

NUCLEAR REGULATORY COMMISSION

ORIGINAL

COMMISSION MEETING

In the Matter of: PUBLIC MEETING

BRIEFING BY EPA ON DRAFT GENERAL
STANDARDS (OCCUPATIONAL EXPOSURES,
MILL TAILINGS)

DATE: September 3, 1980

PAGES: 1 - 101

AT: Washington, D. C.

ALDERSON  REPORTING

400 Virginia Ave., S.W. Washington, D. C. 20024

Telephone: (202) 554-2345

8009190771

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

Public Meeting

BRIEFING BY EPA ON DRAFT GENERAL STANDARDS
(OCCUPATIONAL EXPOSURES, MILL TAILINGS)

- - -

Nuclear Regulatory Commission,
Room 1130,
1717 H Street, N.W.
Washington, D.C.

Wednesday, September 3, 1980.

The Commission met, pursuant to notice, at 2:04 p.m.,

BEFORE:

JOHN F. AHEARNE, Chairman of the Commission

JOSEPH HENDRIE, Commissioner

VICTOR GILINSKY, Commissioner

PETER A. BRADFORD, Commissioner

NRC STAFF PRESENT:

SHELDON TRUBATCH

MR. HOYLE

HOWARD SHAPAR

WILLIAM DIRCKS

ROBERT MINOGUE

ALSO PRESENT:

David Rosenbaum, EPA

Allan Richardson, EPA

William Ellett, EPA

Dan Egan, EPA

Stanley Lichtman, EPA

William Mills, EPA

300 7TH STREET, S.W., REPORTERS BUILDING, WASHINGTON, D.C. 20024 (202) 554-2345

DISCLAIMER

This is an unofficial transcript of a meeting of the United States Nuclear Regulatory Commission held on September 3, 1980 in the Commission's offices at 1717 H Street, N. W., Washington, D. C. The meeting was open to public attendance and observation. This transcript has not been reviewed, corrected, or edited, and it may contain inaccuracies.

The transcript is intended solely for general informational purposes. As provided by 10 CFR 9.103, it is not part of the formal or informal record of decision of the matters discussed. Expressions of opinion in this transcript do not necessarily reflect final determinations or beliefs. No pleading or other paper may be filed with the Commission in any proceeding as the result of or addressed to any statement or argument contained herein, except as the Commission may authorize.

P R O C E E D I N G S

1
2 CHAIRMAN AHEARNE: The Commission meets this afternoon
3 to hear an eagerly awaited, highly regarded, and interesting
4 presentation from a gentleman well known to many of us.

5 Mr. Rosenbaum has graciously agreed to come and talk,
6 rather than just directly send a missive. We're delighted to
7 hear from the illustrious representative of the EPA.

8 David?

9 DR. ROSENBAUM: Thank you.

10 I am delighted to be here. I always feel like I am
11 coming home, partly, when I come to the NRC. First I would
12 like to apologize for the slowness with which these documents
13 are appearing. That is largely due to me.

14 (Laughter.)

15 CHAIRMAN AHEARNE: Such frankness.

16 DR. ROSENBAUM: They would have been out much faster,
17 I'm sure, if I had not been there. I hope that the slowness
18 is in part --

19 CHAIRMAN AHEARNE: You undercut my argument for a
20 single administrator.

21 DR. ROSENBAUM: -- made up for by the quality of the
22 document. That is for everybody to decide on their own, but
23 at least we have made an effort to write them in language that
24 people can understand; and in that way, to make the arguments
25 clearer, so that people who want to support them or attack them

1 can at least be talking about the same thing.

2 Fortunately for all of us, members of my staff know
3 a great deal more about most of these than I do. Therefore,
4 they will do most of the talking. It is my practice to let
5 the people who know the most do the talking, but I may break
6 in from time to time if I feel it is productive.

7 Let me emphasize a few things: One, we are not
8 sure that everything in these documents is right. We are
9 not certain of hardly anything. This is a hard business to
10 be certain of things in, and we have done the best we could.
11 That's all I can say. There is still room for discussion.
12 We have not closed our minds.

13 In that regard, I feel very strongly that it is
14 our job to make the decisions in so far as they are within
15 our purview. Therefore, we look on such distinguished groups
16 as the BEIR Committee, which we paid for, including the BEIR
17 III Report and the BEIR II Report, and the publications of the
18 ICRP, in much the same light as we have looked at scientific
19 literature in general. The people who worked on those things,
20 in general do not have access to any information that is
21 secret or that is not generally published in the scientific
22 literature. We try as best as possible to keep up with the
23 literature in our field, and therefore we don't feel bound
24 by any of these things. We do consider them seriously.

25 We also consider other important sources. In this

1 guidance there are numbers. These numbers, I would like to
2 emphasize again, are not set in concrete. They are proposals
3 at this level.

4 When I say "this level," I mean "my level."

5 CHAIRMAN AHEARNE: Would you review briefly, before
6 you turn over to your co-workers, the procedures that you
7 see occurring on both of these documents?

