From: Lester Slaback <Lester.Slaback@NIST.GOV>
To: <pdr@nrc.gov>
Date: 3/6/01 9:38AM
Subject: comments on NUREG-1736

The address dlm1@nrc.gov for NUREG-1736 comments appears to no longer be valid. Attached are my comments if they are still being accepted.

Disclaimer: the above are the personal musings of the author, and do not represent any past, present, or future position of NIST, the U.S. government, or anyone else who might think that they are in a position of authority.

Lester Slaback, Jr. [Lester.Slaback@NIST.GOV]
NBSR Health Physics
Center for Neutron Research
NIST
100 Bureau Dr. STOP 3543
Gaithersburg, MD 20899-3543
301 975-5810 voice
301 921-9847 fax

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(1)

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Add = A. Berlek (AFB)
C. Brown (CXB)

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Chief, Rules and Directives Division of Administrative Services
Office of Administration
U.S.N.R.C.
Washington, D.C. 20555-0001

Dear Sir:

This form of an annotated 10CFR20 should be a very useful document for many licensees. I hope the project will be carried to completion, and will be maintained in an up-to-date form on the Internet. Please consider the following comments on the draft NUREG-1736, Consolidated Guidance About Materials Licenses:

pg 3-5 (airborne radioactivity area): While it is outside the scope of this publication to change this definition, which was carried over from the old 10CFR20, it appears that it is disproportionate in comparison to the posting requirements for external sources of radiation exposure. At a 12 DAC-hour exposure in a week this posting threshold is equivalent to 0.75 mrem/hr compared to the lowest posting requirement for external sources of 5 mrem/hr. Some discussion as to why this lower threshold is important would aid the user in understanding the rule.

Pg 3-10 (*controlled area* discussion): The first sentence ending in "...in controlled or unrestricted areas." creates the impression that these are separate and distinct. The point should be made that a *controlled area* is just a special kind of *unrestricted area* with all the constraints of an *unrestricted area* .

Pg 3-12 (*distinguishable from background*): There is not any added discussion provided for this item despite voluminous guidance from NRC on this topic. Given that NRC has not established a replacement for BRC, and that voluminous guidance exists from NRC on this concept as applied to different regulatory issues, some discussion on this topic would be valuable for many of the licensees using this document.

Pg 3-13 (discussion of High Radiation Area): Presumably the example of inserting an arm into a port is referring to the upper arm since exposure to an extremity is not a basis for defining a *High Radiation Area*? Also presumably the source of the exposure is more than 30 cm distant from the arm given that element of the definition?

A further comment: Presumably the intent of the NRC in the definition of a *High Radiation Area* is to limit risk, i.e., to limit the potential for exposures that might exceed the limits. Elsewhere NRC has assumed a simplified (some would say simplistic) model for determining dose, *i.e.*, asserting that the highest exposed point represents the dose to be applied against the annual limit. While this model simplifies dosimetry and regulatory compliance interpretations it has the unintended consequence of making certain types of Radiation Area and High Radiation Area postings excessively conservative in terms of risk. These types are primarily those that represent partial body exposures and geometries that require unrealistic assumptions to achieve the exposure. The 'arm' example given represents both of these, *e.g.*, a partial body exposure that reflects a risk that is a small fraction of that for a similar whole body exposure and the default presumption that a person will fully insert the arm for at least an hour (for a field of 100 mrem/hr) through this small hole with no rationale for doing so. While this document is probably not the forum to introduce area averaging perhaps it is appropriate to discuss in more detail a more appropriate interpretation of what is meant by accessible. ANSI/ANS-15.11-1993 provides a candidate definition that might be considered. On the other hand, if such is not done then the offered discussion needs to be expanded to provide the NRC rationale of why small, partial body exposures at 100 mrem in one hour must be classified as *High Radiation Areas* so that the non-expert licensee can anticipate the NRC position.
As a last point this legalistic tightrope chain of thought (HRA - dose - highest exposed point - any point excluding the extremities) results in required posting in some situations where any reasonably trained worker knows that the associated risk is minimal, *e.g.*, for a square centimeter beam of radiation. This has the serious potential of devaluing the meaning and effectiveness of the *High Radiation Area* posting. Some guidance or warning to the licensee on this issue in this discussion is needed.

