

INSPECTION TECHNICAL PROCEDURE

I-148

**RCP INSTRUMENT CALIBRATION AND MAINTENANCE
ASSESSMENT**

September 17, 2001
Revision 0

Approved: _____ Date: _____
Verification and Confirmation Official

Concur: _____ Date: _____

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INSPECTION TECHNICAL PROCEDURE I-148, REV. 0

RCP INSTRUMENT CALIBRATION AND MAINTENANCE ASSESSMENT

1.0 PURPOSE

This procedure provides guidance for assessing elements of the Contractor's Radiological Control Program (RCP) that address instrumentation calibration and maintenance. This guidance is based on the requirements in the Radiation Protection Program (RPP), Safety Requirements Document (SRD), Quality Assurance Manual (QAM), and Integrated Safety Management Plan (ISMP).

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

- RCP instrument calibration and maintenance procedures
- RCP instrument calibration
- RCP instrument maintenance
- RCP instrument operability tests
- RCP calibration and maintenance records.

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 is used by the Office of Safety Regulation (OSR) to verify the Contractor has developed and implemented an effective RCP instrumentation calibration and maintenance program that will ensure: (1) calibrated instruments are used to measure levels of radiation and radioactive materials in work areas, (2) instruments are maintained, (3) only properly operating instruments are used, and (4) records are maintained of the calibration and maintenance of the instruments.

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 that radiological instrumentation is being calibrated and maintained as required by the RCP, authorization basis commitments, and Contractor procedures. This 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 RCP Instrument Calibration and Maintenance Procedures

The inspector should verify the Contractor has prepared, reviewed, and approved procedures to implement its RCP instrument calibration and maintenance procedures. (RPP, Requirements 22 and 44; and QAM, Policy Q-05.1)

3.2 Adequacy and Effectiveness of RCP Instrument Calibration

The inspector should verify the Contractor has implemented its RCP instrument calibration procedures. (RPP, Requirement 22 and 44; and QAM, Policy Q-0.5.1)

3.3 Adequacy and Effectiveness of RCP Instrument Maintenance

The inspector should verify the Contractor has implemented its RCP instrument maintenance procedures. (RPP, Requirements 22 and 44; and QAM, Policy Q-0.5-1)

3.4 Adequacy and Effectiveness of RCP Instrument Operability Testing

The inspector should verify the Contractor has developed, implemented, and maintained an instrument testing program to ensure RCP instruments are capable of performing their intended function. (RPP, Requirement 44; and QAM Q-0.5.1)

3.5 Adequacy and Effectiveness of RCP Instrument Calibration and Maintenance Records

The inspector should verify the records of RCP instrument calibration and maintenance have been developed, reviewed, approved, and maintained as required by the procedures. (RPP, Requirements 89, 92, and 94; and QAM, Policy Q-17.1)

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 Contractor is committed to implement American National Standards Institute (ANSI) N323A (Rev. 1997) for portable instruments and ANSI N323 (Rev. 1978) as guidance for other types of monitoring equipment. The inspector should also be familiar with the content of the documents listed in Section 5.0, "References." Note that while the Contractor is not committed to the DOE

implementation guidance for portable monitoring instrument calibration (DOE G 441.1-7), this document provides useful information describing an effective instrument calibration and maintenance program.

The Contractor plans to use a vendor/sub-contractor located outside the facility to calibrate and maintain its portable radiation monitoring instruments. If the Contractor elects to perform calibration and maintenance of its portable instruments on-site, this inspection procedure should be revised to address the design of the calibration facility.

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 RCP instrument calibration and maintenance program, and (2) records are being created and maintained that demonstrate compliance with authorization basis commitments.

