Radiation Protection: Lines of Inquiry

FUNCTIONAL AREA GOAL: A program which assures the successful conduct of occupational radiation protection operations consistent with the requirements of 10 CFR 835.

REQUIREMENTS:

10 CFR 835 – Occupational Radiation Protection

Lines of Inquiry:

Performance Objective 1: Organization and Administration

- Is there a DOE approved RPP?
- Does the RPP adequately address the requirements of 10 CFR 835?
- Does the RPP include formal plans and measures for applying the as low as reasonably achievable (ALARA) process to occupational exposure?
- Are radiological activities being conducted in accordance with the RPP?
- Are identified guides and technical standards, that are to be adopted as the means to meet 10 CFR Part 835, being followed?
- Does the RPP clearly identify any exemptions that have been approved from the subject requirements?
- If yes, are the conditions on the exemption decision being implemented?
- Does the site RPP adequately cover all the types of radiological activities conducted?
- Are updates of the RPP submitted to DOE as required?
- Are changes submitted whenever a change or an addition to the RPP is made?
- Are changes submitted prior to the initiation of a task not within the scope of the RPP?
- Are subcontractor activities addressed in an approved RPP (are they covered under a single site-wide RPP or do subcontractors have their own RPPs)?
- Do the audit plans and completed audits include examination of program content and implementation?
- Are assessors who review program content qualified (per 835.103)?
- Do the audit plans and completed audits reflect that the process ensures that all functional elements are reviewed no less frequently than every 36 months?
- Are there adequate qualification standards for the personnel reviewed?
- Do the records show that, for the personnel reviewed, personnel meet qualification standards and have completed required training and retraining?
- Are procedures commensurate with the radiological hazards created by the activity?
    - Are procedures technically adequate?
    - Are the procedures consistent with the education, training, and skills of the individuals exposed to those hazards?
    - Are affected personnel knowledgeable of procedure requirements and understand their role in effectively implementing requirements?
- Are procedures effectively implemented?

Performance Objective 2: ALARA Program

- Is there evidence of management commitment to the ALARA program?
- Is there evidence of ALARA training consistent with the provisions of 10 CFR 835 103 and 835.901?
- Are the plans and measures for applying the ALARA process to occupational exposures reflected in procedures that are commensurate with the expected level of exposure, per §835.104?
- Are the design and control provisions in 10 CFR 835 subpart K being met?
- Is there evidence of either physical design features (e.g. confinement ventilation, remote handling, shielding) or administrative controls in radiological work areas?

- Were optimization methods used to ensure that exposure is maintained ALARA in developing facility design and physical controls?
- Do the dose rates in facilities built or modified after 1995 meet the design objectives? – ALARA and less than 0.5 mrem/hr for a continuously occupied area
- In facilities built or modified after 1995 are there design feature that minimize the chance of releases of airborne radioactive materials and should a release occur, do these features control intakes to levels that are ALARA?
- During routine operations are doses in any workplace greater than the limits in 835.202?
- Do the physical and administrative controls in place implement the ALARA process?

Performance Objective 3: External Dosimetry

- Is there adequate staff provided with appropriate technical training?
- How many employees work in the program and what is their education and experience in external dosimetry?
- Is there a technical basis document that explains each program element?
- What is the latest technical basis document and is it adequate?
- Are there procedures that address each step in the activities that determine external dose?
- Are there written procedures for dosimeter processing?
- Are there adequate criteria and methods for identifying individuals who require individual monitoring?
    - What are the criteria for badging individuals?
    - What are the criteria for issuing supplemental dosimeters?
- Are there appropriate personnel dosimeter measurement methods and frequencies?
    - Are correct dosimeters used for given radiation exposures?
    - Are the frequencies for dosimeter exchange correct?
- Are there adequate methods for control, accountability, and safe handling of dosimeters?
- Are control, accountability and safe handling of dosimeters in effect?
- Is there evidence of proper placement of dosimeters?
    - Are workers wearing dosimeters correctly?
- Are appropriate dosimetric models and default parameters for evaluating external dose used?
    - Are appropriate dosimetric and default parameters used for estimating doses when dosimeters are unavailable?
- Is there timely analysis of personnel dosimeter measurements and transmission of results, dose evaluation, and recommendations to monitored individuals, management, and DOE, as appropriate?
    - When are results of processing dosimeters available?
    - When are external doses provided to individuals?
- Is there a quality assurance (QA) program that covers all steps in the activities that determine individual external dose?
- Is the program accredited by DOE?
- Are the proper categories tested?