Pg 3-14 (*licensed material*): A discussion point should be added that material not classified as licensed by NRC might well be regulated by an Agreement State regulator.

Pg 3-15 (discussion of *member of the public*): NUREG/CR 6204 was published prior to the revision of the definition of the *member of the public*. Can one presume that 6204 responses were reviewed in light of the changes to the rule?

The revision to that definition was explicitly intended to ensure that mere presence in a *restricted area* was not a basis for being classified as occupationally exposed. I suggest that a person whose desk location results in exposure to a licensed source is not any more occupationally exposed that a member of the public walking through the area, or a person employed in a near by home subject to the same source of radiation. The draft sentence would basically result in everyone in a hospital or in a university being classed as occupationally exposed simply on the basis of proximity. Further it is not clear in this sentence how this proximity basis meets the requirement that "...the individual's assigned duties involve exposure ...". In one sentence in the discussion proximity is a basis and in another (the delivery person) it is not. Clarification is needed.

Pg 3-16 (*Occupational dose*): Some discussion to expand on the meaning of "... in the course of employment..." and "...in which the individual's duties involve exposure..." is needed. In the first case this does not require the receipt of money. In the second it requires something more than simple geographic proximity related to employment.

Pg 3-16 (*Planned Special Exposure*): For the vast majority of licensees this category of exposure clearly represents an extraordinary event. This point should be made in a discussion point.

Pg 3-13 (discussion of *restricted area*): Please expand this comment to clarify the NRC intent by requiring control over access to a *restricted area,* rather than simply *limiting* access as specified by the definition. The definition says access shall be limited, which according to the common dictionary definition of the words is a less stringent constraint than the word control.

In addition, security over access to radioactive material in restricted areas was a major issue several years ago, and remains one today. This aspect of a restricted area should be commented upon.

Pg 3-21 (*Weighting factor*): A comment cautioning licensees on the use of tables from post-1990 publications that might be using ICRP 60 models and values should be provided. A similar caution relating to neutron quality factors would also be appropriate.

Pg 3-22 (*Year*): A comment demonstrating how a licensee can change the year starting date without omitting a day or using the same day in consecutive years would be useful.

Pg 3-25 (Discussion of the unit roentgen): Clarify the discussion of kerma, and R. The quantity kerma is used in place of the quantity Exposure, and the unit 'rad' that is used with kerma replaces that of R which is used with Exposure. Further, the quantity kerma requires that the target medium be identified for the measurement to be meaningful. In the case of calibrations in place of the quantity Exposure the phrase 'air kerma' is typically used to make this point. Technically this would be different from a calibration in terms of 'tissue kerma', albeit a small difference in most instances. As a further note, while air kerma is used in place of Exposure in fact it is a different quantity with technical differences that users should be cognizant of.

Also see the previous comment about the need for a cautionary statement relating to the differing ICRP quality factors, and data derived from those.

Pg 3-31 (Discussion): While this is a nice explanation for the curious person can a statement be added that this section has no impact on any licensee activities and can be totally ignored? That would be a more practical comment for a licensee, albeit painful for the lawyers.

Pg 3-36 (Discussion): In fact a note of reality could be added. A survey of all major NRC licensees demonstrated that no licensee approached this criterion. If a licensee's operation was projected to approach this limit that operation should be carefully reviewed simply on the basis that it is not the norm for the industry. Providing such a scale would give the reader a practical perspective to judge a planned operation.

Pg 3-39 (Guidance statement): Very nice, succinct summary. Perhaps an added hint that eye dose is likely to need specific monitoring only when exposure to relatively high energy electrons occurs would be useful.

