

**Staff Responses to Public Comments on Draft Regulatory Guide DG-8040
(Proposed Revision 2 of Regulatory Guide 8.24)**

(Public comments have been edited for clarity)

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Comments			NRC Comment Resolution
Originator	DG-8040 Section	Specific Comment	NRC Staff Response
NEI	General	Clarification is needed on whether this guidance applies to all licensed activities involving uranium, e.g., recycled irradiated uranium and handling for quality analysis of irradiated uranium fuel.	As stated in the Introduction, this guidance applies to plants licensed by the NRC to process enriched uranium and fabricate uranium fuel.
NEI	General	SECY-08-0197, Options to Revise Radiation Protection Regulations and Guidance with Respect to the 2007 Recommendations of the International Commission on Radiological Protection, explores options to bring 10 CFR [Part] 20 into line with the Recommendations of the International Commission on Radiological Protection (ICRP) in ICRP Publication 103. While there should be minimal impact from SECY-08-0197 to DG-8040 as currently written, RG 8.24 should be reevaluated if 10 CFR [Part] 20 is revised as a result of SECY-08-0197.	It is the practice of NRC to conform applicable guidance documents with amendments to NRC regulations.
NEI	Section B, "Discussion," paragraph 2	The references to Clearance Classes D, W and Y (ICRP 30) need to be updated to the ICRP 68 Clearance Classes "F, M and S." Uranium Users Group licensees have all been approved to use the more recent metabolic models for internal dosimetry. The statement concerning lung dose as per ICRP 30 should be deleted.	The reference in the Regulatory Guide is aligned with the regulatory position of the agency (see SECY-08-0197). Any modification to this Regulatory Guide to account for use of the ICRP 68 clearance classes will be handled as a separate action, assuming the Commission approves a final rule providing for use of the ICRP 68 clearance classes.

NEI	Section C 1.2, "Surveys of External Radiation Dose Rates"	Paragraph a: Although several dose rate scenarios are given, the actual dose rates will vary depending upon the enrichment of the uranium, contaminants and daughter products present if dealing with recycled irradiated uranium, and whether or not the fuel has been clad.	RG 8.24, Section C.1.2, Paragraph a, deletes the dose rate scenarios and includes the following sentence: "Pellet trays, fuel rods, fuel rod bundles and storage areas are all sources of external exposure and must be evaluated, taking into consideration enrichment, daughter products, contaminants, and cladding."
NEI	Section C 1.2, "Surveys of External Radiation Dose Rates"	Paragraph a: When dealing with the higher enrichments of uranium intermixed with fluorine, the generation of neutrons needs to be considered. There are no stated provisions for surveying for neutron dose rates or for neutron external dosimetry.	RG 8.24, Section C.1.2, Paragraph a, includes the following sentence: "Generally at fuel facilities, surveys of beta-gamma exposure fields are necessary to ensure that personnel dose is adequately monitored and controlled although surveys of neutron exposure fields may also be necessary (e.g., α, n reactions with ^{19}F may produce a relevant radiation hazard in some cases)."
NEI	Section C 1.3, "Measurements of Uranium Concentrations in Air"	This section addresses Air Sampling and should be revised to be more consistent with Regulatory Guide (RG) 8.25, <i>Air Sampling in the Workplace</i> (Rev 1, 1992) or deleted in its entirety and a reference to RG 8.25 added. For example, DG-8040 recommends changing air samples at least once a shift, but frequencies should be based upon radiological conditions. Also, a more detailed discussion of various compensation methods for radon/thoron daughter products collected during air sampling should be present in this section.	RG 8.24, Section C.1.3, Paragraph a, references RG 8.25 for more detail. A new Paragraph e was added to address the more common methods for radon/thoron compensation.
NEI	Section C 1.3, Paragraph a	The sentence should be altered to read "...and air monitors for early warning of significant unexpected releases."	The requested language was already set forth in DG-8040, Section C.1.3, Paragraph b. There is no change to RG 8.24 in this regard.
NEI	Section C 1.3, Paragraph b	Generally, air sampling with any of the methods described in this section should be commensurate with the risk and not required when airborne radioactivity does not exceed the monitoring threshold. The text should be changed to permit the use of lapel air samplers for the "basic	RG 8.24, Section C.1.3, Paragraph b. includes the following two sentences: "In general, the use of lapel samplers is an effective means to provide a basic evaluation of a worker's environment. The use of fixed or lapel

