INSPECTION PROCEDURE 69012

CLASS I RESEARCH AND TEST REACTORS RADIATION PROTECTION

PROGRAM APPLICABILITY: 2545

69012-01 INSPECTION OBJECTIVE

To determine if the facility radiation protection program has been maintained in accordance with regulatory requirements and licensee commitments, since the last inspection.

69012-02 INSPECTION REQUIREMENTS

02.01 Radiation Protection Procedures. Determine if the licensee's procedures for radiation protection at the facility meet regulatory requirements, and licensee commitments.

02.02 Radiological Controls

a. Form NRC-3. Determine if Form NRC-3, "Notice to Employees," is posted as required.

b. Caution Signs, Labels, Signals, and Controls. Determine if restricted areas are posted and controlled as required.

02.03 Protective Clothing. Determine if appropriate protective clothing is used by facility personnel as required.

02.04 Personnel Dosimeters. Determine if the licensee's personnel dosimetry program is effective, maintained and meets regulatory requirements and licensee commitments.

02.05 Exit Surveys. Determine if licensee personnel, equipment and materials exiting a controlled area are monitored as required.

02.06 Personnel Training. Determine if personnel working with or around radioactive materials have been instructed in radiation protection as required.

02.07 Radiation, Surveys, Sampling and Monitoring. Determine if required radiation surveys, sampling and monitoring were performed in accordance with regulatory requirements and licensee procedures.

02.08 Instrument Calibration. Determine if the licensee has implemented a calibration program for the survey, sampling and monitoring instruments in use as required.

02.09 Personnel Exposure Records. Determine if exposure limits in 10 CFR Part 20 were satisfied.

02.10 Changes. Determine if changes with the potential to affect radiation protection activities were consistent with 10 CFR 50.59, the license and Technical Specification (TS) requirements.

02.11 Events. Determine if the licensee addressed radiologically significant events in accordance with regulatory and the licensee's procedural requirements.

02.12 As Low As Reasonable Achievable (ALARA). Determine if an ALARA program has been implemented as required.

02.13 Radiation Protection Program. Determine if the licensee has developed, documented and implemented a radiation protection program in accordance with regulatory requirements (see 10 CFR 20.1101).

02.14 Respiratory Protection Program. Determine if the respiratory protection program meets regulatory requirements (see 10 CFR 20.1701-4) and licensee commitments.

02.15 Planned Special Exposures. Determine if planned special exposures were made in accordance with regulatory requirements (see 10 CFR 20.1206) and licensee procedures.

02.16 Declared Pregnant Women and Dose to Embryo/Fetus. Determine if the dose to the embryo/fetus for declared pregnant women met regulatory requirements (see 10 CFR 20.1208).

69012-03 INSPECTION GUIDELINES

General Guidance

This section provides guidance for the inspection of radiological controls at Class I Research and Test reactors. It is not to be used for the inspection of material licenses of the NRC or Agreement State licenses. If there are concerns relative to other such license activities or conditions, appropriate management is to be informed and determine the course of action.

If practicable, use direct observation to verify inspection requirements. Otherwise use some combination of records review, independent measurements, or discussions or walk-throughs with involved licensee personnel.

Special radiological related areas, such as refueling, maintenance or long-term shutdown, have radiological related inspection requirements in their respective inspection procedures. Inspection requirements in this inspection procedure are not to be repeated if they are fulfilled in other inspection procedures or vice versa.

Requirements for radiation protection are specified in 10 CFR Parts 19 and 20, the TS, and the licensee's procedures. General guidance can be found in ANSI/ANS 15.11, "Radiation Protection at Research Reactor Facilities," 1993, and associated references; and in the other ANSI/ANS Section 15 Standards listed in Appendix B to Inspection Procedure 69001, "Class II Research and Test Reactors." Additional general guidance can 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. References for 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 to the specific guidance document in writing.

The resolution of some items may require specialized inspectors. However, this inspection procedure is generally within the capabilities of assigned inspectors to determine if a potential or actual hazard exists and to initiate appropriate regulatory action. Before any regulatory action is taken, the inspector is to consult with responsible management and the NRR project manager.

The sample sizes recommended 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 Radiation Protection Procedures. The review of the changes to the facility's radiation protection procedures is an acceptable sample for this inspection requirement. Requirements for licensee procedures relative to radiation protection can be found in 10 CFR Part 20, the TS, the Safety Analysis Report (SAR), and the Safety Evaluation Report (SER).

