



Construction Quality and Startup Assessment at the Hanford Site Waste Treatment and Immobilization Plant

May 2019

Office of Enterprise Assessments
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Acronyms

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| ANSI | American National Standards Institute |
| ASME | American Society of Mechanical Engineers |
| BNI | Bechtel National, Inc. |
| BOF | Balance of Facilities |
| CFR | Code of Federal Regulations |
| CM | Configuration Management |
| CMPD | Configuration Management Program Description |
| CMRD | Configuration Management Requirements Document |
| CR | Condition Report |
| CRAD | Criteria and Review Approach Document |
| DFLAW | Direct-Feed Low-Activity Waste |
| DOE | U.S. Department of Energy |
| EA | Office of Enterprise Assessments |
| EIA | Electronic Industries Alliance |
| EMF | Effluent Management Facility |
| HLW | High-Level Waste Facility |
| HR | Human Resources |
| LAB | Analytical Laboratory |
| LAW | Low-Activity Waste Facility |
| NQA | Nuclear Quality Assurance |
| ORP | Office of River Protection |
| PTF | Pretreatment Facility |
| QA | Quality Assurance |
| QAM | BNI Quality Assurance Manual |
| QC | Quality Control |
| SSCs | Structures, Systems, and Components |
| TIM | Training Implementation Matrix |
| WTCC | Waste Treatment Completion Company |
| WTP | Waste Treatment and Immobilization Plant |

**Construction Quality and Startup Assessment
at the Hanford Site Waste Treatment and Immobilization Plant
February 4-13, 2019**

Summary

Scope:

This assessment evaluated construction quality and startup activities at the Hanford Site Waste Treatment and Immobilization Plant (WTP). This assessment was performed within the broader context of an ongoing program of assessments at Department of Energy (DOE) major construction projects.

Significant Results for Key Areas of Interest:

Quality Control Surveillance Program

Implementation of the quality control surveillance program is adequate.

Startup Self-Assessment Program

Overall, the self-assessments completed to date by the Startup organization cover many ongoing work activities. However, an issue was found with one aspect of the program, namely less than 30% of the scheduled management observations were completed in 2018, and the trend is downward to a completion rate of approximately 25% in the three months preceding this assessment.

Certification, Qualification, and Training

Adequate requirements for the certification and qualification of Startup test engineers have been established. In addition, the certification and qualification of Construction field engineers is adequately conducted. The Commissioning and Operations training program is aligned with DOE requirements and governed by program documents that clearly lay out the roles and responsibilities of the WTP staff.

Configuration Management Program

The configuration management program is adequately described in the program description document. However, for startup, several issues were identified with the flowdown of contractual requirements into the configuration management requirements document. Bechtel National, Inc. developed a condition report to address these issues.

Best Practices and Findings

There were no Best Practices or Findings identified as part of this assessment.

Follow-up Actions:

Future assessments will continue to evaluate startup activities as they progress.

Construction Quality and Startup Assessment at the Hanford Site Waste Treatment and Immobilization Plant

1.0 PURPOSE

The U.S. Department of Energy (DOE) Office of Nuclear Safety and Environmental Assessments, within the independent Office of Enterprise Assessments (EA), conducted an assessment of construction quality and startup activities at the Hanford Site Waste Treatment and Immobilization Plant (WTP). The onsite portion of this assessment was conducted from February 4 to 13, 2019. This assessment was performed within the broader context of an ongoing program of assessments at DOE major construction projects. Because of the safety significance of WTP facilities, EA plans to continue these ongoing periodic assessments at the WTP construction site to ensure that construction contractors meet the requirements of 10 CFR 830, Subpart A, *Quality Assurance Requirements*.

2.0 SCOPE

The assessment team conducted this assessment of WTP construction quality and startup processes in accordance with the *Plan for the Office of Enterprise Assessments Assessment of the Hanford Site Waste Treatment and Immobilization Plant Construction Quality and Startup, February 2019*. This assessment evaluated construction quality and startup activities described in the Bechtel National, Inc. (BNI) design, construction, and commissioning contract.

3.0 BACKGROUND

The DOE Office of River Protection (ORP) manages the 56 million gallons of liquid or semi-solid radioactive and chemical waste stored in 177 underground tanks at the Hanford Site. ORP also manages WTP, an industrial complex for separating and vitrifying the radioactive and chemical waste in those tanks. WTP systems are in various phases of design, construction, and startup. ORP staff, primarily in the WTP Construction Oversight and Assurance Division, provide Federal oversight of construction activities at WTP.

