

NRC INSPECTION MANUAL

CNRI/DOCP/RAB

INSPECTION MANUAL CHAPTER 0609 APPENDIX C

OCCUPATIONAL RADIATION SAFETY SIGNIFICANCE DETERMINATION PROCESS

Effective Date: August 3, 2026

Table of Contents

0609C-01	INTRODUCTION	1
01.00	Definitions.....	1
0609C-02	GUIDANCE	3
02.00	More-than-Minor Screening Guidance	3
02.01	Significance determination process for occupational radiation safety	4
	Figure 1 - Occupational Radiation Safety SDP	6
	Attachment 1: Revision History for IMC 0609 Appendix C	1

The significance determination process (SDP) in this appendix is designed to provide a means by which NRC inspectors and management can assess the significance of performance deficiencies related to worker health and safety from exposure to radiation from licensed or unlicensed radioactive materials during routine operations of civilian nuclear reactors.

Background and basis information related to this SDP can be found in Inspection Manual Chapter 0308, "Reactor Oversight Process (ROP) Basis Document," Attachment 3, Appendix C, "Technical Basis for Occupational Radiation Safety Significance Determination Process."

01.00 DEFINITIONS

Within this SDP, the following definitions apply:

- a. Compromised ability to assess dose. Deficient program requirements (e.g., inadequate procedures that resulted in program failures), or failures to implement adequate program requirements, that resulted in a failure to measure or account for exposures that exceed, or could have exceeded:

1. an acute intake of radionuclides greater than 0.02 annual level of intake (ALI), per individual, or
2. 100 mrem whole body from external exposure, per individual.

A compromised ability to assess dose may result from, but is not limited to the following::

- (a) the licensee's failure to use a National Voluntary Laboratory Accreditation Program (NVLAP) certified dosimeter processor when required by 10 CFR Part 20, or
 - (b) failure of the electronic dosimeters (EDs) to respond to, or record, radiation dose, or
 - (c) the improper calibration of instruments or monitors which are used as a basis for establishing protective controls, or
 - (d) the improper collection, analysis, or interpretation of bioassay data that results in missed or underestimated intakes of radioisotopes, or
 - (e) the failure to recognize a radiological hazard (e.g. the potential for exposure to alpha emitting radionuclides, resulting in failure to appropriately assess intakes of these radionuclides), or
 - (f) the improper application of dosimetry methodologies used for dose assessment e.g. (selection of or application of dosimetry models, dose reconstruction methods, or calculation techniques)
- b. Substantial potential for overexposure. An event presents a substantial potential when it was fortuitous that the resulting exposure did not exceed the limits of 10 CFR 20. The concern is not the significance of the resulting, or potential, exposure, but whether the licensee provided adequate controls over the situation, as required, to ensure the Part 20 dose limits

are not exceeded. No credit is given for luck. When assessing whether a finding constitutes a substantial potential for overexposure, consider if it is possible to construct a reasonable scenario in which a minor alteration of circumstances (as they actually happened) would have resulted in a violation of the Part 20 limits. The following circumstances should be considered:

1. Timing: Could the exposure period have reasonably been longer?

EXAMPLE: An individual in the proximity of an unknown source of radiation receives an unplanned excessive exposure. Because of the duration of the exposure, no limits were exceeded; however, the individual could have reasonably stayed in the proximity of the source long enough to be overexposed.

2. Source Strength: Could the radiation source have reasonably been stronger?

EXAMPLE: While working in the spent fuel transfer canal a worker picked up and handled a piece of activated debris, contrary to the RWP instructions. Although this deficiency did not result in an overexposure, similar (but more highly activated) debris was in the same area of the transfer canal. Had the worker picked up one of the more activated pieces of debris, his actions would have resulted in a dose in excess of the Part 20 limits. Nothing prevented the worker from picking up the more highly activated debris.

3. Distance: Could the person have reasonably been closer to the source?

EXAMPLE: In example (1) above, the individual could have been overexposed by standing closer to the source of the radiation.

