Finding	Failure to document delegation of authority to approve SIPD entries as required by procedure. (Section 1.5.2)
IR-01-009-01c-FIN	Finding	Failure to V&V test software prior to its entry onto the approved section of the Software Designation List. (Section 1.10.2)
IR-01-009-02-FIN	Finding	Procedure for calculations was revised such that it no longer met the QAM requirement to identify unverified assumptions. (Section 1.6.2)

Closed

IR-00-001-04-IFI	Follow-up item	Lack of procedures or implementation of QAPIP requirements to define and specify data quality requirements. (Section 1.12.2)
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3.4 List of Documents Reviewed During the Inspection

Procedures Reviewed:

Engineering Department Project Instruction (EDPI) 24590-WTP-3DP-G04B-00001, "Design Criteria," Rev. 0, dated October 8, 2001

EDPI 24590-WTP-3DP-G04B-00005, "Configuration Management," Rev. 0, dated October 8, 2001

EDPI 24590-WTP-3DP-G04B-00016, "Engineering Studies," Rev. 0, dated October 8, 2001

EDPI 24590-WTP-3DP-G04B-00025, "Engineering Interface Control," Rev. 0, dated October 8, 2001

EDPI 24590-WTP-3DP-G04B-00027, "Design Verification," Rev. 0, dated October 8, 2001

EDPI 24590-WTP-3DP-G04B-00033, "Project Reviews," Rev. 0, dated October 8, 2001

EDPI 24590-WTP-3DP-G04B-00034, "Off-Project Design Review," Rev. 0, dated October 8, 2001

EDPI 24590-WTP-3DP-G04B-00037A, "Engineering Calculations," Rev. 0, dated October 8, 2001

EDPI 24590-WTP-3DP-G04B-00038, "Computer Code Error Reporting," Rev. 0, dated October 8, 2001

EDPI 24590-WTP-3DP-G04B-00046, "Engineering Drawings," Rev. 0, dated October 8, 2001

EDPI 24590-WTP-3DP-G04B-00049, "Engineering Specifications," Rev. 0, dated October 8, 2001

EDPI 24590-WTP-3DP-G04B-00053, "Certification and Stamping of Engineering Documents," Rev. 0, dated October 8, 2001

EDPI 24590-WTP-3DP-G04B-00057, "Technical Services Contracts," Rev. 0, dated October 8, 2001

EDPI 24590-WTP-3DP-G04B-00058, "Supplier Engineering & Quality Verification Documents," Rev. 0, dated October 8, 2001

EDPI 24590-WTP-3DP-G04B-00061, "Disposition of Nonconformance Reports," Rev. 0, dated September 28, 2001

EDPI 24590-WTP-3DP-G04B-00062, "Disposition of Field Change Request/Field Change Notice," Rev. 0, dated September 28, 2001

EDPI 24590-WTP-3DP-G04B-00063, "Supplier Deviation Disposition Request," Rev. 0, dated October 8, 2001

EDPI 24590-WTP-3DP-G04B-00070, "Resolution of Startup Field Reports," Rev. 0, dated October 8, 2001

EDPI 24590-WTP-3DP-G04B-00901, "Design Change Control," Rev. 0, dated October 8, 2001

EDPI 24590-WTP-3DP-G04B-00902B, "System and Area Locators," Rev. 0, dated September 19, 2001

EDPI 24590-WTP-3DP-G04B-00903, "System Descriptions," Rev. 0, dated October 8, 2001

EDPI 24590-WTP-3DP-G04B-00904, "Design Criteria Database," Rev. 0, dated October 8, 2001

EDPI 24590-WTP-3DP-G04B-00905, "Determination of Quality Levels," Rev. 0, dated October 8, 2001

Procedure, 24590-WTP-GPP-PADC-003, "Internal Review and Approval of Documents," Rev. 0, dated September 2001

Procedure 24590-WTP-GPP-IT-001, "Use of Quality Affecting Software Applications," Rev. 0, dated September 24, 2001

COP K70C518C, "Code of Practice for Engineering Calculations," Rev 1, dated September 9, 2001

Procedure K70P555, "Design Verification," Rev. 1, dated February 12, 2001

Procedure K70P529C, "Engineering Calculations: Preparation, Checking, and Approval," Rev. 1, dated September 10, 2001

Procedure K70P003A, "Design Review," Rev. 1, dated September 9, 2001

Procedure 24590-WTP-GPP-SANA-002, "Hazard Analysis, Development of Hazard Control Strategies, and Identification of Standards," Rev.0, dated September 28, 2001

Guide 24590-WTP-GPG-SANA-001, "Standards Identification Process Database." Rev.0, dated September 28, 2001

Procedure 24590-WTP-GPP-SANA-003, "Standards Identification Process Database," Rev.0, dated September 28, 2001

