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MEHORANDUM FOR: M. A. Parsont, Chief Radiological Health Standards Branch, SD Parsont

FROM: R. E. Baker Radiological Health Standards Branch, SD

SUBJECT: FEDERAL RADIATION PROTECTION GUIDANCE FOR OCCUPATIONAL EXPOSURES

A working draft of the subject report dated January 10, 1979 was sent to me January 12 by R. Alexander for review and comment. Time has not permitted an in-depth review, but my attached momments may prove to be helpful to him. I would be pleased to discuss my comments with anyone interested in doing so.

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R. E. Baker Radiological Health Standards Branch Office of Standards Development

Enclosure: As stated

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FEDERAL RADIATION PROTECTION GUIDANCE FOR OCCUPATIONAL EXPOSURES

WORKING DRAFT OF JANUARY 10, 1979 Comments by R.E. Baker, OSD

General Comments

The subject EPA draft proposal would require substantial changes in current regulatory practices in providing protection against radiation. The draft presents a rationale which EPA used as a base for recommending classifying all radiation workers in one of three "ranges" each range being subject to an annual dose limit of 1/10, 3/10, or 1 times the RPG (e.g., 1 RPG = 5 rem total-body dose) as defined by the FRC. Additionally, a "graded scale of radiation protection requirements" are recommended for each of the ranges.

In developing the rationale, EPA examined the current data and experience which demonstrates that the <u>average</u> annual dose received by radiation workers is a small fraction of the RPG and that the <u>bulk</u> of workers receive doses well below the RPC. From this EPA concludes that the sub-RPG catagories could be implemented. EPA did <u>not</u> address the impact of the administrative problems in implementing and demonstrating compliance with the new limits. EPA did compare the <u>calculated potential</u> risks to radiation workers to the very <u>real demonstrated</u> risks to workers in other industries and concluded that the radiation workers fared very well in the comparison. It is not clear that EPA considered the degree of worker flexibility needed to operate many nuclear facilities. The draft could be improved substantially by carefully qualifying the statements to more accurately reflect the facts and assumptions discussed and the terminology should be technically correct, particularly where radiation is discussed. Some specific comments are offered.

Specific Comments * * Paragraph Pg Under footnote b, change "Type of Cancer" to "Site 10 . of Cancer" "Figure 1. Average risk of radiation induced cancer by 11 age. The curves show the average risk. . . " "The risk of non-lethal cancers was assumed to be 14 1 approximately identical to chat for lethal cancers for the purpose of assessing the impact of whole body exposures." Should be changed to ". . . lethal cancers (except leukemia) for . . . ". "Figure 3. Average reduction in life expectancy . . . " 15 Line 2: Change "exposure" to "dose" (actually, dose 22 2 equivalent). This is a generic comment which applies to many places throughout the text. The industry of the workers should be stated. Are the 24 2 data for nuclear industry workers only? The text which discusses Figure 6 and the description 26 below Figure 6 are inadequate to explain the figure. The example, what is the set of percentage values presented in parentheses in Figure 6(a)? Line 5: Add "contractor" after "AEC". 2 31 How can one rationalize the justification for "excluding those receiving no measureable dose" in estimating an "average dose" for an industry?

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- 2 -

Specific Comments

For Paragraph

33 A

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In order to more accurately describe what is presented, the "risks" should be referred to as "<u>potential</u> risks" or "<u>calculated</u> risks" for radiation induced effects here and throughout the text. Note that <u>postulated</u> risks from irradiation will be compared to <u>actual</u> risks from other causes.

34 - Page 34 is missing in my copy.

The annual risk values presented in Table 6 would be much more meaningful if the size of the work force were given for each of the selected industries for the selected years.
 Line 1 should read ". . . from exposure to radiation . . ."

Line 2 should read ". . . death <u>postulated to be</u> attributed . . . "

Line 4 should read ". . . estimated <u>potential</u> average number . . . "

Line 13 should read ". . . <u>potential</u> lifetime risks . . ." and ". . . due to exposure to radiation. . . "

See comment for pg 14, paragraph 1.

2 Suggest speaking to the apparent difference in genetic risks postulated to result from irradiation of males <u>vs.</u> females.

45 - Suggest adding "potential" in the title and using clearer nomenclature than the ambigious "(events per lifetime of exposure x 10⁻²)".

> Again note that <u>postulated</u> risks from irradiation are compared to <u>actual</u> risks from other sources.

- 3 -

Specific Comments

Pg Paragraph

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The "data points" should be removed from Figure 9 since they are <u>not</u> data points, but merely calculated values for selected ages.

The questions and answers posed by EPA appear to be cast in a manner which would support a predetermined decision to lower current annual dose limits. This was done by putting the burden of proof on demonstrating a substantial need for retaining current limits rather than demonstrating the need for changing current limits. Such rationale does not appear to be consistant with the goal of reducing the amount of federal regulation or involvement in regulated activities which has been advocated by the administration. Perhaps the more germane question which should be asked is "Is there any demonstrated need to change the current federa? regulations for protection against radiation?" EPA has provided the information to answer this when EPA concluded that based on analyses of dose data and other experience, the current regulatory practice has limited radiation related risks to acceptable levels even when evaluated by generally conservative methods and compared to very real actual risks of other industries.