4. Shielding: Could some unintended shielding have been reasonably removed?

EXAMPLE: A radioactive source (i.e., activated component) was left in a work area such that the only thing preventing the overexposure of an individual worker was the shielding provided by intervening equipment. This was not part of the work activity. The presence of the equipment was fortuitous and nothing prevented the source from being left in an area that would not have provided shielding.

- c. Unplanned, unintended occupational dose. A single occurrence in which an individual receives occupational radiation dose that was not part of the planned or authorized activity due to the failure or degradation of one or more radiation protection controls. This occurs when required barriers, postings, surveys, access controls, or radiological work practices do not function as intended, resulting in dose that should have been prevented.

Examples of conditions that may result in unplanned, unintended occupational dose include, but are not limited to:

- (a) failure to post or secure a radiological area, or
- (b) inadequate access control, or
- (c) missed or incorrect surveys, or
- (d) workers not being informed of radiological conditions, or

(e) failure to follow required radiological work controls

0609C-02 GUIDANCE

02.00 MORE-THAN-MINOR SCREENING GUIDANCE

Each issue entering the SDP process must first be screened using the more-than-Minor (MTM) criteria in this section.

The screening criteria in this section apply to all performance deficiencies (PDs) in the occupational radiation safety cornerstone. These criteria exist in three general areas: (1) a regulatory dose limit being exceeded or when the PD presents a substantial potential for overexposure; (2) unplanned, unintended exposure situation; and (3) failure of a radiation protection program barrier. PDs that do not fall within these general areas are Minor.

A radiation protection program is composed of several barriers designed to provide adequate protection of occupational and public health and safety through defense-in-depth. A radiation protection barrier is a fundamental program element that serves a specific radiation safety function. For the purposes of this SDP the radiation protection program barriers are: (1) hazard identification (e.g., surveys and characterization of radiological hazards associated with hard-to-detect radionuclides); (2) hazard control (e.g., briefings, radiation work permits (RWPs), physical barriers, field oversight, and other engineering controls); and (3) personnel monitoring. A Minor PD in the implementation of a single radiation protection barrier results in a minimal reduction in the protection of health and safety. However, a PD that renders a radiation protection program barrier ineffective, or indicates that a barrier is ineffective, would be appropriately classified as a MTM PD.

The MTM criteria are intended to: (1) ensure that PDs that could result in findings of higher significance are appropriately screened through the applicable SDP criteria, and (2) ensure that issues that represent failures of radiation protection program barriers are documented in inspection reports to facilitate future follow-up in problem identification and resolution inspections and for operating experience purposes.

The following screening considerations are evaluated in order to determine whether a PD screens as Minor or More-than-Minor:

- A. Did the performance deficiency result in an overexposure (i.e., regulatory dose limit being exceeded) or present a substantial potential for overexposure?
 - ☐ a. If NO, go to 02.00.B
 - ☐ b. If YES, then the PD is more-than-Minor
- B. Did the PD result in 100 mrem or more of unplanned, unintended effective dose (i.e., TEDE or TED) to a single individual?
 - ☐ a. If NO, go to 02.00.C
 - ☐ b. If YES, then the PD is more-than-Minor

C. Did the performance deficiency result in a failure of a radiation protection program barrier?

- ☐ a. If NO, Stop. PD is Minor.
- ☐ b. If YES, if any of the following apply, the PD is more-than-Minor; otherwise the PD is Minor.

