INSPECTION PROCEDURE 71124 ATTACHMENT 02

OCCUPATIONAL ALARA PLANNING AND CONTROLS

Effective Date: January 1, 2020

PROGRAM APPLICABILITY: IMC 2515 App A

CORNERSTONES: Occupational Radiation Safety

INSPECTION BASES: See IMC 0308 Attachment 2

SAMPLE REQUIREMENTS:

Sample Requirements		Minimum Baseline Sample Completion Requirements		Budgeted Range	
Sample Type	Section(s)	Frequency	Sample Size	Samples	Hours
Radiological Work Planning	03.01	Biennial	3 per site	3-5 per site	46 +/- 14 per site
Verification of Dose Estimates and Exposure Tracking Systems	03.02	Biennial	3 per site	3-5 per site	
Implementation of ALARA and Radiological Work Controls	03.03	Biennial	2 per site	2-4 per site	
Radiation Worker Performance	03.04	Biennial	1 per site	1 per site	

71124.02-01 INSPECTION OBJECTIVES

01.01 Assess licensee performance with respect to maintaining individual and collective radiation exposures as low as is reasonably achievable (TEDE). This inspection will determine whether the licensee's ALARA program, including administrative, operational, and engineering controls, is effectively maintaining occupational exposure ALARA.

01.02 To conduct a routine review of problem identification and resolution activities per Inspection Procedure (IP) 71152, "Problem Identification and Resolution."

71124.02-02 GENERAL GUIDANCE

Inspectors should perform most of this attachment during an outage, in order that the inspector can directly observe the licensee's ALARA process activities; including planning, implementation of radiological work controls, execution of work activities, and ALARA review of work-in-progress. The remainder of this attachment is inspected as a post-outage review. For inspection activities that require comparison of planned vs. actual ALARA goals, it is acceptable to review the results from the most recently completed outage if there are no completed activities to review during the current outage.

Normally, a minimum of 32 hours should be assessed for plants appearing in the top quartile (i.e., lowest dose) of the plant ranking based on TYRA collective dose. A maximum of 60 hours should be assessed for the plants appearing in the bottom quartile (highest dose). The plants in the second and third quartiles should receive an average of 46 inspection hours biennially. Adjustments to these inspection hours can be made (either an increase or decrease of hours within the range of 32 to 60 hours), based on the source term and overall effectiveness of a licensee's previous and ongoing ALARA and source term reduction efforts. Average contact dose rate measurements of reactor coolant piping can be used as an indicator of the plant's source term.

This inspection should be planned in order that the inspector can directly observe the licensee's ALARA process activities; including planning, implementation of radiological work controls, execution of work activities, and ALARA review of work-in-progress.

Inspectors should review pertinent information regarding overall collective exposure history, current exposure trends, current source term and ongoing or planned work activities. The overall collective exposure performance will be used as an input to establish the resources required to complete this inspection attachment and to provide a perspective on significance for any resulting inspection finding assessment. Factors such as the noted trends in performance and the scope of upcoming radiological work may be considered in determining the level of inspection resources.

The Office of Nuclear Reactor Regulation will calculate and disseminate to the regions, on an annual basis, the annual collective dose histories, three-year rolling averages (TYRA), and plant quartile information for both pressurized-water reactors (PWRs) and boiling-water reactors (BWRs). The quartile standing of the licensee's TYRA is used as another input to assess the current level of challenge to the licensee's program.

Inspectors should review the licensee's annual collective dose histories, TYRA, and quartile rankings. Plant annual collective exposures, along with the TYRA collective exposure and quartile rankings for each operating commercial nuclear plant, are also contained in NUREG-0713. The inspector should use the most recent annual collective exposure data available. If the licensee has recently submitted its 10 CFR 20.2206(c) report for the previous year, the inspector should use these data to calculate the TYRA collective exposure instead of the NUREG-0713 data.

Although 10 CFR Part 20, "Standards for Protection against Radiation," does not require licensees to make every possible effort to demonstrate optimized exposure performance, a high frequency of ALARA deficiencies may indicate a deficiency in the licensee's overall ALARA program in terms of the ability of different work groups (e.g., operations, radiation protection, maintenance, outage planning) to interface effectively with each other.