BNI manages design, construction, and commissioning activities at WTP under contract to ORP. The quality assurance (QA) program requirements for design, construction, and operation of WTP referenced in 24590-LAW-DSA-NS-18-0001, *Documented Safety Analysis for the Low-Activity Waste Facility*, and cited in the BNI contract, are American Society of Mechanical Engineers (ASME) Nuclear Quality Assurance (NQA)-1-2000, *Quality Assurance Requirements for Nuclear Facility Applications*, and DOE Order 414.1C, *Quality Assurance*. BNI document 24590-WTP-QAM-QA-06-001, *Quality Assurance Manual* (QAM), provides a detailed description of the application of the 18 NQA-1-2000 requirements at WTP. The BNI QAM establishes a management system of planned and systematic actions necessary to ensure that structures, systems, and components (SSCs) perform satisfactorily in service.

BNI is under contract to complete the design of the WTP complex and is responsible for delivering equipment and materials necessary for completion of WTP. In March 2017, BNI and AECOM, the contractor responsible for maintenance and commissioning systems, formed a new joint venture called Waste Treatment Completion Company (WTCC). This new organization is a subcontractor to BNI and is contracted to complete construction, conduct startup, and commission WTP. BNI Construction personnel, including craft personnel, field engineers, quality control (QC) inspectors, administrative personnel, and managers, became employees of WTCC on March 31, 2017. Administrative changes have

been implemented to transition BNI Construction procedures and AECOM Startup and Commissioning procedures into WTCC procedures for control of construction, startup, and commissioning work activities. WTCC is required to follow the QAM.

The WTP complex consists of the Pretreatment Facility (PTF) for separating the waste into low-activity and high-activity waste; the High-Level Waste Facility (HLW), where the high-activity waste will be immobilized in glass; the Low-Activity Waste Facility (LAW), where the low-activity waste will be immobilized in glass; the Analytical Laboratory (LAB) for sample testing; and the balance of facilities (BOF), which will house support functions. Construction work is essentially complete for LAB, LAW, and most BOF buildings.

Construction work activities are deferred in PTF pending satisfactory resolution of technical questions regarding separation and processing of the waste and the design life of PTF equipment. Construction was slowed in HLW pending resolution of technical issues involving the waste treatment process. In late 2016, DOE decided to stop construction of HLW to support starting the processing of direct-feed, low-activity waste (DFLAW) from the Tank Farms by 2022. DFLAW requires completion of LAW and construction of the Effluent Management Facility (EMF).

Radioactive mixed-waste effluents from LAW and LAB will be transferred via buried coaxial piping to EMF for processing by concentration in the EMF evaporator. After concentration, the remaining radionuclides and salts will be recycled back to LAW glass production operation or, in off-normal operating scenarios, returned to the Tank Farms via a buried pipe; an additional option is to transfer the waste back to the Tank Farms via a tanker truck. Vapor from the evaporator will be condensed and sampled to ensure compliance with effluent acceptance criteria before being transferred to the existing Liquid Effluent Retention Facility for processing in the existing Effluent Treatment Facility.

4.0 METHODOLOGY

The DOE independent oversight program is described in and governed by DOE Order 227.1A, *Independent Oversight Program*. EA implements the independent oversight program through a comprehensive set of internal protocols, operating practices, assessment guides, and process guides. Organizations and programs within DOE use varying terms to document specific assessment results. In this report, EA uses the terms “deficiencies, findings, and opportunities for improvement” as defined in DOE Order 227.1A. In accordance with DOE Order 227.1A, DOE line management and/or contractor organizations must develop and implement corrective action plans for the deficiencies identified as findings. Other important deficiencies not meeting the criteria for a finding are also highlighted in the report and summarized in Appendix C of this report. These deficiencies should be addressed consistent with site-specific issues management procedures.

As identified in the assessment plan, this assessment considered the requirements of 10 CFR 830, Subpart A, and DOE Order 414.1C, which specify that the contractor must use appropriate national consensus standards to implement DOE QA requirements.

