INSPECTION TECHNICAL PROCEDURE

I-143

RADIATION MONITORING AND CONTROL ASSESSMENT

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1.0 PURPOSE

This inspection procedure provides guidance for assessing elements of the Contractor's Radiological Control Program (RCP) that address radiation monitoring and control. This guidance is based on the requirements in the Radiation Protection Program (RPP), Safety Requirements Document (SRD), Initial Safety Analysis Report (ISAR), Quality Assurance Manual (QAM), and the Integrated Safety Management Plan (ISMP).

This inspection procedure assesses the adequacy and effectiveness of the following:

- Radiation monitoring technical basis
- Radiation monitoring and control procedures
- Radioactive material storage
- Shipping and receiving
- Criticality monitoring
- Records system.

NOTE: This procedure references RPP sections as the basis of many of the requirements. At the time of its writing, the RPP was approved for design and construction. When the revised RPP is approved for operations, this procedure will be reviewed to ensure the inspection attributes and references are appropriate.

2.0 OBJECTIVES

This procedure verifies the Contractor has developed, implemented, and maintained an effective radiation monitoring and control program that will ensure: (1) the radiation hazard has been characterized, (2) monitoring and control procedures appropriate to the hazard have been developed, (3) radioactive material received, stored, or shipped has been surveyed to confirm requirements have been satisfied, and (4) records have been created and maintained to document implementation of the program.

This inspection procedure is a component of the RCP inspection program. This and other inspection procedures will be used on an on-going basis, as needed, to provide assurance radiation monitoring and control activities are being conducted as required by the RCP, authorization basis commitments, and the Contractor’s procedures. This inspection procedure will be used throughout the entire life cycle of the River Protection Project Waste Treatment Plant (RPP-WTP). However, the entire inspection procedure may not be completed during any one inspection and/or every time the inspection procedure is used.

3.0 INSPECTION REQUIREMENTS

3.1 Adequacy and Effectiveness of Radiation Monitoring Technical Basis

The inspector should verify the Contractor has determined the types, levels, and energies of radiation hazard(s) encountered at the RPP-WTP to ensure appropriate instruments and equipment are used to monitor radiation. (RPP, Requirement 44)

3.2 Adequacy and Effectiveness of Radiation Monitoring and Control Procedures

The inspector should verify the Contractor has developed, implemented, and maintained procedures to monitor individuals and areas for radiation to ensure compliance with the authorization basis commitments. (RPP, Requirement 22; and QAM, Policy Q-05.1)

NOTE: ITP I-141, "External Dosimetry Assessment," ITP I-142, "Internal Dosimetry Assessment," and ITP I-148, "RCP Instrument Calibration and Maintenance Assessment," should be used to evaluate those aspects of the RCP. ITP I-149, "Radiological Work Controls Assessment," can also be used to evaluate the procedures that control work in radiological areas.

3.3 Adequacy and Effectiveness of Radioactive Material Storage

The inspector should verify radioactive material in storage is monitored to ensure it is controlled in accordance with authorization basis commitments. (RPP, Requirement 43, and 49 through 54)

3.4 Adequacy and Effectiveness of Shipping and Receiving

The inspector should verify monitoring is performed to satisfy the exposure rate and contamination limits when shipping or receiving radioactive materials. (RPP, Requirements 44, and 51 through 54)

3.5 Adequacy and Effectiveness of Criticality Monitoring

The inspector should verify monitoring is adequate to ensure workers performing sampling of incoming waste are provided sufficient information to maintain exposure within regulatory limits. If a criticality monitoring system is installed, the inspector should verify that it meets the commitments in the authorization basis. (RRP, Requirement 43; and SRD, SC 3.3-6 through 3.3-8)

3.6 Adequacy and Effectiveness of Records

The inspector should verify that monitoring results are documented, reviewed, and maintained to satisfy requirements and commitments in the authorization basis. (RPP, Requirements, Items 76 through 89, 94, and 95; and ISMP, Section 8, Table 8.1)

4.0 INSPECTION GUIDANCE

Inspection guidance is provided to assist the inspector in addressing the inspection requirements set forth in Section 3.0 of this procedure.

The inspector should review the applicable parts of the authorization basis. The inspector should also be familiar with the content of the documents listed in Section 5.0, References.

