INSPECTION TECHNICAL PROCEDURE

I-144

AIR MONITORING PROGRAM ASSESSMENT

August 28, 2003
Revision 1

Approved: Patrick C. Carier Date: 8/27/03
Verification and Confirmation Official

Concur: Robert C. Barr Date: 12/11/03

Table of Contents

INSPECTION TECHNICAL PROCEDURE I-144, REV. 1
AIR MONITORING PROGRAM ASSESSMENT

1.0 PURPOSE

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

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

- Air monitoring implementing procedures.
- Appropriateness of air sampling equipment used.
- Placement of air sampling and real-time air monitoring equipment.
- Air sample evaluation program.
- 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 River Protection (ORP) to verify the Contractor has developed and implemented an effective air monitoring program that will ensure: (1) adequate assessment of the workers' exposure to airborne radioactive material, (2) proper selection of respiratory protective equipment, (3) warning of unexpected increases of airborne radioactivity, (4) evaluation of the effectiveness of engineering controls, and (5) records are maintained of the air monitoring program and its results.

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 airborne radioactivity is being measured and recorded 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 and Immobilization Plant (WTP) facility. 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 Air Monitoring Implementing Procedures

The inspector should verify the Contractor has prepared, reviewed, and approved procedures to implement its air monitoring program. (RPP, Requirements 22, 41, 47, 49, and 50; and QAM, Policy Q-05.1)

3.2 Adequacy and Effectiveness of Air Monitoring Equipment

The inspector should verify the Contractor is using appropriate air sampling and real-time air monitoring equipment. (RPP, Requirements 41 through 44, 49, and 50)

3.3 Adequacy and Effectiveness of Placement of Air Monitoring Equipment

The inspector should verify the Contractor has placed its air monitoring equipment at locations supporting internal dose assessment and control. (RPP, Requirements 41, 42, 44, and 47)

3.4 Adequacy and Effectiveness of Air Sample Evaluation Program

The inspector should verify the Contractor has evaluated its air monitoring results in the context of its bioassay and respiratory protection programs. (RPP, Requirements 41 and 43; and SRD, Safety Criterion (SC) 5.0-2)

3.5 Adequacy and Effectiveness of Records

The inspector should verify records have been prepared and maintained to support the air monitoring program. (RPP, Requirements 76 through 87; 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 inspector should also be familiar with the content of the documents listed in Section 5.0, References.

Note: While the Contractor is not committed to the DOE implementation guidance for air monitoring (DOE G 441.1-8), this document provides useful information describing an effective airborne radioactivity monitoring program.

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 air monitoring program, and (2) records are being created and maintained to demonstrate compliance with the requirements and allow future verification or reassessment of the recorded doses.

4.1 Adequacy and Effectiveness of Air Monitoring Implementing Procedures

To determine the adequacy and effectiveness of the air monitoring implementing procedures, the inspector should perform the following:

4.1.1 Review the RCP to identify those procedures addressing air monitoring. 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 perform the following:

4.1.2 Verify the Contractor has documented a Technical Basis Document (TBD) which address those topics necessary to ensure instruments and equipment used to monitor airborne radioactivity are:

- Appropriate for the type(s), levels, and energies of the radiation encountered.
- Suitable for the environmental conditions where it will operate.
- Periodically maintained and calibrated at established frequencies.
- Routinely tested for operability.

4.1.3 Verify the procedures implement the TBD and address topics such as:

- Selection of sampling and monitoring equipment.
- Calibration of sampling and monitoring equipment.
- Placement of samplers and monitoring equipment are representative of the workers' breathing zone.
- Collection of air samples, calibration of analytical equipment, and analysis of air samples.
- Interpretation of sample results.
- Notification of the need to post areas.

- Operation, including set point determination, and interpretation of continuous air monitors (CAMs).

- Correlation of air monitoring results with respiratory protection equipment selection.

- Correlation of air monitoring results with bioassay determined dose.

- Quality assurance.

- Review, approval, and deposition of results.

4.1.4 If previous ITP I-140 related inspection reports describe the air monitoring procedures as being adequate or if this procedure has been previously performed, then the inspector should do the following:

4.1.4.1 Select five procedures and verify the procedures continue to ensure requirements from the authorization basis will be implemented.

4.1.4.2 Review the results of audits or assessments performed since the last inspection. Follow-up selected identified deficiencies related to procedures to determine if corrective actions were taken, if they were effective, and if the auditors found the procedures were adequate or improving.

4.1.4.3 Verify any changes made to the procedures were reviewed and approved consistent with QAM, Policy Q-0.6-1.

4.1.4.4 Determine based on the following observations from 4.2 through 4.4, if the procedures are adequate to ensure an effective air monitoring program.

4.2 Adequacy and Effectiveness of Air Monitoring Equipment

To determine the adequacy and effectiveness of the air monitoring equipment, the inspector should perform the following:

4.2.1 Based on discussion with representatives of the radiation protection organization and review of the facility layout, evaluate the Contractor's selection of air sampling and CAM systems against the TBD and implementing procedures. The inspector should select one type of lapel sampler, one room sampler, and one CAM and verify by record review and physical observation when possible:

- The equipment is designed to measure the chemical and physical form, energy of emission, and intensity of the radioisotopes expected to be present in the areas that are monitored.