The assessment team used the following criteria and review approach documents (CRADs):

- CRAD-45-52, *Nuclear Facility Construction – Piping and Pipe Supports*
- CRAD-45-53, *Nuclear Facility Construction – Mechanical Equipment Installation*
- CRAD-31-13, *Conduct of Engineering, Objective 4, Configuration Management*.

The assessment team reviewed documents (e.g., requirements documents, procedures, internal assessments, drawings, and training records) and interviewed key personnel responsible for performing construction activities and managing the Startup training and configuration management (CM) programs. The assessment team reviewed QC and QA surveillances, self-assessments conducted by the Startup organization, and the program for certification and qualification of Construction field engineers and Startup test engineers. The Commissioning and Operations training program and the CM program were also reviewed in this assessment.

The members of the assessment team, the Quality Review Board, and EA management responsible for this assessment are listed in Appendix A. The documents reviewed, personnel interviewed, and observations made during this assessment, relevant to the findings and conclusions of this report, are listed in Appendix B.

5.0 RESULTS

5.1 Quality Control Surveillance Program

This section discusses the assessment of the surveillances performed by QC personnel and qualified field engineers.

***Criterion:** Quality assurance surveillances, including surveillances performed by quality control personnel, shall be scheduled to provide coverage, consistency and co-ordination of ongoing work at a frequency commensurate with the status and importance of the work. (NQA-I, Requirement 18; Policy Q-02.3 of the QAM; and DOE Order 414.1C)*

WTCC QC personnel and field engineers performed 173 QC surveillances during calendar year 2018. WTCC Procedure 24590-WTP-GPP-CON-7101, *Construction Quality Control Program*, provides adequate instructions for performing and documenting QC surveillances. The assessment team reviewed the records of 17 surveillances performed by QC and field engineering personnel to evaluate implementation of the QA program by Central Pre-Mix, the WTP concrete supplier subcontractor. These surveillances covered numerous aspects of Central Pre-Mix's QA program, including document control, procurement, certification of the concrete batch plant and concrete trucks, aggregate testing, receipt of materials, and preparations for manufacturing and supplying concrete in cold weather conditions as defined in the BNI specifications and the referenced American Concrete Institute Standard ACI 306, *Guide to Cold Weather Concreting*. The assessment team also reviewed a sample of the records of 10 of the other 156 QC surveillances completed during 2018. These surveillances reviewed other activities, including welding, control of measurement and testing, material testing, and work activities performed by other subcontractors. The surveillance documentation demonstrated adequate subject matter coverage for each assessed area.

Overall, implementation of the QC surveillance program was adequate for the reviewed sample.

5.2 Startup Self-Assessment Program

This section discusses the assessment of the Startup organization's self-assessment program.

***Criterion:** Management and self-assessments shall be performed by line and support organizations to assess the performance of their performance and the adequacy of their processes. (NQA-I, Requirement 18; Policy Q-02.2 of the QAM; and DOE Order 414.1C)*

The assessment team reviewed eight self-assessments conducted by the Startup organization in 2017 and 2018 to assess the organization's performance in procedure development; field execution of work; implementation of the startup observation program; instrument calibration; procurement for startup activities; turnover process; development, review, and approval of test packages; and certification and qualification of Startup test engineers. The self-assessments that were reviewed are listed in Appendix B. BNI Procedure 24590-WTP-GPP-RACA-AM-0002, *Conduct of Assessments*, adequately specifies the responsibilities and processes for performing, documenting, reviewing, and grading self-assessments. With the exception of self-assessment report 24590-WTP-SAR-SU-18-0006, discussed below, the self-assessments were adequate, allowing the Startup organization to identify some potential deficiencies that were then entered into the corrective action program for resolution.

Self-assessment report 24590-WTP-SAR-SU-18-0006, concerning the effectiveness of the Startup observation program, stated that the program was effective. This program is defined in WTCC procedure 24590-WTP-GPP-RASU-SU-0003, *Certification of Startup Test Personnel*. The procedure states "perform observations as directed." The assessment team reviewed the observations directed from November 2018 through January 2019. Thirty-seven observations were assigned over that period, but only nine (25%) were performed. Only 4 of the 17 management personnel who were directed to perform observations actually performed them; the rest did not participate in the observation program. The procedure does not provide for accountability in performing observations or metrics to determine program effectiveness. Consequently, there is no performance measure to determine whether the intent of the program "to identify areas for improvement to the Startup testing program" is being met.