Note: Although the Contractor has not committed to the DOE implementation guidance presented in the DOE G-441.1 "Guides," the inspector may use this guidance as an example of acceptable methods for demonstrating compliance with the radiation/radioactive materials monitoring and control requirements.

The guidance below includes suggested sample sizes of documents and records to be reviewed, and personnel to be interviewed. The inspector may wish to choose a different sample size based on the life cycle of the facility, on the initial observations in any area, or on information provided in previous inspection reports. The samples should be of sufficient size to provide confidence the inspector can conclude if: (1) the Contractor has established and implemented an adequate and effective radiation monitoring and control program, and (2) records are being created and maintained that demonstrate compliance with authorization basis commitments.

4.1 Adequacy and Effectiveness of Radiation Monitoring Technical Basis

To determine the adequacy and effectiveness of the radiation monitoring technical basis, the inspector should perform the following:

4.1.1 Verify by review of the RCP, that it references a documented evaluation of the types, levels, and energies of the radiation hazard present at the facility. The purpose of this evaluation is to ensure that monitoring is performed using instruments and equipment appropriate for the radiological circumstances. For example, radiation from isotopes like ^{3}H, ^{14}C, ^{99}Tc, ^{129}I, and ^{239}Pu can be difficult to measure. Information on the location and concentration of isotopes like these, within the RPP-WTP, is important to radiological monitoring decisions such as the frequency of monitoring, type of analysis performed, and instrumentation used. The Contractor is committed to implement “Part 5, Radiological Monitoring and Surveys” of the Tank Farm Radiological Control Manual (TFRCM). See DOE G 441.1-3 and DOE G 441.1-4, Sections 4.1.3 for additional guidance.

4.1.2 Verify the effectiveness of the radiation monitoring technical basis document by evaluating three examples of radiation monitoring procedures to determine if the TBD guidance is being implemented. This might include observation of the survey or analytical instruments used in the context of their detection capabilities, monitoring techniques, and reporting of the results. For example, during design and construction, the Contractor might use reproduction equipment that contains millicurie quantities of 210-Po. The inspector should verify the TBD identifies the isotope, the type of instrument appropriate for monitoring, and the frequency which monitoring is required. During operation, an isotope like 99-Tc might be a good example to confirm that TDB guidance has been incorporated in monitoring procedures. This step may be conducted in conjunction with Section 4.2.

4.2 Adequacy and Effectiveness of Radiation Monitoring and Control Procedures

To determine the adequacy and effectiveness of the radiation monitoring and control procedures, the inspector should perform the following:

4.2.1 If this procedure has not been performed before, select five RCP procedures related to monitoring, and verify the appropriate steps listed below have been implemented consistent with QAM, Policy Q-06.1 and QAM, Policy Q-05.1.

4.2.2 Verify the procedures ensure that monitoring will be performed to:

- Demonstrate compliance with the RPP (RPP, Requirement 43 (1))
- Document radiological conditions (RPP, Requirement 43 (2))
- Detect changes in radiological conditions (RPP, Requirement 43 (3))
- Detect the gradual buildup of radioactive material (RPP, Requirement 43 (4))
- Verify the effectiveness of engineering controls and process controls in containing radioactive material and reducing radiation exposure (RPP, Requirement 43 (5))
- Identify and control potential sources of individual exposure (RPP, Requirement 43 (6))
- Comply with radiation limits associated with shipping and receipt of radioactive material (RPP, Requirements 52, 53, and 54)
- Control personnel access to high and very high radiation areas (RPP, Requirement 60)
- Control public exposure in the controlled and uncontrolled areas (SRD, SC 5.4-7)
- Control of dose to the embryo/fetus. (RPP, Requirement 36)

4.2.3 Verify that procedures include monitoring frequencies, the types of monitoring to be performed, response to out-of-specification conditions, and guidance for performing special monitoring and surveillance. (ISAR, Appendix 5A, Section 6.5)

Note: During RPP-WTP site preparation and initial construction, the inspector should determine if the monitoring frequency and techniques are consistent with the planned activities. For example, the inspector should verify that monitoring procedures will be performed as the site is excavated to detect any residual sources of radiation. Other examples include the need to perform surveys following radioactive releases from co-located facilities, following environmental conditions that might carry radioactive material on to the site, and in conjunction with use of licensed and non-licensed radioactive materials on-site to support non-destructive testing.

