U.S. Department of Energy
Office of River Protection
P.O. Box 450
Richland, Washington 99352

02-OSR-0594

Mr. R. F. Naventi, Project Manager
Bechtel National, Inc.
2435 Stevens Center
Richland, Washington 99352

Dear Mr. Naventi:

CONTRACT NO. DE-AC27-01RV14136 – REISSUE OF IR-02-015, DESIGN PROCESS INSPECTION REPORT

Reference: ORP letter from R. J. Schepens to R. F. Naventi, BNI, "Inspection Report IR-02-015 – Design Process Inspection," 02-OSR-0530, dated November 21, 2002.

Due to transmitting an incorrect version of Enclosure 2 in the Reference, this letter reissues the corrected version of 02-OSR-0530 (Enclosure). If you have any questions, please contact me, or your staff may contact Robert C. Barr, WTP Safety Regulation Division, (509) 376-7851.

Sincerely,

Roy J. Schepens
Manager

OSR:JEA

Enclosure

cc w/encl:
W. R. Specialetti, BNI

Notice of Finding

The responsibilities of Bechtel National, Inc. (the Contractor) as they relate to conventional non-radiological worker safety and health; radiological, nuclear, and process safety; environmental protection; and quality assurance (QA) are defined in Section C, Standard 7, "Environmental, Safety, Quality, and Health" of the River Protection Project Waste Treatment Plant (RPP-WTP) Contract[1].

Section C, Standard 7, Section (e)(3) "Quality Assurance" of the Contract states, "The Contractor shall develop a QA program, supported by documentation that describes overall implementation of QA requirements." The Contractor's QA program is defined in 24590-WTP-QAM-01-001, Quality Assurance Manual, (referred to as the QA Manual).

During performance of an inspection of the Contractor's design process, conducted September 16 through September 20, 2002, at the Contractor's offices, the Office of River Protection (ORP) identified the following:

1. The QA Manual, Policy Q-03.1, *Design Control*, Section 3.3.2, states in part, "Design information transmitted across interfaces shall be documented and controlled."

   The QA Manual, Policy Q-05.1, *Instruction, Procedures, and Drawings,* Section 3.1.1, states in part, "Activities affecting quality shall be prescribed by and performed in accordance with documented instructions, procedures … for determining that prescribed activities have been satisfactorily accomplished."

   Contrary to the above, the Contractor failed to provide data input controls in accordance with documented instructions or procedures for information contained in the Standards Identification Process Database, which is collected from various sources and used the design process. (Section 1.2, IR-02-015-01-FIN)

2. The QA Manual, Policy Q-03.1, *Design Control*, Section 3.2.1, states, "Applicable design inputs shall be identified and documented and their selection reviewed and approved by those responsible for the design."

   The QA Manual, Policy Q-03.1, *Design Control*, Section 3.5.5, states in part, "Documentation of design analyses shall include…Design inputs and their sources."

   Contrary to the above, the Contractor failed to identify and document applicable design inputs in engineering design calculations, system descriptions, and Design Input Memoranda. (Section 1.3 and 1.4, IR-02-015-02-FIN)

[1] Contract No. DE-AC27-01RV14136, dated December 11, 2000, between Bechtel National, Inc. (the Contractor) and the U.S. Department of Energy (DOE)

3. The QA Manual, Policy Q-03.1, *Design Control*, Section 3.2.4, states, "Design inputs based on assumptions that require confirmation shall be identified and controlled as the design proceeds."

   The QA Manual, Policy Q-05.1, *Instruction, Procedures, and Drawings,* Section 3.1.1, states in part, "Activities affecting quality shall be prescribed by and performed in accordance with documented instructions, procedures … for determining that prescribed activities have been satisfactorily accomplished."

   The QA Manual, Policy Q-05.1, *Instruction, Procedures, and Drawings,* Section 3.5.5, states in part, "Documentation of design analysis shall include: Identification of assumptions and those that must be verified as the design proceeds."

   Contrary to the above, the Contractor had not established a process or procedures for tracking and closure of unverified assumptions in engineering design calculations. (Section 1.4, IR-02-015-03-FIN)

4. The QA Manual, Policy Q-05.1, *Instruction, Procedures, and Drawings*, requires "Activities affecting quality shall be … performed in accordance with documented instructions, procedures, and drawings of the type appropriate to the circumstances …." It also specifies "All individuals at the project shall comply with the implementing documents."

   Contractor implementing procedure 24590-WTP-GPP-PADC-003A, *Internal Review and Approval of Documents*, Revision 1, requires document approvals include documentation of required reviews.

   Contrary to the above, the Contractor failed to follow the above procedure for the approval of documentation packages for drawings 21590-WTP-HLW-M5-V17T-00002, Revision 2 and 21590-WTP-HLW-M5-V17T-00003, Revision 2. Some documentation for these required revisions was missing from Project document Control (PDC). (Section 1.8, IR-02-015-04-FIN).

The ORP 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.

Enclosure 2
02-OSR-0530
IR-02-015

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

INSPECTION: DESIGN PROCESS ASSESSMENT

REPORT NO: IR-02-015

FACILITY: Bechtel National Inc., Waste Treatment and Immobilization Plant

LOCATION: 3000 George Washington Way
Richland, Washington 99352

DATES: September 16 -20, 2002

INSPECTORS: J. Adams (Lead), Senior Regulatory Technical Advisor
P. Carier, Verification Confirmation Official
R. Smoter, Office of Safety Regulation Consultant
R. Shepard, Office of Safety Regulation Consultant
E. Johnson, Office of Safety Regulation Consultant
L. Dell, 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-02-015

INTRODUCTION

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

- Design Process and Procedures (Section 1.2)
- Design Inputs (Section 1.3)
- Design Analysis (Section 1.4)
- Interface Controls (Section 1.5)
- Qualification Tests (Section 1.6)
- Design Software (Section 1.7)
- Design Change Control (Section 1.8)
- Design Process Audits (Section 1.9)
- Open Item Follow-up (Section 1.10)

SIGNIFICANT OBSERVATIONS AND CONCLUSIONS

Conclusions from review of the areas evaluated are as follows:

- The Contractor's design process was prescribed by a set of procedures and instructions, which mostly conformed to the applicable elements of the Quality Assurance Manual (QAM). A Finding (IR-02-015-01-FIN) involving the lack of data input controls in accordance with documented instructions or procedures for design information contained in a database was identified in this section of the inspection. (Section 1.2)

- The Contractor's design inputs were documented, with the 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 implemented for the two systems reviewed. However, the inspectors identified examples of failures to adequately identify and document relevant design inputs resulting in a Finding (IR-02-015-02-FIN). (Section 1.3)

- Design calculations reviewed were documented, controlled and retrievable. However, two Findings were identified relative to calculations. The first Finding was identified for failure to adequately document the source of inputs and the bases for assumptions in design calculations (previously identified as IR-02-015-02-FIN). The second Finding was identified for inadequate control of unverified assumptions in engineering design calculations, specifically for the lack of an adequate process for tracking or ensuring closure of unverified assumptions (IR-02-015-03-FIN). (Section 1.4)

- The Contractor's design effort was adequately coordinated among organizations to ensure integration of design criteria and other technical requirements. Information transmitted across internal and external project interfaces was controlled under formal processes. (Section 1.5)

- The Contractor had not performed any qualification tests, and none were planned at the time of the inspection. The Contractor had an approved procedure in place to identify, plan, and perform qualification tests, if required in the future. The inspectors concluded the qualification testing requirements were being adequately addressed. (Section 1.6)

- The Contractor procedures controlling software used in quality affecting applications adequately met the requirements of the QAM. Quality Affecting Software (QAS) designed, developed, or purchased for use in important-to-safety (ITS) design activities was appropriately documented, approved, and controlled. (Section 1.7)

- The Contractor's design change process implemented via the document review request (DRR) process was not being adequately implemented as noted in Finding IR-02-015-04. (Section 1.8)

- The Contractor's Engineering management assessments were being performed in accordance with applicable procedures and were identifying important issues, however, the Contractor had not used the CAR process, or other suitable process, to fully evaluate these issues and formulate comprehensive corrective actions. QA oversight of the design process, through audits and surveillances, were being performed in accordance with procedures, of generally high quality, and were providing valuable information. However, QA oversight of the design process was limited in scope and depth. The inspectors concluded the Contractor missed opportunities to completely evaluate problems associated with the design process and to implement corrective actions, which could have avoided the conditions resulting in the inspection Findings described elsewhere in this report. (Section 1.9)

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DESIGN PROCESS ASSESSMENT INSPECTION REPORT

1.0 REPORT DETAILS

1.1 Introduction

The Waste Treatment and Immobilization Plant (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 (AB), which included the requirements of an approved Quality Assurance Manual (QAM) and an approved Integrated Safety Management Plan (ISMP).

QAM Policy Q-03.0, "Design Control" and Q-03.2, "Software Quality," described the requirements upon which this inspection was based using Inspection Technical Procedure (ITP) I-104, Rev. 2. This inspection was part of the Office of River Protections (ORP) overall effort to evaluate the adequacy of the Contractor's design program as measured by the implementation of the QAM via the approved design procedures applied to important-to-safety (ITS) systems, structures, and components (SSCs). This was the second inspection of the Bechtel design program. This inspection was performed approximately 45 days prior to the schedule Construction Authorization Request. During the inspection, the inspectors focused on two specific ITS systems, which were the High Level Waste (HLW) C-5 Ventilation System and the HLW Offgas System.

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 Process and Procedures (Inspection Technical Procedure [ITP] I-104)

1.2.1 Inspection Scope

The inspectors reviewed design-implementing procedures and interviewed Contractor staff to determine their understanding of the design procedures and to assess the adequacy and effectiveness of the Contractor's procedures for controlling and implementing the design process in compliance with the QAM.

1.2.2 Observations and Assessments

1.2.2.1 Design Process and Procedures

[1] Contract DE-AC27-01RV14136 between the U.S. Department of Energy and Bechtel National, Inc., dated December 11, 2000

The inspectors reviewed the Contractor's design process procedure, 24590-WTP-3DP-G03B-0001A, *Design Process,* to develop an overall understanding of the design process. The procedure sets forth the overall responsibilities for the Engineering organizations and its responsibility for design control and the technical adequacy of the design in accordance with the established design basis. The design process was divided into four phases: conceptual design, preliminary design, detailed design and implementation. This inspection was performed while the Contractor was in the detailed design phase, performing construction work under a Preliminary Construction Authorization Release (PCAR), and expecting the full Construction Authorization shortly.

The inspectors' review of the Contractor's program determined the preliminary design was signified by documents issued as “alpha” revisions. When the design matured sufficiently, "numeric” revisions were issued, signifying the detailed design phase and the release of the design for construction or procurement. The transition from preliminary to detailed design was an iterative process involving the integration of information from interfacing organizations, finalizing engineering calculations supporting the design and completing precursor design activities (for example, process flow diagrams were needed at the detailed design phase in order to develop detailed Piping and Instrumentation Diagrams, (P&IDs). Preliminary documents (alpha revisions) were issued for component bid, but were required at the numeric revision level for procurement, fabrication or construction. At the time of the inspection, most of the design media for the two systems selected for review were still in the alpha revision stage, limiting the inspectors ability to assess the design process as it relates to the final design output.