03.02 Radiological Controls

a. Form NRC-3. Form NRC-3 should be conspicuously posted. This may be on area bulletin boards, in the halls, laboratory areas and in the control room. If postings are not readily apparent, ask the licensee where these forms are posted and directly observe the postings in one or two such areas. These forms should be posted in sufficient quantities and locations to permit workers to observe them while traveling to or from any location to which the notice applies. The requirement for this may be found in 10 CFR 19.11.

b. Caution Signs, Labels, Signals, and Controls. Observation of the controls for two radiologically controlled areas is an acceptable sample for inspection. Radiologically controlled areas to be observed include reactor-related access control areas and areas where radioactive materials are used or stored. This includes laboratories, chemical fume hoods, radwaste areas and receptacles,

irradiators and sealed sources containing by-product materials. Radiologically controlled areas are required to be conspicuously posted. Requirements for posting can be found in 10 CFR Part 20, Subpart J. Depending on the associated hazard, controls may include tape, rope or structural barriers to prevent access. If volatile radioactive materials are used in an area, it is required to be posted and controlled for airborne contamination. High radiation areas are required to be strictly controlled to prevent unauthorized or inadvertent access. Such controls may include, but are not limited to, direct surveillance, locking the high radiation area, warning lights and audible alarms. Areas occupied by operators or experimenters for long periods of time and common use areas are controlled in accordance with licensee procedures the licensee's ALARA program.

The control of high radiation areas are of particular concern. Requirements for the control of access to high radiation areas can be found in 10 CFR 20.1601. The inspector is cautioned not to enter a high radiation area without a licensee escort trained in radiation protection who is knowledgeable of the high radiation area and the health physics precautions to be taken. Evaluate the licensee's use of controls for radiation areas unique to Research and Test reactors, such as pneumatic irradiation sample transfer systems for "rabbits," beam ports, and other potential radiation work areas for experimental programs. Also evaluate the licensee's use of shielding and controls used to remove or modify shielding.

The licensee's radiation safety program and procedures normally provide specific requirements for the implementation of 10 CFR Part 20, the types of controls used and the circumstances under which they are used.

03.03 Protective Clothing. If possible, the observation of the protective clothing worn by two facility experimenters or other respective personnel during their work activities is an acceptable sample for this inspection requirement. If observation is not practical, discussions with two individuals to determine their use of protective clothing will also provide acceptable samples for this inspection. Requirements for protective clothing may be found in the licensee's procedures or on precautions posted at the entrance to controlled areas. Such protective clothing may include, but is not limited to gloves, booties, rubber boots, hair covers, lab coats, coveralls, and rubber or plastic aprons for use with liquids. Where protective clothing is required, are personnel instructed in the proper use and function of the protective clothing in accordance with 10 CFR 19.12? Does the licensee have provisions for the correct disposition of contaminated protective clothing? This may include, but is not limited to, disposal as radioactive waste as paper products, and the washing and decontamination of more durable items such as cloth coveralls and rubber boots. Depending upon the contaminants, and their half lives, some articles may be held for radioactive decay.

03.04 Personnel Dosimeters. The observation of the personnel dosimetry worn by four facility workers, including one operator and one experimenter, is an acceptable sample for this inspection requirement. Were the dosimetry devices issued to facility personnel appropriate for the type and energy of the emitted radiation and the radiation fields anticipated? Were facility personnel, who are required to use dosimeters, instructed in the proper use and function of the dosimeters? Normally, licensee personnel dosimetry programs include provisions for monitoring beta, gamma, and fast and slow neutrons.

These monitoring devices include, but are not limited to, film or TLD whole body badges and, where appropriate, extremity badges and direct and indirect reading pocket ionization chambers. It is important that dosimetry is worn as required. If alarming dosimeters (chirpers) are used, they are normally checked before each operation to assure that they are operational? It is important that the licensee assess the need for extremity monitors for handling activated samples, and activated or contaminated experimental equipment, such as, irradiated activation foils or a large number of "rabbits" where several small doses could result in a large cumulative dose to the extremities.

If licensee procedures require that personnel exposures on direct reading dosimeters be recorded, observe two selected facility workers leaving the applicable controlled area to determine if the dosimeter readings are actually recorded as required. If the licensee processes it own film or TLD badges, review the process. Regardless of whether the dosimetry is processed by the licensee or processed commercially, it should meet the requirements of 10 CFR 20.1501 for the National Voluntary Laboratory Accreditation Program accreditation.