Pg 3-43 (Discussion: Almost every ... all tissue irradiated.) : This sentence is somewhat inaccurate. While the dose modeling for internal sources represents the best estimate that can practically be achieved the dose assignment for external exposures is purposefully biased towards the highest possible dose assignment, and hence frequently reflects an unrealistic risk. Slight rephrasing can avoid this issue while still expressing the main desired point, e.g., that external and internal assigned doses be summed in an equitable fashion. The subject of equitable risk is best addressed elsewhere.

Another point that should be mentioned to the reader is that there might be reasons other than 10CFR20 requirements for monitoring worker exposures, *e.g.*, liability, work practices, ALARA implementation. The licensee should consult appropriate professionals to discuss these issues.

Pg 3-45 (Guidance Statement, "The preferred method ..."): Very good point, but a stronger statement would be that "A dose estimated based on the Part 20 DAC value will seriously overestimate the dose in virtually all occupational exposure situations for most noble gas radionuclides. Hence the preferred method ...". Very simply, the semi-infinite hemisphere assumption used to calculate the numerical DAC values rarely exists in occupational exposure situations.

Pg 3-45, Note: The phrase "from *other* than noble gases" is confusing in this Note. As per pg 3-46 other than noble gas airborne radioactivity *should be* assessed by measurements and DAC values. Further this first sentence in the note conflicts with the second sentence. Presumably a uniform cloud of ^{41}Ar is not excluded by the conditions of the first sentence so it is implied that airborne radioactivity measures and DAC values should be used, which conflicts with the second sentence. The whole Note needs to be revised.

Pg 3-45, Discussion: It is the rare geometry where the internal dose from a noble gas (excluding radon isotopes and others with radioactive daughters) is controlling. It would not be much work for this document to identify those situations (e.g., the room size for a typical transition volume, which is likely to be the size of a very small closet) and simply state that for other exposure geometries the external source term is controlling.

Pg 3-45, 46: The Note on pg 3-45 states "airborne radioactivity measurements should not be used ..." but the Discussion on pg 3-46 states airborne radioactivity measurements should be used. Each addresses a different exposure geometry (e.g., external vs internal). For clarity the document should reinforce the context of these comments by adding a phrase like "from external sources" or "from internal deposition".

Pg 3-49, Statement of Applicability: This statement is presumably in the context of those licensees using the ALIs and DACs to assign a dose. Presumably this does not apply to those following the guidance on pg 3-46 to do direct bioassay and dose modeling, but do not derive an adjusted ALI or DAC. If this is not true then further clarification is needed.

Pg 3-58/9, Discussion: Have there been any Planned Special Exposures by materials licensees since this rule was created? If not, or if it has only been one or two, a clear statement of that fact would emphasize the rarity of this provision.

Pg 3-61, Discussion: This is a bit of an overstatement in terms of the age duration of elevated risk. Since many minors get some, albeit minimal, exposure during their later school years a more precise statement would be preferred so as to encourage a proper perspective of their risk (typically for exposures in the mid to late teens). Appropriate references should also be provided. Also, the reduced limit is more a reflection of simple conservatism than it is of the actual increased risk. Hence the last sentence is not strictly correct, unless some statement relating to added conservatism is added. I suspect universities and other similar organizations would be very sensitive to the implication that minors aged 15-17 are a factor of ten more sensitive than the adult population.

Pg 3-63, Statement of Applicability: Shouldn't the sentence "A separate written declaration *should* be submitted ..." read "*must* be submitted". Don't previous declarations become moot at the cessation of the pregnancy?

Pg 3-90, Statement of Applicability: Add to the last sentence "... and electronic dosimeters."

Pg 3-98, Discussion: Replace the word *overexposures* with the phrase "...exposures in excess of regulatory limits." The word overexposure has a risk connotation for most readers while the NRC scheme of dose limitation defines the regulatory dose in a manner that can result in minimal risk, even at doses well in excess of the limits. The suggested phrase is more precise in terms of the potential result from the described circumstance.