4.2.4 Verify instrument procedures address periodic calibration, performance and battery tests, response to radiation fields, and technical limitations of monitoring equipment.

Note: Calibration of the instruments should be verified using ITP-148.

4.2.5 Review the Contractor's Radiological Work Permit (RWP) procedure to confirm that it contains all the elements from ISAR, Section 5.4.

4.2.6 If previous ITP I-140, "RCP Programmatic Assessment," related inspection reports describe the radiation monitoring and control procedures as being adequate or if this procedure has been previously performed, the inspector should select five different procedures and verify those procedures continue to ensure that requirements from the authorization basis will be implemented.

4.2.7 Verify that any changes made to the procedures were reviewed and approved consistent with QAM Policy Q-06.1.

4.2.8 Review the results of audits or assessments performed since the last inspection. The inspector should follow-up selected identified deficiencies to determine if corrective actions were taken, if they were effective, and if the auditors found the monitoring program to be adequate or improving.

4.2.9 Determine, based on observations from 4.2.10 through 4.2.14 that follow, the effectiveness of the procedures to ensure adequate control of the radiation hazard. If procedures appear to need improvement, the inspector should discuss the matter with the Radiation Protection Manager (RPM) or designate in an attempt to reach agreement if the procedures are a causal factor in the deficient performance.

4.2.10 Verify implementation of the RWP procedure by selecting five completed and five active RWPs and determine from record review and discussion with Contractor representatives, that radiation monitoring information supporting the hazard evaluation portion of the RWP was based on current documented monitoring results.

4.2.11 From the 10 RWPs reviewed above, the inspector should select two that involve significant radiation exposure and verify by record review and discussion with Contractor

representatives that exposure rates were determined using instruments and equipment capable of evaluating the hazard in the work area as described in the TBD.

4.2.12 From the five active RWPs selected in 4.2.10, select two that involve routine access to the radiological areas for activities such as process operation, sampling, or operator rounds, and verify by observation, Contractor compliance with the specific radiological conditions of the RWP.

4.2.13 Tour occupied portions of the radiological controlled areas to determine if instruments being used to monitor external dose rate and contamination are consistent with the TBD. The inspector should compare the limitations presented in the instrument or equipment operating procedures against the technical basis to determine if the instrument is suitable for the circumstances being used. The inspector should observe the instrument use technique and compare the technique with the limitations expressed in the operating procedure for the type, level, and energy of the radiation present.

Note: ITP-I-145, *Contamination Monitoring and Control Assessment,* may be used to evaluate the contamination and control portion of this guidance.

4.2.14 Observe how the Contractor is implementing its procedure to ensure SRD, SC 5.4-7 (2) (b) requirement to limit public exposure to less than 2 millirem in any one hour and 50 millirem in any one year are satisfied. The inspector should verify the Contractor's technique is consistent with ANSI/ISO – 14001-1996, "Environmental Management Systems-Specifications with Guidance for Use."

4.2.14 Observe implementation of the procedure to monitor and control public exposure in the controlled area.

4.2.15 Observe how the Contractor is implementing its procedure to monitor the exposure to the embryo/fetus of a declared pregnant woman to ensure that dose is maintained within the limits.

4.3 Adequacy and Effectiveness of Radioactive Material Storage

The Contractor presents its general commitments regarding the control of radioactive materials in ISAR, Appendix 5A, Section 5.0, to meet the RPP and SRD requirements. To determine the adequacy and effectiveness of the radioactive material control and the radioactive material storage, the inspector should perform the following:

4.3.1 During design phase inspections, review the current Safety Analysis Report (SAR) and select from the items listed below an appropriate topic, based on facility status, for detailed review. Using the RPM as a focal point for discussion, the inspector should identify the responsible design engineer and review, on a sampling basis, design documentation to confirm that commitments in the SAR have been implemented. Prior to operation, all of the topic should be inspected.

4.3.1.1 Review selected aspects of the design of process material and facility generated solid radioactive waste storage and handling facilities to confirm radiation hazards are adequately monitored, controlled, and the as low as is reasonably achievable (ALARA) process was implemented. Use, as applicable, ITP I-111, "ALARA Program Assessment."