03.05 Exit Survey. The observation of four facility workers leaving a controlled area is an acceptable sample for this inspection requirement. An appropriate check of all personnel, tools, equipment, and protective clothing for contamination is required before leaving a controlled area in accordance with 10 CFR Part 20, Subpart F. Exit monitoring is normally done using hand held friskers, stand-in monitors, portal monitors, or hand and foot monitors. It is important that the exit monitor be shielded from extraneous radiation sources that would mask contamination. A sensitive Geiger-Muller (GM) counter would normally be acceptable to detect beta/gamma emitters. Where hand held friskers are used, the hands are normally monitored before the probe is removed from its mounting, to prevent contamination of the probe. Unless there is a significant problem with the fuel or some experimental contamination problem, alpha contamination is highly unlikely. If alpha contamination is suspected, it can be detected with a hand held gas flow proportional counter with a thin mylar window or by smear survey and analyses using a 2 or 4 pi gas flow proportional counter. Nasal smears may be appropriate where personnel contamination by alpha emitters is suspected.

03.06 Personnel Training. Evaluation of the radiation safety training received by two permanent facility workers, and where applicable, two experimenters or students is an acceptable sample for this inspection requirement. Observe respective activities and discuss the radiation safety training received by these individuals to confirm that appropriate training was actually received and understood. It is important that experimenters and students understand the radiation protection requirements associated with their assigned activities. Was instruction appropriate to the tasks to be performed provided to these individuals and was there adequate supervision of their activities? The licensee's radiation safety training may include, but is not limited to, demonstrations by cognizant facility personnel, formal lectures, testing, films, "dry runs" for more complex or hazardous operations, and applicable instructions for exit surveys, the use of step-off pads, and the provisions of Regulatory Guide 8.13, "Instructions Concerning Prenatal Radiation Exposure." See 10 CFR 19.12.

03.07 Radiation Surveys, Sampling, or Monitoring. The observation of two radiological surveys, sampling or monitoring activities, other than exit surveys, is an acceptable sample

for this inspection requirement. This is to be accomplished by accompanying a person qualified in the licensee's radiation control techniques on normal rounds or may be accomplished by requesting to be shown the manner in which such tasks are normally accomplished. These activities will evidence whether the licensee is controlling the spread of contamination and maintaining doses in accordance with the facility ALARA program (see 10 CFR 20.1101 and 10 CFR Part 20, Subpart F). By direct observation and discussion determine whether personnel conducting these activities are qualified by training and experience. All instrumentation used during these activities are required to be operable, calibrated, and maintained as required by 10 CFR 20.1501(b) and the licensee's procedures. It is important that operability checks are performed on all instrumentation before use, e.g., source and battery checks. Do technicians take smears or instrument readings, as appropriate, in areas that are readily accessible to facility personnel? Particular attention is to be given to beam ports, experimental stations, and ion exchangers for cleanup of primary water, where applicable. If concerns arise, examine the licensee's training records to confirm that technicians are sufficiently trained.

Particular attention is to be given to the following:

a. Were surveys performed as required by the licensee's procedures? The frequency for surveys of areas occupied by operators or experimenters for long periods of time and common use areas are specified in the licensee's procedures. Do the surveys indicate that exposure rates in these areas are consistent with the licensee's ALARA program?

b. If radiation levels above background are suspected in areas outside of the restricted area, determine whether radiation levels are above those specified in 10 CFR Part 20, Subpart D. This is especially important if highly radioactive experiments or objects are adjacent to a wall, and are unshielded. Areas of concern include laboratories, classrooms, and lounges that are uncontrolled. If such a situation is detected, did the licensee evaluate personnel occupancy of these areas and the potential dose to occupants?

c. It is important for the licensee to check for excessive levels of contamination within restricted areas and at the exits from the restricted area. Acceptable levels of contamination are normally specified in facility procedures. These levels may range from 100-1000 disintegrations per minute (dpm) per 100 square centimeters. However, good housekeeping practices generally suggest a barrier any time that contamination levels exceed double the background unless the contamination is removable and the area is immediately decontaminated.

d. The inspector is also encouraged to perform independent radiological surveys as needed to verify licensee assumptions or measurements. Where surveys are performed by an inspector, the measurements are to be compared with those completed by the licensee in the same areas to verify that the results are consistent with that the licensee's radiation protection assumptions and required surveys. These surveys may include, but are not limited to, the survey of a radiation area, the survey of a potentially contaminated area, or the survey of neutron beam experimental areas. Review surveys conducted by the licensee during both shutdown and operations following changes in shielding. Is there

reasonable agreement with the licensee's records? Records for survey, sampling and monitoring are required to be maintained in accordance with 10 CFR 20.2103.

e. If the potential exists for airborne contamination, how does the licensee assure that levels are within the regulatory requirements of 10 CFR Part 20, Subparts C and D?

f. Examine surveys of solid waste material to determine whether the licensee complies with their procedures and requirements. Information Notice 85-92, "Surveys of Wastes Before Disposal from Nuclear Reactor Facilities," (Accession No. 8511270325), is to be used as technical guidance.