The EPA recommendations do not adequately consider the need for worker flexibility in nuclear operations, nor has the impact of the administrative problems of implementation, inspection and demonstration of compliance been addressed.





Spec	cific Comments	
Pg	Paragraph	
62	A.2.	"Monitoring" will not assure ALARA.
62	B.1.	"Supervision" will not assure ALARA.
62	C.3.	What "formal" consideration of previous exposure and
64		what is intended? The last sentences is an over-simplistic example which
		would better be omitted.

JE Ocker 1/31/29



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From Harton -

QUESTIONS

- p.2 Is exposure to radon daughters from milling covered by these guides or like mining?
- p. 38, 46, 51, 63 Why compare <u>maximum</u> for radiation with an <u>average</u> for non-radiation accidents?
- 3. The agreement on page 46 comparing the <u>maximum</u> radiation risks to the <u>average</u> non-radiological risk needs to emphasize more strongly that radiation workeers are also subject to non-radiological risks, if the argument is to appear logical. This line of reasoning could, however, be extended to justify "rem credits" for industries with above average non-radiological safety records. Is this EPA's intent?
- 4. p. 50 Why is question (a) obvious?
- 5. p. 51 Do we want to allow user to make choice?
- 6. p. 51 Does EPA mean different occupations or different exposures within each occupation?
- 7. p: 55 Does this allow the setting of quarterly limits by NRC?
- p. 56 Top of page; Isn't this inconsistent? EPA is effectively lowering limit by 10, i.e. more than 2 or 3.

- 9. p. 58, C.(a) Why should radiation risks be lower?
- 10. p. 58, C.(d) What does this mean?
- 11. The first sentence on p. 60 states that "workers should be classified into ranges..." Who (EPA, other agencies, or licensees) will classify the workers into these ranges?
- 12. p. 62 Why does Range A necessarily require knowledge of radiation protection principl/es?
- 13. p. 63 Why does this have to be retroactive?
- 14. How will guidance be affected by BEIR III. i.e. if risks deemed greater by factor of 2 or 4?

COMP TNTS

- 15. Figures 1, 2, 3 on p. 11, 13, J5 Should indicate that they apply to a whole body dose.
- 16. Table 3 (p. 21) lists somatic risk factors for partial-body irradiation. The Table should indicate that these are fatal and non-fatal cancer per lifetime per 10⁵ person-rem. The source of these risk factors should be given.



- 17. In Figure 9 (p. 48) the symbol key does not match the graphs.
- 18. The summation organ cancer (both fatal and non-fatal) exceeds the number of cancers from whole body irradiation (Table 10, p. 67). This apparent discrepancy should be explained.
- 19. The text on page 18 indicates that the level of natural incidence of genetic effects is shown on Figure 4, but I am unable to locate it.
- 20. The numbers in Table 6 need to have units applied to them.
- 21. Missing: References, Chap VII to X and appendices.
- 22. Table 5 (p. 28) gives whole body doses to occupational workers. The mean whole body dose listed in Table 5 for nuclear waste disposal is 40 mrem/yr. This values is over an order of magnitude less than the range (0.5-2rem) of values given in NUREG-0216 (see attachment). The values given in NUREG-0216 are based on actual measurements of doses to workers at low-level waste disposal sites. Workers at low-level waste disposal sites. Workers at low-level waste disposal sites operations were changed at disposal sites.



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NURE6-0216

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TABLE III

ANALYSIS OF BURIAL GROUND OPERATIONAL

EXPOSURE EXPERIENCE

SITE	YEAR	AVERAGE ANNUAL INDIVIDUAL WHOLE	MAN-REM	Volyme (ft)	Activity (Curles)	MAN-REM (ft ³)	MAN-REM Curie
		BODY EXPOSURE (REMS)	2.0	50,000	12,000	4x10 ⁻⁵	1.6x10-4
Washington Nevada	1974	0.5 1	2.4	53,000 : 113,000	: 113,000	4.5x10-5	2.1x10
	1975	1.5	7.5	101,000	104,000	7.4x10-5	7.2x10-5
	1970			137.000	3,745	5.1x10-5	1.9x10 ⁻³
	1973	*1.4	10	145,000	24,000	6.9x10-5	x10 ⁻⁵ 4.2x10
	1974	1.9	10	175,000	18,000	6.3x10 ⁻⁵	6.1x10
	1975	0.88	36.2	1,420,000	90,200	2.5x10 ⁻⁵	4.0x10
South Caroline	1969-1972	0.68	25.7	548,000	21,500	4.7x10-5	1.2x10
	1073	0.78	12.5	304,000	2,830	4.1x10	4.4×10
	1973	0.88	17.6	437,000	3,200	4.0x10-9	5.5x10
TOT	AL		132	3,370,000	392,000		

14.