Performance Objective 4: Internal Dosimetry

- Is there adequate staff with appropriate technical training?
    - How many employees work in the program and what is their education and experience in internal dosimetry?
- Is there an internal dosimetry technical basis documentation providing scientific information and other rationale explaining essential elements of the internal dosimetry program to support dose evaluation methods?
- What is the latest technical basis document and is it adequate?
- Are there written policies and procedures covering essential steps in the activities used to determine worker internal dose?

- Are there written procedures for determining internal doses?
- Are there defined criteria for identifying workers who need to participate in the individual monitoring program?
    - What are the criteria for enrolling individuals in the bioassay program?
- Are there appropriate radiobioassay measurement methods and frequencies;
- Are correct measurement methods used for given radiation exposures?
- Are the frequencies for sample collection correct?
- Are there methods for control, accountability, and safe handling of samples;
- Are control, accountability and safe handling of samples in effect?
- Are appropriate dosimetric models and default parameters for evaluating internal dose used?
- Are appropriate dosimetric and default parameters used for estimating doses?
- Is there timely analysis of radiobioassay samples and measurements, transmission of results, dose evaluation, and recommendations to operations management;
    - When are results of bioassay available?
    - When are internal doses provided to individuals?
- Is there adequate detection capability and quality of radiobioassay measurements;
- Are the procedures adequate to determine levels present?
    - What is the L_C or MDA for the procedures?
    - Is the correct quantity being used to determine positive results?
- Are there defined criteria and actions for identifying individuals with suspected intakes, based on workplace measurements and radiobioassay measurements?
- How are suspected intakes identified?
- Are there appropriate action level guidelines?
    - What are the guidelines for taking action?
- Is there a defined program to report internal doses to workers, management, and DOE?
    - When are internal doses reported to individuals?
    - When are internal doses reported to management?
- Is there a quality assurance program covering essential steps in the activities that determine worker internal dose?
- Is the program accredited by DOE?
- Are the proper categories tested?

Performance Objective 5: Area/Workplace Monitoring

- Is area monitoring performed to: (1) Document radiological conditions; (2) Detect changes in radiological conditions; (3) Detect the gradual buildup of radioactive material;(4) Verify the effectiveness of engineering and process controls in containing radioactive material and reducing radiation exposure; and (5) Identify and control potential sources of individual exposure to radiation and/or radioactive materials?
- Through documents reviews and interviews determine the frequencies of radioactive surface contamination surveys. Are these frequencies appropriate?
- For the radionuclide being measured, are the field or laboratory instruments used to analyze surface swipes or to take direct surface contamination measurements sufficiently sensitive to detect the surface contamination at the levels specified in Appendix D of 10 CFR 835?
- Are the instruments and equipment used for monitoring: (1) Periodically maintained and calibrated on an established frequency; (2) Appropriate for the type(s), levels, and energies of the radiation(s) encountered; (3) Appropriate for existing environmental conditions; and (4) Routinely tested for operability?
- Is airborne radioactivity monitored where an individual is likely to receive an exposure of 40 or more DAC-hours in a year?
- Is airborne radioactivity monitored as necessary to characterize the airborne radioactivity hazard where respiratory protective devices are required for protection against airborne radionuclides?

- Is real-time air monitoring performed as necessary to detect and provide warning of airborne radioactivity concentrations that warrant immediate action to terminate inhalation of airborne radioactive material?
- Are packages received from transportation containing radioactive material exceeding a Type A quantity (as defined in 10 CFR 71.4) monitored for external radiation levels?
- Are packages received from transportation containing radioactive material (other than special form or gaseous materials) monitored for surface contamination?
- Is the monitoring of packages containing radioactive material described above completed as soon as practicable following receipt of the package, but not later than 8 hours after the beginning of the working day following receipt of the package?

