

# NRC INSPECTION MANUAL

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## INSPECTION PROCEDURE 69004

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### CLASS I RESEARCH AND TEST REACTOR EFFLUENT AND ENVIRONMENTAL MONITORING

PROGRAM APPLICABILITY: 2545

#### 69004-01 INSPECTION OBJECTIVE

To determine if the licensee's environmental monitoring program has been effectively maintained to meet regulatory requirements and licensee commitments, since the last inspection.

#### 69004-02 INSPECTION REQUIREMENTS

02.01 Effluent Reports. Determine if effluent releases reported in the licensee's Annual Report or other required report were within regulatory limits.

02.02 Effluent Control, Monitoring and Records. Determine if radiological releases, were controlled, monitored, and recorded as required.

02.03 Environmental Monitoring. Determine if the facility environmental monitoring program meets regulatory requirements and licensee commitments.

02.04 As Low As Reasonably Achievable (ALARA) Considerations. Determine if facility effluent releases are maintained as required by the licensee's ALARA program.

02.05 Waste Storage. Determine if gaseous, liquid, and solid radioactive wastes are accounted for and stored as required.

02.06 Cold Water Chemistry. Determine if the licensee has controlled cold water chemistry as required.

02.07 Constraint on Radioactive Air Effluents. Determine whether the licensee meets 10 CFR 20.1101(d) requirements on the magnitude of radionuclides annually emitted to the ambient air from the facility, and if not, determine if the licensee meets 10 CFR 20.1101(d) requirements for reporting.

### General Guidance

General guidance may be found in the ANSI/ANS Section 15 Standards listed in Appendix B to Inspection Procedure 69001, "Class II Non-Power Reactors." Additional general guidance may be found in the Division 2 Regulatory Guides, and the "Other Regulatory Guides of Possible Interest to Division 2 Recipients" listed in the Division 2 Regulatory Guides Table of Contents. This guidance is to aid in the technical evaluation of licensee programs and is not to be used as requirements unless the licensee has committed in writing to the NRC for the use of the specific guidance document.

The sample sizes suggested in this inspection procedure are provided for broad planning purposes and to define the typical depth of the inspection. They are not intended to be rigid requirements on the inspector.

### Specific Guidance

03.01 Effluent Reports. Regulatory requirements for concentrations of radiological nuclides that may be released to the ambient air can be found in Table 2 of Appendix B to 10 CFR Part 20 and in some cases the licensee's Technical Specifications (TS). Regulations for the release of liquid effluents to the sanitary sewage system is provided in Table 3 of Appendix B to 10 CFR Part 20. The report of effluent releases is normally found in the licensee's Annual Report or other report as required by TS. These reports are usually available in the office. If the licensee's report on effluents is not available in the office, it can be obtained from the licensee. The report of effluent releases, the TS, the Safety Analysis Report (SAR), and the Safety Evaluation Report (SER) are to be reviewed before conducting the onsite inspection. Discharge paths and reporting requirements for the release of radiological materials into the environment are identified in the TS, SAR and SER. Comparison of these documents to the as-built condition of the facility are to be made to assure that no new release paths were created by such things as design changes and maintenance.

03.02 Effluent Control, Monitoring, and Records. The observation of the actual conduct of two releases of radionuclides to the ambient air and two liquid effluent releases is an acceptable sample for this inspection requirement. If actual releases cannot be observed, the licensee's records for two gaseous and two liquid effluent releases since the last inspection are to be reviewed. Are the records current and maintained in accordance with 10 CFR Part 20, Subpart L? If the licensee was authorized to release concentrations above the limits in Tables 2 or 3 of Appendix B to 10 CFR Part 20, do the licensee's records confirm compliance with the applicable conditional release limits in the TS or license? Liquid effluent from research and test reactors is normally discharged to the sanitary sewer system with credit taken for dilution by normal flow in the system. The liquid effluent concentration limits and dilution factors used by the licensee should be reviewed relative to site specific data in the TS and SAR.

Some facilities may use online monitoring instrumentation. If online instrumentation is used, the observation of online monitoring during selected portions of two operational periods is an acceptable sample for this inspection requirement. Alarm setpoints and

surveillance requirements for online monitoring instrumentation may be found in the TS. If the online instrumentation is inoperable, the TS may allow acceptable alternatives such as grab sampling, calculational estimates, or some combination of both as the acceptable monitoring methods.

TS required monitoring instruments are required to be operable, calibrated, and maintained. The calibration frequency for this instrumentation is normally specified in the licensee's procedures. A schedule for maintenance, consistent with the manufacturer's recommendations, is usually established by licensee administrative controls, or the licensee may simply refer to the manufacturer's recommendations to schedule these tasks. Argon-41 is normally the most common radionuclide identified in gaseous releases. ANSI/ANS-15.11, "Radiological Controls at Research Reactors," 1993, provides general guidance for acceptable methods for the calibration of effluent monitors.

Liquid releases are generally reactor dependent. Does the licensee have the capability to identify all radionuclides released from the facility? If not, what provisions are available? The normal method for detecting, identifying, and quantifying gamma emitting radionuclides is gamma spectrometry. Liquid scintillation counting is normally used to detect and identify beta emitting isotopes such as tritium, Sr-89, Sr-90 and Fe-59. Is instrumentation used for isotopic analyses operable, calibrated and maintained?