H-11

page 4

23. On p. 68 it is stated that "At 30 rem/yr" (to the lung) "the risk of fatal cancer would exceed that of the whole body guide." This statement appears to be in error. Since the risk of lung cancer is only about 13% of the risk from whole body exposure (Table 3, p. 21) and since the limit for whole body exposure is 5 rem/yr (p. 68), then the maximum limit for lung exposure should be about 38 rem/yr, not 15 rem/yr. Exposure of the lung to 36 rem/yr would lead to a lifetime risk of 0.034 which is still below the risk from whole body exposure to 5 rem/yr (i.e. 0.042).

24. Impact of additional monitoring requirements

EPA proposes a graded scale of radiation protection requirements (page 62 of the preliminary draft) which would mandate individual personnel monitoring of each individual who would be likely to receive an annual dose in excess of 500 millirems. By implication, also, an individual in range Arwho would be likely to receive an annual dose approaching 500 millirems must also be individually monitored. These provisions would involve an additional impact on licensees, in terms of providing monitoring devices, recording the data, and storing the records. ICRP has recommended that individual personnel monitoring be provided for individuals likely to exceed 1/3 of the annual dose limit, in this case 1.67 rems. The proposed guidance would require such monitoring at 500 millirems or less, a reduction by a factor in excess of 3. The potential economic impact of this requirement, with questionable increase in protection, should be evaluated with care before considering this expanded monitoring requirement.



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25. Definition of "Radiation Worker"

EPA proposes a definition of "radiation worker" (p. 60 of Enclosure B) with no particular demonstration of need. And such definition would have to be developed with extreme care so as not to include individuals to whom the guidance should not apply or exclude individuals to whom it should apply. The present NRC regulatory structure is directed toward controlling access by individuals, whether or not they meet any specific definition of "radiation worker" to areas in which a potential exists for significant radiation protection requirements (p. 62 of the preliminary draft). Such a definition will not clarify the intent of radiation protection and will not contribute to increased radiation protection, and therefore, should not be developed.

26. Limitation on an Individual's Career Accumulated Dose

EPA proposes an additionel limitation on accumulated occupational dose to an individual (pages 6. 63 of the preliminary draft). The material on page 64 implies that a decision to limit cancer exposure (and those potentially to limit career employment opportunities) rightfully belongs with the individual worker. However, the prior paragraphs discuss a requirement to limit career dose to approximately 100 rems.



We oppose any such requirement. Presumably, by accepting employment entailing radiation exposure, the individual has balanced the radiation of up to 5 rems per year risks against the benefits of the employment. In general, such a person would conclude that acceptance of such risks for an additional year, in principle identical, regardless of prior exposure, is still valid given those on going employment benefits, particularly if the alternative involves any significant potential interference with career plans. No such arbitrary career limit should be imposed on any individual, except by his or her specific choice.

27. p. 69 Lowering level to 15 plus increase in alpha RBE to 20 means a four-fold reduction in MPC!

28. The differences between proposed occupational exposure categories is within the range of undertainty in dose and risk models. It does not seem warranted to establish such finely divided exposure categories when there is so much uncertainty in the models. For example, the radiation risks shown in Figures 7 and 8 (pages 37, 39) are based on calculated deaths rather than counted deaths, whereas risks other than radiation are presumably based on actual deaths observed in the industry. NCRP #43 has cautioned regulatory agencies in strictly equating calculated deaths due to radiation with actual deaths.

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29. Comment regarding the recommendation on Page 60. Many of our licensees have workers who could logically be placed in Ranges A and B of EPA's guide. Currently, many of these workers are not subjected to tough ALARA guidelines, because they could not possibly exceed 5 rem on the job. However, if their allowable dose dropped to 0.5 rem, many may exceed the limit -- resulting in more fines and regulations. This might force us to fine one company for exposing a worker to 1 rem while allowing another company to regularly expose workers to 4 rem. Our only justification for such a position is that the 4 rem exposure produced a benefit while the 1 rem exposure did not. If we truly believe 5 rem is safe, we would have a difficult time enforcing a lower value. And if we want to issue the guidelines but not enforce it, why bother?

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- 30. p. 60 Definition of radiation worker (1/100 of RPG) may be too low - 0.05 rems/yr; 0.04 mrems/yr avg. How do you exclude people from radiation worker category. Furthermore, this is not compatible with the <u>current</u> description of non-occupational exposure (0.5 rems/yr). See also comment on page 52.
- 31. p. 62 Range B-3. There will be some well known problems with implementation of the fertile female worker consent requirement.

Range C The relationship between <u>annual</u> exposures in this range and requirements on a <u>task</u> basis is unclear.

- 32. p. 65-72 I presume that the reductions in organ RPG's are made with some advance knowledge of the BEIR III report as well as for the sake of computation facilities.
- 33. Application of the A, B, and C range concept to internal exposures and measurement of air concentrations and dose determinations does not seem to have been so well thought out as with external exposures.
 There could be serious implementation problems here. I note that Section VII Secondary Guidance has not been provided yet. This may shed some light on the problems.

Note that Section II A is supposed to be added when the BEIR III Report is available.