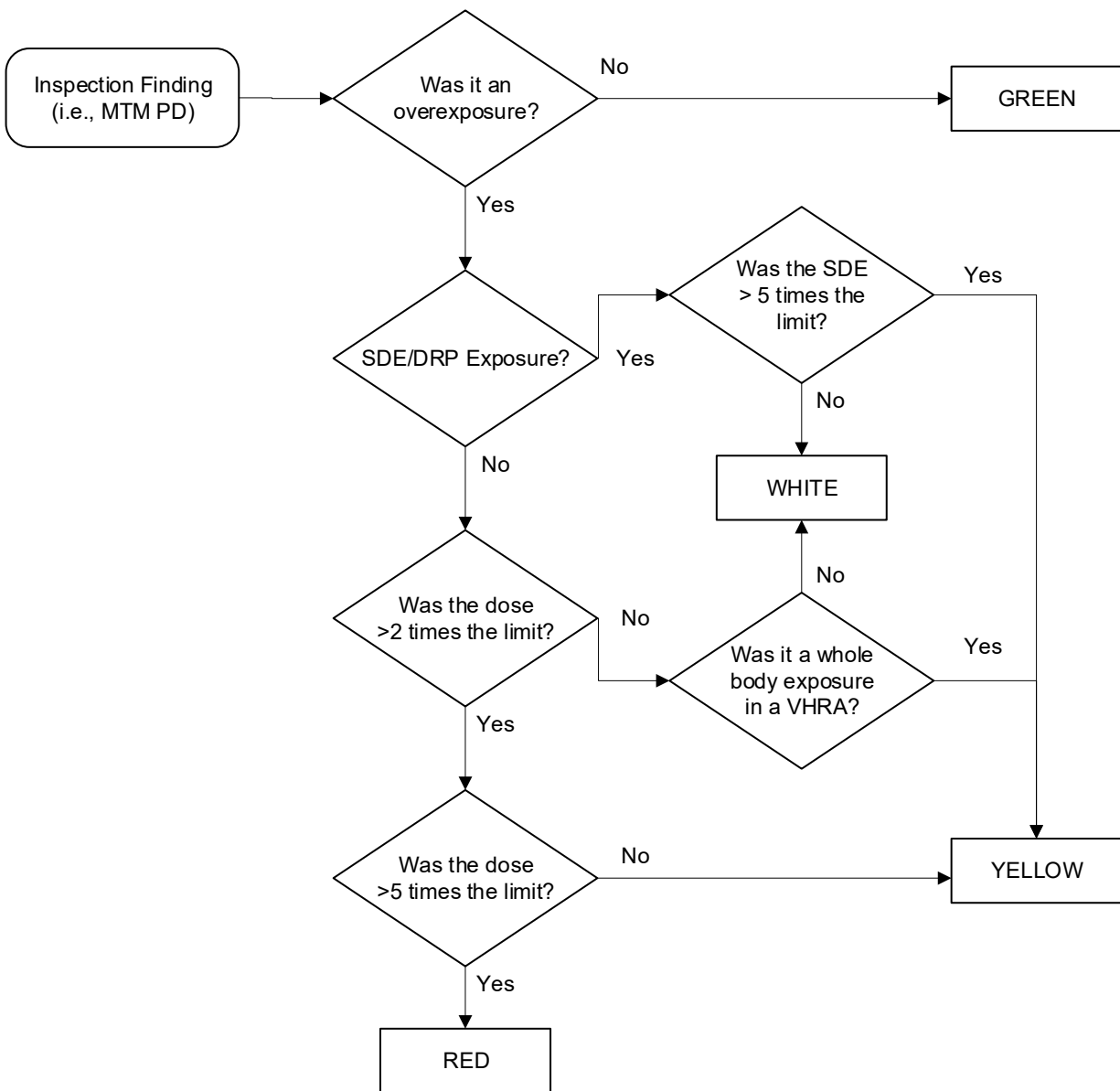
Barrier	MTM Criteria
Hazard Identification	In the case of a hazard characterized by an accessible external dose rate of 1,000 mrem/hour or more measured at 30 centimeters from the radiation source or 30 centimeters from any surface that the radiation penetrates, or an airborne radiological hazard of 100DAC or more, did the licensee fail to perform an adequate survey such that the hazard was not identified, or mischaracterized.
Hazard Control	In the case of a hazard characterized by an accessible external dose rate of 1,000 mrem/hour or more measured at 30 centimeters from the radiation sources or 30 centimeters from any surface that the radiation penetrates, or an airborne radiological hazard of 100DAC or more, did the licensee fail to implement adequate controls (either physical access controls, engineering or work controls, or field oversight).
Personnel Monitoring	Was there a compromised ability to assess dose, or was monitoring required, but not completed?

