INSPECTION TECHNICAL PROCEDURE

I-105

STANDARDS SELECTION PROCESS ASSESSMENT

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Revision 3

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INSPECTION TECHNICAL PROCEDURE I-105, REV. 3
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1.0 PURPOSE

The purpose of this inspection procedure is to assess the adequacy of the Contractor's use of the standards selection process (DOE/RL-96-0004, *Process for Establishing a Set of Radiological, Nuclear, and Process Safety Standards and Requirements for the River Protection Project Waste Treatment Plant*). The standards selection process is a continuing element of the integrated safety management program, which is required by the River Protection Project Waste Treatment and Immobilization Plant (WTP) Contract[1] to ensure that safety requirements are defined, implemented, and maintained.

2.0 OBJECTIVES

- Verify the Contractor's tailoring process[2] for identifying and justifying the appropriate and applicable standards is being appropriately conducted.

- Verify the Contractor is appropriately using the DOE/RL-96-0004 standards selection process in developing and refining subordinate standards and new standards, as well as modifications to existing standards, when substantial changes occur to the facility or to elements of the facility process.

- Verify the Contractor is appropriately documenting justifications for changes to the approved standards and maintaining records of linkages in the steps (work, hazards, hazard controls, standards) in the standards selection process.

3.0 DEFINITIONS

The definitions included in the following references are incorporated by reference into this inspection procedure:

- DOE/RL-96-0006, *Top-Level Radiological, Nuclear, and Process Safety Standards and Principles for the River Protection Project Waste Treatment Plant Contractor*, "Glossary."

- RL/REG-97-05, *Office of Safety Regulation Management Directives*, "Glossary." (The Glossary also includes a list of acronyms that are incorporated by reference into this inspection procedure.)

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

[2] "Tailoring," in the context of integrated safety management, is described in Section 5.1 of *Regulatory Unit Position on Tailoring for Safety*, RL/REG-98-17, Revision 1, 1998. The Contractor's implementation of the tailoring process is described in Appendixes A and B of the *Safety Requirements Document*, BNI-5193-SRD-01, Volumes I and II.

In addition, the following definitions apply to this inspection procedure:

- **Hazards Control Strategy**. A set of generally described provisions (barriers, dilution/dispersal, physical limitations on material quantities, administrative material controls, confinement, ventilation of flammable gas, etc.) and/or approaches (defense in depth, use of passive features, prevention, mitigation, etc.) which are intended to ensure adequate control of hazards associated with a specific process or portion of a process.

- **Tailoring**. "Adapting a safety program, practice, or requirement within the integrated safety management system to suit the need or purposes of a particular operation/activity, taking into account the type of work and the associated hazards." (RL/REG-98-17, *Regulatory Unit Position on Tailoring for Safety*)

4.0 BACKGROUND

Standard 7 in Section C.6 of the WTP Contract requires the Contractor to develop and implement a standards-based integrated safety management program to comply with the specific nuclear regulations defined in the 10 CFR 800 series of nuclear safety requirements, and with the regulatory program established in DOE/RL-96-0003, *DOE Regulatory Process for Radiological, Nuclear, and Process Safety for the River Protection Project Waste Treatment Plant Contractor*; DOE/RL-96-0004, DOE/RL-96-0005, *Concept of the DOE Regulatory Process for Radiological, Nuclear, and Process Safety for the River Protection Project Waste Treatment Plant Contractor*; and DOE/RL-96-0006. Revisions to these documents are acceptable if the changes are mutually agreed to by the Contractor and the DOE, and if the changes do not negatively impact the WTP project cost and schedule. The Contract requires DOE/RL-96-0004 be followed. DOE guidance on the standards selection process was provided in RL/REG-98-17.

The Contractor's standards identification process is continuing and iterative in nature. As noted in RL/REG-98-17, the Contractor is required to use the DOE-approved process for standards identification and, therefore, satisfies DOE/RL-96-0004. Refinement of specific hazards controls and related standards will result: (1) following DOE approval of the initial set of Contractor-proposed standards in the Safety Requirements Document (SRD); and (2) as the detailed definition of work (i.e., the RPP facility design) matures, and the Contractor's understanding of the facility hazards and its associated engineered and administrative controls evolve. Identification of additional standards and subordinate standards, and modifications to existing standards, are expected to occur. As these iterations are implemented, this inspection procedure is intended to be used to assess the adequacy of the Contractor's additions and modifications to the existing set of DOE-approved standards. The level of detail of the inspection will be adapted by the inspection team leader and will accommodate the relative progress the Contractor has made towards the selection of standards for the Construction Authorization Request (CAR) and beyond.