The procedures governing the design process are listed in Section 3.4 of this report. These procedures were reviewed against the QAM to determine if the quality assurance requirements were incorporated in the implementing procedures. The inspectors determined the procedures mostly contained the elements described in the QAM, although two instances of a lack of procedural control over elements of the design process were identified. One example of the lack of procedural control is described later in this section and the other in Section 1.2.2.2.

Interviews with selected design engineers and engineering leads indicated personnel understood the basic requirements of the procedures. However, the review of procedures by the inspectors indicated the procedures were vague relative to instructions for checking drawings or calculations. The interviews confirmed variance existed in the methods used to accomplish review activities, mostly dependent on the expectations of the engineering lead for the design area in question.

While the inspectors found no example in which the lack of detailed procedural guidance had led to a design error, the inspectors noted the Contractor was identifying significant quality issues with respect to design documents, which could be attributed to a lack of sufficient procedural guidance. An example of this was the Contractor’s management assessment (24590-WTP-MAR-ESH-02-009, *Management Assessment of Safety Analysis Calculations*) did reveal a significant condition adverse to quality. Section 1.4 of this report provides the results of this assessment of engineering calculations. The results of this assessment resulted in the Contractor's Environmental Safety and Health (ES&H) organization initiating Corrective Action Request (CAR) 24590-WTP-CAR-QA-02-095, dated May 13, 2002. The Contractor QA organization initiated 24590-WTP-CAR-QA-02-119, dated June 6, 2002 based on a trend of

surveillances dealing with the same issue. The root cause investigations for these CARs had not been completed at the end of the inspection; therefore, the extent of condition and corrective actions had not been fully established. Additional CARs had been generated, which has broadened this issue but the entire scope was still under review during the inspection. However, the inspectors were informed a lack of guidance regarding the performance of the checking function in the engineering calculation procedure, had been identified as a contributing cause, and a revision to the procedure 24590-WTP-3DP-G04B-00037C, Revision 0, *Engineering Calculations*, dated March 25, 2002 was in management review.

1.2.2.2 Lack of Control over Design-related Databases

The procedure for design criteria selection required the design engineer to consult the Standards Identification Process Database (SIPD) and the Design Criteria Database (DCD) to determine required inputs for the design. The inspectors' review of the procedures governing both of these data sources, revealed a lack of control over the data, as detailed below.

The QA Manual, Policy Q-03.1, *Design Control*, Section 3.3.2, states in part, "Design information transmitted across interfaces shall be documented and controlled." In addition, the QA Manual, Policy Q-05.1, Section 3.1.1, states in part, "Activities affecting quality shall be prescribed by and performed in accordance with documented instructions, procedures … for determining that prescribed activities have been satisfactorily accomplished."

The inspectors reviewed the SIPD database procedure, 24590-WTP-GPP-SANA-003A, *Standards Identification Process Database,* and determined the procedure did not address data input controls. The procedure did not provide for checking and approval of data prior to or after entry. The inspectors reviewed the DCD procedure, 24590-WTP-3DP-G04T-00904A, and determined the procedure did provide for checking and approval. The lack of procedural controls to determine the acceptability of the data after entry represents a failure to control the SIPD database input information (i.e., control of design attributes and criteria into database). This is an example of the Finding dealing with lack of control over the information in databases. (IR-02-015-01-FIN)

The inspectors interviewed design engineers, systems engineers, lead engineers, and Supervisors responsible for the preparation of the HLW C5 Ventilation system (C5V) and HLW Offgas (Offgas) systems to determine how SIPD and DCD users obtained the data. Although the engineering procedures provided for the use of SIPD and DCD data directly, the interviews indicated some of the SIPD and DCD users obtained the data from the database directly; while others did not and went to the primary source documents. Some of the engineers preparing the drawings and Design Input Memoranda (DIMs) knew how to directly access SIPD and DCD databases, but in one instance, the supervisor printed out the SIPD and DCD databases for the systems of interest for the designers and engineers to use. This was not provided for in the procedures. Contractor management was aware of this issue and issued a CAR (24590-WTP-CAR-QA-02-216) during the inspection.

1.2.3 Conclusions

The inspectors concluded the design process was prescribed by a set of procedures and instructions, which generally included the required elements of the QAM. The inspectors found one instance of a procedure, which lacked data input controls performed in accordance with documented instructions or procedures for design information contained in the design databases. This was considered an inspection Finding (IR-02-015-01-FIN). (Note: Section 1.4 below describes another required element of the design process, which was also not covered by an appropriate procedure or instruction).

1.3 Design Input (ITP I-104)

1.3.1 Inspection Scope

The inspectors reviewed the Contractor's procedures and design media as well as interviewed Engineering staff and management to assess whether:

1. Design inputs were identified and documented with their selection reviewed and approved by the responsible engineering group.

2. Design inputs were specified and approved on a timely basis to permit design activities to be implemented correctly.

3. Human factors specialists were identifying opportunities for design improvements and providing recommendations to address human factors principles and processes.

1.3.2 Observations and Assessments

1.3.2.1 Inputs were Identified and Documented

The inspectors reviewed engineering department project instructions (EDPI) 24590-WTP-3DP-G04B-00001A, *Design Criteria*, to assess the process for identifying, documenting and approving design inputs. The inspector reviewed 14 diagrams and associated DIMs depicting the High Level Waste (HLW) Melter Offgas system and the HLW C5 Ventilation system, to evaluate compliance with the Design Criteria procedure. The diagrams and DIMs reviewed are listed in Section 3.4 (System Drawings and Associated DIMs) of this report. Interviews were conducted with managers and engineers to review their understanding of the process used to identify design inputs. The emphasis of this inspection was to review completed design documents at numeric revision to the degree they were available.

The Design Criteria procedure required design engineers to consider design criteria input from the Design Criteria Database (DCD), Basis of Design (BOD), Contract, Authorization Basis (AB) documents, Standards Identification Database (SIPD), and 23 other listed sources. DIMs were required to be generated for specifications and “primary” drawings. For the systems reviewed for this inspection, the primary drawings were Process Flow Diagrams (PFDs), Piping

and Instrumentation Diagrams (P&IDs), and Ventilation and Instrumentation Diagrams (V&IDs). DIMs 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 be documented on an associated DIM. The DIM was required to be prepared at each revision of the design media and checked concurrently with the associated design media. The preparer and checker of a DIM were required to be trained in AB maintenance. The inspectors concluded this procedure conformed to requirements of Section 3.2 of Policy Q-03.1, "Design Control," of the approved project Quality Assurance Manual (QAM) to identify, document, and have design inputs approved by the responsible engineering group.

The inspectors conducted interviews with four engineers, who prepared or checked the diagrams and DIMs, to understand the specific process used to identify design inputs. Three engineering group leads were interviewed to determine the expectations for checking DIMs. All interviewees provided a consistent explanation of the process used to obtain design inputs, which conformed to the Design Criteria procedure. The engineers interviewed stated design inputs were obtained from the DCD through the use of keyword searches. Input from SIPD was provided to the engineer upon request from the Environment, Safety and Health organization. Other design inputs were obtained from system interfaces and from discipline expertise.

The inspectors verified, by a review of training profile printouts for a sampling of engineering staff, engineers involved in the preparation of the DIMs for the systems selected were current in required training. This included verification of AB maintenance training.

The inspectors requested a data printout from the DCD and SIPD containing the design input criteria applicable to the two systems selected. Using this data, the inspectors compared the printouts to the DIMs to check the process for selecting design inputs. Further, the inspectors selected some of the documents to determine if the revision number cited was the revision in force when the DIM was prepared.

During review of the DIMs, the inspectors identified two types of failure to identify and document applicable design inputs. The first involved a failure to identify an applicable design input in the DIM. The second involved the use of design inputs, which were not approved documents and therefore, not under change control. Lacking change control meant the relevant design input could not be replicated with assurance. These are two examples of a failure to identify and document applicable design inputs in accordance with the requirements of the QAM.

The examples of this failure are contained in the Table below:

Table of Examples of Failure to Identify Applicable Design Inputs

DIM Reviewed	Apparent Deficiency
24590-HLW-M6I-HOP-00001, Rev C 24590-HLW-M6I-HOP-00006, Rev B 24590-HLW-M6I-HOP-00003, Rev C	The DIM references the SRD Volume 1, Revision 0. The sections referenced appear to be from SRD Volume 2. The DIM does not include Volume 2 in the list of input documents. At the time of the preparation of the DIM, SRD Volume 2 was at Revision 0d. The DIM references two tables in the PSAR but does not include other sections of the PSAR resulting from the DCD search. See paragraph 4.4.3 of the PSAR Rev. H as an example.
24590-HLW-M6I-HOP-00002, Rev C	The DIM references two tables in the PSAR but does not include other sections of the PSAR, which are applicable. For example, paragraph 4.4.3 of the PSAR revision H is applicable.
24590-HLW-M5I-V17T-00004, Rev 2 24590-HLW-M5I-V17T-00003, Rev 2	SRD Safety Criteria 4.4-8 is not referenced.
24590-HLW-M8I-C5V-00006001, Rev A 24590-HLW-M8I-C5V-00004001, Rev A 24590-HLW-M8I-C5V-00005001, Rev A	The reference to the ISAR in these DIMs is volume 1; however, the sections cited were in volume 2. Further, neither applicable sections of the PSAR or ISAR volume 1 were listed. There were useful references in both of these documents, which should have been cited in the subject DIM.
24590-HLW-M8I-C5V-00002001, Rev B 24590-HLW-M8I-C5V-00004001, Rev A 24590-HLW-M5I-V17T-00004, Rev 2 24590-HLW-M6I-HOP-00002, Rev C	These DIMs reference design inputs, which were not yet approved, and therefore, were not under change control. The lack of approval of the reference was denoted by an asterisk on the drawing number.

The inspectors also reviewed procedure 24590-WTP-3DP-G04T-00903B, Rev 0, *System Descriptions*, dated February 20, 2002, since these documents were referenced on several of the DIMs reviewed for each system. Section 2 of this procedure states:

> "System descriptions describe in detail the system equipment, unit operations, sequences, interlocks, and recovery operations that are consistent with the development of the Piping and Instrumentation Diagrams (P&IDs), Ventilation & Instrumentation Diagrams (V&IDs), and Mechanical Handling Diagrams (MHDs)."

Further, section 3.3 of the System Description procedure required the system description be reviewed for conformance to design criteria by a checker.