4.3.1.2 Verify that fixed radiation monitoring is planned to meet the commitments presented in ISMP, Section 3.9.1.3.

4.3.1.3 Verify that access control requirements for high radiation areas have been implemented. (RPP, Requirements 57 through 63)

4.3.1.4 Confirm the design includes provisions for radioactive sealed source storage.

4.3.2 During site preparation and construction, verify the radiation protection organization has approved any sealed sources of radioactive material brought on site, including radiography sources by external organizations, and has issued and implemented procedures to monitor use of the material.

4.3.3 During construction, periodically walk-down the radioactive material storage facilities to observe implementation of the design to verify that committed standards are being used.

4.3.4 During pre-operational testing, the inspector should walkdown the SAR design to verify the as-built configuration for solid radioactive wastes systems and to confirm that pre-operational testing demonstrated the system's performance objectives.

4.3.5 During facility operation, the inspector should focus on selected procedures from the RCP and verify by observation and record review that procedures are being implemented. The same technique should be used during deactivation.

4.3.6 Verify that responsibilities and authorities for management of radioactive materials described in ISAR, Appendix 5A, Section 5.1, or the current SAR, have been incorporated in procedures.

4.3.7 Verify procedures for identification, storage, use, and control of process radioactive materials have been developed and implemented by observing operations and review of facility records. (ISAR, Appendix 5A, Section 5.2 or the FSAR)

4.3.8 Verify procedures for the radiological aspects of solid radioactive waste management including generation, packaging, storage, access control, and documentation have been developed and implemented by observation of monitoring activities and review of monitoring records. (Contract Interface Description 3;[1] and ISAR, Appendix 5A, Section 5.5)

[1] Contract No. DE-AC27-01RV14136 between DOE and Bechtel National, Inc., dated December 11, 2000, Section C.9, Interface Description 3.

4.3.9 Verify procedures for the radiological aspects of support activities involving solid radioactive materials like vacuum cleaners, decontamination equipment, storage, laundry facilities, etc. have been developed and implemented. (ISAR, Appendix 5A, Section 5.8)

4.4 Adequacy and Effectiveness of Shipping and Receiving

To determine the adequacy and effectiveness of the radioactive material shipping and receiving activities, the inspector should perform the following:

4.4.1 Verify by review of the RCP the Contractor has prepared procedures controlling the packaging and shipment of radioactive materials. The focus of this inspection effort is to verify procedures for monitoring the packages and documenting the monitoring results meet the requirements in Department of Transportation and U.S. Postal Service regulations for off site shipments and Contract Interface Description 3, for on site shipments. Observations of the actual activity should be performed, if possible.

4.4.2 For off-site outgoing shipments, confirm that procedures include the following:

- Radiation level limits in 49 CFR 173.441
- Guidance on how to perform the radiation level monitoring
- Direction how to document the monitoring results
- Contamination level limits in 49 CFR 173.443
- Guidance on how to perform the contamination monitoring
- Direction on how to document the contamination monitoring results.

4.4.3 Observe the monitoring of an off-site shipment to confirm procedures are being implemented. If shipments are made by U.S. Mail, conduct the inspection using the U.S. Postal Service regulations.

4.4.4 For "on-site shipments," verify by review of the RCP the Contractor has prepared procedures controlling the on-site packaging and shipping of radioactive material consisted with the WTPRCM, Article 423 and Contract Interface Description 3.

4.4.5 Observe the monitoring of an on-site shipment to confirm the procedures are being implemented.

4.4.6 Verify by review of the RCP, the Contractor has developed procedures that ensure packages of radioactive material received by the facility are expeditiously monitored in accordance with RPP, Requirements 52 through 54 .

4.4.7 Review records of the receipt for ten shipments of radioactive material. Determine if the required monitoring was performed in a timely manner according to procedure and if any reports were required, they were also made as required.

4.4.8 Observe a shipment of radioactive materials being monitored to determine if the monitoring instrumentation is appropriate to the type, level, and energy of the emissions. Also, the inspector should determine if the technique is appropriate and if the procedure is being fully implemented.