Overall, the self-assessments completed to date cover many ongoing work activities. (One area that Startup has not assessed is CM, as discussed in Section 5.6.) However, although 24590-WTP-SAR-SU-18-0006 concluded that the observation program is effective, the program is not fully effective in that less than 30% of the scheduled observations were completed in 2018. Furthermore, the completion rate is trending downward, with assigned observations for the three months preceding this assessment having a completion rate of approximately 25%. **(Deficiency)**

5.3 Certification and Qualification of Startup Test and Construction Field Engineers

This section discusses the assessment team's review of resolution of deficiencies identified during QA surveillances of certification and qualification of Startup test engineers and Construction field engineers. The assessment team also reviewed the training program for Startup test and Construction field engineers.

***Criterion:** Each organization shall provide for indoctrination, training, and qualification of personnel performing or managing activities affecting quality. (NQA-1, Requirement 2; Policy Q-02.4 of the QAM; and DOE Order 414.1C)*

Certification and Qualification of Startup Test Engineers

The WTCC self-assessment of the Startup test engineers' certification and training program, number 24590-WTP-SAR-SU-18-0001, identified 41 discrepancies in the qualification records reviewed. Condition report (CR) 24590-WTP-GCA-MGT-18-00258 was initiated to disposition and correct these discrepancies, which were primarily administrative issues (e.g., failing to complete a training record or form).

The assessment team reviewed two QA surveillances, numbers 24590-WTP-SV-QA-18-003 and 24590-WTP-SV-QA-18-038, which were performed as a follow up to assess the adequacy of closure of CR number 24590-WTP-GCA-MGT-18-00258, discussed above. BNI-WTP Procedure 24590-WTP-GPP-

RAQA-QA-1000, *Quality Assurance Surveillance*, adequately describes the methods for scheduling, planning, performing, and reporting QA surveillances.

QA surveillance 24590-WTP-SV-QA-18-003 identified some issues concerning Startup test engineers' qualification and certification records in addition to those identified in self-assessment number 24590-WTP-SAR-SU-18-0001, and followed up on corrective actions in the associated CR. This QA surveillance was thorough and effective in identifying that the education and experience of some Startup test engineers had not been verified prior to their employment at WTP.

In December 2014, CR 24590-WTP-PIER-MGT-14-1410 was initiated after a review disclosed that Bechtel Corporate Human Resources (HR) had not verified the education and experience of more than 100 field engineers employed by BNI on the WTP project between 2010 and 2014. As a result, the onsite HR office now maintains a record listing each Startup engineer's education and experience. The assessment team reviewed the records for randomly selected Startup engineers and verified that their records adequately documented their education and experience. The assessment team also reviewed QA surveillance 24590-WTP-SV-QA-18-038, which was performed to verify that corrective actions were adequate to resolve these issues and concluded that the surveillance was adequate.

The assessment team reviewed WTCC Procedure 24590-WTP-GPP-RASU-SU-0003, *Certification of Startup Test Personnel*, which establishes the qualification and certification process for Startup test engineers; discussed the Startup test engineer training program with Startup engineers and training managers; and reviewed the training program requirements specified in the procedure. The initial requirements for Startup test engineer candidates are to read and document their review of 92 applicable BNI and WTCC procedures in the learning management system. After completing this "read and sign" program, the candidates are evaluated by qualified individuals and then must pass a written proficiency examination, complete on-the-job training, and complete a performance demonstration, with the results documented on form 24590-RASU-F00019, *Startup Test Personnel Certificate of Qualification*.

However, Startup test engineers are not included in the document "*Qualified Positions in Accordance with DOE Order 426.2*" (see section 5.4), which defines the population of covered positions. The WTP contract (DE-AC27-01RV14136) and the Commissioning Plan contain language requiring Startup Testing technical staff to be trained in accordance with the DOE Training Order. Specifically, contract Section C.6, Standard 5 titled "Commissioning" (24590-WTP-PL-RACT-CG-0001), includes the process of startup testing under the commissioning title, and section C.3.f.6 directs that commissioning staff shall be trained in accordance with the DOE order. The Commissioning Plan, conditionally approved by ORP on March 5, 2018, flows down the contract requirements and follows through with language that is consistent with the DOE order applicability to Startup technical staff. ORP field office personnel stated that they would review the contract and Commissioning Plan language and address the applicability of the order.