5.0 INSPECTION REQUIREMENTS

The DOE has approved Volume II, Appendix A to the SRD (through implementation of Revision 1f) as the standard which "…implements the process for establishing a set of radiological, nuclear, and process safety requirements and standards as described in DOE/RL-96-0004 and RL/REG-98-17." In Appendix A, the Contractor describes the application of the eight steps in the process that are consistent with the steps identified in RL/REG-98-17. The following inspection elements (Sections 5.1 through 5.8) are subdivided into the eight essential process steps such that the Contractor's implementation of the standards identification process can be evaluated.

5.1 Standards Process Initiation

This is a preparatory step in the standards identification process to ensure adequate resources with appropriate technical background are available and organized to carry out the tasks embodied in the process.

5.1.1 The inspector should verify the Contractor has assigned appropriate staff to the safety requirements and standards identification Process Management Team (PMT). (SRD, Volume II, Appendix A, Section 2.0)

5.2 Identification of Work

This step in the standards identification process involves identifying and documenting the work the Contractor needs to perform such that hazards inherent in the work can be identified and evaluated. This step is iterative. Identification of work should be reconsidered as the facility design evolves, and should be based on the outcome of hazards evaluations and development of hazards control strategies.

5.2.1 The inspector should verify identification of work was performed by work activity experts who are integrally associated with the facility design, have extensive knowledge of the overall processing approach, and are knowledgeable of the processes that must be performed. (SRD, Volume II, Appendix A, Section 3.0)

5.2.2 The inspector should verify oversight for the identification-of-work activity was provided by the PMT. (SRD, Volume II, Appendix A, Section 2.0 and 3.0)

5.2.3 The inspector should verify, when required, the functions, processes, and parameters have been selected through the use of trade studies and definition of functional requirements. (SRD, Volume II, Appendix A, Section 3.0)

5.2.4 The inspector should verify the Contractor used an iterative process (as necessary) when performing the identification-of-work step. (SRD, Volume II, Appendix A, Section 3.0)

5.3 Hazards Evaluation

Hazards evaluation is the key element in the identification and characterization of the hazards associated with the WTP facility. The hazards evaluation process should provide relevant, reliable, and sufficient results to support decisions regarding hazards control measures and selection of standards.

5.3.1 The inspector should verify the Contractor's hazards evaluation process includes the following elements: (SRD, Volume II, Appendix A, Section 4.0)

- Identification of hazards
- Identification of potential accident/event sequences
- Estimation of accident consequences
- Estimation of accident frequencies
- Consideration of common-cause and common-mode failures
- Definition of design basis events
- Definition of operating environments
- Identification of potential control strategies
- Documentation.

5.3.2 The inspector should verify the methodologies and guidelines in the American Institute of Chemical Engineers (AIChE) *Guidelines for Hazards Evaluation Procedures, Second Edition with Worked Examples*, were used to perform a structured and systematic examination of the systems or components selected in Section 6.3.1 of this inspection procedure to identify potential accidents, including common-mode and common-cause failures. (SRD, Volume II, Appendix A, Section 4.2)

5.3.3 Each postulated radiological accident should be assigned a severity level reflecting its unmitigated consequences. The inspector should verify severity levels estimated early in the design process conform to the estimated radiological consequences provided in Section 4.3.1 of Volume II, Appendix A to the SRD, and are confirmed as the design progresses. (SRD, Volume II, Appendix A, Section 4.3)

5.3.4 The inspector should verify the Contractor's estimates for the frequency of internal events are validated as the design progresses. (SRD, Volume II, Appendix A, Section 4.4)

5.3.5 The inspector should verify an initial set of potential hazards controls has been identified to manage each potential accident. These hazards controls should address means for preventing and/or mitigating the consequences of the accident. (SRD, Volume II, Appendix A, Section 4.8) Between the CAR and the Operating Authorization Request, testing and experimental validation will address any residual uncertainties documented in the Preliminary Safety Analysis Report.

5.4 Development of Control Strategies

This step clarifies the integral connections among the identification of work, hazards, and hazards control strategies. Documentation of the hazards control strategy development process should be a narrative defining the overall approach to control a specific preidentified hazard. The control strategy should be described in terms of the safety functions[3] required (e.g., limit release of radionuclides) and in terms of the set of engineered features, administrative controls, and management systems selected for implementing the strategy.

5.4.1 The inspector should verify hazards control strategy documentation provides the bases for the strategies identified and conforms to the guidance provided in the SRD, Volume II, Appendix A, Section 5.0.