Licensees usually monitor and dispose of normal effluents effectively. However, many licensees conduct experiments that produce radioactive gases or liquid waste directly. Cleaning highly contaminated experimental equipment can also release radioactive gases and liquid waste. Does the licensee have precautions or procedures to monitor and control such discharges, consistent with the respective hazards associated with them?

The design objectives of the effluent systems are to be examined to assure that the licensee is not using the systems in a manner for which they were not intended. Circumstances may arise during operation that were not considered in the design of the system. For example, the licensee may be venting fission fragments from an experiment through an Argon-41 discharge system or discharging a variety of activation products to the atmosphere from irradiated experiments, when only Argon-41 was considered in the design of the system.

Licensees may keep primary coolant and other liquid waste in a holdup tank to allow radioactive liquids to decay to near background levels. The licensee's methods for sampling before discharge are to be examined. Radioactive particulates may settle to the bottom of the tank. If the effluent is sampled from the surface, the water may appear clean. The activity in the sample must be representative of what is actually in the system. Particular attention is to be given to undetected release paths from experiments for tritium and from coolant storage for heavy water reactors.

03.03 Environmental Monitoring. The frequency of air, water, soil and vegetation sampling is normally specified in the TS, SAR, SER or other applicable regulatory documents. It should be noted that some licensees will also use Thermoluminescent Dosimeters (TLDs) placed at specific locations, as environmental monitors. Environmental monitoring records, since the last inspection, are to be reviewed for omissions; obvious mistakes; anomalous measurements; observed biases and trends in the data. If required

by the licensee's environmental monitoring program, the licensee is to be observed taking and analyzing a soil sample downwind from a gaseous discharge point if practical. If required by the licensee's environmental monitoring program, the licensee is also to be observed taking and analyzing a water sample downstream from a liquid effluent discharge point, if practical. This need not be done if the licensee discharges liquid effluents to the sanitary sewer system. Are the results of the analyses comparable with the latest results recorded by the licensee?

03.04 As Low As Reasonably Achievable (ALARA) Considerations. Requirements to minimize the release of radioactive material to the environment can be found in 10 CFR 20.1101(b), 20.1301, 20.1302 and 10 CFR Part 20, Subpart K. ALARA considerations are to be discussed with operations or radiation protection personnel, as appropriate, to determine what measures and considerations have been taken to maintain effluent releases consistent with the facility ALARA program. This may include discussion of the considerations given to activities that resulted in the largest radiological effluent contribution from the reactor facility. If the TS or licensee procedural controls do not include requirements for ALARA, professional judgement is required to determine whether the licensee is maintaining effluent releases ALARA.

03.05 Waste Storage. If practical, one gaseous, liquid and solid waste storage installation is to be examined to determine whether they meet the requirements of the TS, and 10 CFR Part 20. Are gaseous, liquid and solid wastes appropriately stored in engineered storage tanks or areas? It is to be recognized that some licensees do not store or hold up gaseous releases but rely on online monitoring capabilities. A description of the storage facility and location can be found in the SAR. If the facility has liquid holdup tanks, tritium storage facilities, and solid waste drums that provide radwaste storage capability, storage is required to be consistent with 10 CFR Part 20, the TS and the licensee's procedural requirements. Does the licensee maintain a current inventory of all radioactive waste stored onsite? Be alert for unmonitored release pathways, and changes in the facility that could create unmonitored release pathways.

03.06 Cold Water Chemistry. Observation of one required chemical analysis is an acceptable sample for this inspection requirement. Does the licensee maintain and implement policies and procedures, as required, for the control of plant process water to minimize corrosion and out of core radiation fields? These policies and procedures identify the chemical variables to be monitored such as chemical composition, pH, conductivity; the monitoring locations; schedules for sampling; provisions for taking representative samples and the diagnostic actions to be taken when critical limits are reached or exceeded. One of the contributing factors of metal attack is the formation of locally corrosive environments resulting from the ingress of impurities during plant operation and shutdown. Are chemicals and reagents used in the chemical analyses fresh (within the recommended shelf life)? Are records of required non-radioactive chemical analyses consistent with the TS, licensee procedures and the description in the SAR?

03.07 Constraint on Radioactive Air Effluents. Licensee records are to be reviewed to determine the magnitude of the annual air effluent releases from the licensee's facility and whether they meet 10 CFR 20.1101(d). This regulation applies a constraint of 10 millirem in a year to the exposure resulting from air effluents. The difference between this constraint and the limits in 10 CFR 20.1301 is that exceeding a constraint level does not

necessarily result in enforcement action, whereas exceeding a limit always results in enforcement action. Acceptable methods to estimate the dose from air emission, and thereby show compliance, are described in Regulatory Guide 4.20, "Constraint on Releases of Airborne Radioactive Materials to the Environment for Licensees Other than Power Reactors." Licensees may also use their own site-specific methods for showing compliance, subject to NRC approval before use (e.g., SAR methods for effluent dose calculations). In cases where the constraint is exceeded, the licensee is required to notify NRC that the constraint was exceeded, describe the corrective actions to be taken, and the schedule for completion of such actions to ensure the constraint will not again be exceeded. Enforcement action may be taken if such reports are not filed as required by 10 CFR 20.2203 or if corrective action does not prevent recurrence.

#### 69004-04 RESOURCE ESTIMATE

For Planning purposes, the estimated direct onsite inspection effort to complete this procedure is 10 hours. Actual inspection at any facility may require more or less effort depending on past inspection history, conditions at the facility, and safety significance of the inspection findings.

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