24590-WTP-PL-MG-01-002, "RPP-WTP Configuration Management Plan," Rev. 0, dated October 8, 2001

Procedure 24590-WTP-GPP-PADC-002A, "Project Records Management," Rev.0, dated September 15, 2001

COP K70C515D_2, "Code of Practice for Computer Program Use," Rev. 2

Procedure K13P023_0, "Internal Review and Approval of Documents," Rev. 0, dated December 2000

Procedure 24590-WTP-GPP-RTD-001, "Technology Development," Rev 0, dated October 12, 2001

Procedure 24590-GPP-CPRO-001, "Production of River Protection Project Waste Treatment Plant Procedures," dated September 2000

Other Documents Reviewed:

Management Assessment Report 24590-WTP-MAR-ENG-01-008, "Design Process Self-Assessment, Systems Engineering," Rev. 0, dated September 13, 2001

Basis of Design 24590-WTP-DB-ENG-01-001, Rev. A, dated August 20, 2001

Operations Requirements Document 24590-WTP-RPT-OP-01-001, Rev. D, dated August 20, 2001

WTP Project Organization Charts, 24590-WTP-ORC-HR-01-001, Rev. 3, dated October 2001

Design Criteria Database, CCN 022339, dated October 2001

Functional Specification, 24590-WTP-PL-G-01-001, Rev. A, dated August 2001

Quality Assurance Manual, 24590-WTP-QAM-QA-01-001, Rev. 0, dated August 2001

Drawing, 24590-HLW-M8-750-00001004, "HLW Vitrification Building, System 750, Plant Room V&ID, C5 Extract Sheet 4 of 5," Rev. A, dated August 2001

DIM, 24590-HLW-M8I-750-00001004, "HLW Vitrification Building, System 750, Plant Room V&ID, C5 Extract Sheet 4 of 5," Rev. A, dated August 2001

DRRs for Drawing, 24590-HLW-M8-750-00001004 and DIM, 24590-HLW-M8I-750-00001004, dated July 2001

Drawing, 24590-LAW-M6-LOP-00001, "P&ID – LAW Primary Offgas Process System Melter 1," Rev. A, dated October 2001

DIM, 24590-LAW-M6I-LOP-00001, "P&ID – LAW Primary Offgas Process System Melter 1," Rev. A, dated October 2001

DRRs for Drawing, 24590-LAW-M6-LOP-00001 and DIM, 24590-LAW-M6I-LOP-00001, dated September 2001

Drawing, 24590-LAW-M6-LVP-00001, "P&ID LAW LVP System Melters Secondary/Offgas," Rev. A, dated September 2001

DIM, 24590-LAW-M6I-LVP-00001, "P&ID LAW LVP System Melters Secondary/Offgas," Rev. A, dated September 2001

DRRs for Drawing, 24590-LAW-M6-LVP-00001 and DIM, 24590-LAW-M6I-LVP-00001, dated September 2001

Drawing, 24590-HLW-M6-RLD-00001, "P&ID – HLW Radioactive Liquid Waste Disposal System Active Effluent Collection," Rev. A, dated October 2001

DIM, 24590-HLW-M6I-RLD-00001, "P&ID – HLW Radioactive Liquid Waste Disposal System Active Effluent Collection," Rev. A, dated October 2001

DRRs for Drawing, 24590-HLW-M6-RLD-00001 and DIM, 24590-HLW-M6I-RLD-00001, dated October 2001

Drawing, 24590-HLW-M6-RLD-00002, "P&ID – HLW Radioactive Liquid Waste Disposal System Sumps and Collection Vessel," Rev. A, dated October 2001

DIM, 24590-HLW-M6I-RLD-00002, Rev. A, "P&ID – HLW Radioactive Liquid Waste Disposal System Sumps and Collection Vessel," dated October 2001

DRRs for Drawing, 24590-HLW-M6-RLD-00002 and DIM, 24590-HLW-M6I-RLD-00002, dated October 2001

Drawing 24590-HLW-M5-V17T-00002, "Process Flow Diagram HLW Vitrification Melter (System 211)," Rev. 0

DIM 24590-HLW-M5-V17T-00002, "Process Flow Diagram HLW Vitrification Melter (System 211)," Rev. 0

Drawing 24590-HLW-M51-V17T-00004, "Process Flow Diagram HLW Secondary Offgas (System 231)," Rev. 0

DIM 24590-HLW-M5-V17T-00004, "Process Flow Diagram HLW Secondary Offgas (System 231)," Rev. 0

Drawing 24590-HLW-M8-750-00002001, "HLW Vitrification Building, System 750, Volumetric V&ID, C5 Cascade System EL (-)21'-0," Rev. A