Performance Objective 6: Radiological Control

- Are RWPs required for:
    - Entry into radiological areas?
    - Handling of materials with removable contamination that exceed the values of 10 CFR 835?
    - Work in localized benchtop areas, laboratory fume hoods, sample sinks, and containment devices that has the potential to generate contamination in areas that are otherwise free of contamination?
    - Work that disturbs the soil in soil contamination areas?
    - Work that involves digging in underground radioactive material areas?
- Do the RWPs adequately describe the:
    - Work activities?
    - Work area radiological conditions?
    - Dose rate?
    - Contamination levels?
    - Airborne levels?
    - Dosimetry requirements?
    - Pre-job briefing requirements?
    - Training requirements for entry?
    - Protective clothing and respiratory protection requirements?
    - Radiological Control coverage requirements and stay time controls?
    - Limiting radiological conditions that may void the RWP?
    - Special dose or contamination reduction considerations(ALARA reviews)?
    - Special personnel frisking considerations?
- Do the RWPs have authorizing signatures?
- Have people signed in on out on the RWPs as required?
- Observe ongoing work – are people adhering to RWP requirements?
- Discuss with workers and RCTs – are they knowledgeable about their RWP and its requirements and the work area radiological conditions?
- Do individuals have GERT equivalent prior to unescorted access to controlled areas [see 835.901(a)]?
- Are personnel entry controls maintained for each radiological area?
- Is the degree of control commensurate with existing and potential radiological hazards within the area?
- Does access to radiological areas require appropriate training?
- Are one or more of the following methods used to ensure control?
    - Signs and barricades
    - Control devices on entrances
    - Conspicuous visual and/or audible alarms
    - Locked entrance ways
    - Administrative controls
- Are control(s) installed at radiological area exits such that they will not prevent rapid evacuation of personnel under emergency conditions?

- For each entry into a high radiation area:
    - Is the area monitored as necessary during access to determine the exposure rates to which the individuals are exposed?
    - Is each individual monitored by a supplemental dosimetry device or other means capable of providing an immediate estimate of the individual's integrated equivalent dose to the whole body during the entry?
- Are adequate controls established (per 10 CFR 835.502(b)) for each entrance or access point to a high radiation area where radiation levels exist such that an individual could exceed an equivalent dose to the whole body of 1 rem (0.01 sievert) in any one hour at 30 centimeters from the source or from any surface that the radiation penetrates?
- Are additional measures implemented (per 10 CFR 835.502(c)) to ensure individuals are not able to gain unauthorized or inadvertent access to very high radiation areas?
- Is protective clothing required for entry to areas in which removable contamination exists at levels exceeding the removable surface contamination values specified in 10 CFR 835?
- Is the selection and use of the protective clothing appropriate for the hazard?
- Are individuals exiting contamination, high contamination, or airborne radioactivity areas monitored for the presence of surface contamination?
- Is the monitoring adequate?
- Do postings and labels include the standard radiation warning trefoil in black or magenta imposed upon a yellow background?
- Are signs clearly and conspicuously posted and do they include radiological protection instructions?
- Do site procedures adequately require posting and labeling consistent with 10 CFR 835?
- Are areas posted as required by 10 CFR 835?
- Are items and containers appropriately labeled?
- Do labels provide sufficient information to permit individuals handling, using, or working in the vicinity of the items or containers, to take precautions to avoid or control exposures?
- Does the site control the release of material and equipment with removable surface contamination levels on accessible surfaces exceeding the removable surface contamination values specified in 10 CFR 835?
- Does the site control the release of material and equipment if prior use suggests that the removable surface contamination levels on inaccessible surfaces are likely to exceed the removable surface contamination values specified in 10 CFR 835?
- Does the site implement appropriate monitoring and controls for the movement on-site from one radiological area for immediate placement in another radiological area of material and equipment with removable surface contamination values exceeding the values specified in 10 CFR 835?
- Does the site control material and equipment with fixed contamination levels that exceed the total surface contamination values specified in 10 CFR 835 which is released for use in controlled areas outside of radiological areas?
- Are removable surface contamination levels below the removable surface contamination values specified in 10 CFR 835?
- Is the material or equipment routinely monitored and clearly marked or labeled to alert personnel of the contaminated status?
- Are appropriate controls maintained and verified which prevent the inadvertent transfer of removable contamination to locations outside of radiological areas under normal operating conditions?
- Are areas in which contamination levels exceed the values specified in 10 CFR 835 controlled in a manner commensurate with the physical and chemical characteristics of the contaminant, the radionuclides present, and the fixed and removable surface contamination levels?
- Are areas accessible to individuals where the measured total surface contamination levels exceed, but the removable surface contamination levels are less than, corresponding surface contamination values specified in 10 CFR 835 adequately controlled when located outside of radiological areas?
- Are the areas routinely monitored to ensure the removable surface contamination level remains below the removable surface contamination values specified in 10 CFR 835?