The inspectors reviewed the selected system descriptions for the two systems and found the following. The system description for the C5V system, 24590-HLW-3YD-C5V-00001, Rev A, did not describe the following SIPD Safety Case Requirements (SCRs):

- SCR-HVENT/N0001 – C5V exhaust filters must withstand moisture challenge due to failure of the offgas treatment system or melter upset (including caustic/acidic gas and humidity), and

- SCR-HVENT/N0009 – C5V condensate must be routed to an appropriate low concentration radioactive material collection system.

The system description for the HLW Melter Offgas System, 24590-HLW-3YD-HOP-00001, Rev. A, did not describe the following SIPD SCRs:

- SCR-HMELT/N0006 – The system shall be designed to mitigate pressure surges up to 14 times normal flows, and

- SCR-HMELT/N0007 – Air purge in Standby Offgas System shall prevent flow of gas and particle carryover into the system during normal operations, and

- SCR-HMELT/N0008 – Stop injection of ammonia on low temperature in SCR.

The inspectors reviewed the document control printout for each of these system descriptions and determined each was used as references in other design media. Interviews with engineering supervisors indicated the system descriptions were considered to be key design-related documents because they contained a compilation of requirements for the system, the relationship to other systems and the elements of system operation and maintenance. As key design inputs, Systems Descriptions did require update for design changes. Based on interview with the engineer and supervisor, the inspectors understood the integrated safety management (ISM) team had met and determined the need for a change, but did not put an action item in place to update the System Description after SIPD was revised.

The issue identified above (the lack of incorporation of design inputs into DIMs and the failure to incorporate the features and assumptions identified as SCRs in SIPD), was considered an example of a failure to identify and document applicable design inputs. This forms the basis for a portion of the inspection Finding IR-02-015-02-FIN, with the other issue (failure to document design inputs to design calculations) associated with Finding IR-02-015-02-FIN being described in Section 1.4 of this report).

1.3.2.2 Design Inputs were Specified and Approved on a Timely Basis

During the inspectors interview with the four design engineers, the inspectors also confirmed the design inputs were specified and approved on a timely basis to permit design activities to be carried out in a correct manner. Each designer and lead was aware of the inputs needed to bring their assigned design media to completion. They were confident these would be available in a time frame to permit the design to proceed reasonably close to schedule.

1.3.2.3 Human Factors (HF)

The inspectors reviewed Contractor documents addressing human factors (HF) considerations for incorporating into the design. The inspectors also interviewed the Contractor's HF specialist and selected Contractor personnel responsible for implementing the design process. The inspectors reviewed the Operations Requirements Document design requirements relative to the two systems selected for consistency with the AB and the design media reviewed.

The Integrated Safety Management Plan (ISMP), 24590-WTP-ISMP-ESH-01-001, Section 3.12 states:

> "During plant design, the human factors specialist, in conjunction with experienced operators and maintainers, identifies opportunities for design improvement and provides recommendations to project designers and engineers."

Based on an interview, it was determined the HF specialist served principally as a consultant to the project. Design engineers who were aware of the availability of the HF specialist had the ability to obtain advice, but there was no formal plan (See inspection report IR-02-014) to describe how HF considerations would be incorporated into the design. The HF specialist was included in the document review request process by which selected design media was reviewed for comment by affected organizations. The HF specialist indicated the comments regarding HF were included in the Commissioning and Training department comments. The specialist also indicated the resolution of comments regarding HF, were not sent back to the specialist except in cases where the person resolving the comments had a previous working relationship with the specialist.

Section 4.1.3 of the ISMP states design guides for HF are available to designers. The inspectors requested copies of these and were provided a copy of 24590-WTP-GPG-J-002, *Design Guide for the Human Machine Interface*. The inspectors confirmed with the HF specialist this guide was guidance on the design of computer screens used in plant operations. Interviews with selected design engineers did not reveal any other guides were available to guide designers in HF engineering.

1.3.3 Conclusions

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

- There was a process for identifying, documenting, reviewing and approving applicable design inputs. However, examples were identified of a failure to identify applicable design inputs. These examples a part of the basis of a Finding (IR-02-015-02-FIN).

- Design inputs were specified and approved on a timely basis to permit design activities to be carried out appropriately.

- No formal HF plan or program addressed the manner in which human factor considerations were reviewed and incorporated into the design. (See Inspection Report IR-02-014)

1.4 Design Analysis (ITP I-104)

1.4.1 Inspection Scope

The inspectors reviewed the Contractor's procedures, design media, and interviewed engineering staff and management to assess whether:

1. Engineering design calculations were controlled and retrievable.

2. Design analyses documentation included (1) the objective, (2) inputs and their sources, (3) background data, (4) assumptions, (5) computer calculations and identification of the originator, and (6) reviewer and approver.

1.4.2 Observations and Assessments

1.4.2.1 Engineering Design Calculations were Controlled and Retrievable

The inspectors reviewed EDPI 24590-WTP-3DP-G04B-00037C, Rev 0, *Engineering Calculations*, dated March 25, 2002, to assess the process for developing, checking and approving calculations for conformance to the QAM.

The engineering calculations procedure defined three classes of calculations, preliminary, committed preliminary, and confirmed. Preliminary calculations were not performed with the intent of being directly incorporated in final design documents. These calculations contain assumptions, which must be verified. Committed preliminary calculations form the basis for the issuance of final design media such as drawings or specifications for various uses (including construction or procurement), but had not yet reached the confirmed status (may contain unverified assumptions). Confirmed calculations support final design media and shall not contain any unverified assumptions. The procedure also specified the requirements for the form and content of calculations and the process for checking and approving.

The inspectors reviewed a sampling of 17 design calculations associated with the High Level Waste (HLW) Melter Offgas System and the HLW C5 Ventilation system to evaluate compliance with the Engineering Calculations procedure. These calculations were listed in Section 3.4, *List of Documents Reviewed During the Inspection*, of this report. The inspectors also conducted interviews with managers and engineers to determine their level of understanding of the process for executing the requirements of this procedure. The inspectors did not identify any deficiencies associated with calculations reviewed, which would have affected the conclusion of the calculations; however, the inspectors did identify issues associated with the documentation of engineering calculations and tracking and closure of unverified assumptions in the calculations. These issues are discussed below.

Several of the committed preliminary calculations reviewed identified unverified assumptions associated with final design media (i.e., Revision 0 or higher design media issued for uses such as procurement and construction). Interviews with design engineers, engineering managers and supervisors, and the Quality Assurance Manager revealed no procedural requirement for tracking of unverified assumptions. The inspectors determined most engineering groups developed informal processes (normally log books) for tracking unverified assumptions. In the case of unverified assumptions in calculations related to final design media, there was no established method to identify all the unverified assumptions associated with the approved design media. Based on this, the inspectors' concluded it would be very difficult for Engineering managers to manage the associated risks inherent with the approval of final design documents, developed in part, on the basis of calculations with unverified assumptions.

The inspectors determined from these interviews there was no documented approach for ensuring unverified assumptions would be closed at any specific point in the design or construction of the waste treatment plant (WTP). The inspectors' interviews resulted in inconsistent views among managers and supervisors regarding when unverified assumptions must be closed, how this would be coordinated and accomplished at the project level, or the specific responsibilities associated with these actions. Most managers and supervisors indicated it was the responsibility of the individual cognizant engineers to track unverified assumptions, update calculations as necessary, and determine the impacts of these updates on other design documents.

The QA Manual, Policy Q-03.1, *Design Control*, Section 3.2.4, states, “Design inputs based on assumptions that require confirmation shall be identified and controlled as the design proceeds.” In addition, the QA Manual, Policy Q-05.1, Section 3.1.1, states in part, “Activities affecting quality shall be prescribed by and performed in accordance with documented instructions, procedures … for determining that prescribed activities have been satisfactorily accomplished.” Further, the QA Manual, Policy Q-05.1, Section 3.5.5, states in part, "Documentation of design analysis shall include: Identification of assumptions and those that must be verified as the design proceeds."

Contrary to the above, the lack of project process to track and ensure closure of unverified assumptions in engineering calculations is a Finding (IR-02-015-03-FIN). Overall the inspectors concluded design calculations were controlled and retrievable with the exception of the above Finding.

1.4.2.2 Design Analyses Documentation Included the Objective, Inputs and their Sources,

The inspectors also reviewed the engineering calculations to determine if: (1) design inputs and their sources were documented; (2) assumptions made in the calculations were adequately justified; and (3) unverified assumptions were identified to facilitate updating the calculation. During this review the inspectors identified several examples of incomplete documentation of design inputs including:

- Design inputs which were not attributed to a specific source document.

24590-HLW-MAC-C5V-00004, Revision B – HLW-C5V Equipment Sizing assumes chilled water flow of 45 degrees F without indicating the source or rationale for this number. I also recall that Excel was indicated as being used in this calc without reference to the version.

24590-HLW-M3C-30-00001, Revision B – HLW Process Flow Diagram Process Stream Information, contained an assumption of ejector pump flow rate of 40gpm in Section 3.1 but does not establish a source or rationale for this number.

- Assumptions, which were not justified or not adequately justified.

24590-HLW-MKC-HOP-00003, Revision A, Sizing of the HLW Submerged Bed Scrubber Column and Vessel contained two unverified assumptions on sheet 5 of the calc but were not identified as unverified and no rationale was provided for them.

- Data in the calculations appeared to be either an input or assumption (i.e., information not generated within the calculation itself) but was not identified as either.

24590-HLW-M6C-231-00001, Revision 0 – HLW Melter Offgas Line Sizing does not list Excel as having been used but it appears that this program was indeed used.

The inspectors discussed the issues described above with Contractor management and supervisory personnel from the Engineering, ES&H, and Quality Assurance departments. During interviews with the inspectors, Contractor management acknowledged the issue associated with inadequate quality of design input documentation in engineering calculations and indicated similar issues had been identified in management assessments (conducted by Contractor corporate and project personnel) and various project Corrective Actions Requests (CARs). In particular, Contractor corporate assessment, *WTP Calculation Review, Job No. 24590*, controlled correspondence number (CCN): 036539, provided extensive examples and discussion of these (and additional) issues associated with engineering design calculations. The inspectors review indicated CAR 24590-WTP-CAR-QA-119 specifically addresses the quality of engineering design calculation documentation. The inspectors found that CAR 24590-WTP-CAR-QA-119 was designated as "significant." According to the Contractor's corrective action procedures, the significant designation required a root cause analysis be performed. The Contractor had not completed the root cause analysis or formulated a complete set of corrective actions to address the CAR during the inspection.

1.4.3 Conclusions

The inspectors concluded the Contractor had a process to control and retrieve design calculations and design analyses. However, several inconsistencies were identified which were:

1. Inadequate controls of unverified assumptions in engineering design calculations; specifically the lack of a documented process for tracking and ensuring timely closure of unverified assumptions to engineering calculations (IR-02-015-03-FIN).

2. The failure to adequately document the source of inputs and the bases for assumptions in design calculations. (previously documented as Finding IR-02-015-02-FIN in Section 1.3 of this report)

3. The quality of design calculations needed improvement as recognized in Contractor assessments and corrective action documentation.