- Calibration of the CAM is in accordance with the manufacturer's instructions using National Institute of Standards and Technology traceable standards to demonstrate the veracity of the CAM to detect the energy and intensity of isotopes measured.

- Flow instruments have been calibrated recognizing the expected temperature and pressure range of operation.

- Interference from non-radioactive isotopes have been considered in the filter selection.

- Sample line deposition and filter loading characteristics have been addressed.

- Power source reliability is addressed.

- The audio and visual alarm annunciation system is effective.

NOTE: If the sample selected for review is taken from a stack or duct, ANSI/HPS N-13.1, *Sampling and Monitoring Release of Airborne Radioactive Substances from the Stacks and Ducts of Nuclear Facilities*, can be used to determine the acceptability of the system since the Contractor is committed to the standard in SRD, SC 5.1-2 (through WAC 246-247, *Radiation Protection – Air Emissions*). The Contractor is also committed to ANSI N42.18, *Specification and Performance of On-Site Instrumentation for Continuously Monitoring Radioactivity in Effluents.*

4.2.2 Following the above review, to the extent possible, the inspector should physically inspect several fixed samplers to confirm agreement with information provided. Also, the inspector should verify:

- The sampler is operating properly.

- The flow meter has been calibrated.

- There is no evidence of leakage into the system between the sample holder and the flow instrument.

- The direction of flow through the sample media is clear so as not to decrease counting efficiency.

- The filter media is as stated, is not clogged, and was last changed as required.

4.2.3 Select two grab samplers available for use, and use the same methodology in 4.2.1 above to verify their operability.

4.2.4 Select several lapel samplers available for use and verify the following:

- The sampler has documentation (e.g., a sticker) indicating it has been calibrated.

- Functional checks of the operability have been completed.
- Filters and tubing are as specified by the manufacturer.
- Procedures are in place to issue the lapel sampler and process sample filters.

4.2.5 Select two CAMs being used to aid in the control of exposure to individuals or groups of individuals involved in activities potentially resulting in a significant change in airborne radioactivity to determine if:

- The CAMs have been calibrated.
- Functionally checks have been performed as required.
- The CAMs are powered from the specified source.
- There is no in-leakage of air between the filter and flow monitor.
- The CAMs' alarm set-point and alarm function will result in notification of the workers at the earliest indication of an unplanned release of airborne activity without resulting in spurious alarms due to fluctuations in background as described in the TBD.
- Workers know how to respond to the CAMs alarms.

4.3 Adequacy and Effectiveness of Placement of Air Monitoring Equipment

To determine the adequacy and effectiveness of the placement of air monitoring equipment, the inspector should perform the following:

4.3.1 The placement of air monitoring equipment will, to some extent, depend on the purpose of the monitoring. Air monitoring is required to: evaluate the intake of radioactive materials, establish posting requirements, aid in the selection of respiratory protective equipment, warn of changes in airborne activity levels, and determine the effectiveness of engineering controls. To assess the Contractor's placement of its air monitoring equipment, the inspector should perform the following:

Note: During the WTP site preparation and initial construction, the inspector should determine if the monitoring/sample frequency and techniques are consistent with the planned activities. For example, verify monitoring will be performed as the site is excavated to detect any residual sources of radioactive material. Other matters to consider include the impact on monitoring following radioactive releases from co-located facilities and following environmental conditions potentially carrying radioactive material on to the site.

4.3.1.1 Review documentation of compliance with the TBD implementing procedure for at least one example of each air monitoring purpose. This should include physical observation of the monitoring device to confirm it is placed consistent with the documentation. As a part of this observation the inspector should confirm the following:

- Air monitoring to evaluate intake should be representative of the worker's breathing zone. This might be accomplished with a lapel air sampler if it is properly located on the body within one foot of the worker's head and is capable of detecting the minimum concentrations necessary to satisfy RPP requirements. If fixed low volume continuous samplers are used, confirm the sample head placement is representative of the breathing zone. If grab samplers are used, they also must be placed to collect breathing zone samples of sufficient volume to determine compliance with minimum derived air concentration (DAC) values specified in the RPP.

- Air monitoring to establish posting requirements should be based on airflow studies of the area or room being posted. Some areas or rooms may require multiple samples or monitors to reasonably determine the concentration. Samplers or monitors located inside radiological areas near louvers and doors, under negative pressure, may be prone to false low readings due to the flow of cleaner air into the room.

- If CAMs are intended to warn of changing airborne radioactivity, then its proximity and location within the effluent path are critical to producing a timely warning.

- Air monitoring equipment used to evaluate the effectiveness of engineering controls may vary widely. Simple trending of routine fixed flow sample results might be adequate in some cases. Specialized gas monitors might be necessary to evaluate some process components. The inspector should verify equipment locations are consistent with the manufacturers recommendations and do not use tubing or other materials with the potential to greatly reduce the detection capability of the equipment.