5.4.2 The inspector should verify control strategies conform to the requirements defined in the implementing standard for defense-in-depth. (SRD, Volume II, Appendix A, Section 5.0, and Volume II, Appendix B, Section 2.1)

5.4.3 The inspector should verify structures, systems, and components (SSC) used in control strategies for Severity Level (SL)-1 and -2 (event frequencies of $<1 \times 10E^{-6}$ and $<1 \times 10E^{-4}$ per year, respectively) events satisfy the single-failure criteria. (SRD, Volume II, Appendix A, Section 5.0, and Volume II, Appendix B, Section 2.1)

5.5 Identification of Standards

Standards should be selected to implement the control strategies identified in the previous steps in the standards selection process. The standards may be selected from any source, including consensus standards from international sources, or they may be ad hoc. However, the standards must be consistent with the control strategies.

5.5.1 The inspector should verify the standards selection process is an iterative activity and implementation of the standards selected is tailored to better fit the hazards as the design evolves. (SRD, Volume II, Appendix A, Section 7.0; ASME NQA-1, Supplement 3S-1, paragraphs 2 and 3)

5.5.2 The inspector should verify documentation of the linkages from the hazards identified, to the control strategies, and to the standards identified. (SRD, Volume II, Appendix A, Section 7.0)

5.6 Confirmation of Standards

This step consists of a confirmation of the selected set of standards based on review by the Contractor's Project Safety Committee (PSC).

[3] The term "safety function" is defined in DOE/RL-96-0003, "Glossary."

5.6.1 The inspector should verify confirmation of standards is based on a defined and documented review approach. (SRD, Volume II, Appendix A, Section 8.0; ASME NQA-1, Supplement 3S-1, paragraphs 2 and 3)

5.6.2 For the standards reviewed in Section 6.5.1 of this inspection procedure, the inspector should verify confirmation of these standards was appropriately documented and comments from the PSC were formally dispositioned by the process management team. (SRD, Appendix A, Section 8.0).

5.7 Formal Documentation

For the standards reviewed in Section 6.5.1, the inspector should verify results of the standards selection process are appropriately documented in the SRD. The inspector also should verify the SRD appropriately identifies and justifies the set of requirements and standards selected to provide adequate protection for workers, the public, and the environment. (SRD, Volume II, Appendix A, Section 9.0; ASME NQA-1, Supplement 3S-1, paragraph 7)

5.8 Recommendations

For the standards reviewed in Section 6.5.1 below, the inspector should verify the Contractor has certified the recommended set of standards, when properly implemented, provides adequate safety, complies with applicable laws and regulations, and conforms with DOE/RL-96-0006. (SRD, Volume II, Appendix A, Section 10.0)

6.0 INSPECTION GUIDANCE

NOTE: In conducting inspections under this procedure, inspectors should review the applicable sections in the SRD, the Hazard Analysis Report (HAR), and the integrated Safety Management Plan (ISMP). Additional regulatory expectation can be found in:

- DOE/RL-96-0004, *Process for Establishing a Set of Radiological, Nuclear, and Process Safety Standards and Requirements for the River Protection Project Waste Treatment Plant*
- RL/REG-98-17, *Regulatory Unit Position on Tailoring for Safety*
- RL/REG-99-05, *Review Guidance for the Construction Authorization Request*
- RL/REG-00-16, *Position on the Selection of Design Standards*.

6.1 Standards Process Initiation

As required by the SRD, Volume II, Appendix A, Section 2.0, the safety requirements and standards identification process management team shall comprise managers from the following organizations:

- Environmental Safety and Health
- Engineering
- Operations.

The Radiological, Nuclear, and Process Safety Manager will be assigned management responsibility for the standards identification process. In addition, participants in each step of the standards identification process should be integrally associated with plant design, as opposed to individuals exclusively dedicated to staffing the standards selection process (RL/REG-98-17, Section 5.1).

If possible, obtain and review the resumes and position descriptions for the selected managers from the list of organizations above. Responsibilities related to the safety requirements and standards identification process management team should be embodied in the position descriptions. These assignments may also be documented in the Contractor's organizational or administrative procedures, or specifically in memorandums or other correspondence. Review of the applicable resumes should indicate whether these individuals are qualified for their responsibilities related to the standards identification process.

6.2 Identification of Work

6.2.1 Work activity experts will be drawn from the following organizations:

- Engineering staff
- Operations staff.

The Inspector should review the position descriptions, or other work assignment documents, to determine if they contain provisions for identification-of-work activities for the applicable staff in these organizations. These responsibilities also may be embodied in the Contractor's organizational or administrative procedures, or specifically in memorandums or other correspondence. The inspector should ensure assigned staff have appropriate experience and knowledge in their assigned areas. Results of the Inspection Technical Procedure I-106, "Personnel Training and Qualification Assessment," may be useful for this review.