1.5 Interface Control (ITP I-104)

1.5.1 Inspection Scope

The inspectors reviewed procedures, design documentation, and interviewed Contractor staff to assess the processes used to control interfaces between internal and external organizations were adequately controlled in accordance with applicable QAM and procedural requirements.

1.5.2 Observations and Assessments

The inspectors' review determined the Contractor had established several processes for collecting, controlling, and transmitting, design-related information across organizational interfaces. The inspectors assessed a sample of these processes, which addressed both internal interfaces within the Contractor's project organization and key interfaces with external organizations as follows.

1.5.2.1 Internal Interfaces

The inspectors reviewed procedures and interviewed project personnel regarding the integration of design requirements at the project level to assess the exchange of design information between various engineering groups, and to determine if information being exchanged between various engineering groups was adequately controlled. From discussions with engineering supervisory and management personnel, the inspectors found various documents and methods were used to collect and transmit information between groups. Some examples include:

- Service Schedules (input to mechanical support systems design)
- Electrical Load Schedules (input to electrical systems design)
- Heat Load Assessment Sheets (input to heating, ventilation, and air conditioning (HVAC) systems design).

The preparation, review, and approval of these documents were not addressed by specific project procedures, and various methods were used to control this information. From interviews with engineering personnel and Quality Assurance management, combined with the review of sample documents, the inspectors determined internal interface information was being documented, reviewed, and controlled in accordance with general project documentation procedures such as 24590-WTP-GPP-PADC-003, *Internal Review and Approval of Documents*, and the information was being adequately controlled.

Based on the above, the inspectors concluded the Contractor had established and implemented adequate processes for transmitting information across internal project interfaces.

1.5.2.2 External Interfaces

The inspectors review of the Contractor's procedures determined key technical interfaces between the Contractor, ORP, and the tank farm contractor were being controlled in accordance with 24590-WTP-PL-MG-02-002, *Interface Management Plan*, and project procedure 24590-WTP-GPP-MGT-003, *Interface Control Procedure*. The implementation of these procedures resulted in the preparation of Interface Control Documents (ICD) describing the key responsibilities and technical parameters associated with WTP plant and organizational interfaces. From interviews with interface management and engineering personnel and the review of schedules and sample ICD documentation, the inspectors determined all ICDs had been completed (revision 0 or greater) and were being scheduled for periodic updates. Issues requiring resolution, including finalizing various technical parameters associated with tank farm waste retrieval and WTP development work, were documented, assigned to responsible organizations, and tied to specific project milestones for resolution. Technical parameters cited in the ICDs were documented with respect to their sources. The inspectors reviewed the following ICDs to verify technical parameters in the ICD were being reflected in the DCD:

- 24590-WTP-ICD-MG-01-006, Rev 1, *ICD-6 – Interface Control Document for Radioactive, Dangerous Liquid Effluents* (addressed the interface between the WTP and the Liquid Effluent Retention Facility/Effluent Treatment Facility).

- 24590-WTP-ICD-MG-01-020, Rev 0, *ICD-20 – Interface Control Document for High-Level Waste Feed*.

The inspectors determined the important technical interfaces identified in these ICDs were recorded in the DCD and, therefore, made available to the design process.

Based on the above, the inspectors determined there was a documented and controlled technical interface between ORP, the tank farms, and the WTP design process.

1.5.3 Conclusion

The Contractor had developed and implemented interface processes to coordinate the design process among organizations to ensure integration of design criteria and other technical requirements. Information was being transmitted across internal and external project interfaces under formal processes.

1.6 Qualification Tests (ITP I-104)

1.6.1 Inspection Scope

The inspectors interviewed engineering managers and reviewed procedures to assess the adequacy of qualification testing performed to verify the design adequacy of important to safety structures, systems, and components (SSCs).

1.6.2 Observations and Assessments

The inspectors reviewed procedure 24590-WTP-3DP-G04B-00027A, *Design Verification*, and determined it addressed a process for identifying and planning qualification tests in accordance with the qualification test requirements of QAM, Policy Q-03.1, Section 3.9. From interviews with engineering department managers, the inspectors determined management personnel were aware of qualification testing requirements. The inspectors also determined no qualification tests had been performed and no qualification tests were planned at the time of inspection.

1.6.3 Conclusion

No qualification tests had been performed and none were planned at the time of the inspection. The contractor had an approved procedure, which addressed qualification test requirements and engineering managers were aware of qualification testing requirements. On this basis, the inspectors concluded qualification testing was adequately addressed.

1.7 Software Design Control (ITP I-104)

1.7.1 Inspection Scope

The inspectors reviewed the requirements of the Contractor's QAM, the Contractor's written procedures controlling software development and use, software baseline records including verification and validation records, and interviewed Information Technology (IT), Quality Assurance, and Engineering staff and managers to assess whether designed, developed, or purchased software used in ITS (termed "Quality Affecting Software" (QAS)) design activities was appropriately documented, approved, and controlled.

1.7.2 Observations and Assessments

1.7.2.1 Approval and Control of QAS Software

The inspectors determined through document reviews the Contractor has established a controlled QAS list in accordance with Waste Treatment Plant (WTP) project procedure 24590-WTP-GPP-IT-005, *Project IT Change Control Process*. The list is referred to as the Software Designation List (SDL). The inspectors reviewed the SDL and selected a sample of three of 22 QAS applications, and installations for those applications on specific desktop computers, to assess installation and installation testing, and access control.

The inspectors selected the following sample of approved QAS applications from the SDL to assess installation and installation testing, and access control:

- Micro-Shield – Shielding and dose assessment
- MCNP – Monte Carlo N-Particle Criticality shielding and dose assessment calculations
- Pipe-FLO Professional – Pressure vessel code design software.

Procedure 24590-WTP-GPP-IT-001, *Use of Quality Affecting Software Applications*, established a process for QAS software to be installed and tested to ensure the application works in the WTP environment prior to use. Installation testing included copying the application onto the target computer and running the application on the computer with known input data and comparing application output with known validated output. The QAM requires the establishment of controls to permit authorized access and prevent unauthorized access to computer systems. Computer system startup passwords and screen saver passwords are adequate examples of controlling access to prevent unauthorized access to the computer systems.

The inspectors determined through documentation reviews and inspection of QAS software installations on the following five desktop computers, the above listed QAS software had been 1) properly installed, 2) tested to ensure the application works in the WTP environment prior to use, and 3) adequately controlled to prevent inadvertent use and modification.

- Compaq AP550, Workstation number JO00933
- Compaq AP550, Workstation number JO00937
- Compaq AP550, Workstation number JO00652
- Compaq AP550, Workstation number WC75584
- Compaq AP500, Workstation number WC75535.

The *Use of Quality Affecting Software Applications* procedure required error identification and notification to users of the QAS software. The inspectors reviewed six software error notifications for a sample of three QAS applications out of 22 listed on the SDL. The software error notifications require:

- Classification of the error for severity;

- A description of the error and potential impacts to data and analysis;
- Recommendations for error avoidance;

- An application user distribution list; and

- A confirmation signature block to document the application user has received and understands the error notification.

The inspectors determined error identification and notification was adequate. The six error notifications were:

- 24590-SEN-PS-01-003, Rev 0, M150 family, dated July 16, 2002
- 24590-SEN-ST-02-001, Rev 1, GTSTRUDL Version 25, dated April 16, 2002
- 24590-SEN- ST-02-003, Rev 1, GTSTRUDL Version 25, dated April 10, 2002
- 24590-SEN- ST-02-004, Rev 1, GTSTRUDL Version 25, dated April 10, 2002
- 24590-SEN- ST-02-005, Rev 0, HADCRT Version 1c, dated January 28, 2002.

The inspectors interviewed a senior quality engineer in the QA organization whose focus and expertise lies in the IT area and determined two vendors performed ITS design work using QAS

software. Procedure 24590-WTP-GPP-IT-008, *Software Life Cycle Management*, required approval of vendors supplying software used in ITS work. The inspectors reviewed *Supplier Audit Report,* 24590-WTP-AR-QA-01-011, and *Quality Assurance Surveillance Report,* 24590-WTP-SV-QA-02-363, and determined the Contractor adequately addressed evaluation of the vendors software QA programs.

On the basis of the reviews described above, the inspectors concluded the Contractor's procedural controls applied to the QAS applications reviewed were adequately implemented for installation and installation testing, access control, identification and notification of software errors, and Contractor evaluation of the vendors software QA programs

1.7.2.2 Documentation of QAS Software

The *Software Life Cycle Management* procedure established a process for the grading of software to determine the controls and verifications to be applied to the software. The grading process allows the Contractor Project Program Sponsor to determine if the software is QAS or Non-QAS and if the software is QAS, whether it produces data affecting Immobilized High Level Waste (IHLW).

The *Use of Quality Affecting Software Applications* procedure established a process for the verification and validation (V&V) of QAS software. The V&V of the QAS includes:

- The date of the V&V and the computer hardware/platform(s) tested
- Identification of the tester and data recorder
- User application requirements the application was tested against
- A summary of the test problems and comparison of the results and acceptability.

The inspectors reviewed the following documents associated with software grading, and V&V of QAS software from a sample of three of 22 applications listed on the SDL, and determined the activities were adequate for ITS design activities:

- 24590-WTP-VV-E-02-001, Rev 0, *Verification and Validation Report for DOS Version ETAP Release 7.35*, dated February 4, 2002.

- 24590-WTP-VV-QAS-E-01-001, Rev 0, *Quality Affecting Software Application Form, Electrical transient Analyzer Program (ETAP), Power Station Version 3.0.2*, dated January 7, 2002.

- 24590-WTP-VV-QAS-E-02-001, Rev 0, *Quality Affecting Software Application Form, Electrical transient Analyzer Program (ETAP), DOD Version Release 7.35*, dated February 13, 2002.

- 24590-WTP-VV-E-01-001, Rev 0, *Verification and Validation Report for ETAP Power Station version 3.0.2*", dated November 8, 2001.

- 24590-WTP-RPT-M-02-003, Rev 0, *Software requirements specification for PIPE-FLO Compressible Version 7.0*, dated May 16, 2002.

- 24590-WTP-PL-M-02-006, Rev 0, *Project Plan for PIPE-FLO Professional Version 7.0*, dated September 16, 2002.

- 24590-WTP-QAS-IT-02-023, Rev 0, *Quality Affecting software Application Form, PIP-FLO Compressible Version 7.0*, dated June 13, 2002.

- 24590-WTP-RPT-M-02-006, Rev 0, *Test Plan/Report for PIPE-FLO Compressible Version 7.0*, dated May 16, 2002.

- CF 24590-WTP-CAF-ENG-01-001, Rev 0, *Computer Application Use Registration, Pipe-FLO version 7.0*, dated July 26, 2001.

- 24590-WTP-VV-M-01-001, Rev 1, *Verification and Validation Report for Pipe-FLO, version 7.0*, dated October 2, 2001.

- 24590-WTP-RPT-M-02-007, Rev 0, *Software Requirements Specification for PIPE-FLO Professional Version 7.0*, dated September 18, 2002.