		evaluation of the exposure of workers" because lapel air samplers are more representative of what the individual worker has been exposed to than fixed air sample locations. The majority of workers handling unclad fuel utilize several distinct workstations throughout the course of their workdays. Depending upon a worker's vicinity to a fixed sampling point, the exposure may be significantly under or over estimated. Fixed location samplers are well suited for stationary work assignments if they occur, and for the basic evaluation of the air airborne concentrations and the effectiveness of contamination control practices and engineered solutions.	samplers should be evaluated to ensure that the sampling program is commensurate with the risk involved."
NEI	Section C 1.3, Paragraph d	Unless the counting instrumentation has a radon/thoron daughter compensation algorithm, then a one-time immediately counted air sample reading may not be sufficient to be providing warning of an airborne release of uranium. The presence of radon/thoron daughters will mask the uranium counts; if one were to rely solely on the gross counts present, then the results will be overestimated and cause false positives. Also, the last sentence should be removed. The sample counting rate error is not established every time a sample is counted as implied by this sentence. In addition, low level results will require prolonged counting times to achieve an accuracy level inconsistent with the level of potential intake.	DG-8040, Section C.1.3, Paragraph d. states samples should be counted a second time, after allowing a sufficient period for decay. RG 8.24 remains unchanged in this regard. The second counting does not preclude taking action when a high release is suspected. The last sentence of RG 8.24, Section C.1.3, Paragraph d., which replaced the last sentence of DG-8040, Section C.1.3, Paragraph d., reads: "A facility needs to address management of uncertainties and accuracy (Ref. 4)."
NEI	Section C 1.3, Paragraph e	Air sample filtering change out should be based on the potential for filter loading, impact on alpha self absorption and/or exposure or risk. Therefore, prescribing a change out every shift is not consistent with RG 8.25.	The second sentence of RG 8.24, Section C.1.3, Paragraph f., which replaced the second sentence of DG-8040, Section C.1.3, Paragraph e., reads: "Filter exchange frequency should be evaluated to address buildup of material on the filter media, which reduces the airflow."
NEI	Section C 1.3, Paragraph f	This section should be reworded to also include the intake limits for insoluble forms of uranium that would lead one to consider use of continuous air monitoring.	Limits are referred to generically, rather than specifically, by referring to 10 CFR 20.1201(e). Specific limits, in the form of concentrations may change over time, but the generic reference to a Derived Air Concentration is adequate. RG 8.24 remains unchanged in this

			regard.
NEI	Section C 1.3, Paragraph g	In addition to minimizing the length of the sampling line, there is also a need to minimize the number of turns/bends in the sampling line and to ensure that there are no sharp turns in the line. Additionally, the sample line needs to be made of a material that will not accumulate a static charge and that will be chemically unreactive to the chemical form of the uranium being collected. This section should also provide a reference or discussion of the optimal filter media to use for sample collection. Also, the word "maximize" should be changed to "optimize." Samples should be collected in such a manner as to ensure that the samples are collected isokinetically and will not preferentially size-select the uranium particles collected. Additionally, too high of a flow rate can collect radon/thoron daughter products faster than these products can decay; this buildup can result in a false alarm in a continuous air monitor. Section 1.4, Surface Contamination Surveys: Subsection 1.4.d states: "The accuracy of the calibration standard should be ± 2 percent of the stated value and traceable to a primary standard such as that maintained by the National Institute of Standards and Technology." <i>NCRP Report 112</i> lists $\pm 1-2$ percent as the typical uncertainty for the National Standard, while it recommends between 3 and 20 percent for the "primary standards for Field Level labs."	<p>The point of RG 8.24, Section C.1.3, Paragraph g. is to address worker safety and limitation. Reference 7 addresses all of the aspects of the comment provided and will not be restated here. This paragraph is not intended to address the accuracy of the calibration standard.</p> <p>RG 8.24, Section C.1.3, Paragraph g. uses the term "optimize," rather than "maximize," the term used in DG-8040,</p>
NEI	Section C 1.4, "Surface Contamination Surveys," Paragraph d	Sentence 1 should be reworded to "...and equipment should be within calibration and checked before..." otherwise it can be interpreted as needing to perform calibrations on a daily basis. However, this paragraph should be moved to Section 1.11, "Calibration of Radiation Safety Instruments." Also, the reference to bioassay monitoring is unnecessary as bioassay laboratories are NV-LAP accredited and must meet stringent requirements to retain their accreditation. These requirements include calibration and laboratory practices. The bioassay labs are overwhelmingly vendors and references to specific practices in this REG Guide should be in specific bioassay guidance.	<p>RG 8.24, Section C.1.4, Paragraph d. uses the phrase "within calibration" in response to the comment. The reference to "bioassay" was replaced with "friskers and monitors."</p> <p>In addition, RG 8.24, Section C 1.11, adds a new paragraph d. which states: "The accuracy of the calibration standard should be maintained at $\pm 3-20$ percent of the stated value for field activities and traceable to a primary standard, such as that maintained by the National Institute of Standards and Technology."</p>

