

## RADIATION PROTECTION

PROGRAM APPLICABILITY: 2600

### 83822-01 INSPECTION OBJECTIVE

To determine whether the licensee's performance is in accordance with regulatory requirements related to radiation protection, and to evaluate the adequacy of certain aspects of the licensee's radiation protection program.

### 83822-02 INSPECTION REQUIREMENTS

02.01 Radiation Protection Program. Determine that the performance of the radiation protection program, commensurate with the potential risk involved in the licensee's activities, is being implemented and documented. Determine the radiation protection function's responsibilities and independence from operations. Determine that program performance is being reviewed at least annually, both for content and implementation.

02.02 Radiation Protection Procedures. Determine that performance due to changes in the radiological protection procedures made since the last inspection are consistent with regulations and license requirements.

02.03 Instruments and Equipment. Determine that the performance of radiation protection instruments and equipment is in accordance with license requirements and licensee procedures.

#### 02.04 Exposure Controls

- a. External Exposure. Determine that the licensee's performance is in accordance with the following regulatory requirements:
  1. 10 CFR 20.1501 & 20.1502 (surveys and monitoring)
  2. 10 CFR 20.1201 (occupational dose limits)
  3. 10 CFR 20.1206 (planned special exposures)
  4. 10 CFR 20.1207 (exposure of minors)
  5. 10 CFR 20.1208 (dose to an embryo/fetus)
  6. 10 CFR 20.1203 (external dose from airborne material)

7. 10 CFR 20.2104 (prior occupational dose)
8. 10 CFR 20.2106 (records of monitoring results)
9. 10 CFR 20.2105 (records of planned special exposures)
10. 10 CFR 20.2102 (records of radiation protection program)
11. 10 CFR 20.1301 (dose to the public)
12. 10 CFR 20.1101(b) and (d) (ALARA)

b. Internal Exposure. Determine that licensee's performance is in accordance with the following regulations:

1. 10 CFR 20.1501 & 20.1502 (surveys and monitoring)
2. 10 CFR 20.1201 (exposure limits)
3. 10 CFR 20.1501(a) & (b) (surveys and monitoring)
4. 10 CFR 20.1701 & 1702 (use of engineering and other controls)
5. 10 CFR 20.1202 (summation of external and internal doses)
6. 10 CFR 1204 (determination of internal dose)
7. 10 CFR 20.1302 re:§20.1301 (dose to the public)

c. Respiratory Protection. For facilities with a respiratory protection program, determine if licensee's performance is in accordance with 10 CFR 1703.

#### 02.05 Posting, Labeling, and Control

a. Posting and Labeling. Determine if licensee's performance is in accordance with 10 CFR 20.1902, §20.1903, §20.1904, §20.1905, §20.1501, §20.1502 and other posting and labeling requirements specified in the license or licensee procedures.

b. Control. Determine if licensee's performance is in accordance with the license requirements, licensee procedures, and the following regulations:

1. 10 CFR 20.1601 (high radiation area access)
2. 10 CFR 20.1602 (very high radiation area access)
3. 10 CFR 20.1801 (security of stored material)
4. 10 CFR 20.1802 (control of material not in storage)

c. Posting of Notices. Determine if licensee's performance is in accordance with 10 CFR 19.11.

#### 02.06 Surveys

a. Requirements. Determine if licensee's performance is in accordance with the following regulations:

1. 10 CFR 20.1501(a) & (b) (surveys)
  2. 10 CFR 20.2103 (survey records)
- b. Leak Tests. Determine if licensee's performance is in accordance with license requirements or other NRC regulations for leak testing of radioactive sealed sources.

02.07 Notifications and Reports

- a. To the NRC. Determine if licensee's performance is in accordance with the following regulations and license requirements:
1. 10 CFR 20.2201 & 2202(b) (loss of control or theft of material)
  2. 10 CFR 20.2202 & 2203 (incidents, and exposures)
  3. 10 CFR 20.2202(a) & 2203 (overexposure)
  4. Other radiation protection reports required by the license and by applicable provisions of 10 CFR 30-39, 40, 70 and 72.
- b. To the Individual. Determine if licensee's performance is in accordance with 10 CFR 19.13.