- 24590-WTP-CAF-ST-01-001, Rev 0, *Computer Application Use Registration for GTSTRUDL Version 25*, dated August 17, 2001.

- 24590-WTP-VV-ST-01-001, Rev 0, *Verification and Validation Report for GTSTRUDL*, dated July 25, 2001.

- CCN: 024286, "Documenting GT STRUDL Verification Output", dated October 25, 2001.

- CCN: 032642, "V&V Package for GT STRUDL," dated May 2, 2002.

On the basis of the reviews described above, the inspectors concluded the Contractor's procedural controls for grading and verification and validation of QAS software applications was adequately implemented.

1.7.3 Conclusions

Procedures controlling software used in quality affecting applications adequately met the requirements of the QAM. QAS software designed, developed, or purchased for use in ITS design activities was appropriately documented, approved, and controlled.

1.8 Design Change Control (ITP I-104)

1.8.1 Scope

The inspectors reviewed the design change implementing procedures associated with the document review request (DRR), document reports from document control, and reviewed a limited number of design change documents, as well as conducted interviews with the Contractor staff and Project Document Control (PDC) personnel, to assess the Contractor's design control program and procedures associated with the DRR.

1.8.2 Observations and Assessments

The previous ORP inspection report, IR-02-007 *Configuration Management,* dated July 8, 2002, Section 1.5, reviewed the implementation of procedures prescribed to control status and communicate design changes consistent with configuration control through the design organization. This inspection resulted in three Findings for failure to follow procedures relative to portions of the change control processes. (See IR-02-007-03a, b, c-FIN). Therefore, this inspection focused on the Contractor's implementing procedures (24590-WTP-3DP-G04B-0046, *Engineering Drawing,* (governing the production of engineering drawings and 24590-WTP-GPP-PADC-003A, *Internal Review and Approval of Document,* (governing the DRR process)) to assess how well the Contractor's design control procedures and procedure implementation relied upon the support systems needed to identify, control, status, and communicate ongoing design changes to provide consistent system integration and document control through the design organization.

The inspection assessed the design change control process as controlled by the document review request process, for the processing of "numeric" revisions for the two ITS systems being reviewed. Since the design documents for the systems selected were still largely in the preliminary phase, these had not yet been included in the Contractor's configuration management process. Since this inspection was focused on completed design, only numeric drawings were considered in the sampling. Of the 14 drawings supplied for these systems, only two were numeric drawings. Conclusions are based on this limited number of numeric drawing available for the sample.

Per procedure 24590-WTP-3DP-G04B-0046, *Engineering Drawing,* (governing the production of engineering drawings), the review of proposed changes to the design are forwarded from the design organization to the affected interfaces using the Document Review Request (DRR) process to document the review. Section 3.2.1 of *Engineering Drawing,* required the originator to use the DRR process to provide for a record of the engineering review prior to release. Further, procedure 24590-WTP-GPP-PADC-003A, *Internal Review and Approval of Document,* (governing the DRR process) required the review of proposed designs and changes be documented along with the resolution of comments resulting from the review. The inspectors reviewed the two drawings (24590-WTP-HLW-M5-V17T-00002, Rev 2 and 24590-WTP-HLW-M5-V17T-00003, Rev 2) associated with the systems selected for the review, and found both lacked documentation of the required reviews. The inspectors' review of the document package in PDC, did not contain the HLW Area Project Engineer, Mechanical Handling and Electrical Engineer review comments and were identified as "Review Required" on the DRR forms for

these design changes. This has been identified as a Finding for failure to follow procedure (IR-02-015-04-FIN).

1.8.3 Conclusions

The inspectors concluded the design change process implemented via the *Internal Review and Approval of Document* procedure, document review request (DRR process) was not being adequately implemented as noted in Finding IR-02-015-04.

1.9 Audits (ITP I-104)

1.9.1 Inspection Scope

The inspectors reviewed Engineering management assessments (MAs), QA audits and selected surveillance reports, design process corrective action reports (CARs), and interviewed QA auditors and management to assess the adequacy of the project oversight relative to the design process.

1.9.2 Observations and Assessments

Management Assessment of the Design Process

The inspectors reviewed the Engineering MA reports performed by the Contractor between July 19, 2001 and July 11, 2002, to assess the scope, quality, and results of oversight by Engineering. A total of seven Engineering MAs were performed during this period. The inspectors found these Engineering management assessments were performed on schedule and in conformance with the Contractor's management assessment procedure. The inspectors also found these MAs were identifying important issues, which needed evaluation as conditions adverse to quality, as well as corrective actions.

The inspectors reviewed five Engineering MA reports performed between May 23, 2002, and July 26, 2002. The review found the Contractor assessment teams had made 19 recommendations, which were being tracked for the Engineering organization. This tracking was listed in the Quality Assurance Information System (QAIS) under three follow-up items dealing with needed improvements to: (1) configuration management (CM), (2) Design Input Memorandum (DIM), and (3) implementation of the field change request (FCR) process. The inspectors determined a number of the issues identified in these recommendations and follow-up items were important and warranted prompt evaluation and corrective action. This determination was based, in part, on the observation that a number of the issues being identified in the Engineering MA effort, were identical or related to, issues for which DOE has initiated Findings in previous inspections or for which the Contractors QA organization had written CARs as the result of audits and surveillances.

Although important issues were being identified during Engineering MAs, the Contractor's Engineering organization was not aggressively evaluating problems being identified or formulating comprehensive corrective actions to address the problems. This is evidenced by the fact that no CARs had been initiated by the engineering organization for any of the issues described above.

On the basis of the review described above and discussion with Engineering personnel, the inspectors concluded the Contractor's Engineering MA effort complied with applicable assessment procedures and was effective in identifying issues requiring attention. However, the inspectors noted important issues identified in MAs did not result in CARs and, therefore, the extent of evaluation and management attention given to these issues did not always appear to be commensurate with the importance of issues.

Quality Assurance Audits and Surveillances of the Design Process

From reviews of audit and surveillance documentation and discussion with QA management, the inspectors found the Contractor QA organization did not perform an assessment, or set of assessments, specifically established to provide an overall assessment of the Contractor's design process. However, the QA organization did perform a number of audits and surveillances addressing various aspects of the design process. In order to assess the collective scope of these QA audit and surveillance activities relative to the design process, the inspectors worked with Contractor QA personnel and reviewed documentation to establish the extent to which the QA organization had evaluated the implementation of QAM Policy Q-03.1, *Design Control*, and QAM Policy Q-03.2, *Software*. These portions of the QAM address the QA requirements directly relevant to the design process or design software, which is an integral part of the design process. As part of this effort, QA personnel provided documentation showing the elements of QAM, Policy Q-03.1 and Q-03.2, which were assessed by the QA organization for proper implementation either by audit or surveillance. From this documentation, the inspectors determined most of the provisions of QAM Policy Q-03.1 and QAM Policy Q-03.2 were addressed; however, there were some gaps. For example, Sections 3.1.2, 3.1.3, 3.5.5, 3.11, and 6.1A-H of QAM Policy Q-03.1 were not addressed in a QA audit or surveillance. The inspectors also noted approximately half the QA surveillances cited by the Contractor were performed prior to October 2001, when engineering procedures were essentially rewritten by BNI. On the basis of the above, the inspectors concluded the scope of audits and surveillances performed by the QA organization was not sufficient to result in an up-to-date and comprehensive assessment of the Contractors design process at the time of the inspection.

The inspectors reviewed QA audit reports and surveillance reports in order to evaluate the depth and quality of QA oversight of the design process and the extent of corrective actions taken to address issues identified in the oversight process. The following describes these reviews.

The inspectors reviewed the QA audit reports associated with the design process and QAM Policy Q-03.1. The Contractor had completed two such reports at the time of the inspection. These were (1) internal audit report (IAR)-QA-01-008, which involved verifying relevant QAM requirements were incorporated in engineering procedures, and (2) 24590-WTP-IAR-QA-02-006, *Engineering Design Change Control Process*. The first audit did not result in any CARs. Six CARs were initiated as the result of issues identified in 24590-WTP-IAR-QA-02-006. From

a review of the audit reports and the associated CARs, the inspectors determined the audits were thorough, well planned, and effectively identifying issues, which required evaluation and corrective action. However, the inspectors noted the audits only addressed a limited portion of the design process. Also, audit 24590-WTP-IAR-QA-02-006 specifically excluded engineering calculations and some aspects of configuration management from its scope related to design changes. Based on the review outlined above, the inspectors concluded the above QA audits related to implementation of QAM, Policy 3.1 were well done and useful in identifying areas for improvement; however, the audits only addressed a limited scope with respect to verifying the design process was in compliance with the QAM, Policy 3.1.

The inspectors intended to assess QA audits related to QAM, Section 3.2, "Software," however, none had been completed at the time of the inspection. The QE Manager stated no audits were performed in this area due to lack of qualified lead auditors knowledgeable in this field.

The inspectors reviewed the following sample of QA surveillance reports, which were related to QAM Policy Q-03.1 and QAM Policy Q-03.2:

- 24590-WTP-SV-QA-01-029, Rev. 0, dated July 30, 2001, related to software verification and validation;

- 24590-WTP-SV-QA-01-135, Rev. 0, dated November 11, 2001 and Rev. 1 dated October 1, 2002, related to verification of the Bechtel San Francisco Computer Library's compliance with the WTP QAM Policy 3.2;

- 24590-WTP-SV-QA-02-002, Rev. 0, dated January 2, 2002, performed as a follow-up to DR-QA-01-026, which identified the RPP-WTP HLW Glass Pour Model had not been verified and validated;

- 24590-WTP-SV-QA-02-181, Rev. 0, dated March 16, 2002, performed to verify compliance to the procedure 24590-WTP-3DP-G04B-00046A, *Engineering Drawing*;
- 24590-WTP-SV-QA-02-206, Rev. 0, dated May 2, 2002, performed to follow-up on the QA surveillance 24590-WTP-SV-AS-01-147, which identified an issue with four preliminary calculations, and DIM 24590-HLW-DBI-S13T-0001; and

- 24590-WTP-SV-QA-02-486, Rev. 0, dated August 23, 2002, performed to follow-up on surveillance 24590-WTP-SV-QA-02-004.

From these reviews the inspectors determined the QA surveillances were being performed in accordance with applicable procedures and were providing useful information. One of the surveillances, 24590-WTP-SV-QA-01-135, was particularly extensive and provided an excellent assessment in its subject area. The inspectors did note, however, corrective actions associated with problems identified in surveillance reports were not always well formulated or documented. Some examples are:

- 24590-WTP-SV-QA-01-029 indicated Contractor purchased software, used for safety related calculations, and without verification and validation (V&V) reports, had been purchased prior to the procedure requirements purchased software V&V reports, and

therefore, the requirements for reports were not applicable. The inspectors noted the disposition in the surveillance report was not consistent with QAM Section 3.2, which requires a V&V process be implemented for all software used for safety related calculations. The inspectors verified a proper V&V had been performed for all relevant software at the time of the inspection, even though the problem existed at the time the surveillance report was written.