For each sample, conduct a routine review of problem identification and resolution activities using Inspection Procedure (IP) 71152, “Problem Identification and Resolution.” Per IP 71152, it is expected that routine reviews of PI&R activities should equate to approximately 10 to 15 percent of the resources estimated for the associated baseline cornerstone procedures, this is a general estimate only based on the overall effort expected to be expended in each strategic performance area. It is anticipated that the actual hours required to be expended may vary significantly from attachment to attachment, depending on the nature and complexity of the issues that arise at the particular facility. Overall, an effort should be made to remain within the 10 to 15 percent estimate on a strategic performance area basis. Inspection time spent assessing PI&R as part of the baseline procedure attachments should be charged to the corresponding baseline procedure.

71124.02-03 INSPECTION REQUIREMENTS

03.01 Radiological Work Planning Sample

Verify the integration of ALARA planning into work activities, procedures, and/or radiation work permits (RWP) and that plans identify appropriate dose reduction techniques for implementation.

Specific Guidance

a. Review a list of work activities (e.g., radiation work permits) ranked by actual or estimated exposure, that are in progress or were completed during the last outage, and select work activities of the highest exposure significance (i.e., 5 person-rem or greater), or that involve work in high dose rate areas.

   A work activity is one or more closely related tasks that the licensee has reasonably grouped together as a unit of work for the purpose of ALARA planning and work controls. In determining a reasonable grouping of radiological work, factors such as historical precedence, industry norms, and special circumstances should be considered.

b. Consider if the licensee has reasonably grouped the radiological work into work activities, based on historical precedence, industry norms, and/or special circumstances. Focus on work activities that accrued dose significantly greater than projected and approached or exceeded the 5 rem collective dose thresholds by 50% (see NRC Inspection Manual Chapter 0609, Appendix C, ALARA significance determination process).

   A work activity may have benefited from proper ALARA radiological work planning, yet exceeded its intended dose outcome because of unplanned and/or unexpected conditions or emergent work. Although the pressures of outage scheduling may impact the determination of what additional controls and other measures are reasonably achievable, the licensee is still required to manage these activities such that the resulting doses are ALARA.

c. ALARA work plans and dose reduction techniques should be commensurate with the radiological risk of the work activity and consider the overall benefit of the dose

reduction method to collective dose.

ALARA assessments should take into account decreased worker efficiency from use of respiratory protective devices and/or heat stress mitigation equipment (e.g., ice vests). A total effective dose equivalent (TEDE) ALARA evaluation may be used to document the planning for dose reduction based on use (or non-use) of respiratory protection equipment.

Consider if the licensee's work planning considered the use of remote technologies (such as teledosimetry, remote visual monitoring, and robotics) as a means to reduce dose and the use of dose reduction insights from industry operating experience and plant-specific lessons learned.

d. Compare the results achieved with the intended dose established in the licensee's ALARA planning for the selected work activities.

Consider person-hour estimates provided by maintenance planning and other groups to the radiation protection group with the actual work activity time results, and the accuracy of these time estimates. Consider the reasons for any inconsistencies between intended and actual work activity doses.

For work activity dose that significantly exceeds projections, consider evaluating the following:

1. The interfaces between operations, radiation protection, maintenance, maintenance planning, scheduling and engineering groups for interface problems or missing program elements,

2. The shielding requests generated by the radiation protection group with respect to dose rate reduction, assigned value, and engineering shielding responses for follow through, and

3. Whether work activity planning considers the benefits of dose rate reduction activities such as shielding provided by water-filled components/piping, job scheduling, and shielding and scaffolding installation and removal activities.

e. Determine if post-job/work activity reviews were conducted to identify lessons learned and that any lessons learned are tracked for future work activities. Licensees may use multiple means to track lessons learned (e.g., corrective action program, just in time training files, etc.).

03.02 Verification of Dose Estimates and Exposure Tracking Systems Sample

Verify licensee dose estimates for radiologically significant work activities are reasonable and that the licensee has established measures to track, trend and, if necessary, reduce occupational doses for work that is in progress.

Specific Guidance

a. If the work activity is a repetitive task (e.g., performed each outage), the inspector should consider if the licensee's planning process also considered long-term (e.g., over the life of the plant) cost-beneficial ALARA initiatives for exposure reduction. In addition, consider the licensee's ability to determine if doses for a work activity are ALARA, or whether they need to be reduced further, based on the source term reduction methods, and the accuracy of exposure estimates made in the planning process.

b. For licensees in the high collective dose quartile with a work activity dose that significantly exceeds projections, review the licensee's exposure tracking system and thresholds for re-evaluating dose estimates to assess the adequacy of ALARA planning. The level of exposure tracking detail, exposure report timeliness, and exposure report distribution are reviewed for assessment of keeping collective exposures ALARA.

c. Review the assumptions and bases for ALARA work planning documents. Exposure estimates should be based on reasonable assumptions (e.g., dose rates and work hour estimates) and correct calculations with some flexibility allowed for the expected variability caused by the limits of forecasting.