Additional guidance can be found in 10 CFR 20.1902.

03.08 Instrument Calibration. Requirements for the calibration of survey, sampling and monitoring instruments can be found in 10 CFR 20.1501(b). Verification of the calibration of radiation monitoring instrument(s) used in the licensee's radiation surveys for the above requirements is an acceptable sample for this inspection requirement. Calibration requirements are generally specified in the licensee's procedures. Do all survey, sampling and monitoring instruments have current calibrations appropriate for the types and energies of radiation to be detected? Such instruments may include, but are not limited to, Geiger Muller (GM) setups, ionization chambers, air sampling equipment, beta and gamma spectrometers, gas flow proportional counters, and Bonner spheres. The technical adequacy of calibration procedures at facilities that perform their own calibrations is to be examined. ANSI N323, "Radiation Protection Instrumentation Test and Calibration," 1978, provides additional guidance in this area.

03.09 Personnel Exposure Records. The review of 50 percent of the facility's personnel dosimetry record is an acceptable sample for this inspection requirement. The licensee is required to keep exposure records (e.g., TLD or film badge records) on form NRC-5 or equivalent (See 10 CFR 20.2106). 10 CFR Part 20, Subpart B provides the occupational dose standards for individuals in restricted areas. If individuals routinely exceed 20 percent of the exposure limits, the issue is to be reviewed further to determine that the radiation exposure is consistent with the licensee's ALARA program. ALARA guidance can be found in 10 CFR 20.1101(b) and in Regulatory Guide 8.10, "Operating Philosophy for Maintaining Occupational Exposures As Low As is Reasonably Achievable." If there were exposures greater than the 10 CFR Part 20 limits, determine if the licensee reported the over exposures in accordance with 10 CFR Parts 20.2202 and 20.2203, how the licensee addressed the problem, and inform appropriate management and the responsible NRR project manager.

03.10 Changes. Review major changes in organization, personnel, facilities, equipment, programs, and procedures that could affect radiation protection activities since the last inspection. Changes in the facility or procedures described in the safety analysis report are required to be made in accordance with 10 CFR 50.59. Also, review any organizational change in the involving the radiation protection manager. These could include changes in authorities, responsibilities, position in the organizational structure, and reporting chains. Particular attention is to be given to the reporting chain above the facility director if required by the TS. Be sensitive to changes that reduce the ability of the radiation protection

manager to have direct recourse to the onsite facility manager in order to resolve concerns and issues related to the implementation of the radiation protection program. Are personnel who oversee the radiation protection program, and those personnel with radiation protection duties, qualified by training and experience to perform intended functions? It is important for all facility workers to be aware of and understand changes that affect their work activities.

03.11 Events. Review major radiation control events at the facility since the last inspection. This inspection requirement may have been examined in part during the assessment of personnel exposure records; it need not be repeated, if in the inspectors professional judgement, it has already been adequately addressed. If major incidents occurred, were they reported to the NRC in accordance with 10 CFR 20.2202? Events having radiologically related significance are required to be addressed in accordance with the facility TS, procedures and administrative controls. Were corrective actions reviewed by the safety review committee and consistent with facility TS and procedures for the resolution of the problems? It is important for workers to be aware of and understand the nature and cause of the events and the corrective actions taken. If radiologically significant events were not effectively addressed by the licensee, appropriate management and the NRR project manager are to be so informed.

03.12 As Low As Reasonably Achievable. The verification of ALARA implementation for one routinely performed experiment or process, having an actual or potential for a relatively high radiological exposure, is an acceptable sample for this inspection requirement. The effectiveness of the licensee's ALARA program can be determined by discussions with operations or radiation protection personnel with respect to ALARA considerations for the activities selected. See 10 CFR 20.1101(b) and the licensee's administrative controls. If this part of the inspection was covered under other inspection requirements, it need not be repeated if the inspector(s) determine that it has previously received adequate evaluation.