Deficiencies identified during a self-assessment of these engineers' certification records and a follow-up QA surveillance were adequately resolved and closed. Review of the Startup test engineers' training records is identified as a follow-up item in Section 8.0 of this report.

Certification and Qualification of Construction Field Engineers

WTCC Procedure 24590-WTP-GPP-RACN-FE-3100, *Field Engineering and Subcontract Coordination Qualification and Certification*, establishes the requirements for qualification and certification of Construction field engineering and subcontract coordination personnel who perform inspection and test activities. Construction field engineers and subcontract coordinators inspect commercial grade structures, systems, and components (SSCs), but QC inspectors do not. This procedure is adequate.

QA surveillance 24590-WTP-SV-QA-18-031 was performed as part of an extent-of-condition review to determine whether the issues identified in the Startup test engineers' qualification and certification program were also evident in the program for Construction field engineers. Two CRs, CR 24590-GCA-MGT-18-01367 and CR 24590-GCA-MGT-18-01368 were initiated by QA to resolve deficiencies identified in the certification and qualification of construction field engineers during surveillance 24590-WTP-SV-QA-18-031. The assessment team reviewed these CRs, discussed corrective actions with the Field Engineering manager and QA personnel, reviewed the qualification and certification records for randomly selected field engineers, and concluded that the corrective actions to close the CRs were adequate.

The qualification and certification program for Construction field engineers is adequate, as were the associated QA surveillances.

5.4 Commissioning and Operations Training Program

This section contains the assessment of the training program for Commissioning and Operations personnel.

Criterion: *Establish a selection, training, qualification, and certification requirements for contractor personnel who can impact the safety basis through their involvement in the operations, maintenance, and technical support of hazard category 1, 2, and 3 nuclear facilities. (DOE Order 426.2)*

The training program at WTP is divided into two areas: the Commissioning and Operations training program, which is implemented in accordance with DOE Order 426.2, *Personnel Selection, Training, Qualification, and Certification Requirements for DOE Nuclear Facilities*, and the Engineering, Procurement, and Construction training program, which is not subject to the conditions of the order. Both programs implement a graded approach to the systematic approach to training.

The Commissioning and Operations training program addresses the positions listed in procedure 24590-WTP-LIST-RATQ-TQ-0001, *Qualified Positions in Accordance with DOE Order 426.2*, and is governed by WTP procedure 24950-WTP-PD-RATQ-TQ-0001, *Commissioning and Operations Training Program Description*. These procedures adequately describe the roles and responsibilities of line and training management who implement these programs.

The Training organization is structured with the Operations procedures group reporting to the Training Manager; the operations procedures and the training material use the same software package. This structure has allowed the development of training to keep up with the turnover of systems and any modifications that may have been implemented during construction and testing. The subject matter expert for each system is able to provide input for both procedures and training material, which are developed concurrently. The assessment team's interviews with Training management, supervisors, and instructors indicated that the Training staff is well qualified and is engaged in the training process.

DOE Order 426.2 requires BNI to submit to ORP a Training Implementation Matrix (TIM) describing the implementation of the Contractor Requirements Document. The "Hanford Tank Waste Treatment and Immobilization Plant Training Implementation Matrix (TIM) for Commissioning" (document number 24590-WTP-RPT-TR-10-004, Rev. 3) was approved by BNI in 2016. The TIM is thorough, outlining how the organization implements certain aspects of the training order and identifying elements that will be implemented in the future. BNI is required to submit the TIM for ORP approval before cold commissioning.

The Commissioning and Operations training program is governed by a set of program documents that clearly lay out the roles and responsibilities of WTP staff. The organization is staffed and structured to allow for efficient and effective development of both training materials and operating procedures.

5.5 Configuration Management Program

This section discusses the assessment of the WTP CM program as it relates to the startup process. The WTP CM program is contractually required to be based on American National Standards Institute (ANSI)/Electronic Industries Alliance (EIA)-649A, *National Consensus Standard for Configuration Management*. The CM requirements of DOE Order 420.1C, *Facility Safety*, are not contractually invoked for the current phases of the WTP project.

