
INSPECTION TECHNICAL PROCEDURE

I-123

CORROSION/EROSION EVALUATION ASSESSMENT

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INSPECTION TECHNICAL PROCEDURE I-123, REV. 0 CORROSION/EROSION EVALUATION ASSESSMENT

1.0 PURPOSE

This procedure provides Office of Safety Regulation (OSR) guidance to ensure the River Protection Project Waste Treatment and Immobilization Plant (WTP) Contractor is adequately implementing the Ad Hoc Implementing Standard For Erosion/Corrosion and Assessments contained in Appendix H of the Safety Requirements Document (SRD) in the design and procurement of equipment.

The Contractor is required by the Contract¹ through the Ad Hoc Implementing Standard for Erosion/Corrosion and Assessments² to document on a Material Selection Data Sheet the assumed process chemistry conditions for important-to-safety (ITS) components. A Corrosion Evaluation provides corrosion analyses, material selection, corrosion allowance, and operating limitations. The inspector will assess the Corrosion Evaluation for consistency with the conditions described in the Ad Hoc Implementing Standard for Erosion/Corrosion and Assessments.

2.0 OBJECTIVES

This procedure verifies the adequacy of the Contractor's procedures for implementing the Ad Hoc Implementing Standard for Erosion/Corrosion.

This procedure also verifies the following for selected ITS vessels or piping systems:

- The adequacy of the Contractor's methodology for identification of the assumed bounding environments during operation
- The adequacy of the Contractor's selection of material based on alloy performance data and the assumed bounding environments.

3.0 DEFINITIONS

Corrosion – The degradation of a material of construction by a chemical or an electrochemical process. Electrochemical corrosion requires an anode and a cathode interconnected by both an ionic conductor and an electronic conductor.

¹ Contract No. DE-AC27-91RV14136 between the U.S. Department of Energy and Bechtel National, Inc., dated December 11, 2000.

² Ad Hoc Implementing Standard for Erosion/Corrosion and Assessments, SRD Volume II, Appendix H, 24590-WTP-SRD-ESH-01-001-02.

Erosion – Destruction of metals or other materials by the abrasive action of moving fluids. It is usually accelerated by the presence of solid particles or matter in suspension as in two-phase flow.

Black Cell – A shielded cell in the Pretreatment and High Level Waste (HLW) facilities for which no maintenance or entry is planned for the 40-year design life of the plant.

4.0 INSPECTION REQUIREMENTS

This inspection procedure provides guidance for verifying implementation of the Ad Hoc Implementing Standard for Erosion/Corrosion and Assessments. A Corrosion/Erosion Evaluation is prepared by the Contractor for each vessel and piping system. The inspections should be performed on completed evaluation reports that document the Contractor's Corrosion/Erosion Evaluation. The inspector should determine whether the Contractor's Corrosion/Erosion Evaluation reports contain sufficient information for evaluation against the criteria stated in the Ad Hoc Implementing Standard and in the Contractor's procedures. The reports should also be reviewed to determine the adequacy of the bounding environmental conditions and the adequacy of the selection of materials for each vessel and piping system.

4.1 Adequacy of the Contractor's Procedures

The inspector should verify the adequacy of the Contractor's procedures for material selection. The Contractor's procedures for materials selection are described in Materials Selection Report, Document No. 24590-WTP-RPT-M-01-001, Rev. 0.

4.2 Review of Contractor's Evaluations for Specific Vessel and Piping Systems

4.2.1 Identification of the Assumed Bounding Environments

The WTP will treat a wide range of radioactive wastes. The materials of construction for the vessels and piping will be subject to corrosion/erosion during the processing of these wastes. Process Engineering provides chemistry and operating conditions for the entire spectrum from start-up to accidents. Operations provide information on the effect of operating limits and input on off-normal conditions. The inspector should verify the adequacy of the bounding environments/conditions assumed for material selection.