4.1 Adequacy and Effectiveness of RCP Instrument Calibration and Maintenance Procedures

To determine the adequacy and effectiveness of the RCP instrument calibration and maintenance procedures, the inspector should review the RCP and RPP to identify those procedures that address radiation and radioactive material monitoring instrumentation calibration and maintenance. If those procedures have not been reviewed pursuant to Inspection Technical Procedure (ITP) I-140, "RCP Programmatic Assessment," and found to contain all the required safety elements from the authorization basis, then the inspector should perform the following:

4.1.1 If this procedure has not been performed before, select those topics, appropriate to the facility phase, from the requirements listed below and verify that: (1) procedures have been developed, reviewed, and approved consistent with QAM, Policy Q-05.1, (2) sufficient information has been provided to ensure that requirements from the authorization basis will be consistently accomplished, and (3) recommendations from the authorization basis have been incorporated when appropriate:

4.1.1.1 During site preparation and construction, the inspector should review the procedure or procedures that describe how radiation monitoring instrumentation will be calibrated and maintained by the sub-contractors providing contamination monitoring and oversight of potential radioactive material or radiation producing sources on-site. The inspector should verify that the requirements stated in Part 6, Chapter 5, of the *Waste Treatment Plant Radiological Control Manual (WTPRCM)* are addressed. (RPP, Requirement 44; and QAM, Policy Q-07.1)

4.1.1.2 For facility operation and deactivation, the inspector should review the Contractor purchase requisition between the Contractor and its instrument calibration service provider or sub-contractor to determine if it contains sufficient specificity to ensure the instruments will be calibrated and maintained in accordance with contemporary industry

standards and QAM, Policy Q-07.1 requirements. The inspector should verify that the requirements stated in Part 6, Chapter 5, of the WTPRCM are addressed.

4.1.2 During operation and deactivation, the inspector should verify by record review, the following programmatic elements of a fixed and portable instrument calibration and maintenance program have been established in procedures:

- Individual authorities and responsibilities
- Listing of all instruments to be calibrated and maintained by the vendor
- List of all other instruments to be calibrated and maintained by the Contractor
- Maintenance and calibration schedules and criteria for vendor and Contractor calibrated instruments
- Control of instrument technical manuals and change notices
- Training and qualifications for the individuals performing the calibration and maintenance
- Calibration source procurement, handling, and intensity verification
- Control of test and measuring equipment used in calibration and maintenance
- Individual calibration and maintenance procedures for each type of instrument
- Audit schedule and procedures for the vendor and Contractor
- Procedures for notification and resolution of "as-found" instrument calibration results
- Receiving inspections of instruments from the vendor
- Periodic performance tests for response time and geotropism
- Documents and record control.

4.1.3 If the procedures described in 4.1.2 have been previously inspected, the inspector should review procedures generated for any new instrumentation, and changes to about five procedures made since they were last inspected, to verify they contain appropriate detail and were reviewed and approved in accordance with site procedures.

4.2 Adequacy and Effectiveness of RCP Instrument Calibration

To determine the adequacy and effectiveness of the Contractor's measures to ensure its instruments are properly calibrated, the inspector should review the following:

- 4.2.1 For instruments calibrated by the Contractor's vendor, the inspector should perform the following:
 - 4.2.1.1 Confirm by review of the "Approved Suppliers List," the vendor providing calibration services has been qualified as described in QAM, Policy Q-07.1.
 - 4.2.1.2 Review all Contractor audits of the vendor, since the last inspection, to confirm that audits were performed consistent with procedures and QAM, Q-07.1.
 - 4.2.1.3 Determine, based on review of the Contractor's audits, if the Contractor has established that the vendor is calibrating the instruments consistent with industry standards and manufacturers' technical recommendations.
 - 4.2.1.4 Determine if the Contractor has confirmed the effectiveness of the vendor's corrective action in response to previously identified adverse observations.
 - 4.2.1.5 Review the results of receipt inspections performed by the Contractor of calibrated equipment received from the vendor to establish the quality of the vendor's performance.
 - 4.2.1.6 Review the results of at least one month's operability test data to determine if the instruments maintained response expectations.
 - 4.2.1.7 Select at least two types of instruments used to establish exposure control limits on Radiation Work Permits and two used to monitor potentially contaminated materials for release. Determine from record review and discussions with the RPM or designee, how the Contractor has ensured the instruments are properly calibrated for the energy, intensity, and form of radiation being measured.
 - 4.2.1.8 If the results of 4.2.1.1 through 4.2.1.7 indicate the Contractor has not demonstrated through its audits that instruments are properly calibrated, discuss the advisability of conducting an inspection at the vendor's facility with the OSR management team. If an inspection is conducted at the vendor's facility, use Sections 4.1, 4.2, 4.3, and 4.5 of this procedure as a guidance.
- 4.2.2 For instruments calibrated by the Contractor, the inspector should perform the following:
 - 4.2.2.1 Observe the calibration of three different types of instruments. Use ANSI N323 and the manufacture's manual for specific technical guidance. The inspector should perform the following:
 - Determine if the calibration source is traceable to the National Institute of Standards and Technology (NIST)