Pg 3-106: The phrases "...even death..." and "life threatening" should be qualified as to apply to situations well in excess of the posting threshold and to substantial, upper body exposures. The most common VHRA geometry in industry and research facilities, *e.g.*, a small radiation beam, in fact would basically result in a freckle.

Pg 3-113 thru 3-132: There does not appear to be any discussion on the use of respirators under OSHA approved programs for non-radiological purposes where there is airborne radioactivity at levels that do not precipitate the subpart H requirements. The Statement of Consideration on subpart H and a letter of interpretation issued by NRC make it clear that such usage with the

relating incidental radiological exposure is permissible. Many licensees are in this situation, *i.e.*, industrial use of respirators under an OSHA program in areas with potential non-zero airborne radioactivity that represents a minimal, incidental exposure. The draft Regulatory Guide is ambiguous, at best, on this issue. This point should be clarified in these pages.

Pg 3-143, Discussion: It would be very beneficial to licensees if this discussion, *i.e.*, not enough to present a significant radiation hazard, applied to 20.1801 (pg 3-133) in terms of a lessened level of security expectation.

Pg 3-149(2), Discussion: It would be useful if a statement was added relating to the detection technology that is expected to be used to show *no detectable radioactivity*. In particular it would be useful if the usual guidance of using the best available, routine, low background survey technology were indicated, as opposed to sampling and counting in world-class, low background analysis labs.

Pg 3-163, Guidance: The statement in bold is puzzling. After allowing SI units to be added parenthetically this statement asserts that these parenthetical entries are "... not in lieu of the special units". Previous text has clearly stated that the results in terms of special units must always be provided. What is the issue intended to be covered by this bolded sentence? If it is important for the licensee to understand then more explanation is needed. If it is simply legal boilerplate then can it be so identified?

Pg 3-163, Guidance Statement: This forthright admission of non-conformance to the NRC's own policy begs the question, why? NRC should at least provide a reference that defends or explains this schizophrenia.

Pg 3-180, Discussion - "The degree of exposure is not specified.": This statement may be an accurate observation but it is remarkably unhelpful. Is it intended to impart that the degree of exposure is not relevant, not important, to be determined by the licensee, or some other alternative? Since any source of any radionuclide, no matter how many light-years distant, can result in a non-zero exposure to anyone on earth the words in the Requirement really need some supplementary interpretation.

Pg 3-180: Some guidance on the action desired by the NRC of the licensee for quantities less than those specified in 20.2201 would be useful. It is presumed that the *significant quantities* of the discussion refer to 20.2201(a)(1)(i) and the *lesser quantities* to 2201(a)(1)(ii).

Pg 3-183, Discussion: The phrase 'may cause' is much more encompassing than the regulatory requirement 'threatens to cause'. The phrase 'threatens to cause' has an immediacy that one would interpret to mean high likelihood. While NRC should reasonably ask licensees to use a conservative judgement in deciding to make such a report in the discussion section a more accurate description is needed of the meaning of 'threatens to cause'.

Also the NRC should caution the licensee not to use this reporting mechanism as a means simply of informing the NRC of something that is a very unusual condition for the licensee. As part of this caution the NRC response to such reports might be described.

Pg 3-192, Discussion: You should probably add " and some types of research reactors." Under *testing facilities* defined in 50.2 (which to be accurately interpreted for some facilities requires a carefully reading of 10CFR50.21(c), 50.21(b), 50.22, and section 31 of the Atomic Energy Act) some of the NRC licensed research and test reactors are also required to make this report. Any simplification of the very twisted path through these references would be useful.

Pg 3-192, Guidance: It is stated that Form 5's must be submitted for those who were *provided* monitoring. The rule appears to require such a report only for those who were *required* to be monitored. Please clarify.

Sincerely,

Lester A. Slaback, Jr.
MS 3543