4.5 Adequacy and Effectiveness of Criticality Monitoring

The only criticality constraint, as of April 2000, involves the sampling and analysis of incoming waste to confirm that it is less than the criticality safety limits. ISAR Section 6.1.5 indicates that DOE will sample the waste and the Contractor will review and accept or reject the DOE analytical results. The Contractor may base its decision on its own confirmatory results. To determine the adequacy and effectiveness of criticality monitoring, the inspector should perform the following:

4.5.1 Verify by selective review of the design, the Contractor has provided adequate shielding, ventilation control, and radiation monitoring capabilities in the design of the sampling system, if installed at the facility. The inspector should verify the sample system geometry and “worse case” incoming concentration of fissile material will not exceed the nuclear criticality safety limits expressed in ISAR Section 6.1.3 or subsequent safety analysis reports.

4.5.2 Prior to operation, verify by review of pre-operational testing that installed radiation monitoring equipment associated with the criticality sampling system, or criticality monitoring equipment if it has been installed, has been designed, installed, and tested as stated in the current SAR to meet the requirements in SRD, SC 3.3-6 through 3.3-8.

4.6 Adequacy and Effectiveness of Records

Periodic performance of I-151, "RCP Documents, Records, and Reports Assessment," and QAM inspections will routinely address the adequacy of the Contractor’s radiological program records management system. During the conduct of this inspection, the inspector should confirm that documents, records, and reports reviewed, related to the radiation monitoring and control, met the technical and regulatory requirements. No additional records need be reviewed to establish the effectiveness of the radiation monitoring and control records.

5.0 REFERENCES

10 CFR 835, "Occupational Radiation Protection," *Code of Federal Regulations,* as amended.

49 CFR 173, “Shippers-General Requirements for Shipments and Packaging,” *Code of Federal Regulations,* as amended.

ANSI/ISO-14001-1996, *Environmental Management Systems-Specifications with Guidance for Use*, American National Standards Institute/International Standards Organization, 1996.

DOE G-441.1-3, *Internal Dosimetry Program Guide,* U.S. Department of Energy, 1999.

DOE G-441.1-4, *External Dosimetry Program Guide*, U.S. Department of Energy, 1999.

DOE G-441.1-9, *Radioactive Contamination Control Guide*, U.S. Department of Energy, 1999.

Waste Treatment Plant Radiological Control Manual, MN-24590-01-00001, Rev. 0, Bechtel National, Inc., 2001.

RL/REG-98-26, *Inspection Technical Procedures* (ITP), U.S. Department of Energy, Office of River Protection, 2001.

ITP I-111, "ALARA Program Assessment"
ITP I-140, "RCP Programmatic Assessment"
ITP I-141, "External Dosimetry Assessment"
ITP I-142, "Internal Dosimetry Assessment"
ITP I-148, "RCP Instrument Calibration and Maintenance Assessment"
ITP I-149, "Radiological Work Controls Assessment"
ITP I-151, "RCP Documents, Records, and Reports Assessment"

Initial Safety Analysis Report, BNFL-5193-ISAR-01, Rev.2, Bechtel National, Inc., 2001.

Integrated Safety Management Plan, BNFL-5193-ISP-01, Rev. 6, Bechtel National, Inc., 2001.

Safety Requirements Document, BNFL-5193-SRD-01, Volumes I and II, Rev. 4, Bechtel National, Inc., 2001.

Radiation Protection Program for Design and Construction, BNFL-TWP-SER-003, Rev. 8, Bechtel National, Inc., 2001.

Quality Assurance Manual, QAM-24590-01-00001, Bechtel National, Inc., 2001.

6.0 LIST OF TERMS

ALARA	as low as is reasonably achievable
DOE	U.S. Department of Energy
FSAR	Final Safety Analysis Report
ISMP	Integrated Safety Management Plan
ISAR	Initial Safety Analysis Report
OSR	Office of Safety Regulation
PSAR	Preliminary Safety Analysis Report

RCP	Radiological Control Program
QAM	Quality Assurance Manual
RPM	Radiation Protection Manager
RPP	Radiation Protection Program
RPP-WTP	River Protection Project Waste Treatment Plant
RWP	Radiation Work Permit
SAR	Safety Analysis Report
SC	Safety Criterion
SRD	Safety Requirements Document
TBD	Technical Basis Document
WTPRCM	Waste Treatment Plant Radiological Control Manual

Attachments: None

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