- 24590-WTP-SV-QA-01-135 identified unsatisfactory results associated with certain software. No documentation was available (such as a DR, CAR, or follow-up surveillance) to demonstrate these issues were addressed. 24590-WTP-SV-QA-01-135 was revised resolving the issue during the course of the inspection.

1.9.3 Conclusions

The inspectors concluded the Engineering management assessments were being performed in accordance with applicable procedures and were identifying important issues, however, the Contractor had not used the CAR process, or other suitable process, to fully evaluate these issues and formulate comprehensive corrective actions. QA oversight of the design process, through audits and surveillances, were being performed in accordance with procedures, of generally high quality, and were providing valuable information. However, QA oversight of the design process was limited in scope and depth. The inspectors concluded that, although there were no violations cited in this area of the inspection, the Contractor missed opportunities to completely evaluate problems associated with the design process and to implement corrective actions, which could have avoided the conditions resulting in the inspection Findings described elsewhere in this report.

1.10 Adequacy of Closure of Inspection Items (Inspection Administrative Procedure ((IAP) A-105 and A-106)

The following inspection follow-up items were reviewed to determine if they could be closed. For follow-up on Findings, the inspectors reviewed the Notice of Findings and the Contractors' responses to the Findings, and verified implementation of the corrective actions stated in the responses.

(Closed IR-01-009-01a-FIN) The Contractor failed to follow the procedure for completing document reviews. In this example of an Inspection Finding the Contractor's document review procedures required document approvals 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 procedure requirements, several Interface Control Documents (ICDs) were missing the DRR documentation for the required reviewers or the DRR comment resolution was not indicated by the reviewer's signature or marked "Editorial Comments Only."

The contractor provided their responses to the Finding in a letter dated January 25, 2002,[2] and documented the discrepancy in a Corrective Action Report (CAR) 24590-WTP-CAR-QA-01-034 dated December 24, 2001.

In their response the Contractor agreed with this example of an Inspection Finding and committed to the following three corrective actions:

1. The ICDs will be reviewed and approved in accordance with 24590-WTP-GPP-PADC-003, "Internal Review and Approval of Documents," prior to the documents being transmitted to the DOE. The next revision of the ICDs was scheduled for completion by March 14, 2002.
2. A new interface procedure (24590-WTP-GPP-MGT-003, "Interface Control Procedure") will be generated that will clearly define the responsibilities of WTP Interface Team Members to ensure compliance with all project procedures. The new interface procedure was scheduled for issuance by June 3, 2002.
3. All interface management participants will receive additional management instructions that will include lessons learned on this specific finding and the process for interface management document review and approval. The training for interface management personnel was scheduled for completion by April 15, 2002.

The inspectors verified that Revision 0 of the ICDs were completed and submitted to DOE by the March 14, 2002 as committed above. In a letter dated March 14, 2002[3], BNI submitted to DOE deliverable C.9.1, which consisted of ICDs jointly developed with the DOE, the Tank Farm Contractor, and Hanford Site Contractors. The inspectors randomly selected three DRRs associated the following ICDs to determine if the procedure in item 1 above was followed:

- ICD-3, Interface Control Document for Radioactive Solid Waste
- ICD-19, Interface Control Document for Low Activity Waste Feed
- ICD-20, Interface Control Document for High Level Waste Feed.

The inspectors found no discrepancies with the above DRR documents and concluded the process described in procedure 24590-WTP-GPP-PADC-003, "Internal Review and Approval of Documents," was followed.

The inspectors verified the new interface procedure (listed in item 2 above) was issued. The new procedure defined the responsibilities of the WTP Interface Team Members and provides detailed guidance to ensure compliance with project procedures. The procedure was issued on July 22, 2002.
The inspectors were provided with a copy of meeting minutes[4] that documented training provided to key individuals involved in the ICD process. The meeting took place on January 25, 2002 and material provided in the minutes provided evidence that management expectation for the ICD process and lessons learned from the above finding were discussed.

[2] BNI letter from A. R. Veirup to M. K. Barrett, ORP, "Bechtel National, Inc. Response to Design Process Assessment Report, IR-01-009," CCN:027664, dated January 25, 2002.
[3] BNI letter from A. R. Veirup to M. K. Barrett, ORP, "Deliverable Item C.9.1, Interface Control Documents, CCN: 030108, dated March 14, 2002.
[4] BNI Meeting Minutes, CCN: 027492, Interface Management Participants & Discussions, date of meeting January 25, 2002.

The inspectors also reviewed Quality Assurance Surveillance Report 24590-WTP-SAV-QA-02-410 and found no discrepancies in the surveillance performed or the conclusion drawn by the individual performing the surveillance.

Based on the above information, this example of an Inspection Finding is considered closed.

(Closed IR-01-009-01b-FIN) The Contractor failed to follow procedure for managing project records. The Project Records Management procedure required that managers communicate delegation of authority through memorandum or electronic mail. In this example of an Inspection Finding, the Contractor did not document delegation of authority to approve Standards Identification Process Database (SIPD) safety information.

The contractor provided their responses to the Finding in a letter dated January 25, 2002, (see footnote 1) and documented the discrepancy in a Corrective Action Report (CAR) 24590-WTP-CAR-QA-01-033 dated December 20, 2001.

In their response the Contractor agreed with this example of an Inspection Finding and committed to the following corrective actions:

1. Issue an immediate Procedure Change (IPC) to procedure 24590-WTP-GPP-PADC-022, "Project Records Management," which clarifies delegation of authority.
2. Permanently incorporated the IPC into the above listed procedure in accordance with project requirements.

The inspectors reviewed IPC 24590-WTP-GPP-PADC-002E_0 and found the immediate revision clarified the use of delegation of authority. The inspectors also reviewed the permanent change which incorporated the clarifications made in the IPC. The inspectors found the permanent change made to the project records management procedure incorporated all the changes made in the IPC. The inspectors reviewed also reviewed the CAR listed above and found no discrepancies. Based on the above information, this example of an Inspection Finding is considered closed.

(Closed IR-01-009-02-FIN) The Contractor failed to adequately prescribed QAM requirements in an implementing procedure. Procedure 24590-WTP-3DP-G04B-00037A, "Engineering Calculations," prescribed less restrictive requirements than those described in the Quality Assurance Manual (QAM), Policy Q-03.1, "Design Control." Section 3.5.5 of the QAM stated "Documentation of design analysis shall include: …D. Identification of assumptions and those that must be verified as the design proceeds." The above engineering procedure specified the above requirements as "should" versus "shall."

The contractor provided their responses to the Finding in a letter dated January 25, 2002, (see footnote 1) and documented the discrepancy in a Corrective Action Report (CAR) 24590-WTP-CAR-QA-01-035 dated December 24, 2001.

In their response the Contractor agreed with this example of an Inspection Finding and committed to modify the engineering calculation procedure to correctly reflect the QAM requirements. The inspectors were provided with a revised copy of the engineering calculation procedure. The inspectors' verified procedure 24590-WTP-3DP-G04B-00037B "Engineering Calculations" was modified to reflect the "shall" requirements of the QAM. The inspectors also reviewed the associated completed CAR and found no discrepancies. Based on the above, this inspection Finding is considered closed.

(Closed IR-02-002-01-FIN) The Contractor failed to implement the requirements of Integrated Safety Management Plan (ISMP), Section 3.16.1.2, Project Safety Committee (PSC) review functions. Several functions of the PSC listed in the ISMP were not being performed.

The contractor provided their responses to the Finding in a letter dated March 11, 2002,[5] and documented the discrepancy in a Corrective Action Report (CAR) 24590-WTP-CAR-QA-02-007 dated January 10, 2002.

In their response the Contractor agreed with this Inspection Finding and committed to the following.

> "To avoid further Findings procedure 24590-WTP-GPP-SREG-001, "Project Safety Committee," will be revised as follows:
> - An individual PSC member will be assigned to each activity and safety related document identified as a review item for the PSC. The PSC member will be responsible for ensuring assigned items are reviewed by the PSC as required by the procedure. Activities that are not applicable to construction will not have a PSC assigned at this time.
> - A schedule for PSC review of each item will be included. The schedule will have the review items assigned frequencies of "quarterly" and "as needed", as appropriate. Activities that are not related to construction will not be scheduled at this time.
>
> A Management Assessment of the PSC is currently underway. This assessment will evaluate both the performance of the PSC against the procedure and the items PSC is reviewing."

The Contractor committed to revise the above procedure and to complete the management assessment by April 1, 2002. The Contractor also committed to review all areas the PSC was responsible for and applicable to construction activities by June 30, 2002.

The inspectors were provided a copy of revised procedure 24590-WTP-GPP-SREG-001, "Project Safety Committee," dated March 7, 2002. The revised procedure included a new Appendix A entitled "PSC Oversight Matrix." The matrix provided a list of activities that would be reviewed by the PSC and assigned a responsible PSC member for ensuring the activity is reviewed on a periodic basis. The matrix also included assigned frequencies for when these activities would be reviewed. The inspectors also reviewed PSC meeting minutes for meetings

[5] BNI letter from A. R. Veirup to M. K. Barrett, ORP, "Bechtel National, Inc. Response to Safety Integration Assessment Report, IR-02-002," CCN:029862, dated March 11, 2002.

held on June 5, 2002 and June 12, 2002. The inspectors found the subjects covered in the minutes coincided with the subjects discussed in the PSC procedure. The inspectors also found the meeting minutes documented review of the applicable construction activities as committed in the Contractor's response to the Notice of Finding.

The inspectors reviewed the Management Assessment 24590-WTP-MAR-ESH-02-005, Revision 0 and Revision 1. Revision 0 of the management assessment was completed on March 29, 2002 and Revision 1 was issued on April 17, 2002. The inspectors found the scope, line of inquiry and the recommendations made in the assessment report were complete and well thought out.

The inspectors also reviewed the above CAR documenting the above Finding and the associated surveillance report (24590-WTP-SV-QA-02-422), which verified completion of the corrective actions. The inspectors found no discrepancies. Based on the above, this inspection Finding is considered closed.

2.0 EXIT MEETING SUMMARY

The inspectors presented the inspection results to members of Contractor management at an exit meeting on July 24, 2002. The Contractor acknowledged the Findings and conclusions presented.