02.01 SIGNIFICANCE DETERMINATION PROCESS FOR OCCUPATIONAL RADIATION SAFETY

- Step 1. Identify if the inspection finding involved an overexposure.
- a. If the finding involves an overexposure, then go to Step 2.
 - b. If the finding DOES NOT involve an overexposure, then the finding is GREEN.
- Step 2. Identify if the exposure was a shallow dose equivalent from a discrete radioactive particle (SDE/DRP).
- a. If the overexposure was an SDE/DRP exposure, then go to Step 3.
 - b. If the overexposure WAS NOT an SDE/DRP exposure, then go to Step 4.

- Step 3. Consider the magnitude of the SDE.
- a. If the SDE was MORE than 5 times the limit, then the significance of the inspection finding is YELLOW.
 - b. If the SDE was LESS than, or equal to, 5 times the limit, then the significance of the inspection finding is WHITE.
- Step 4. Consider the dose when the overexposure is NOT an SDE/DRP exposure.
- a. If the dose was LESS than, or equal to, 2 times the limit go to Step 5.
 - b. If the dose was MORE than 2 times the limit, go to Step 6.
- Step 5. Consider the risk of an overexposure in a Very High Radiation Area
- a. If the dose limit was exceeded from external exposures while IN a Very High Radiation Area, then the significance is YELLOW.
 - b. If dose limit was exceeded from external exposures while NOT IN a Very High Radiation Area, then the significance is WHITE.
- Step 6. Consider the magnitude of the dose received.
- a. If the dose was MORE than 5 times the limit, then the significance of the inspection finding is RED.
 - b. If the dose was LESS than, or equal to, 5 times the limit, then the significance of the inspection finding is YELLOW.

Figure 1 - Occupational Radiation Safety SDP



Attachment 1: Revision History for IMC 0609 Appendix C

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)
	ML23318A438 04/21/00 CN 00-007	Initial issue.		
	ML020730751 03/06/02 CN 02-008	Revised to incorporate changes gained since its implementation and feedback from a series of public meetings with NEI staff and other stakeholders. Major revisions included: 1. The three-year rolling average collective dose criteria were moved from the screening questions in IMC 0612 (formerly 0610*) to IMC 0609. 2. The >50% and 5 person-rem criteria were moved from the screening questions in IMC 0612 (formerly 0610*) and are addressed in the text to provide guidance in determining if an ALARA issue is "more than minor." 3. Definitions of "unplanned, unintended collective dose" and "work activity" are provided. 4. The "greater than 2 occurrences in 18 months" criteria has been revised to "greater than 4 occurrences within a calendar year."		
	ML031820519 06/24/03 CN 03-020	Revised to conform to the recently revised basis for the Shallow Dose Equivalent (SDE) limit in 10CFR20 and the deletion of the former Enforcement Discretion for Hot Particles.		

N/A	ML040210250 12/16/03 CN 03-041	Added definition and criteria for determining when a licensee has a compromised ability to assess dose. Revised to expand the guidance for applying the SDP to Occupational Radiation Protection inspection issues. Specifically, the Appendix C text has been revised to clarify what is meant by the question of whether the licensee's ability to assess dose was compromised by an identified program deficiency. The term "programmatic" which caused confusion during a recent SERP, was replaced by additional text to clarify the concept. Also, additional quantitative examples of deficiencies that could have compromised the licensee's ability, are provided.	N/A	N/A
	ML081930811 08/19/08 CN 08-024	Revised definition of a substantial potential for overexposure; revised text to match flow diagram; revised text and flow diagram to bring SDP outcomes more in line with Enforcement Policy Supplements.	N/A	ML081930830 0609C-1192 0609C-1064
	ML26146A235 ML26215A249 08/03/2026 CN 26-035	Added more-than-Minor screening criteria. Removed ALARA from SDP consistent with agency response to EO 14300, Section (b). Removed "compromised ability to assess dose" and "substantial potential for overexposure" as thresholds for greater-than-green findings and repurposed them as indicators of performance deficiencies (PDs) that are more-than-Minor (MTM). Revised definitions to facilitate use. Added reference to improper application of dosimetry methods in definition of compromised ability to assess dose. Removed ALARA as SDP input. Updated Figure 1 to correspond with changes.		ML25274A088 ML26138A274