NEI	Section C 1.4, "Surface Contamination Surveys," Paragraph e	This section implies that licensees have surface contamination limits. Rather, licensees have "acceptable levels" since there is no technical basis for surface contamination limits.	<p>The intent of RG 8.24, Section C.1.4,, Paragraph e. is that licensees will propose and justify allowable surface contamination limits, at which point decontamination will be implemented.</p> <p>The first two sentences of RG 8.24, Section C.1.4, Paragraph e. read: "The regulations in 10 CFR Part 20 do not specify limits for surface contamination. Each applicant may propose and justify surface contamination limits allowable before decontamination is required in each work area."</p> <p>The last sentence of RG 8.24, Section C.1.4, Paragraph e. reads: "Appendix A of this regulatory guide presents the contamination limits for controlled areas that the NRC staff considers acceptable and that the applicant does not need to justify."</p>
NEI	Section C 1.5, "Protective Equipment and Clothing Contamination Surveys"	There appears to be a conflict between the 200 dpm/100 cm ² for personal clothing specified in Section 1.5 and the free release limits (total contamination levels of 5000 dpm/100 cm ²) specified in Sections 1.5, 1.7 (Surveys of Equipment, Premises, or Scrap before Release for Uncontrolled Use) and Table 1 (Acceptable Surface Contamination Levels). As written, one would assume 200 dpm/100 cm ² applies to total contamination levels; however removable contamination surveys of personnel are not routinely performed.	RG 8.24, Section C.1.5 remains unchanged in this regard. The NRC staff finds that the level of 200 dpm per 100 cm ² (9×10^{-7} $\mu\text{Ci}/\text{cm}^2$) is acceptable and need not be justified by the applicant. Any level beyond the 200 dpm requires justification.
NEI	Section C 1.5 Paragraph b	Monitoring of protective clothing prior to doffing should be performed when there is reason to suspect the presence of contamination but is not necessary in all instances. Monitoring after doffing should always be performed. Use of proper doffing techniques significantly reduce the	Monitoring of protective clothing prior to doffing does not add value. The reference to survey of clothing prior to doffing is removed.

		potential for resuspension of material and hence inhalation.	
NEI	Section C 1.5, Paragraph d	Doffing activities are performed in an intermediate buffer area between the Controlled Area and the Uncontrolled Area. This can be thought of as the Warm area in the "Hot/Warm/Cold" zone naming convention. Also, this section incorrectly implies that surveys of personal clothing worn beneath protective clothing are required and that washing is typical after clothing removal. The last sentence of this section should be moved to Section 3, "Records of Surveys."	Personnel clothing worn beneath protective clothing is not assumed to be contaminant-free. RG 8.24, Section C.1.5, Paragraph d. states that if contamination levels exceed preselected limits upon doffing, the health physics office should be contacted for direction. The import of the statement is reinforced in Section C.3, in terms of record retention
NEI	Section C 1.5, Paragraph e	Personnel contamination survey should be performed prior to washing to indicate the effectiveness of the contamination controls and PPE selected. This information is lost if personnel wash first. Additionally, washing before survey increases the amount of radioactive waste generated.	RG 8.24, Section C.1.5, Paragraph b. Paragraph C.1.5.b. addresses the effectiveness of personnel survey. RG 8.24, Section C.1.5, Paragraph e. only addresses paying particular attention to certain areas prior to leaving change areas. Reference to washing prior to survey has been removed.
NEI	Section C 1.6, "Personal Surveys"	Sub-section 1.6b references Regulatory Guide 8.11, <i>Applications of Bioassay for Uranium</i> . The most recent revision to RG 8.11 was in 1974, and RG 8.11 is not consistent with current 10 CFR 20. RG 8.11 states: "The bioassay program described in this guide is applicable to the inhalation of uranium and its compounds, but does not include the more highly transportable compounds UF ₆ and UO ₂ F ₂ ."	RG 8.24, Section C.1.6, Paragraph b. deleted the reference to RG 8.11. ANSI-N13.22-1995, "Bioassay Program for Uranium" will be the only reference cited.
NEI	Section C 1.6, "Personal Surveys," Paragraph b	There should be a threshold criterion concerning the potential/suspected significant intake of uranium before collection of bioassay samples or nasal swabs. Most fuel facilities rely on air sampling to monitor intake and determine if follow up, is necessary which, based on this guidance, would result in unnecessary follow up.	Action levels are specified in ANSI-N13.22-1995, "Bioassay Program for Uranium."
NEI	Section C 1.10, "Leak Tests of Sources"	This section references Appendix A, <i>Leak Test Requirements</i> , stating: "Each source shall be tested for leakage at intervals not to exceed 6 months." A consistency review with recommendations of the following NRC Branch Technical Positions listed in NUREG 1520, section 4.4.7.3(13), is warranted:	Both DG-8040, Section C.1.10. and RG 8.24, Section C.10, state that the leak test should be conducted in accordance with the terms of the specific license. The intent is to incorporate the applicable requirements of NRC Branch Technical Positions into regulatory guidance.