Criterion: *A configuration management process must be established that controls changes to the physical configuration of project facilities, structures, systems and components in compliance with ANSI/EIA-649A. This process must also ensure that configuration is in agreement with the performance objectives identified in the technical baseline and the approved quality assurance plan. (DOE Order 413.3B, Program and Project Management for the Acquisition of Capital Assets)*

The CM program is adequately described in 24590-WTP-PD-RACM-CM-0001, *Configuration Management Program Description* (CMPD), which directly incorporates the 5 CM functions and the CM principles of ANSI/EIA-649A. The CMPD adequately defines the applicability of the CM principles to the phases of the WTP project (i.e., engineering, procurement, construction, startup, cold commissioning, and hot commissioning). For the startup phase, 40 of the 41 principles are appropriately identified as applicable. The exception is Principle 3-4, “Document and use the appropriate level of authority to approve any temporary departures from approved configuration.” Though not identified as applicable to the startup phase, observations of the Startup organization indicated that Principle 3-4 is adequately implemented for systems under Startup’s control. Overall, BNI has adequately defined a CM program and its applicability in the CMPD.

WTP document 24590-WTP-REQM-RACM-CM-001, *Configuration Management Requirements Document* (CMRD), establishes the CM requirements for each of the BNI and WTCC requirements areas, such as engineering, document control and records management, and document administration (procedures, procurement and subcontracts, construction, startup, maintenance). Requirements in the CMRD, when flowed down to the requirements areas, establish a basis for procedures, describe requirements development, and provide the means to develop training that ensures requirements are met as stated in procedure 24590-WTP-RAPR-PR-0001, *Document Administration and Procedures Program Description*. BNI and WTCC have developed an electronic Requirements Management System (for programmatic requirements) and Technical Requirements Management System (for technical requirements), using DOORS® software, that effectively capture requirements and link the flowdown of those requirements to implementing documents.

For the Startup requirements area, the CMRD establishes 8 requirements to capture the 5 CM functions and the applicable CM principles of ANSI/EIA-649-A. The eight requirements are not “mapped” to the CM functions and principles in the CMRD to ensure that the established set of requirements is sufficient to effectively implement the 5 CM functions and the 40 CM principles identified in the CMPD as applicable to startup. The assessment team identified three applicable CM principles that were not addressed by requirements in the CMRD: CM training (Principle 1-5); use of performance measures to assess the CM program (Principle 1-6); and CM assessments (Principle 5-3). The assessment team discussed this issue with the BNI and WTCC management team; subsequently the contractor initiated condition report CR 24590-WTP-GCN-MGT-19-00129 addressing the discrepancy. This issue is

identified as a follow-up item in Section 8.0 of this report to ensure that adequate corrective actions are effectively implemented.

Overall, the assessment team concluded that the CMPD adequately captures the required CM functions and principles. However, several issues were identified in the flowdown of requirements from ANSI/EIA-649A into subsequent contractor requirements documents. BNI has developed a CR addressing these issues.

6.0 FINDINGS

The assessment team did not identify any findings during this assessment. Deficiencies that did not meet the criteria for a finding are listed in Appendix C of this report, with the expectation from DOE Order 227.1A for site managers to apply their local issues management processes for resolution.

7.0 OPPORTUNITIES FOR IMPROVEMENT

The assessment team did not identify any opportunities for improvement during this assessment.

8.0 ITEMS FOR FOLLOW-UP

- Assess the records for certification and qualification of Startup test engineers (see Section 5.3).
- Assess BNI's programmatic implementation of ANSI/EIA-649A and evaluate the adequacy of condition report CR 24590-WTP-GCN-MGT-19-00129 resolution (see Section 5.5).