6.2.2 The inspector should review a sample (at least five) of the products of the design input process identification-of-work activity, such as process or system descriptions, to ensure identification-of-work was accomplished completely and appropriately, with proper oversight by the process management team.

6.2.2.1 The inspector should verify appropriate design inputs, such as regulatory requirements, design bases, performance requirements, codes, and standards have been identified and documented and the selection was reviewed and approved by the responsible design organization. The inspector should verify changes from approved design inputs, including the reason for the changes, have been identified, approved, documented, and controlled. (NQA-1, Supplement 3S-1, paragraph 2)

6.2.2.2 The inspector should verify design methods, materials, parts, equipment, and processes essential to the function of the SSC have been selected and reviewed for suitability. (NQA-1, Supplement 3S-1, paragraph 3)

6.2.2.3 The inspector should verify final design, consisting of approved design output documents (such as drawings, calculations, design criteria, system descriptions, etc) and changes thereto, are related to the design input by documentation of sufficient detail to permit verification and identify assemblies or components that are part of the item being designed. (NQA-1, Supplement 3S-1, paragraph 3)

6.2.3 From the sample of products reviewed above (6.2.2), the inspector should determine if other information derived from experience such as reports or trade studies were used to ensure selection of optimum functions, processes, and parameters, and functional requirements of SSCs are properly defined. Results of the identification of work activity should be documented in the SRD. (NQA-1, Supplement 3S-1, paragraph 3)

6.2.4 Identification of work should be reconsidered in light of the design evolution, the outcome of hazards evaluations, and the development of hazards control strategies. The inspector should ensure mechanisms are in place and being followed to revisit identification of work when new or unexpected information about the process is identified.

6.3 Hazards Evaluation

6.3.1 Elements included in the hazards evaluation process may be verified by an in-depth review of at least one system or major component. The inspector should review the Contractor's documentation associated with the facility hazards evaluation for the system or component, and should verify the elements identified in Section 5.3.1 above and Section 4.0 of Volume II, Appendix A to the SRD were included.

6.3.2 The inspector should review the Contractor's documentation associated with the facility hazards evaluation, and verify the guidelines of AIChE (1992) were followed.

6.3.3 The inspector should verify conformance and confirmation of severity levels for the systems or components selected in Section 6.3.1 above. The inspector should review the Contractor's accident analysis documentation to verify validation of postulated accident severity levels. For each accident scenario, when addressing the potential consequences to facility workers, co-located workers, and the public, the accident analysis should consider the following:

- Inventory of material at risk
- Respirable release fraction
- Fraction of the airborne material released to potentially occupied locations
- Bounding atmospheric dispersion coefficients
- Radiological composition of the material released
- External radiation field
- Exposure times.

6.3.4 As the facility design progresses, early estimates of the internal event frequencies should be refined by use of hazards analysis techniques. For the systems or components selected in Section 6.3.1, the inspector should review the current HAR to verify hazards analysis techniques, such as Hazard and Operability, and event trees and/or fault trees, were used to refine the estimates of the internal event frequencies reviewed.

6.3.5 For the systems or components selected in Section 6.3.1, the inspector should review the current HAR to verify each potential accident identified has an associated set of potential hazards controls and verify the functions of each potential hazard control are clearly described.

6.4 Development of Control Strategies

6.4.1 For the potential accidents identified with the systems or components selected in Section 6.3.1, the inspector should review the hazards control strategy documentation to verify all control strategies considered are identified, and a defensible rationale for selection of the preferred strategies is provided.

6.4.2 The implementing standard for defense-in-depth is presented in the SRD, Appendix B. The inspector should review the documentation for the hazards control strategies to verify it conforms to the requirements of defense-in-depth. Application of the defense-in-depth principle should encompass the following sub-principles:

- Defense-in-depth
- Prevention
- Control
- Mitigation
- Automatic systems
- Human aspects.

6.4.3 Event severity levels for unmitigated accidents are defined in the SRD, Volume II, Appendix A. The inspector should review the hazards control strategy documentation to verify SSCs used in hazards control strategies for SL-1 and -2 events satisfy the single-failure criteria. Volume II, Appendix B to the SRD states implementing standards for single-failure criteria are the American National Standards Institute (ANSI)/American Nuclear Society (ANS) Standard-58.9-1981, *Single Failure Criteria for Light Water Reactor Safety-Related Fluid Systems*, and Institute of Electrical and Electronics

Engineers, Inc. (IEEE) Standard 379-1994, *Application of the Single-Failure Criterion to Nuclear Power Generating Station Safety Systems*.