- Are the areas conspicuously marked to warn individuals of the contaminated status?
- Is each accountable sealed radioactive source inventoried at intervals not to exceed six months?
- Does the inventory establish the physical location of each accountable sealed radioactive source, verify the presence and adequacy of associated postings and labels; and establish the adequacy of storage locations, containers, and devices?
- Is each accountable sealed radioactive source subject to a source leak test upon receipt, when damage is suspected, and at intervals not to exceed six months?
- Is the source leak test capable of detecting radioactive material leakage equal to or exceeding 0.005 microcurie?
- Are sources stored in a controlled location, subject to periodic inventory and subject to source leak testing prior to being returned to service?
- Are accountable sealed radioactive sources, found to be leaking radioactive material, controlled in a manner that minimizes the spread of radioactive contamination?

Performance Objective 7: Emergency Exposure Situations

- Was the risk of injury to those individuals involved in rescue and recovery operations minimized?
- Did operating management weigh actual and potential risks against the benefits to be gained?
- Was any individual required to perform rescue actions that might involve substantial personal risk?
- Did any employees receive emergency exposures in the last five years?
- Were they permitted to return to work during the calendar year in which the emergency occurred?
    - Did contractor management and DOE field management approve in advance?
    - Was the employee counseled regarding additional exposure?
    - Did the employee sign a statement to agree to return to work?
    - Were all doses exceeding the limits recorded in the employee's file?
    - Did contractor management notify the DOE field organization when the conditions resulting in an emergency dose in excess of the limits was eliminated?

Performance Objective 8: Nuclear Accident Dosimetry

- How are individuals involved in a nuclear accident screened for follow-up?
- What methods are available for analysis of biological materials?
- What fixed nuclear accident dosimeters are in place?
- How are PNADs assigned and were employees wearing them during any criticality event?

Performance Objective 9: Records

- Does the site have a records retention program?
- Per §835.1(c), are individual monitoring records collected and maintained for occupational exposure resulting from activities excluded from 10 CFR 835 (e.g. work for the NRC)?
- Are these records used to assess compliance with the dose limits in §835.202?
- Per §835.4, are the quantities for radioactivity, absorbed dose, equivalent dose and exposure, used in records indicated in units of curie (becquerel), rad (gray), rem (sievert), or roentgen?
- Are records maintained to document doses received by all individuals for whom monitoring was required pursuant to § 835.402 and to document doses received during planned special exposures, unplanned doses exceeding the monitoring thresholds of § 835.402, and authorized emergency exposures?
- Are the results of individual external and internal dose monitoring that is performed, but not required by § 835.402, recorded? Recording of nonuniform equivalent dose to the skin is not required if the dose is less than 2 percent of the limit specified for the skin at § 835.202(a)(4).
- Are the records sufficient to evaluate compliance with the dose limits in subpart C of 10 CFR 835?