DIM 24590-HLW-M8I-750-00002001, "HLW Vitrification Building, System 750, Volumetric V&ID, C5 Cascade System EL (-)21'-0," Rev. A

Drawing, 24590-HLW-M5-V17T-00003, Rev. 0, "Process Flow Diagram HLW Vitrification Primary Offgas (System 231)," dated August 2001

DIM, 24590-HLW-M51-V17T-00003, Rev. 0, "Process Flow Diagram HLW Vitrification Primary Offgas (System 231)," dated August 2001

Drawing, 24590-LAW-M6-PSW-00002, Rev. A, "P&ID – LAW Process Service Water System Process Cell Racks," dated October 2001

DIM, 24590-LAW-M6I-PSW-00002, Rev. A, "P&ID – LAW Process Service Water System Process Cell Racks," dated October 2001

BNFL-5193-QAP-01, "Quality Assurance Program and Implementation Plan," Rev. 4C

Approved Project IT Software Baseline Report of dated October 19, 2001

Software Designation Lists, dated September 24, 2001, and dated November 7, 2001

CALC-W375LV-NS00029, "Validation of MCNP4C for Photons and Verification for All Applications," dated February 13, 2001

CALC-24590-NS00003, "Validation of MCNP 4C for RPP-WTP Criticality Calculations," dated June 4, 2001

RPT-24590-NS00002, "Verification and Validation Report for MCNP 4C," Rev. 0, dated May 29, 2001

CAF-W375-01-00009, "Computer Application Registration Form for MCNP 4C," Rev. 0, dated February 15, 2001

CALC-24590-NS00024, "Verification of the Computer Code GXQ, Version 4.0D," Rev. 0, dated June 13, 2001

RPT-24590-TE-00005, "GXQ, Version 4.0D – Qualified User's Documentation," Rev. 0, dated June 13, 2001

24590-WTP-VV-PS-01-002, "Verification and Validation Report for Bechtel's Pipe Support Family of Programs (PCFAPPS)," Rev. 0, dated August 30, 2001

24590-WTP-VV-E-01-002, "Verification and Validation Report for SETROUTE Version 8.6.0," Rev. 0, dated October 25, 2001

OSR Inspection Report IR-01-002, "Procurement and Configuration Management," dated June 18, 2001

OSR Inspection Report IR-01-003, "Quality Assurance Assessment," dated August 15, 2001

Contractor training lesson plan and slides used in QAM Training in August/September 2001

Contractor QA Surveillance schedule for 2001

Graphic results of QA surveillances by "activity category" for 2001

24590-HLW-NLC-H93T-0001, "HLW Cell/Cave Liner Calculations," Rev. 0, dated August 16, 2001

24590-HLW-MEC-231-00001, "Sizing of HLW SBS Vessel Cooling Coils," Rev. 0, dated August 16, 2001

24590-BOF-MCC-910-00001, "Process Air System Sizing," Rev. 0, dated August 16, 2001

24590-HV-PR00001, "HLW Blended Glass Former Average Densities," Rev. 0, dated May 11, 2001

W375LP-PR00059, "Determining Heating Duty Required for Eluant Vessels V43070A/B (System LP-340)," Rev. 0, dated March 28, 2001

24590HV-PR00004, "Re-evaluation of Primary Offgas HEPA Filters," Rev. 0, dated June 6, 2001

W375LP-PR00058, "Simple Mass Balance to Determine the Steady-State Mass Flow of LL SBS into PT (Systems LP 130, 140, 510, and 550)," Rev. 1, dated March 28, 2001

24590-PTF-MVC-CXP-00001, "Batch Specification for CXP-VSL-00001," Rev. A, dated October 25, 2001

Quality Assurance Surveillance Report, 24590-WTP-SV-QA-01-006, "Assumptions in Calculations," Rev. 0, dated June 26, 2001

24590-WTP-DR-QA-01-006, "Unverified Assumptions in Engineering Calculations," Rev. 0, dated June 26, 2001

Quality Assurance Surveillance Report, 24590-WTP-SV-QA-01-045, "Corrective Action Verification for DR-W375-01-QA00021, Unverified Assumptions in Calculations," Rev. 0, dated August 2, 2001

Quality Assurance Surveillance Report, 24590-WTP-SV-QA-01-051, "Corrective Action Verification for DR-W375-01-QA00021, Unverified Assumptions in Calculations," Rev. 0, dated August 15, 2001

Memorandum CCN 021141, "Management and Use of Project Technical Software and Calculations," dated July 17, 2001

Interface Control Document 24590-WTP-ICD-MG-01-002, "Portable Water," Rev. A, dated July, 2001

Interface Control Document 24590-WTP-ICD-MG-01-003, "Radioactive Solid Waste," Rev. A, dated July, 2001