Appendix A Supplemental Information

Dates of Assessment

Onsite Assessment: February 4-13, 2019

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Appendix B

Key Documents Reviewed, Interviews, and Observations

Documents Reviewed

- BNI Specification No. 24590-WTP-3PS-G000-T0005, Rev. 4, *Engineering Specification for Cleanness Requirements for WTP Fluid Systems*, February 23, 2016
- BNI Specification No. 24590-WTP-3PS-G000-T0018, Rev. 3, *Engineering Specification for Flushing and Cleaning Requirements for the Startup of Quality and Commercial Fluid Systems in all Facilities*, October 20, 2016
- BNI Specification No. 24590-WTP-3PS-PS02-T0001, Rev. 10, *Engineering Specification for Shop Fabrication of Piping*, September 10, 2009
- BNI Specification No. 24590-WTP-3PS-PS02-T0003, Rev. 10, *Engineering Specification for Field Fabrication and Installation of Piping*, November 25, 2011
- WTCC Startup Procedure 24590-WTP-GPP-RASU-SU-0003, Rev. 3, *Certification of Startup Test Personnel*, July 18, 2018
- WTCC Construction Procedure 24590-WTP-GPP-CON-7101, Rev. 13, *Construction Quality Control Program*, March 9, 2017
- WTCC Procedure 24590-WTP-GPP-MGT-044, Rev. 11, *Nonconformance Reporting and Control*, August 9, 2018
- Document number 24590-WTP-QAM-QA-06-001, Rev. 18, *Quality Assurance Manual*, January 30, 2018
- WTCC Procedure 24590-WTP-GPP-RACN-FE-3100, Rev. 3, *Field Engineering and Subcontract Coordination Qualification and Certification*, May 10, 2018
- BNI-WTP Procedure 24590-WTP-GPP-RAQA-QA-1000, Rev. 6, *Quality Assurance Surveillance*, November 14, 2018
- BNI-WTP Procedure 24590-WTP-GPP-RACA-AM-0002, Rev. 4, *Conduct of Assessments*, November 19, 2018
- BNI Guide 24590-WTP-GPG-HR-0004, Rev. 2, *WTP Employee Education and Experience Verification*, March 27, 2017
- BNI-WTP Procedure 24590-WTP-GPP-CTRG-009, Rev. 5, *Procedure Based Job Analysis for Training*, March 27, 2017
- Procedure 24590-WTP-LIST-RATQ-TQ-0001, Rev. 3, *Qualified Positions in Accordance with DOE Order 426.2*, January 24, 2019
- Procedure 24950-WTP-PD-RATQ-TQ-0001, Rev. 2, *Commissioning and Operations Training Program Description*, September 25, 2018
- Document 24590-WTP-RPT-TR-10-004, Rev 3, *Hanford Tank Waste Treatment and Immobilization Plant Training Implementation Matrix*, September 19, 2016
- Procedure 24590-WTP-PD-RACM-CM-0001, Rev. 6, *Configuration Management Program Description*, September 19, 2018
- Procedure 24590-WTP-REQM-RACM-CM-0001, Rev. 4, *Configuration Management Requirements Documents*, September 7, 2018
- Procedure 24590-WTP-PD-RAPR-PR-0001, Rev. 7, *Document Administration and Procedures Program Description*, March 1, 2018
- Self-Assessment Report 24590-WTP-SAR-SU-17-0001, Rev. 0, *Startup Test Index/Procedure Development and Approval*, March 12, 2018
- Self-Assessment Report 24590-WTP-SAR-SU-17-0002, Rev. 0, *Startup Field Execution*, March 12, 2018
- Self-Assessment Report 24590-WTP-SAR-SU-18-0001, Rev. 0, *Adequacy of Completion of Startup Personnel Certificate of Qualification Records*, June 20, 2018