4.3.1.2 Review the results of selected bioassays for individuals receiving dose in excess of that which would have resulted from the intake of greater than 40 derived air concentration hours (DAC-Hrs) in one year. Select one case indicating the individual worked in the same location for most of the year. Determine if CAMs or air samples in the area indicated a concentration of activity responsible for the observed dose. If it appears air monitoring should have indicated the dose, but did not, determine if the Contractor evaluated the situation. If the Contractor evaluated the situation, determine if the placement of the monitoring equipment played a role. If the Contractor had not performed an evaluation, inspect the actual location and determine if there is a reasonable explanation for the potential disconnect between the bioassay calculated dose and the intake exposure.

4.4 Adequacy and Effectiveness of Air Sample Evaluation Program

To determine the adequacy and effectiveness of the air sample evaluation program, the inspector should perform the following:

4.4.1 Ensure the focus of assessing air sample evaluation is on the collection, analysis, and reporting of sample results. Applicable sections of ITP-I-142, "Internal Dosimetry Assessment" should be used to address the relationship between air sample results, bioassay, and internal dose.

4.4.2 Select from review of air sample results performed since the last inspection, records of two routine area low volume flow rate air samples, two lapel samples, and three grab samples for review. The inspector should perform the following for this set of samples:

- Verify the implementing procedure for sample collection, labeling, and screening is performed.
- Determine if counting equipment used to analyze the samples is calibrated in accordance with procedures and control charts are maintained and indicated the equipment is within the acceptability criteria when the samples are counted.
- Verify the laboratory quality assurance program is up-to-date and being implemented.
- Verify the counting procedure is followed and those results are consisted with the algorithm documented by the Contractor.
- Verify results are reviewed, approved, and documented as required by procedure.
- Verify reports, if required, are prepared and distributed in a timely manner.

NOTE: The Initial Safety Analysis Report (ISAR), Section 5.7 "Air Sampling," indicated the Contractor would be using U.S. Nuclear Regulatory Commission Regulatory Guide 8.25, and NUREG 1400 in developing its air sampling program. Though the ISAR is no longer an authorization basis document, these guides contain appropriate information to assess the technical adequacy of the air sample evaluation.

4.5 Adequacy and Effectiveness of Records

Periodic performance of ITP 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 documents, records, and reports reviewed, related to air monitoring, meet the technical and regulatory requirements. No additional records need be reviewed to establish the effectiveness of the air monitoring records.

5.0 REFERENCES

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

ANSI/HPS N13.1-1993, *Sampling and Monitoring Releases of Airborne Radioactive Substances From the Stacks and Ducts of Nuclear Facilities,* American National Standard Institute, 1993.

ANSI N42.18-1991, *Specification and Performance of On-Site Instrumentation for Continuously Monitoring Radioactivity in Effluents,* American National Standards Institute, 1991.

ANSI Z88.2-1992, *American National Standard for Respiratory Protection,* American National Standard Institute, 1992.

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

DOE G 441.1-8, *Air Monitoring Guide,* U.S. Department of Energy, 1999.

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

Integrated Safety Management Plan, 24590-WTP-ISMP-ESH-01-001, Rev. 3, Bechtel National, Inc., 2003.

Preliminary Safety Analysis Report to Support Construction Authorization, 24590-WTP-PSAR-ESH-01-001, Bechtel National, Inc.

Quality Assurance Manual, 24590-WTP-QAM-QA-01-001, Rev. 4, Bechtel National, Inc., 2003.

Radiation Protection Program for Design and Construction, 24590-WTP-RPP-ESH-01-001, Rev. 0, Bechtel National, Inc., 2001.

RL/REG-98-26, *Inspection Technical Procedures*, U.S. Department of Energy, Office of River Protection, 2003.

ITP I-140, "RCP Programmatic Assessment"
ITP I-142, "Internal Dosimetry Assessment"
ITP I-151, "RCP Documents, Records, and Reports Assessment"

Safety Requirements Document, 24590-WTP-SRD-ESH-01-001-02, Volume II, Rev. 2h, Bechtel National, Inc., 2003.

U.S. NUREG 1400, *Air Sampling in the Workplace*, 1994.

U.S. NRC Regulatory Guide 8.25, *Air Sampling in the Workplace,* U. S. Nuclear Regulatory Commission, 1999.

WAC, Chapter 246-247, *Radiation Protection – Air Emissions*, Washington Administrative Code, as amended.

6.0 LIST OF TERMS

ALARA	as low as is reasonably achievable
BNI	Bechtel National Inc.
ANSI	American National Standards Institute
CAM	continuous air monitor
CFR	Code of Federal Regulations
DAC	Derived Air Concentration
DOE	U.S. Department of Energy
HPS	Health Physics Society
ISMP	Integrated Safety Management Plan
ISAR	Initial Safety Analysis Report
ORP	Office of River Protection
QAM	Quality Assurance Manual
RCP	Radiological Control Program
RPP	Radiation Protection Program
RPM	Radiation Protection Manager
RPO	Radiation Protection Organization
RWP	Radiation Work Permit
SC	Safety Criterion
SRD	Safety Requirements Document
TBD	Technical Basis Document
WAC	Washington Administrative Code
WTP	Waste Treatment and Immobilization Plant

Attachment: None