02.08 As Low As Is Reasonably Achievable (ALARA). Paragraph 20.1101(b) of 10 CFR 20 states that persons engaged in NRC licensed activities shall, to the extent practicable, maintain occupational doses and doses to members of the public ALARA. During inspections:

- a. Determine if high level management has made a commitment to minimize exposure to workers and has clearly defined procedures and policies to implement the ALARA philosophy.
- b. Determine that licensee personnel are made aware of management's commitment to keep occupational exposures ALARA.
- c. Ascertain that the radiation protection staff has been given authority to make certain that ALARA policies are carried out and that workers have been adequately trained to understand the ALARA philosophy and how it should be implemented at their work places.
- d. Determine that management and its designees perform periodic (at least annual) audits of its program (special attention should be given to methods to lower internal and external exposure and to determine that effluents released are ALARA.
- e. Determine if licensee's performance is in accordance with 10 CFR 19.12 with respect to workers' understanding of radiation protection in their work place, and how the training received includes an understanding of ALARA as it pertains to the work place.
- f. Determine whether modifications to equipment, facilities, and procedures, have been made where practicable to significantly reduce exposures at a reasonable cost. The benefits gained should outweigh the cost of modifications. Also determine if the licensee has considered the ALARA philosophy during the engineering phase for changes in facilities, equipment, or processes and whether an ALARA review was performed during initial implementation of changes.
- g. Determine if the RSO and radiation protection staff's performance includes:

1. Identification of the origins of radiation exposures by location and job category and have noted trends in the amounts of radiation at the locations.
  2. Consideration of ways to reduce exposures in those locations where exposure to personnel are significant.
  3. Periodically reviewing operating procedures that affect radiation safety and have made surveys of operations to identify situations where radiation exposures can be reduced.
- h. Determine if licensee's performance includes a program in which workers can make suggestions on radiation protection (feedback).
- i. Determine if licensee's performance includes the use of adequate equipment and supplies in the radiation protection program, and if procedures are available for proper use of these supplies and equipment.

#### 83822-03 INSPECTION GUIDANCE

03.01 Radiation Protection Program. By discussions with radiation protection management and by review of organizational documents, determine whether radiation protection safety functions:

- a) report to senior plant management independent of operations management;
- b) radiation protection safety functions maintain familiarity with all plant activities;
- c) radiation protection safety functions participate in inspections and audits; and
- d) the radiation protection safety functions provide input to training.

The radiation protection functions are expected to:

- a) review changes to operating procedures;
- b) maintain familiarity with all operations within the facility requiring radiation protection controls;
- c) conduct or participate in inspections and audits of radiation protection safety practices;
- d) examine reports of procedural violations and other deficiencies for possible improvement of radiation protection safety practices; and
- e) report their findings to plant management.

These activities should be influenced by priorities established by operations, but should not be controlled by operations.

Review the outcome of the licensee's implementation of its radiation protection program to determine if licensee's performance ensures safety and compliance with regulatory requirements. Determine if the program content and implementation are being reviewed at least annually. Inspect the documentation for these reviews.

Review of the licensee's Health Physics (HP) log book or file on HP problems may be useful to identify areas deserving special attention. Particular attention should be directed toward identifying trends and ascertaining whether corrective actions were directed toward the cause and not merely the symptoms.

Regulatory Guides 8.8 and 8.10 may be discussed in terms of providing useful guidance to the licensee regarding ALARA. If the licensee has a documented commitment to ALARA, implementation of the program should be discussed with management. Determine that the ALARA goals are adequate and realistic.

The licensee may have submitted certain of his radiation protection procedures, or his radiation protection manual, along with the license application and, in some cases, those procedures or the manual may be incorporated into license requirements. There are references to licensee procedures throughout this inspection procedure; however, this is not done for all inspection areas. The absence of a notation regarding licensee procedures is not intended to preclude the inspector from inspecting a given area against licensee procedures if there is an applicable license requirement.

03.02 Radiation Protection Procedures. Review any substantive changes to procedures which have been implemented since the last inspection if problems are identified in a specific program area; determine that limits, precautions, controls, etc., specified in the procedures are consistent with regulations and license requirements.

03.03 Instruments and Equipment

- a. Randomly select instruments of each major type and examine them to determine operability and proper alarm settings, if alarm settings are applicable. These may include portable survey instruments, fixed monitoring equipment, constant air monitors, portable air samplers, pocket dosimeters, and alarming dosimeters.
- b. Review the most recent calibration records of the instrument(s) selected for inspection to assure that the calibration and surveillance program for these instruments are being accomplished in accordance with license requirements or licensee procedures.
- c. Determine that the licensee has a system (a schedule, card file, etc.) which identifies all the instruments and identifies when they are due for calibration or functional testing.
- d. Determine that the procedures used to calibrate the instruments selected above contain: review and approval requirements of the licensee's procedural system or license requirements, acceptance criteria including values for trip settings that conform to license requirements, if applicable, and detailed stepwise instructions.
- e. Determine that the licensee uses survey instruments that are appropriate for the type and intensity of radiation measured.