		<p>License Condition for Leak-Testing Sealed Byproduct Material Sources (April 1993) License Condition for Leak-Testing Sealed Plutonium Sources (April 1993) License Condition for Plutonium Alpha Sources (April 1993) License Condition for Leak-Testing Sealed Source Which Contains Alpha and/or Beta-Gamma Emitters (April 1993) License Condition for Leak-Testing Sealed Uranium Sources (April 1993)</p>	
<p>NEI</p>	<p>Section C 1.8, "Surveys of Packages Received and Packages Prepared for Shipment"</p>	<p>Introduction: The first sentence would be better said as "the packages are subject to the normal surveys and procedural controls needed to control contamination and exposure for items moved within the facility." Knowledge of process or material nature (activated material for example) is likely to make the external and contamination issues well understood for some shipments. Many forms and amounts of radioactive materials have very limited external or contamination issues. Sentence 2: Include a statement in this section that if packages containing radioactive material are offered for transportation and packages are still in transit than the labeling must comply with the requirements of DOT 49 CFR 172.400. Surveys for contamination and exposure control as the same as the shipping survey. Usually the final (outgoing) shipment surveys are conducted in specific low background areas to enhance the accuracy of the measurements. Package opening- The package opening requirements are overly prescriptive. Opening the interior packaging containing loose (dispersible) radioactive material is not performed in the receiving, warehouse, or shipping areas, but in controlled areas. A more generic statement such as "appropriate controls should be exercised in opening packages" [sic] Sealed sources are not the same as fine powder, many shipments have multiple layers of enclosure, many shipments are low level. Shipping casks may be opened under water or in a prepared bay. The last sentence in the section should read packages may not be released for shipment unless</p>	<p>Introduction: DG-8040, Section C 1.8, specifies that the requirements of 10 CFR 20.1906, 'Procedures for Receiving and Opening Packages' applies. Sentence 2: RG 8.24, Section C.1.8, includes a reference to 10 CFR Part 71, which in turn refers to DOT regulations (via 10 CFR 71.5). In addition, the last sentence of Section 1.8 states the general applicability of 10 CFR Part 49 requirements. Package Opening: While no specific prescription for opening packages are included, the generic suggestion is noted and included in Section C.1.8: "Appropriate controls should be exercised in opening packages." Statement is already included that addresses evaluation of radiation and contamination levels in regards to shipment per 10 CFR Part 49. Shipment or transfer: Staff views the term "transfer" broadly. It is understood that movements within the exterior boundaries of a plant site that do not involve use of public roads would not be subject to Title 49 CFR.</p>

		external radiation and contamination levels satisfy the requirements of Title 49. Transfer often refers to movement within a specific site. As long as radioactive material movement does not use public roadways et al, Title 49 does not apply.	
NEI	Section C 1.12, "Ventilation Surveys," Paragraph a	<p>As in previous sections, state the regulatory or guidance references for the technical requirements of this section. For control of particulate contamination, the necessary capture velocity is not a singular number but depends on the hood configuration, size of the contaminant, velocity imparted to the contaminant, and velocity of competing air streams. Guidance for selection of the proper fume hood airflow velocity is provided in "Industrial Ventilation," 26th Edition by the ACGIH. Per this reference, the maximum control velocity at the face of a fume hood should not exceed 125 feet per minute (fpm) because of the creation of eddies in front of the operator that will pull airborne material into the workers breathing zone. For some operations, face velocities in the range of 80 to 100 fpm are acceptable and should not lead to stoppage of work. Linear flow and the absence of eddies is more important than velocity.</p> <p>Also, the frequency of checking the pressure drop across the fume hood filters should be dependent upon the frequency of usage of the fume hood and the observed pressure drop indicated on the magnehelic or manometer. Another option for checking the operability of the fume hood prior to use is an airflow indicating device mounted inside the fume hood. Prior to use, the operator also needs to ensure that the sash of the hood is in the proper position. Finally, there should be caveat that that the recommendations are applicable to hoods and enclosures where there is a propensity to resuspend radioactive materials in air as a result of the physical or chemical properties of the material or actions of personnel or equipment.</p>	<p>RG 8.24, Section C.1.12, Paragraph b. adds references for Reg Guide 8.15, for survey frequency, and for "Industrial Ventilation," 26th Edition by the American Conference of Industrial Hygienists (ACGIH), for selection of the proper fume hood airflow velocity.</p> <p>The NRC staff has determined that Section C.1.12, paragraph a. is adequate and staff will not specify the variables upon which the frequency of checking the pressure drop across the fume hood filters is dependent. Likewise, the staff will not specify the options for checking the operability of fume hood.</p>
NEI	Section C 1.12,	References to glovebox "flow rate" should be removed from	RG 8.24, Section C.1.12, Paragraph b., third