   Accurate exposure estimates usually require a detailed task analysis of the work activity. However, in cases of routine activities, the licensee may rely on previous experience to establish the intended dose and reasonable work controls, in lieu of detailed analysis. Look for bottom-up (aggregation of individual task estimates) exposure estimates corroborated by top-down (historical work activity dose rate times work activity duration) estimating methods. Use of past outage experience combined with additional industry experience can provide a reasonable exposure estimate approach.

   If exposure estimates appear questionable, use site-specific experience as the primary standard of comparison, and utilize industry data (as available) or actual work activity exposure data as a secondary standard of comparison to determine the reasonableness of licensee exposure estimates.

d. Evaluate the licensee's outcomes when adjusting exposure estimates, or re-planning work, when unexpected changes in scope or emergent work are encountered. Consider whether dose threshold criteria are established and followed to prompt additional reviews and/or additional ALARA planning and controls.

   During the conduct of radiologically significant maintenance work, the inspector should consider if licensee management was aware of the exposure status of the work and would intervene if exposure trends increased beyond exposure estimates.

   Determine whether the frequency of these adjustments call into question the adequacy of the original ALARA planning process. Determine if adjustments to exposure estimates (intended dose) are based on sound radiation protection and ALARA principles or if they are just adjusted to account for failures to control the work.

e. If applicable, review licensee evaluations of inconsistent or incongruent results from the licensee's intended radiological outcomes. For example, review failures to adequately plan work activities, failures to provide sufficient management oversight of in-plant work activities, failures to conduct work activities without significant rework, failures to implement radiological controls as planned, etc.

Consider if licensees are implementing reasonable ALARA programs based on the licensee's ALARA evaluations. Place particular focus on higher dose work activities.

When collective dose for work activities is not tracking true to projections, licensee actions should revolve around evaluation and implementation of in-field dose reduction strategies and not be limited to dose estimating activities.

03.03 Implementation of ALARA and Radiological Work Controls Sample

Verify adequate ALARA and radiological work controls are appropriately communicated and implemented.

Specific Guidance

a. Review the licensee's administrative, operational, and engineering controls planned for the radiologically significant outage or on-line maintenance work activities and review the integration of radiological work controls and ALARA requirements into work packages, work procedures and/or RWP documents. Administrative, engineering and operational controls include, but are not limited to procedures, RWPs, ALARA Plans, TEDE ALARA Evaluations, work orders, etc. Engineering controls include temporary and permanent (e.g., lead, tungsten, and water) shielding, system flushing, permanent and portable ventilation systems, glove bags, tents, etc. Operational controls include work sequencing, work scheduling, and other operational dose mitigation strategies such as consideration of the benefits of dose rate reduction activities provided by water filled components/piping, maintaining steam generators full when working on reactor coolant pumps, etc.

b. Observe risk-significant work activities taking place in high radiation, locked high radiation or very high radiation areas whenever possible. Also consider evaluating work activities that involve hard-to-detect isotopes, alpha contamination and/or respirable radiation hazards. Focus on work activities that present radiological risk to workers in terms of high collective doses, high individual doses, diving activities in or around spent fuel or highly activated material, or that involves potentially changing (deteriorating) radiological conditions for detailed review.

b. Observe in-plant work activities and consider whether the licensee has effectively integrated the planned administrative, operational, and engineering controls into the actual field work.

c. Observe in-plant work activities and consider whether the licensee is tracking doses, performing timely in-progress reviews, and, when jobs are not trending as expected, consider if the licensee appropriately communicates methods to reduce dose.

Consider if health physics and ALARA staff are involved with the management of radiological work control if/when in-field activities deviate from the planned controls

(e.g., RWP, ALARA plans, work order instructions, radiological hold points, and stop work criteria).

Consider if the Outage Control Center and station management provide sufficient support for ALARA re-planning as needed.

d. ALARA staff should be involved with emergent work activities during outage or on-line maintenance. Specifically, ALARA activities should involve evaluation and implementation of in-field dose reduction strategies and not limited to dose estimating activities. Emergent work activities create the need for prompt ALARA planning to achieve dose reductions, such as procedure review, work controls, shielding and worker pre-job ALARA briefings for dose intensive tasks.