03.04 Exposure Controls

a. External Exposure

1. Examine any changes made in procedures for control and use of personnel monitoring equipment; determine that limits, precautions, controls, etc., specified in the procedures are consistent with regulations and license requirements.

Examine the type of monitoring devices used, the period of use or exchange period, and the number used to determine if these aspects seem consistent with the monitoring program. Determine who the supplier is, and if the service has been changed since the last inspection, determine the reasons for the change. Determine that the personnel dosimetry processor is accredited by NVLAP.

NOTE: If applicable to the facility being inspected, determine that processor is DOELAP accredited.

For pocket dosimeters or pocket chambers, determine when they are read and recharged, the number used, and review the calibration procedure or leak test procedure.

Evaluate the adequacy of the licensee's procedures or system for evaluating and using personnel monitoring data to control and minimize exposures. The

licensee should account for occupational radiation doses to personnel resulting from exposures to licensed material and other unlicensed radiation sources (e.g. x-ray machines).

2. Review reports of exposure summaries generated since the last inspection to determine that licensee's performance is in accordance with regulatory requirements.
3. Review the records of all persons who received planned special exposures since the last inspection. Determine that exposure histories are on file for these individuals.
4. Determine, by discussion with supervision, if minors have been permitted to work in restricted areas and, if so, determine that licensee's performance is in accordance with 10 CFR 20.1207 by review of exposure records.
5. For licensees who are required to monitor in accordance with 10 CFR 20.1502, review of all NRC Form 5 may be appropriate, depending on the number of monitored personnel. For licensees who are not required to monitor, due to the lack of a likelihood that any worker would receive more than 5 millisieverts in a year, a sampling of NRC Forms 5 generated as a result of voluntary monitoring may be appropriate. If a licensee is not required to monitor and chooses not to monitor worker exposures, the inspector need only review the licensee's presumptive analysis of exposures and determine the assumptions used in that analysis.

b. Internal Exposure

1. During review of exposure evaluations in 03.03b4 below, determine that the licensee's performance is in accordance with internal exposure limits.
2. Review randomly selected air sampling and bioassay records.
3. By observation, discussion, and review of documentation, determine that engineering controls are considered and used to the extent practicable. Evaluation of process and engineering controls incorporated as part of the facility or equipment as licensed will be performed in the licensing process; the inspection program will evaluate the use of other engineering controls.
4. Review documentation of evaluations performed as the result of unplanned exposures. Determine the appropriateness of preventive measures instituted following an unplanned exposure.

c. Respiratory Protection

1. Determine that the equipment is certified by NIOSH/MSHA or otherwise approved by NRC.
2. Determine proper selection of equipment.
3. Determine by review of records and by discussions that a maintenance and training program is conducted and that it is administered and conducted in accordance with written procedures. Determine by review of records, discussions, and observations that respirator users are individually fitted for respirators and that respiratory equipment is operationally tested prior to each use.

4. Randomly select several control requirements and determine compliance; by review of records, by discussions, or observation.
5. In taking credit for the protection provided by the use of respiratory protective equipment, 10 CFR 20.1703 requires that the protection factor be greater than the multiple by which peak concentrations are expected to exceed the values of Table 1, Appendix B, Column 3 of 10 CFR Part 20, unless ALARA considerations indicate otherwise. Determine that this criterion is considered in selecting respirators.

#### 03.05 Posting, Labeling, and Control

- a. Posting and Labeling. Inspect representative areas to determine compliance; pay particular attention to "temporary" work areas that may be required for maintenance activity, newly established work areas, etc.

Inspect a random sampling of containers in work or storage areas.

- b. Control

1. Randomly select high radiation or very high radiation areas to determine that access is controlled in accordance with regulations or license requirements.
2. Inspect areas where radioactive material is located or stored in an unrestricted area.
3. Review a random selection of radiation work permits (RWPs) on file and those currently in effect.
4. Review a random selection of records (e.g., radiation level surveys, interlock tests, audible & visible alarm test results) and inspect work areas to determine licensee's controls ensure the safety of workers and members of the public.

- c. Posting of Notices. Determine, by questioning of management, how the licensee performs in accordance with the requirements of 10 CFR 19.11; inspect bulletin boards or other places where notices are posted; question a few individuals to determine if they are aware of the posting of notices.