3.0 REPORT BACKGROUND INFORMATION

3.1 Partial List of Persons Contacted

T. Austin, Consultant to the Chief Information Officer
D. Brooks, Human Factors Specialist
T. Brown, Interface Management
D. Canazaro, Programs Manager
C. Chung, Senior Mechanical Engineer
G. Clark, Design Engineer
K. Cleveland, Senior Mechanical Engineer
A. Cutrona, Design Engineer
F. Davis, Deputy Engineering Manager - Electrical
S. Dinyar, Electrical Manager
G. Duncan, Deputy Engineering Manager - Mechanical
W. Eaton, HLW Engineering Group Supervisor
M. Ehlinger, Quality Engineer
P. Faulk, Information Technology Change Manager
J. Ferguson, DCD Maintenance
J. Fish, Engineering Automation
R. Garrett, Systems Analysis Manager
J. Ho, Design Supervisor
J. House, Information Technology Infrastructure/Operations Manager
E. Hughes, Deputy Engineering Manager – Systems and Projects

E. Isern, Engineering Supervisor, Low Activity Waste Mechanical Systems
S. Ketola, Systems Engineering
B. Klinger, Assessment Manager
D. Larson, Process Engineer
B. Mallonee, Engineering Automation
R. Miles, Engineer
L. Nelsen, Radiological Safety Engineer
M. Platt, Safety Programs Lead
R Refuerzo, Senior Designer
J. Roth, Deputy Manager, Process Engineering
J. Rutherford, Quality Assurance Lead Auditor
G. Shell, Quality Assurance Manager
J. Simiele, Radiological Safety Engineer
G. Warner, Quality Engineering Manager
J. Smith, Supplier Quality Assurance Manager
P. Talmage, Senior Quality Engineer
A. Tan, Design Engineer
K. Yu, HVAC/Fire Protection Group Supervisor
K. Vacca, Training Manager
D. Wilson, Engineer
M. Wright, Mechanical Systems Engineering Group Supervisor

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-01-015-01-FIN	Finding	Failure to adequately control information contained in SIPD. (Section 1.2)
IR-01-015-02-FIN	Finding	Failure to identify and document applicable design inputs in engineering design calculations, System Descriptions, and Design Input Memorandum (Section 1.3 and 1.4)
IR-02-015-03-FIN	Finding	Failure to establish a process and procedure for tracking and closure of unverified assumptions in engineering design calculations (Section 1.4)
IR-01-015-04-FIN	Finding	Failure to follow procedure (Section 1.8)

Closed

IR-01-009-01a-FIN	Finding	Section 1.10
IR-01-009-01b-FIN	Finding	Section 1.10
IR-01-009-02-FIN	Finding	Section 1.10
IR-02-002-01-FIN	Finding	Section 1.10

3.4 List of Documents Reviewed During the Inspection

System Descriptions

24590-HLW-3YD-HOP-00001, Revision A – System HOP: HLW Melter Offgas Treatment Process System Description, dated May 23, 2002

24590-HLW-3YD-C5V-00001, Revision A – System Description – System C5V HLW C5 Area Ventilation, dated May 28, 2002

System Drawings and Associated DIMs (Drawing numbers listed)

24590-HLW-M8I-C5V-00001001, Revision B – HLW Vitrification Building, System C5V, Volumetric V&ID, Melter Cave No. 1

24590-HLW-M8I-C5V-00002001, Revision B – HLW Vitrification Building, System C5V, Volumetric V&ID, Melter Cave No. 2

24590-HLW-M8I-C5V-00003001, Revision B – HLW Vitrification Building, System C5V, Volumetric V&ID, Canister Ops Area

24590-HLW-M8I-C5V-00004001, Revision A – HLW Vitrification Building, System C5V, Plant Room V&ID, Melter Cave No. 1 Exhaust Filters

24590-HLW-M8I-C5V-00005001, Revision A – HLW Vitrification Building, System C5V, Plant Room V&ID, Melter Cave No. 2 Exhaust Filters

24590-HLW-M8I-C5V-00006001, Revision A – HLW Vitrification Building, System C5V, Plant Room V&ID, Canister Operations Area, Exhaust Filters

24590-HLW-M8I-C5V-00007001, Revision A – HLW Vitrification Building, System C5V, Plant Space V&ID, Exhaust Fans

24590-HLW-M5I-V17T-00003, Revision 2 – Process Flow Diagram HLW Vitrification Primary Offgas (System HOP)

24590-HLW-M5I-V17T-00004, Revision 2 – Process Flow Diagram HLW Vitrification Secondary Offgas (System HOP)

24590-HLW-M6I-HOP-00001, Revision C – P&ID- HLW Melter Offgas System Melter 1 Primary Offgas Scrubber

24590-HLW-M6I-HOP-00002, Revision C – P&ID- HLW Melter Offgas System Melter 1 Primary Offgas Treatment

24590-HLW-M6I-HOP-00003, Revision C – P&ID- HLW Melter Offgas System Melter 1 Secondary Offgas Treatment

24590-HLW-M6I-HOP-00004, Revision B – P&ID- HLW Melter Offgas Fluidics Air Rack HOP-RK-00025

24590-HLW-M6I-HOP-00006, Revision B – P&ID- HLW Melter Offgas System Melter 1 Primary Offgas Scrubber Condensate Vessel

Engineering Calculations

24590-HLW-MAC-C5V-00004, Revision B – HLW-C5V Equipment Sizing

24590-HLW-MEC-231-00001, Revision 0, Sizing of HLW SBS Vessel Cooling Coils

24590-HLW-MKC-HOP-00003, Revision A, Sizing of the HLW Submerged Bed Scrubber Column and Vessel

24590-HLW-MKC-HOP-00002, Revision A, Sizing of the HLW Silver Mordenite Column

CALC-W375HV-PR00021, Revision 0 – Sizing of the HLW Energy Recovery Heat Exchanger

CALC-W375HV-PR00024, Revision 1 – Process Design Requirements HLW Melter Offgas HEME

CALC-W375HV-PR00034, Revision 0 – Sizing of the HLW Offgas Thermal Oxidizer Electric Heater

CALC-W375HV-PR00035, Revision 0 – Sizing of the HLW Thermal Oxidizer Column

24590-HLW-M3C-30-00001, Revision B – HLW Process Flow Diagram Process Stream Information

24590-HLW-M6C-231-00001, Revision 0 – HLW Melter Offgas Line Sizing

24590-HLW-M6C-HOP-00005, Revision A – HLW SBS Condensate Receiver Vessel Sizing

24590-HLW-M6C-HOP-00010, Revision A – HLW Air Line Rack Sizing

24590-HLW-MAC-HOP-00001, Revision A – HLW Booster Fans and Stack Fans Sizing

24590-HLW-MEC-231-00001, Revision 0 – Sizing of the HLW SBS Cooling Coils

24590-HLW-MKC-HOP-00002, Revision A – Sizing of the HLW Silver Mordenite Column

24590-HLW-MKC-HOP-00003, Revision A – Sizing of the HLW Submerged Bed Scrubber

24590-HLW-MKC-HOP-00005, Revision A – HLW Vitrification Wet Electrostatic Precipitator Sizing

Procedures

24590-WTP-3DP-G03B-00001A, Revision 0, *Design Process*, dated April 11, 2002

24590-WTP-3DP-G04B-00001A, Revision 0, *Design Criteria,* dated October 8, 2001

24590-WTP-3DP-G04B-00005, Revision 0, *Configuration Management*, dated October 8, 2001

24590-WTP-3DP-G04B-00016, Revision 0, *Engineering Studies*, dated October 8, 2001

24590-WTP-3DP-G04B-00027B, Revision 0, *Design Verification,* dated May 23, 2002

24590-WTP-3DP-G04B-00033, Revision 0, *Project Reviews*, dated October 8, 2001

24590-WTP-3DP-G04B-00034A, Revision 0, *Off-Project Design Review,* dated January 10, 2002

24590-WTP-3DP-G04B-00037C, Revision 0, *Engineering Calculations*, dated March 25, 2002

24590-WTP-3DP-G04B-00046, Revision 1, *Engineering Drawings*, dated August 2, 2002

24590-WTP-3DP-G04B-00049A, Revision 1, *Engineering Specifications*, dated August 20, 2002

24590-WTP-3DP-G04T-00903B, Revision 0, *System Descriptions*, dated February 20, 2002

24590-WTP-3DP-G04T-00904A, Revision 0, *Design Criteria Database*, dated January 10, 2002

24590-WTP-GPP-PADC-003A, Revision 1, *Internal Review and Approval of Documents*, dated April, 9, 2002

24590-WTP-GPP-SANA-001, Revision 1, *Accident Analysis*, dated July 23, 2002

24590-WTP-GPP-SANA-002, Revision 1, *Hazard Analysis, Development of Hazard Control Strategies, and Identification of Standards,* dated July 23, 2002

24590-WTP-GPP-SANA-003A, Revision 0, *Standards Identification Process Database*, dated December 13, 2001

24590-WTP-GPP-SREG-002, Revision 2, *Authorization Basis Maintenance*, dated July 31, 2002

24590-WTP-3DP-G05B-00034, Revision 0, *Indoctrination/Orientation and Training*, dated October 8, 2001

24590-WTP-GPP-CTRG-002A, Revision 3, *Training*, June 26, 2002

24590-WTP-3DP-G06B-00010, Revision 0, *Specifying Supplier Quality Assurance Program Requirements*, dated October 8, 2001

24590-WTP-GPP-IT-006, Revision 1, *Requesting Services from the IT Department*, dated April 17, 2002

24590-WTP-3DP-G04T-00010, Revision 0, *Determination of Quality Levels*, dated October 8, 2001

24590-WTP-3DP-G04B-00010, Revision 0*, Specifying Supplier Quality Assurance Program Requirements*, dated October 8, 2001

24590-WTP-GPP-MGT-003, Revision 0, *Interface Control Procedure*, dated July 22, 2002

24590-WTP-GPP-IT-001, Revision 1, *Use of Quality Affecting Software Applications*, dated April 17, 2002

24590-WTP-GPP-IT-008, Revision 0, *Software Life Cycle Management*, dated April 17, 2002

24590-WTP-GPP-IT-005, Revision 1, *Project IT Change Control Process*, dated April 17, 2002

24590-WTP-GPP-IT-013, Revision 0, *Protection of Project Data*, dated April 17, 2002

Management Assessments, Surveillances And Audits

24590-WTP-MAR-ESH-02-009, Revision 0, *Management Assessment of Safety Analysis Calculations*, dated June 20, 2002

24590-WTP-MAR-ENG-01-002, Revision 0, *Annual Management Assessment by WTP Engineering Integrated QA Program Effectiveness*, dated July 17, 2001

24590-WTP-MAR-ENG-01-008, Revision 0, *Design Process Self-Assessment Systems Engineering*, dated October 24, 2001

24590-WTP-MAR-ENG-02-001, Revision 0, *Configuration Management Assessment of Field Change Request--April 2002*, dated May 15, 2002

24590-WTP-MAR-ENG-02-004, Revision 0, *Engineering Technology Management Assessment Engineering Processes*, dated July 11, 2002

24590-WTP-MAR-ENG-02-006, Revision 0, *Engineering Management Assessment Systems and Projects*, dated July 11, 2002

24590-WTP-MAR-ENG-02-007, Revision 0, *Engineering Management Assessment Mechanical Group*, dated July 11, 2002

24590-WTP-MAR-ENG-02-008, Revision 0, *Engineering Management Assessment Electrical, Control Systems and HVAC/FP*, dated July 11, 2002

24590-WTP-SV-QA-01-029, Revision 0, dated July 30, 2001

24590-WTP-SV-QA-01-135, Revision 0, dated November 11, 2001 and Rev. 1 dated October 1, 2002

24590-WTP-SV-QA-02-002, Revision 0, dated January 2, 2002

24590-WTP-SV-QA-02-181, Revision 0, dated March 16, 2002

24590-WTP-SV-QA-02-206, Revision 0, dated May 2, 2002

24590-WTP-SV-QA-02-486, Revision 0, dated August 23, 2002

24590-WTP-SV-QA-02-363, Rev 0, Quality Assurance Surveillance Report, WTP San Francisco Engineering Surveillance, dated June 25, 2002

24590-WTP-IAR-QA-02-006, Revision 0*, Engineering Design Change Control Process*, dated September 4, 2002

24590-WTP-IAR-QA-01-008, Revision 0, *WTP Project HLW Audit*, dated Marcy 27, 2002.