6.5 Identification of Standards

6.5.1 Identification of standards is an iterative activity. Initially, the set of standards and requirements should be derived from a general understanding of the process hazards. The inspector should review the documentation associated with identification of a sample of at least five standards and verify implementation of the standards selected is tailored to better fit the hazards based on hazards evaluation and development of control strategies as the design evolves.

6.5.2 Documentation of the standards and requirements identification process should provide justification of the selected standards, as well as the links to control strategies in the HAR. For the standards reviewed in Section 6.5.1, the inspector should review the Contractor's documentation associated with this step to verify documentation of the linkages from the hazards identified, to the control strategies, to the standards identified in the SRD. See the SRD, Section 7.0 of Appendix A, for Contractor requirements associated with identification and documentation of standards.

6.6 Confirmation of Standards

The inspector should perform an adequacy review of the Contractor's documentation for the Confirmation of Standards activity. Documentation should include confirmation of the selected set of standards by the PSC, and documentation of the PSC review.

6.7 Formal Documentation

The inspector should perform an adequacy review of the Contractor's documentation for the Formal Documentation activity. Documentation of the results of the standards selection process may be incorporated by reference in the SRD.

6.8 Recommendations

The inspector should perform an adequacy review of the Contractor's documentation for the Recommendations activity. Documentation should include, as a minimum, the certification signature of the WTP Manager of Operations.

7.0 REFERENCES

AIChE, *Guidelines for Hazards Evaluation Procedures, Second Edition with Worked Examples,* Center for Chemical Process Safety, American Institute of Chemical Engineers, New York, New York.

ASME NQA-1, *Quality Assurance Program Requirements for Nuclear Facilities*, 1989 Edition

DOE/RL-96-0003, *DOE Regulatory Process for Radiological, Nuclear, and Process Safety for the River Protection Project Waste Treatment Plant Contractor,* Rev. 2, U.S. Department of Energy, Office of River Protection, 2001.

DOE/RL-96-0004, *Process for Establishing a Set of Radiological, Nuclear, and Process Safety Standards and Requirements for the River Protection Project Waste Treatment Plant Contractor,* Rev. 2, U.S. Department of Energy, Office of River Protection, 2001.

DOE/RL-96-0005, *Concept of the DOE Regulatory Process for Radiological, Nuclear, and Process Safety for the River Protection Project Waste Treatment Plant Contractor*, Rev. 2, U.S. Department of Energy, Office of River Protection, 2001.

DOE/RL-96-0006, *Top-Level Radiological, Nuclear, and Process Safety Standards and Principles for the River Protection Project Waste Treatment Plant Contractor,* Rev. 2, U.S. Department of Energy, Office of River Protection, 2001.

Hazard Analysis Report, BNFL-5193-HAR-01, Bechtel National, Inc., Richland, Washington.

IEEE, 379-1994, *Application of the Single-Failure Criterion to Nuclear Power Generating Station Safety Systems*.

24590-WTP-ISMP-ESH-01-001, *Bechtel Integrated Safety Management Plan*, Bechtel National, Inc., Richland, Washington.

RL/REG-97-05, *Regulatory Unit Management Directives*, U.S. Department of Energy, Office of River Protection, 2001.

RL/REG-98-17, *Office of Safety Regulation Position on Tailoring for Safety*, Rev. 1, U.S. Department of Energy, Richland Operations Office, 1998.

RL/REG-98-26, *Inspection Technical Procedures*, U.S. Department of Energy, Richland Operations Office, 2001.

ITP I-106, "Personnel Training and Qualification Assessment"

24590-WTP-SRD-ESH-01-001-02, Rev. 1f*, Safety Requirements Document*, Volume II, Bechtel National, Inc., Richland, Washington.

ANSI/ANS Standard-58.9-1981, *Single Failure Criteria for Light Water Reactor Safety-Related Fluid Systems,* American National Standards Institute/American Nuclear Society, New York, New York, 1981.

8.0 LIST OF TERMS

AIChE	American Institute of Chemical Engineers
ANS	American Nuclear Society
ANSI	American National Standards Institute
CAR	Construction Authorization Request
HAR	Hazard Analysis Report
IEEE	Institute of Electrical and Electronics Engineers, Inc.
ISMP	Integrated Safety Management Plan
PSC	Project Safety Committee
SL	severity level
SRD	Safety Requirements Document
SSC	structures, systems, and components
WTP	Waste Treatment and Immobilization Plant

Attachment: None