#### 03.06 Surveys

- a. Requirements. Determine that the licensee has established schedules for periodic surveys of work areas of the plant and facility site; determine that surveys are conducted using approved procedures; review a random selection of survey records to see that surveys are being performed according to schedules; determine that the survey results are reviewed by appropriate supervision; determine that corrective actions have been taken, as appropriate. Attempt to observe surveys in progress by licensee personnel. Determine the adequacy of the surveyor's knowledge in checking the survey instrument for proper operation with a dedicated check source and in the use of the instrument for conducting radiation surveys.

Determine specifically that schedule and procedural requirements for surveys appear adequate to demonstrate compliance with the following aspects of the regulations and with pertinent license requirements.

1. 10 CFR 20.1201 (permissible doses)

Determine whether due consideration is given to energy, beta exposure, and extremity exposure, and whether neutron surveys are performed if appropriate.

2. 10 CFR 20.1203 and 20.1204 (exposure to airborne radioactivity)

Determine whether both particulates, non-noble gases and vapors are considered, if appropriate.

3. 10 CFR 20.1902 (posted areas)
4. 10 CFR 20.1301 (radiation in unrestricted areas)

- b. Leak Tests. Inspect a random selection of records of leak tests of radioactive sealed sources.

### 03.07 Notifications and Reports

- a. To the NRC. The objective is to determine if the licensee is reporting all the events and data required by the regulations and the license. The inspector should have reviewed those reports submitted since the last inspection; therefore, a determination should be made whether events have occurred which have not been reported. A discussion with management, operating personnel, maintenance, and health physics personnel, and review of RWPs, log books, and other data during the course of the inspection should aid in this determination.
- b. To the Individual. Determine by discussion with individuals selected at random (identified during the course of inspection of other requirements) whether they were notified in accordance with 10 CFR 19.13.

03.08 ALARA. For fuel facilities, ALARA programs are part of the license application. The programs are audited periodically and the results reported to the Radiation Safety Committee for action.

The depth of the ALARA programs will depend on the quantities of radioactive materials possessed and used, and whether the potential for radiation exposures can be significant. The following guidance should be used as applicable or at the inspector's discretion (compare to guidance outlined in Section 02.08).

- a. Facility personnel should be made aware of management's commitment to keep exposures to workers ALARA. The commitment should appear in policy statements, instructions to personnel, and similar documents. As a minimum, workers should be familiar with the ALARA commitment so that they can explain what the commitment is, what ALARA means, why it is recommended, and how they have been advised to implement it on their jobs. Examine a selection of policy standards and instructions (if they exist) and interview workers to determine if they understand the ALARA philosophy and what it means at the work place.
- b. As a minimum, management should be able to discuss which operating procedures were reviewed, in which locations most exposures are being received, what groups of workers are receiving the highest exposures, what discussions they have had with the radiation protection staff or outside consultants, and what steps have been taken to reduce exposures. Examine a random sample of records and interview personnel to determine what has been done to reduce exposures.
- c. No guidance.
- d. No guidance.

- e. Radiation workers should understand how radiation protection relates to their job and should be retrained at least annually, or as otherwise stated in the license application. Training should be sufficient to ensure that workers can correctly answer questions on radiation protection as it relates to their jobs. Interview workers (consistent with the size of the program) to determine if the workers understand radiation protection as it relates to their jobs and if they have an opportunity to discuss radiation safety with the radiation protection staff.
- f. Inquire if modifications have been made to facilities and equipment to reduce exposures. Randomly examine any procedures or records that reflect modifications and attempt to determine the extent of the benefits gained through modifications (for example, modifications may have been beneficial if exposures of 50 mrems/hour were reduced by a factor of 10 to 5 mrems/hour. It may not be beneficial to reduce 1 mrem/hour to 0.1 mrem/hour, considering cost and risk. In both of the above examples, consideration must be given to costs of modification and risk to the population). Determine that ALARA measures do not disproportionately increase the risks from non-radiological hazards, such as industrial hazards.
- g. Examine Radiation Safety Committee records or other records on ALARA policies to determine whether source-term surveys have been conducted and actions taken to reduce significant exposures.
- h. No guidance.
- i. Examine equipment and supplies to determine if they adequately protect personnel from unnecessary radiation. Such equipment and supplies may include, but are not limited to, decontamination supplies, survey meters, protective clothing, ventilation systems, air sampling equipment, and supplies used for posting areas, such as radiation areas.

END