- Verify that procedures regarding test and measuring equipment are followed to confirm radiation calibration intensities, environmental conditions, or other parameters critical to the calibration process
- Verify that source emissions are representative of the radiation hazard being measured in the facility or the instrument has been "type tested" pursuant to ANSI N 42.17 A and C for the source and environmental conditions
- Verify, prior to the calibration procedure being performed, that environment conditions such as temperature and barometric pressure are known
- Confirm the individual performing the calibration is qualified and authorized to perform the work
- Observe the calibration process and confirm that it is consistent with the procedure
- Observe the "as found" readings. Determine if they are compared to acceptable levels and if the results are documented. Ask the individual if "as found" levels outside the acceptable range are reported to responsible health physicists in accordance with established procedures
- Determine if the range of the instrument is adequately calibrated and, if adjustments are made, the instrument is rechecked following the adjustments
- Verify all the data required by procedure is documented and calibration stickers are affixed to the instrument.

4.2.2.2 Review the results of operational test/functional check data for two of the instruments from 4.2.2.1 above, to determine if the instruments maintained response expectation throughout the last calibration cycle. If the instruments failed to maintain response within specifications during the last calibration cycle, the inspector should determine if the Contractor reduced the duration of the calibration cycles.

4.2.2.3 Review the results of the last audit of the Contractor's instrument calibration program by the Contractor to determine if the audit was conducted consistent with the audit plan. If significant deficiencies were identified, determine if the proposed corrective actions were completed and if their effectiveness was evaluated.

4.3 Adequacy and Effectiveness of RCP Instrument Maintenance

To determine the adequacy and effectiveness of the RCP instrument maintenance program, the inspector should perform the following:

4.3.1 For instruments maintained by the Contractor's vendor, the inspector should perform the following:

- 4.3.1.1 Confirm by review of the "Approved Suppliers List," the vendor providing maintenance services has been qualified as described in QAM, Policy Q-07.1.
- 4.3.1.2 Review all Contractor audits of the vendor, since the last inspection, to confirm that audits were performed consistent with procedures and QAM, Policy Q-07.1.
- 4.3.1.3 Determine, based on review of the Contractor's audits, if the Contractor has established that the vendor is performing instrument maintenance consistent with industry standards and manufacturers' technical recommendations.
- 4.3.1.4 Determine if the audit confirmed replacement parts were procured in accordance with procedures to ensure they at least meet manufacturer's specifications.
- 4.3.1.5 Determine if the audit found vendor recommended changes to calibration and maintenance frequency, were based on instrument performance records.
- 4.3.1.6 Determine if the Contractor has confirmed the effectiveness of the vendor's corrective action in response to previously identified adverse observations.
- 4.3.1.7 If the results of 4.3.1.1 through 4.3.1.6 indicate the Contractor has not demonstrated through its audits that instruments are properly maintained, discuss the advisability of conducting an inspection at the vendor's facility with the OSR management team as described in Section 4.2.1.8.
- 4.3.2 For instruments maintained by the Contractor, the inspector should perform the following:
- 4.3.2.1 Observe the maintenance of instruments. Use ANSI N323 and the manufacturer's manual for specific technical guidance. The inspector should perform the following:
- Confirm the individual performing the maintenance is qualified and authorized to perform the work
 - Confirm the maintenance is performed consistent with the procedure
 - Determine if the "as found" condition is documented
 - Determine if replacement parts met the manufacturer's specification
 - Determine when adjustments are made, the instrument is re-calibrated when appropriate
 - Verify that all the data required by procedure is documented.
- 4.3.2.2 Review at least 10 records of instrument maintenance performed on instruments most important to radiological safety. The inspector should determine the following:

- Is the maintenance performed by an authorized individual?
- Is the documentation consistent with the procedure?
- Does the documentation indicate a need to change the calibration or maintenance frequency?
- Were the records reviewed by a supervisor?

4.3.2.3 Review the results of the last audit of the Contractor's instrument maintenance program to determine if the audit was conducted consistent with the audit plan. If significant deficiencies were identified, determine if the proposed corrective actions were completed.

4.4 Adequacy and Effectiveness of RCP Instrument Operability Testing

To determine the adequacy and effectiveness of the Contractor's RCP instrument operability testing, the inspector should perform the following:

4.4.1 Perform the following to verify the Contractor has developed, implemented, and maintained a program to ensure that RCP instruments are checked for proper operation at appropriate intervals:

- Review the operability test procedure to ensure that it addresses the type of check to be performed, frequency, acceptable results, actions to be taken based on test results, and method of documentation
- Observe performance on several tests to determine if the procedures are being followed
- Discuss with instrument users their expectations of the test process to determine if the test results are used to change calibration or maintenance frequencies
- Check five instruments to determine if the tests are being performed and documented
- With permission of the Contractor representative, select three instruments, from those available for use, and perform the operability test in accordance with the procedure to verify the results are consistent with the last previously required documented results.

4.4.2 Review the results of any previous audits of the operability-testing program to determine if the Contractor is effectively monitoring program implementation.

4.5 Adequacy and Effectiveness of RCP Calibration and Maintenance Records

Periodic performance of Inspection Procedure 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 instrumentation calibration and maintenance program, met technical and regulatory requirements. No additional records need be reviewed to establish the effectiveness of the instrument calibration and maintenance records.

5.0 REFERENCES

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

ANSI N 323A, *Radiation Protection Instrumentation Test and Calibration, Portable Survey Instruments*, American National Standards Institute, 1978 and 1997.

ANSI N 42.17A, *Performance Specifications for Health Physics Instrumentation-Portable Instrumentation for Use in Normal Environmental Conditions*, American National Standards Institute, 1989.

ANSI N 42.17C, *Performance Specifications for Health Physics Instrumentation-Portable Instrumentation for Use in Extreme Environmental Conditions*, American National Standards Institute, 1989.

DOE G-441.1-7, *Portable Monitoring Instrument Calibration Guide*, U.S. Department of Energy, 1999.

DOE RCTP 99-04, *Acceptable Approach for Controlling and Calibrating Radiation Detection Instruments*, Office of Worker Protection Programs and Hazard Management, 1999.

DOE RCTP 95-03, *Operability of Radiological Monitoring Instruments*, Office of Worker Protection Programs and Hazard Management, 1995.

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

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

ITP I-140, "RCP Programmatic 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, Volume 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, Preliminary, QAM-24590-01-00001, Rev. A, Bechtel National, Inc., 2001.

6.0 LIST OF TERMS

ALARA	as low as is reasonably achievable
ANSI	American National Standards Institute
BNI	Bechtel National Inc.
DOE	U.S. Department of Energy
ISMP	Integrated Safety Management Plan
ISAR	Initial Safety Analysis Report
NIST	National Institute of Standards Technology
OSR	Office of Safety Regulation
QAM	Quality Assurance Manual
RCP	Radiological Control Program
RPP	Radiation Protection Program
RPP-WTP	River Protection Project Waste Treatment Plant
RWP	Radiation Work Permit
SC	Safety Criterion
SRD	Safety Requirements Document
WTPRCM	Waste Treatment Plant Radiological Control Manual

Attachments: None