03.13 Radiation Protection Program. The requirements for a radiation protection program are in 10 CFR 20.1101, with record keeping requirements in 10 CFR 20.2102. It is acceptable for a licensee implementing the requirements of 10 CFR 20.1101(c) to use a combination of reviews and audit each year that covers all aspects of the radiation protection program during a two-three year cycle (rather than a one-year cycle) provided that the combination of these reviews and audits cover program content and implementation. Reviews and audits should incorporate the following features to assess procedural compliance, technical performance, implementation, and the effectiveness of the facility radiation protection program.

a. Radiation Protection Observations. Do facility supervisors periodically perform observations of the effectiveness of the staff in such areas as radiological work practices, work monitoring, procedural compliance, and survey adequacy?

b. Audits and Reviews. Is the radiation protection program periodically reviewed as required by 10 CRF 20.1101(c) and are audits performed by the radiation safety group in accordance with their program requirements

c. Safety Committee Audits. Does the safety committee audit and evaluate the radiation protection program to assure compliance with 10 CFR Part 20, the TSs and other program requirements?

03.14 Respiratory Protection Program. Guidance for the use of respiratory protection equipment is given in Regulatory Guide 8.15, NUREG-0041, and Appendix A to 10 CFR 20.1001 through 20.2402. 10 CFR 20.1702 requires the use of respiratory protection equipment (and other controls) to limit intakes of radioactive material consistent with ALARA. Question 60, under the heading for 10 CFR 20.1703 in the questions and answers on Part 20, provides additional guidance. Other means of meeting ALARA goals may also be acceptable.

03.15 Planned Special Exposures. Although planned special exposures are not generally expected at non-power reactors, 10 CFR 20.1201(b), 20.1206, 20.2104(b) and(e)(2), 20.2105, 20.2106, 20.2202(e), and 20.2204 provide requirements, as appropriate, for planned special exposures. Guidance relative to planned special exposures may be found in the response to comments for the final rule on 10 CFR Part 20 [56 FR 23371-23372 (Microfiche 58869-132 to 136)], in the definition of planned special exposures in 10 CFR 20.1003, and in Regulatory Guide 8.35, "Planned Special Exposures." Additional, guidance is provided in the questions and answers on the "new" 10 CFR Part 20. See Questions and Answers 8, 24, 63, 135, 136, and 137 under the heading of "10 CFR 20.1206 Planned Special Exposures," and in question and answer 112 under the heading of "10 CFR 20.2105 Records of Planned Special Exposures."

03.16 Declared Pregnant Women and Dose to Embryo/Fetus. 10 CFR 20.1208, 20.1502(a)(2), and (b)(2), and 20.2106(e) and (f) provide requirements for the dose to the embryo/fetus and exposures to declared pregnant women. Associated definitions are provided in 10 CFR 20.1003. Declaration of pregnancy must be voluntary and must be in writing. The declaration is revocable by the woman and the woman does not need to provide any "medical proof" of pregnancy. Regulatory Guide 8.36, "Radiation Dose to the Embryo/Fetus," provides an acceptable method for assessment of the dose for the embryo/fetus. Position 2.3 in Regulatory Guide 8.7, "Instructions for Reporting and Recording Occupational Radiation Exposure Data," provides guidance relative to records and reports for the dose to the embryo/fetus. In addition, Regulatory Position 4 in Regulatory Guide 8.35 provides guidance on exposures to minors and declared pregnant women. Additional guidance is provided in the response to comments on the final rule [56 FR 23372-23374 (microfiche 58869-136 to 141)], in Questions and Answers 59, 84, 120, 138, 382, 416, 439, 440, 441, 442, and 443 for the "new" 10 CFR Part 20, under the heading "10 CFR 20.1208 Dose to the Embryo/Fetus."

69012-04 RESOURCE ESTIMATE

For planning purposes, the direct onsite inspection effort to complete this inspection procedure is estimated to be 18 hours. Actual inspection at any facility may require more or less effort depending on past inspection history, conditions at the facility, and safety significance

American National Standards Institute/American Nuclear Society Standard-15.11, "Radiological Controls at Research Reactors," 1993 (Microfiche Address: 65725-212 to 230).

Regulatory Guide 8.10, "Operating Philosophy for Maintaining Occupational Exposures As Low As is Reasonably Achievable," 1977 (Microfiche Address: 46008-243 to 245).

END