When possible, attend in-progress review discussions, outage status meetings, and/or ALARA committee meetings.

e. Compare the radiological results achieved (e.g., individual radiological exposures, collective radiological exposures, personnel contamination events, radiological intakes/ uptakes, electronic dosimeter alarms) with the intended radiological outcomes.

f. Consider if the licensee captures lessons learned for use in the next outage.

03.04 Radiation Worker Performance Sample

Verify workers are implementing appropriate ALARA techniques commensurate with the radiological hazards and the work involved.

Specific Guidance

a. Observe radiation worker and radiation protection technician implementation of ALARA techniques during work activities being performed in radiation areas, airborne radioactivity areas, or high radiation areas. Concentrate on work activities that present the greatest radiological risk to workers. (This review can be performed in concert with the inspection of exposure controls and work coverage in Inspection Procedure 71124.01).

Radiation workers should be utilizing the low dose waiting areas to maintain their doses ALARA (e.g., moving to the low dose waiting area when subjected to temporary work delays).

b. Observe radiation worker performance to determine whether the training and skill level are sufficient with respect to the radiological hazards and the work involved. Consider if workers demonstrate the ALARA philosophy in practice (e.g., workers are familiar with the work activity scope and tools to be used, workers use ALARA low-dose waiting areas) and follow procedures (e.g., workers are complying with work activity controls).

c. Interview individuals from selected work groups to assess their knowledge and awareness of planned and/or implemented radiological and ALARA work controls.

Work groups (e.g., craft personnel, supervisors, managers and radiation safety staff) should be aware of ALARA controls and should receive appropriate on-the-job

supervision to ensure the ALARA requirements are met. First-line job supervisor should be ensuring the work activity is conducted in a dose efficient manner (e.g., work crew size minimized, workers properly trained, proper tools and equipment available at start of job).

71124.02-04 REFERENCES

10 CFR Part 20, “Standards for Protection Against Radiation”

Inspection 71124.01, “Radiological Hazard Assessment and Exposure Controls”

Inspection Procedure 71152, “Problem Identification and Resolution”

Inspection Manual Chapter 0609, Appendix C, “Occupational Radiation Safety Significant Determination Process”

NUREG-0713, “Occupational Radiation Exposure at Commercial Nuclear Power Reactors and Other Facilities”

END

Revision History for IP 71124.02

Commitment Tracking Number	Accession Number Issue Date Change Notice	Description of Change	Description of Training Required and Completion Date	Comment Resolution and Closed Feedback Form Accession Number (Pre-Decisional, Non-Public Information)
N/A	12/02/09 CN 09-030	Conducted four year search for commitments and found none. This new procedure is being issued as a result of the 2009 ROP IP Realignment. It supersedes inspection requirements in IP 71121 and 71122.	YES 09/09/2009	ML092810389
N/A	ML15344A278 03/02/16 CN 16-009	Revisions to the IP 71124.02 procedure attachment were made in response to the 2013 ROP Enhancement Project. The revisions clarified the existing inspection requirements and enhanced the inspection guidance section. The revision also changes how inspection samples are counted. In addition, a feedback form was incorporated.	N/A	ML15344A308 Closed FBF 71124.02-1762 ML15352A239

Commitment Tracking Number	Accession Number Issue Date Change Notice	Description of Change	Description of Training Required and Completion Date	Comment Resolution and Closed Feedback Form Accession Number (Pre-Decisional, Non-Public Information)
N/A	ML17286A285 12/21/17 CN 17-031	Major editorial revision of IP 71124.02. Section 02 was audited and modified to move guidance to Section 03 and concisely state actions necessary to complete each requirement Changed biennial hours from avg of 54 to 46, with min of 36 and max of 64. Moved these hours to 71124.01 by increasing annual hours by 4. Added "(depending on the resource estimate from Section 04)" to each requirement with a sample range to allow inspectors to more readily modulate effort per Section 04. PI&R was transitioned from an independent sample to a requirement that would be completed as part of each sample. Guidance section updated to reflect resource estimates for routine review of PI&R activities per IP 71152 Section 04.01.	Verbal discussion of changes during 2017 HP Counterpart meeting, 09/06/2017	ML17300A471

Commitment Tracking Number	Accession Number Issue Date Change Notice	Description of Change	Description of Training Required and Completion Date	Comment Resolution and Closed Feedback Form Accession Number (Pre-Decisional, Non-Public Information)
N/A	ML19253D144 12/23/19 CN 19-042	Major editorial revisions of IP 71124.02 to conform with IMC 0040 formatting guidance	Verbal discussion of changes during 2019 HP Counterpart Meeting. 09/04/2019	ML19253D167