8 DR. ROSENBAUM: Yes. I would be glad to.

9 As a start on that, I would like to say that the
10 primary things we are going to talk about are the occupational
11 guidance, and the uranium mill tailings standards for inactive
12 piles. We will be willing to talk a little bit about the
13 high-level waste, but that hasn't even gotten through me yet.
14 And in any case, I don't think there would be time to go
15 through all three of those very important documents with any
16 depth in one meeting. We would be glad to come back another
17 time and talk about high-level waste in more detail.

18 Neither the occupational guidance nor the uranium
19 mill tailings have been approved by David Hawkins, who is
20 the Assistant Administrator and my boss. And even after they
21 are approved by him, they would still have to be approved
22 by Douglas Costel, who is the head of the agency. It is not
23 that they don't know what it's about -- you know, what they
24 are about and have been briefed on them, but they have not
25 approved them. So that this is not an official EPA position

1 even as a proposal.

2 What has to be done, the pathways are somewhat
3 different. The occupational guidance is guidance under the
4 old Federal Radiation Council authority. It is not issued
5 by EPA. EPA recommends it to the President. If the President
6 so chooses, he issues it.

7 The occupational guidance which is now in effect was
8 issued by President Eisenhower in 1960. Therefore, it is done --
9 there is always interagency consultation on anything, but in
10 the case of guidance there is much more, because the President
11 will want to have the advice of all the different agencies
12 concerned presumably before he issues something under his name.

13 Therefore -- and in the case of guidance, because
14 it is guidance we are under no legal compunction to have any
15 hearings at all, and could in fact just send the guidance to
16 the President, and if the President so chooses he could sign it
17 and put it in the Federal Register. In fact, that is not what
18 we are going to do.

19 We plan to have widespread hearings in this case,
20 and as in the other standards and guides we will be issuing
21 we are going to be taking a great deal of our travel money so
22 that we can have hearings around the country and not just in
23 Washington. Many of these hearings will be held -- all of
24 these hearings will be held in each place in part on weekends
25 and at nights so that those who have jobs and who are not paid

JWB

1 to go to the hearings can come and tell us what they think.
2 There will of course also be hearings in Washington.

3 We have an arrangement with NRC and OSHA to have
4 joint hearings. They actually will be paid for by EPA, and
5 we already have a contractor who is doing the administrative
6 workup on the hearings.

7 CHAIRMAN AHEARNE: That sounds like a good arrange-
8 ment.

9 DR. ROSENBAUM: Yes. Somebody else. And we're happy
10 to do that. So that at such time that the guidance is signed
11 by Mr. Costel, it will be put in the Federal Register. We
12 will have a comment period, and after the comment period is
13 closed and we have time to digest the comments, there will
14 be set some hearings at different places around the country
15 including Washington.

16 CHAIRMAN AHEARNE: It will be signed out as a
17 proposed document?

18 DR. ROSENBAUM: As a proposed document. Even after
19 the whole process of the hearings and we have considered the
20 comments, and Mr. Costel signs it again, it will still only be
21 a proposal to the President. It will be a recommendation to
22 the President that he sign it.

23 I would hope, if everything goes smoothly, that we
24 could have hearings early in the spring. I don't think, given
25 the procedures that have to be gone through, that it is

1 realistic to think that we could have them much earlier than
2 that. Therefore --

3 CHAIRMAN AHEARNE: Which year, David?

4 DR. ROSENBAUM: This year -- next year; next spring.
5 That's a reasonable comment, given my record.

6 CHAIRMAN AHEARNE: No, not given your record; given
7 the record of this issue.

8 DR. ROSENBAUM: Well, I see no reason why we
9 shouldn't be able to have them next spring, at the moment,
10 unless things come up that I don't now know about.

11 And if that happens next spring, and everything
12 else goes smoothly, we should be able to get them to the
13 President by perhaps a little more than a year from now. I
14 would say sometime the fall after this fall we're entering.

15 What the President would then do, I have no idea.
16 But I think at that point, ordinarily the President asks for
17 advice from other affected agencies, and perhaps from the
18 public. And now that we have consolidated government by
19 forming several new independent radiation bodies such as the
20 Radiation Policy Council, some of these things may be referred
21 when they get to the President, to those bodies, and that
22 may take longer -- therefore, the process of the President
23 signing might take longer than it would otherwise be; I don't
24 know.

25 As far as the uranium mill tailings goes, in that

1 case it is a standard--it doesn't have to go to the President--
2 issued by the Administrator of EPA. We have already put in
3 the Federal Register the cleanup standards for the inactive
4 piles.

5 We have now sent to Mr. Hawkins the rest of the
6 package, which is the disposal of handling the piles themselves
7 for the inactive piles. And if all goes well, we might be
8 able to get that proposed in the Federal Register within a
9 month or so. I think that won't take very long -- I can't
10 guarantee it.

11 And then we have to have hearings, and go through
12 the normal process of making a standard. We have to answer
13 the comments -- and I don't have any way to guess how
14 voluminous the comments will be.