	"Ventilation Surveys," Paragraph b, Sentence 3	this section unless they are explicitly used in the context of an air-locked antechamber. Daily operability of glovebox enclosures includes glove inspections and checking the pressure difference between the glovebox interior and the room. A glovebox that is not operating at the pre-determined specifications should be removed from service until repairs can be affected.	sentence, revised to read: "In addition to these surveys, each enclosure should be equipped with a device that indicates operability." Revisions also made to the fourth sentence to remove references to "flow rates." RG 8.24, Section C.1.12, Paragraph b. adds a final sentence to reflect the principle that a glovebox that is not operating at the pre-determined specifications should be removed from service until repairs can be affected.
NEI	Section C 3 "Records of Surveys," Paragraph c	<p>This section implies that a signature for the person making a record entry must follow each entry. Instead, a signature is record for each document produced not each entry. Please clarify.</p> <p>Part 3(a)-External radiation, weighted organ doses, weighted total exposure are dealt with in another Regulatory Guide. External exposures, multiple badging and variable external radiation fields and external doses are typically far less important at Fuel Cycle Facilities than internal dose. The weighted system is optional for external dose and should be specified as such.</p>	<p>The sentence "[t]he signature of the person making the record and the data should appear on the same page immediately following each record entry" is unchanged from RG 8.24, Rev. 1 (October 1979). The signature per record entry is the practice acceptable to staff for recordkeeping purposes and this sentence remains in place with Revision 2. An applicant may submit an alternative recordkeeping procedure for review.</p> <p>Section C.3 provides the methods and practices acceptable to staff for showing compliance with the recordkeeping requirements of 10 CFR Part 20. The NRC staff makes no distinction between the relative importance of external exposures and internal exposures at fuel cycle facilities.</p>
NEI	Table 2, "Survey Frequencies"	Routine survey frequencies specify "active processing areas" with a monthly frequency. DG-8040 should clarify the term "active" applies to those areas listed in Table 2 and table 2 should not include air sampling.	Table 2 has been relabeled as Appendix B in RG 8.24, Revision 2. The term "active" has been replaced by the term "operational." The comment does not provide a basis as to why air sampling should not be included in Appendix B. Revision 2 retains air sampling in Appendix B. An applicant may submit alternative air sampling frequencies for review.
NEI	Table 2, "Uranium receiving,"	Opening the interior packaging containing loose (dispersible) radioactive material is not performed in the receiving, warehouse, or shipping areas. Material	Table 2 (now Appendix B in RG 8.24) makes no reference to opening of packages. Section C.1.8 addresses package opening. An

	warehousing, shipping"	packaged in DOT-compliant packaging or in sealed containers are not opened in these areas and so the presence of removable surface contamination is a low potential and the surveys should be performed "quarterly". Additionally, it should be recognized that routine air sampling in these areas may not be warranted.	applicant may submit an alternative justification for performing less than monthly surveys.
NEI	Table 2, "Fuel assembly, inspection, storage"	The necessary frequency of contamination surveys and routine air sampling depend upon whether this line refers to these stations inside or outside of a Controlled Area because these activities are performed several times through the manufacturing process. Tasks performed on fuel that has not been fully clad are performed inside a Controlled Area. Tasks performed on fuel that has been clad are performed in the Uncontrolled Area. Fuel cladding is designed to withstand the physical forces present inside an operating reactor core and because of this robustness, clad fuel areas do not warrant routine air sampling.	An applicant may submit an alternative proposal to the guidance of this regulatory guide.
NEI	References	The References section needs to be amended to include the Regulatory Position Statements frequently referenced in this document. These include Regulatory Positions C.2, C.3 and C.1.4. If these cannot be included on the list, then copies should be attached to this document.	Comment is unclear. References to the applicable NRC regulations (10 CFR Part 20) are cited throughout this regulatory guide.