Corrective Action Reports

24590-WTP-CAR-QA-02-095, dated May 13, 2002

24590-WTP-CAR-QA-02-119, *Engineering Calculations*, dated June 6, 2002

24590-WTP-CAR-QA-02-154, dated July 29, 2002

24590-WTP-CAR-QA-02-155, dated July 29, 2002

24590-WTP-CAR-QA-02-156, dated July 26, 2002

24590-WTP-CAR-QA-02-157, dated July 26, 2002

24590-WTP-CAR-QA-02-158, dated July 26, 2002

24590-WTP-CAR-QA-02-159, dated July 26, 2002

24590-WTP-CAR-QA-02-160, dated July 26, 2002

24590-WTP-CAR-QA-02-216, dated September 18, 2002

Other Documents Reviewed

24590-WTP-ISMP-ESH-01-001, Revision 1e, *Integrated Safety Management Plan*, dated July 26, 2002

24590-WTP-QAM-QA-001, Revision 1, *Quality Assurance Manual*, dated July 12, 2002

24590-WTP-SRD-ESH-01-001-02, Revision 1d, *Safety Requirements Document Volume II*, dated July 26, 2002

24590-WTP-PL-G-01-001-02, Revision 0, *Functional Specifications*, dated October 27, 2001

24590-WTP-DB-ENG-01-001, Revision 0, *Basis of Design*

24590-WTP-RPT-OP-01-001, *Operations Requirements Document (ORD)*, November 8, 2001

24590-WTP-GPG-J-002, Revision A, *Design Guide for the Human Machine Interface (HMI),* June 4, 2002

Design Criteria Database output for the HLW Offgas System and the HLW C5V System

Standards Identification Process Database output for the HLW Offgas System and the HLW C5V System

24590-WTP-ICD-MG-01-004, Revision 0, *ICD-4 – Interface Control Document for Dangerous Wastes*

24590-WTP-ICD-MG-01-006, Revision 1, *ICD-6 – Interface Control Document for Radioactive, Dangerous Liquid Effluents*

24590-WTP-ICD-MG-01-020, Revision 0, *ICD-20 – Interface Control Document for High-Level Waste Feed*

24590-WTP-RPT-G-01-001, Revision 9, *Software Designation Lis*t, dated August 1, 2002

24590-WTP-RPT-IT-01-001, Revision 11, *Approved Project IT Software Baseline Report*, dated September 11, 2002

24590-WTP-VV-E-02-001, Revision 0, *Verification and Validation report for DOS Version ETAP Release 7.35*, dated February 4, 2002

24590-WTP-VV-QAS-E-01-001, Revision 0, *Quality Affecting Software Application Form, Electrical transient Analyzer Program (ETAP), Power Station Version 3.0.2*, dated January 7, 2002

24590-WTP-VV-QAS-E-02-001, Revision 0, *Quality Affecting Software Application Form, Electrical transient Analyzer Program (ETAP), DOD Version Release 7.35*, dated February 13, 2002

24590-WTP-VV-E-01-001, Revision 0, *Verification and Validation Report for ETAP PowerStation Version 3.0.2*, dated November 8, 2001

24590-WTP-CAF-ST-01-001, Revision 0, *Computer Application Use Registration for GTSTRUDL Version 25*, dated August 17, 2001

24590-WTP-VV-ST-01-001, Revision 0, *Verification and Validation report for GTSTRUDL*, dated July 25, 2001

Memorandum, CCN: 024286, Documenting GT STRUDL Verification Output, dated October 25, 2001

Memorandum, CCN: 032642, V&V package for GT STRUDL, dated may2, 2002

24590-WTP-VV-QAS-E-01-002, Revision 0, *Quality Affecting Software Application Form, Setroute Version 8.6.0*, dated December 15, 2001

24590-WTP-VV-E-01-002, Revision 1, *Verification and Validation Report for Setroute Version 8.6.0*, dated November 12, 2001

24590-WTP-QAS-ESH-01-001, Revision 0, *Quality Affecting Software Application Form, MicroShield Version 5.05*, dated January 7, 2002

24590-WTP-QAS-ESH-01-002, Revision 0, *Quality Affecting Software Application Form, MCNP Version 4C*, dated January 7, 2002

24590-WTP-RPT-NS-01-002, Revision 0, *Quality Affecting Software Documentation for MicroShield 5.05 and MCNP4C*, dated August 27, 2002

24590-WTP-VV-CSA-02-003, Revision 0, *Verification and Validation report for SHAKE 2000 Version 1.0*, dated April 10, 2002

24590-WTP-QAS-CSA-02-002, *Quality Affecting Software Application Form, SHAKE 2000 version 1.0*, dated May 3, 2002

24590-WTP-RPT-M-02-003, Revision 0, *Software requirements specification for PIPE-FLO Compressible Version 7.0*, dated May 16, 2002

24590-WTP-PL-M-02-006, Revision 0, *Project Plan for PIPE-FLO Professional Version 7.0*, dated September 16, 2002

24590-WTP-QAS-IT-02-023, Revision 0, *Quality Affecting software Application Form, PIP-FLO Compressible version 7.0*, dated June 13, 2002

24590-WTP-RPT-M-02-006, Revision 0, *Test Plan/Report for PIPE-FLO Compressible Version 7.0*, dated May 16, 2002

CF 24590-WTP-CAF-ENG-01-001, Revision 0, Computer Application Use Registration, Pipe-FLO version 7.0, dated July 26, 2001

24590-WTP-VV-M-01-001, Revision 1, *Verification and Validation report for Pipe-FLO, version 7.0*, dated October 2, 2001

24590-WTP-RPT-M-02-007, Revision 0, *Software Requirements Specification for PIPE-FLO Professional Version 7.0*, dated September 18, 2002

24590-WTP-QAS-IT-02-009, Revision 0, *Quality Affecting Software Application Form, HADCRT (Hanford Double Contained Receiver Tanks) version 1.3e*, dated March 11, 2002

24590-WTP-QAS-IT-02-005, Revision 0, *Quality Affecting Software Application Form, HADCRT (Hanford Double Contained Receiver Tanks) version 1.3*, dated February 12, 2002

24590-WTP-HMC-H82T-00001, Revision 1, *Verification of Computer Code HADCRT, version 1.3e*, dated February 14, 2002

24590-WTP-HMC-H82T-00001, Revision 0, *Verification of Computer Code HADCRT, version 1.3*, dated November 11, 2001

Fuel Cycle Facilities Source Term Model HADCRT 1.3: User's Manual, revision 2 of FAI/00-98, dated September 2001

24590-WTP-PL-J-01-001, Revision A, *Software Quality Assurance Plan for Control Systems*, dated May 13, 2002

24590-WTP-PL-J-01-002, Revision A, *Software Configuration Management Plan for Control Systems*, dated May 13, 2002

24590-WTP-PL-J-01-003, Revision A, *Software Project Plan for the Integrated Control network*, dated July 1, 2002

24590-SEN-E-01-003, Revision 0, *Setroute Version 8.6.0*, dated January 30, 2002

24590-SEN-PS-01-003, Revision 0, *M150 family*, dated July 16, 2002

24590-SEN-ST-02-001, Revision 1, *GTSTRUDL Version 25*, dated April 16, 2002

24590-SEN- ST-02-003, Revision 1, *GTSTRUDL Version 25*, dated April 10, 2002

24590-SEN- ST-02-004, Revision 1, *GTSTRUDL Version 25*, dated April 10, 2002

24590-SEN- ST-02-005, Revision 0, *HADCRT Version 1c*, dated January 28, 2002

BNI RPP-WTP Approved Suppliers list, dated September 17, 2002

CCN: 021981, Review of GN Northern Quality Assurance Program by WTP Quality Assurance, dated August 27, 2001

CCN: 026532, Bechtel National Inc. Audit-24590-WTP-AR-QA-01-029, Rev 0, dated December 20, 2001

CCN: 027179, Bechtel National Inc. Audit-24590-WTP-AR-QA-02-001, Rev 0, dated January 22, 2002

CCN: 035589, Contract No. DE-AC27-01-RV-14136-Bechtel National, Inc.'s Audit of Duratek, Maryland - 24590-WTP-AR-02-009, Rev 0, dated July 10, 2002

CCN: 022274, Contract No. DE-AC27-01RV14136 - Supplier Audit report number 24590-WTP-AR-01-011, Rev 0, Dated August 30, 2001, Bechtel National, Inc., Limited Scope Audit of Duratek, dated September 10, 2001

Workstations Inspected

Compaq AP550, Workstation number JO00933
Compaq AP550, Workstation number JO00937
Compaq AP550, Workstation number JO00652
Compaq AP550, Workstation number WC75584
Compaq AP500, Workstation number WC75535
Compaq AP500, Workstation number WC81408

3.5 List of Acronyms

AB	authorization basis
BNFL	BNFL Inc.
BNI	Bechtel National, Inc.
BOD	Basis of design
CAR	Correction Action Report
CCN	Controlled Correspondence Number
CFD	Computational Fluid Dynamics
CM	configuration management
CSA	Critical Software Applications
DCA	Design Change Application
DCD	Design Criteria Database
DCN	Design Change Notice
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
FCR	Field Change Notice
HF	Human Factors
HLW	High Level Waste
HVAC	Heating, ventilation, and air conditioning
IAR	Internal Audit Report
ICD	Interface Control Document
IHLW	immobilized high-level waste

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
MA	Management Assessment
MCNP	Monte Carlo N-Particle
MFD	Mechanical Flow Diagram
MHD	Mechanical Handling Diagram
ORP	Office of River Protection
OSR	Office of Safety Regulation
PCAR	Preliminary Construction Authorization Request
P&ID	Piping and Instrumentation Diagrams
PDC	Project Document Control
PFD	Process Flow Diagram
QA	Quality Assurance
QAIS	Quality Assurance Information System
QAM	Quality Assurance Manual
QAS	Quality Affecting Software
R&T	Research & Technology
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
WTP	Waste Treatment and Immobilization Plant