Interface Control Document 24590-WTP-ICD-MG-01-005, "Nonradioactive, Nondangerous Liquid Effluents," Rev. A, dated July, 2001

Interface Control Document 24590-WTP-ICD-MG-01-006, "Radioactive, Dangerous Liquid Effluents," Rev. A, dated July, 2001

Interface Control Document 24590-WTP-ICD-MG-01-009, "Land for Siting," Rev. A, dated July, 2001

Interface Control Document 24590-WTP-ICD-MG-01-011, "Electricity," Rev. A, dated July, 2001

Interface Control Document 24590-WTP-ICD-MG-01-012, "Road," Rev. A, dated July, 2001

Interface Control Document 24590-WTP-ICD-MG-01-014, "Immobilized High-Level Waste," Rev. A, dated July, 2001

Interface Control Document 24590-WTP-ICD-MG-01-015, "Immobilized Low-Level Waste," Rev. A, dated July, 2001

Interface Control Document 24590-WTP-ICD-MG-01-016, "Entrained Solids," Rev. A, dated July, 2001

Interface Control Document 24590-WTP-ICD-MG-01-019, "Low-Activity Waste Feed," Rev. A, dated July, 2001

Interface Control Document 24590-WTP-ICD-MG-01-020, "High-Level Waste Feed," Rev. A, dated July, 2001

Interface Control Document 24590-WTP-ICD-MG-01-023, "Waste Treatability Samples," Rev. A, dated July, 2001

Test Specification 24590-WTP-TSP-RT-01-020, "Pretreatment Pilot Evaporator Testing," Rev. 0, dated October 12, 2001

Test Specification 24590-WTP-TSP-RT-01-017, "Glass Pour Model for IHLW and ILAW Cooling," Rev. 0, dated October 3, 2001

Test Specification 24590-WTP-TSP-RT-01-011, "Tank 241-AP-104 Sample Compositing, Homogenization and Analyses," Rev. 0, dated October 19, 2001

Test Specification 24590-WTP-TSP-RT-01-016, "LAW Integration Primary and Secondary Off-Gas Performance Testing," Rev. 0, dated October 25, 2001

3.5 List of Acronyms

AB	Authorization Basis
ABCN	Authorization Basis Change Notice
ANS	American Nuclear Society
APE	Area Project Engineer
BNFL	BNFL Inc.
BNI	Bechtel National, Inc.
BOD	Basis of design
CAP	Corrective Action Plan
CAR	Correction Action Report
CCN	Controlled Correspondence Number
CFD	Computational Fluid Dynamics
CFR	Code of Federal Regulations
CHG	CH2M Hill Hanford Group
COP	Code of Practice
CSA	Critical Software Applications
DCA	Design Change Application
DCD	Design Criteria Database
DCN	Design Change Notice
DF	Decontamination Factor
DIM	Design Input Memorandum
DOE	U.S. Department of Energy
DR	Deficiency Report
DRR	Document Review Request
EDPI	Engineering Department Project Instruction

ES&H	Environmental, Safety and Health
gpm	gallons per minute
HEPA	high efficiency particulate air
HFE	Human Factors Engineering
HLW	High-level waste
HSA	Hazard and Safety Analysis
HVAC	Heating, ventilation, and air conditioning
IAP	Inspection Administrative Procedure
ICD	Interface Control Document
ICF	interface change form
IHLW	immobilized high-level waste
IMP	Interface Management Plan
IR	inspection report
ISM	Integrated Safety Management
ISMP	Integrated Safety Management Plan
IT	Information Technology
ITP	Inspection Technical Procedure
ITS	important-to-safety
LAW	Low-activity waste
LL	low-level
LPP	LAW pretreatment plant
LVP	LAW vitrification plant
MCNP	Monte Carlo N-Particle
MFD	Mechanical Flow Diagram
MHD	Mechanical Handling Diagram
ORP	Office of River Protection
OSR	Office of Safety Regulation
P&ID	Piping and Instrumentation Diagrams
PCAR	Partial Construction Authorization Request
PDC	Project Document Control
PFD	Process Flow Diagram
PSAR	Preliminary Safety Analysis Report
PT	Pretreatment
QA	Quality Assurance
QAM	Quality Assurance Manual
QAP	Quality Assurance Program
QAPIP	Quality Assurance Program and Implementation Plan
QAS	Quality Affecting Software
QL	Quality Level
R&T	Research & Technology
RPP	River Protection Project
SBS	Submerged Bed Scrubber
SCR	Safety Case Requirement
SDL	Software Designation List
SIPD	Standards Identification Process Database
SSCs	structures, systems, and components
V&ID	Ventilation and Instrumentation Diagrams
V&V	verified & validated

VFD	Ventilation Flow Diagram
VIT	vittrification
WTP	Waste Treatment Plant