- Self-Assessment Report 24590-WTP-SAR-SU-18-0002, Rev. 0, *Startup Test Results Package Process*, June 14, 2018
- Self-Assessment Report 24590-WTP-SAR-SU-18-0003, Rev. 0, *Turnover Walkdown Punchlist Process*, September 11, 2018
- Self-Assessment Report 24590-WTP-SAR-SU-18-0004, Rev. 0, *Instrument Calibration Process*, October 29, 2018
- Self-Assessment Report 24590-WTP-SAR-SU-18-0005, Rev. 0, *Startup Procurement Process*, December 6, 2018
- Self-Assessment Report 24590-WTP-SAR-SU-18-0006, Rev. 0, *Effectiveness of Startup Observation Program*, February 6, 2019
- Quality Control Surveillance of Central Pre-Mix Activities, Numbers 24590-WTP-SV-QC-18-011, -012, -031, -043, -054, -066, -089, -090, -109, -110, -111, -128, -154, -155, -160, -161, and -0170
- Quality Control Surveillance Numbers 24590-WTP-SV-QC-18-101, -115, -116, -117, 125, -130, -147, -159, -162, and -176
- Condition Report 24590-WTP-PIER-MGT-14-01410, *WTP Pre-employment Verification of Education and Experience Self-Assessment*, December 14, 2014
- Condition Report 24590-WTP-GCA-MGT-18-00258, *Issues with Startup Test Personnel Certification and Qualification Records*
- Condition Report 24590-WTP-GCA-MGT-18-01295, *WTP Engineering Specification 24590-WTP-3PS-G000-T0005 Did Not Meet Pipe Cleanness Requirements of Mechanical Design Criteria*, November 26, 2018
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- Condition Report 24590-GCA-MGT-18-01367, *Performance of Inspections by Field Engineers Prior to Certification*
- Condition Report CR 24590-GCA-MGT-18-01368, *Level III Program Manager Certification*
- Design Criteria 24590-WTP-DC-M-06-001, Rev. 1, *Mechanical Systems Design Criteria*, August 12, 2011
- Quality Assurance surveillance, number 24590-WTP-SV-QA-18-003, *Report for Surveillance of Startup Test Personnel Qualifications and Certifications*, March 20, 2018
- Quality Assurance surveillance, number 24590-WTP-SV-QA-18-031, *Report for Surveillance of Certification of Responsible Field Engineer Certifications*, May 29, 2018
- Quality Assurance surveillance, number 24590-WTP-SV-QA-18-038, *Report for Surveillance for Closure of Condition Report 24590-WTP-GCA-MGT-18-00258 and 24590-WTP-SV-QA-18-003*, October 3, 2018
- Quality Assurance surveillance, number 24590-WTP-SV-QA-18-126, *Report for Surveillance for Qualifications and Certifications of Field Engineers*, December 13, 2018
- Procedure 24590-WTP-3DP-G044B-00005, Rev. 6, *Configuration Management*, January 17, 2019
- 24590-WTP-RPT-ENG-01-001, Rev. 13, *Technical Baseline Description*, December 18, 2018
- Program Description 24590-WTP-PD-RARM-0001, Rev. 8, *Requirements Management Program Description*, September 20, 2018
- GEIA Standard ANSI/EIA-649-A 2004, *National Consensus Standard for Configuration Management*, October 2004
- Self-Assessment Report 24590-WTP-SAR-PENG-18-0001, Rev. 1, *Effectiveness of Temporary Modification Control Procedure Process Compliance (24590-WTP-GCA-MGT-16-01616)*, September 4, 2018
- WTP Line Surveillance Report, 24590-BOF-SV-OP-18-001, Rev. 0, *Balance of Facility Demineralized Water System Configuration Verification Walkdown*, September 2018
- 24590-WTP-PD-RATR-TR-0001, Rev. 2, *Project Training Program Description*, November 6, 2018

- WTP contract (DE-AC27-01RV14136)
- 24590-WTP-PL-RACT-CG-0001, Rev. 0, *Commissioning Plan*, July 5, 2017

Interviews

- WTCC Field Engineers
- WTCC Lead Civil Field Engineer
- Construction Field Engineering Manager
- WTP Construction Oversight and Assurance Division Site Inspectors
- WTCC Startup Manager
- WTCC Senior Startup Engineers (3)
- Quality Assurance Engineers (3)
- CM Subject Matter Expert
- WTCC Readiness Assurance Maintenance Manager
- BNI Nuclear Safety Manager & staff members
- BNI Resident Engineering Manager
- BNI Chief Engineer
- WTP Radiological and Quality Engineering Manager
- WTCC Balance of Facility Readiness Assurance Representatives (2)
- WTCC Nuclear Facility Manager
- WTCC Training Manager
- WTCC Engineering, Procurement, and Construction Training Instructor (2)
- WTCC Commissioning and Operations Training Instructor (2)
- WTCC Maintenance Program Requirements Area Manager

Observations

- Demonstration of Requirements Management System
- Demonstration of Technical Requirements Management System

Appendix C Deficiencies

Deficiencies that did not meet the criteria for a finding are listed below, with the expectation from DOE Order 227.1A for site managers to apply their local issues management processes for resolution.

- WTP is not meeting the requirements of procedure 24590-WTP-GPP-RASU-SU-0003, *Certification of Startup Test Personnel*, Section 6.6, “Observation of Test Performance,” in that only 25% of the scheduled assessments were performed from November 2018 through January 2019.