4.2.2 Selection of Material

The material selection process requires identifying alloys that resist corrosion/erosion under the bounding assumed environmental conditions and design life, as required by the Ad Hoc Implementing Standard for Erosion/Corrosion and Assessments. The inspector should verify the data and correlations for the significant corrosion mechanisms and assess the suitability of the materials selected.

5.0 INSPECTION GUIDANCE

5.1 Adequacy of the Contractor's Procedures

The inspector should review the Contractor's procedures for implementation of the Ad Hoc Implementing Standard for Erosion/Corrosion and Assessments. The review should verify aspects of the Ad Hoc Procedure are addressed in the Contractor's implementing procedures. In particular, the implementing procedures should provide specific guidance for identifying bounding environments for possible conditions, for addressing the corrosion/erosion modes identified in the Ad Hoc Standard, and for selecting appropriate materials.

5.2 Review of Contractor's Corrosion/Erosion Evaluations

The inspector should select a representative sample of the Contractor's specific system Corrosion/Erosion Evaluation Reports for review. The sample should include selections from the three major processing facilities and represent a range of conditions that vessels and piping systems may be subject to. Corrosion/Erosion Evaluation Reports should be reviewed for vessels and systems located in black cells.

5.2.1 Identification of the Assumed Bounding Environments

The inspector should assess the component descriptions and assumptions of chemical and physical conditions provided in the Contractor's Corrosion/Erosion Evaluation Reports in sufficient detail to ensure that the results are technically supportable. The inspector should verify the maximum corrosion that is predicted for the bounding environments/conditions for alloys that are recommended as acceptable for each of the Contractor's evaluations that are reviewed. The inspector should verify off-normal conditions are identified and are included in the corrosion assessment including off-normal conditions that may include inadvertent transfer of chemicals from adjacent tanks. The inspector should determine if the identification of the assumed bounding environments during operation of each vessel and piping system is appropriate.

5.3 Selection of Material

The inspector should verify the Contractor's materials selection for each vessel and piping system is adequate, based on the assumed bounding chemical and physical environments and verify assessments for corrosion/erosion are consistent with the requirements of the Ad Hoc Implementing Standard, and in particular, each corrosion/erosion mechanism described in the Ad Hoc standard has been addressed as appropriate.

The corrosion/erosion data and correlations provided by the references should be reviewed to verify they support the adequacy of the materials selected as required by the Ad Hoc Implementing Standard for Erosion/Corrosion and Assessments. Unverified assumptions in the Contractor's Evaluation Reports, such as the use of data extrapolation or interpolation, and the

possible consequences should be evaluated by the inspector. Risks associated with uncertainties on data and correlations should be understood and discussed in the inspection report.

Since test conditions will not likely duplicate the chemical makeup of high level wastes during pre-treatment processing in the WTP, interpolation and extrapolation of correlations for corrosion will be required. Extrapolation of rates to long times will usually be required because it is unlikely that data will be found for a 40 year period of exposure.

Alloy performance data are presented in the Materials Selection Report. Verify the recommended material for each component meets the requirements for corrosion resistance without exceeding the corrosion allowance. Suggested good practice regarding corrosion allowance is provided in Appendix E in Section VIII of the ASME Boiler and Pressure Vessel Code.

6.0 REFERENCES

ASME Section VIII, Appendix E, *Suggested Good Practice Regarding Corrosion Allowance*, 2001-07-01.

JR Divine, *Materials Selection Report*, Document No. 24590-WTP-RPT-M-01-001, Rev. 0, Draft for Review, Bechtel, Richland, Washington.

Materials Selection Report, Document No. 24590-WTP-RPT-M-01-001, Rev. 0, Bechtel National, Inc.

Safety Requirements Document, Volume II, 24590-WTP-SRD-ESH-01-001-02, Appendix H, *Ad Hoc Implementing Standard for Erosion/Corrosion and Assessments*, Bechtel National, Inc., 2002.

7.0 ACRONYMS

ITS	important-to-safety
WTP	Waste Treatment and Immobilization Plant