- Are the records sufficient to provide dose information necessary to complete reports required by subpart I of 10 CFR 835?
- Do the records include the following quantities for external dose received during the year: (i) The effective dose from external sources of radiation (equivalent dose to the whole body may be used as effective dose for external exposure); (ii) The equivalent dose to the lens of the eye; (iii) The equivalent dose to the skin; and (iv) The equivalent dose to the extremities?
- Do the records include the following information for internal dose resulting from intakes received during the year: (i) Committed effective dose; (ii) Committed equivalent dose to any organ or tissue of concern; and (iii) Identity of radionuclides?
- Do the records include the following quantities for the summation of the external and internal dose: (i) Total effective dose in a year; (ii) For any organ or tissue assigned an internal dose during the year, the sum of the equivalent dose to the whole body from external exposures and the committed equivalent dose to that organ or tissue; and (iii) Cumulative total effective dose?
- Do the records include the equivalent dose to the embryo/fetus of a declared pregnant worker?
- Has documentation of all occupational doses received during the current year, (except for doses from planned special exposures and emergency exposures) been obtained to demonstrate compliance with the dose limits in § 835.202(a)?
- Have reasonable efforts been made to obtain complete records of prior years occupational internal and external doses for workers monitored in accordance with § 835.402?
- Are the records specified in this section that are identified with a specific individual readily available to that individual?
- Have data necessary to allow future verification or reassessment of the recorded doses been recorded?
- Does the records management program include a process to ensure that all records required by this section will be transferred to the DOE upon cessation of activities at the site that could cause exposure to individuals?
- Have the results of monitoring for radiation and radioactive material as required by subparts E and L of this part (except for monitoring required by § 835.1102(d)) been documented and maintained?
- Have the results of monitoring used to determine individual occupational dose from external and internal sources been documented and maintained?
- Have the results of monitoring for the release and control of material and equipment (as required by § 835.1101(d)) been documented and maintained?
- Have the results of maintenance and calibration performed on instruments and equipment (as required by § 835.401(b)).been documented and maintained?
- Have training records been maintained, to demonstrate compliance with § 835.901?
- Have actions taken to maintain occupational exposures ALARA (including the actions required for this purpose by § 835.101, as well as facility design and control actions required by §§ 835.1001, 835.1002, and 835.1003), been documented?
- Have records been maintained to document the results of internal audits and other reviews of program content and implementation?
- Have records containing written declarations of pregnancy, including the estimated date of conception, and revocations of declarations of pregnancy been maintained?
- Have changes in equipment, techniques, and procedures used for monitoring been documented?
- Have records been maintained to demonstrate compliance with the requirements o for sealed radioactive source control, inventory, and source leak tests?

Performance Objective10: Reports to Individuals

- Have annual reports of dose been sent to individuals?
- Did the reports contain the required information?
- Did any unmonitored individuals receive occupational dose and receive annual reports?
- Were terminated employees provided termination reports?
- Were employees provided their records upon request?

Performance Objective 11: Radiation Safety Training

- For GERT equivalent, has each individual completed radiation safety training on the topics established at § 835.901(c) commensurate with the hazards in the area and the required controls?
- Was the training provided/required before individuals were permitted unescorted access to controlled areas?
- Was the training provided/required before individuals received occupational dose during access to controlled areas at a DOE site or facility?
- Was the training provided/required before individuals were permitted unescorted access to radiological areas?
- Was the training provided/required before performing unescorted assignments as a radiological worker?
- Have individuals completed radiation safety training, examinations, and performance demonstrations required for entry to the area and performance of the work?
- Do procedures require that all escorted individuals comply with the documented radiation protection program?
- Does the retraining include successful completion of an examination?

Performance Objective 12: Limits for Embryo/Fetus

- Were any written declarations of pregnancy submitted?
- Were any written declarations of pregnancy withdrawn?
- Do records indicate that continuation of the work assignment would lead to doses that exceed 0.5 rem?
- Were work restrictions developed to avoid exceeding 0.5 rem exposure?
- Are doses properly calculated?