15 CHAIRMAN AHEARNE: Did you say you would have
16 hearings on that, also?

17 DR. ROSENBAUM: Yes. In the same way, we'll have
18 them around the country, particularly in appropriate spots
19 where they have uranium mill tailings. We probably won't
20 have them in Boston.

21 We have contractors already working on both of
22 those -- administrative contractors -- to do the administra-
23 tive work to set up the hearings. And we will in these
24 hearings not only hold them in cities, but we have given the
25 contractors an advertising budget so that the people in that

1 area will be well aware, through the public press and the
2 other media, that the hearings are being held and that we are
3 indeed interested in their opinion.

4 Is that adequate for what you meant for the
5 procedures?

6 CHAIRMAN AHEARNE: That's excellent.

7 COMMISSIONER HENDRIE: Dave, before you go on,
8 the mill tailings standard is cited in the mill tailings bill
9 of a year-odd ago. And as I recall the language of the bill,
10 it becomes a controlling general standard for us, I think,
11 doesn't it?

12 DR. ROSENBAUM: Well, you're dealing with the
13 active piles, I believe, primarily; and the standard we are
14 putting out so far is the inactive piles.

15 COMMISSIONER HENDRIE: I see; okay.

16 DR. ROSENBAUM: The inactive piles were due by law
17 to be promulgated last November.

18 COMMISSIONER HENDRIE: But in due time, there will
19 also be some active piles standards?

20 DR. ROSENBAUM: Yes.

21 COMMISSIONER HENDRIE: And those we follow because
22 the mill tailings law says EPA does the general ones, and you
23 do the license conditions to conform.

24 DR. ROSENBAUM: Yes.

25 COMMISSIONER HENDRIE: But on the occupational

1 standards, those are a Presidential directive to the Executive
2 Branch and are controlling for all of the Executive Branch
3 agencies. Nominally as an independent agency, it is not --
4 well, I am not sure whether we are bound by that or not.
5 If I look to your end of the table, Sheldon --

6 MR. TRUBATCH: We have stated publicly in the past --
7 the Commission has stated that it would consider itself bound
8 to follow the standards. That doesn't really answer your
9 question as to whether we are legally bound.

10 COMMISSIONER HENDRIE: Well, I know what we're going
11 to do, we're going to follow them. But I was just curious --

12 CHAIRMAN AHEARNE: Joe, one of the reasons we are
13 going to conduct hearings is to develop our own understanding
14 of the issues.

15 COMMISSIONER HENDRIE: Well --

16 CHAIRMAN AHEARNE: But perhaps Bob Minogue might
17 want to answer your question as to what the Standards Office
18 plans to do.

19 Don't worry, David, we will get to your presentation.

20 DR. ROSENBAUM: We are here to serve.

21 MR. MINOGUE: Guidance of this type has to be
22 implemented by a specific agency. So the activity that we
23 would look to do within NRC would be more aimed at implementing
24 standards to take that guidance and apply it to what we
25 regulate.

JWB

1 COMMISSIONER HENDRIE: Yes.

2 MR. MINOGUE: On the other question, I believe that
3 the matter of conforming to FRC guidance is one of policy.
4 What the law is on the matter I'm not clear, but it certainly
5 has been the past policy to conform as if it were mandatory.

6 COMMISSIONER HENDRIE: I was just curious as to how
7 the law lay on the matter. There is the general proposition of
8 are we compelled by Executive Orders, because this would be
9 in effect an Executive Order of the President. I think in
10 general we claim not to be.

11 On the other hand, in this radiation protection
12 matter, there is Reorganization Plan No. 3 a number of years
13 ago which split off the responsibility for establishing the
14 general health standards from a radiation standpoint in EPA,
15 and I wonder if there isn't a tie that binds legally back
16 through Reorganization Plan No. 3.

17 I was just curious --

18 MR. MINOGUE: I think it is quite complex, and I am
19 not aware that any detailed analysis has been done, because
20 it is a matter of policy that we have always conformed to
21 FRC guidance. I really don't know the answer to the legal
22 question.

23 CHAIRMAN AHEARNE: Howard?

24 MR. SHAPAR: I believe the answer is that if this
25 is a Federal Radiation Council function -- which I believe it

1 is -- then that function stems from Section 274 of the
2 Reorganization Act -- I mean, of the Atomic Energy Act. It
3 is specifically mentioned in our Act. Now the Federal Radiation
4 Council was transferred by Reorganization Plan No. 3 to the
5 EPA. I think the answer to the question is: If that function
6 is performed pursuant to Section 274 of the Atomic Energy
7 Act and the recommendations made of the President, and the
8 President signs it, it is binding on everybody including the
9 NRC.

10 COMMISSIONER HENDRIE: You have more muscle than
11 you thought you had, Dave.

12 (Laughter.)

13 COMMISSIONER HENDRIE: So what do you want us to do?

14 DR. ROSENBAUM: Do you have any extra money?

15 (Laughter.)

16 DR. ROSENBAUM: Just let me introduce the people
17 who are going to give most of the briefing. First of all,
18 let me say, please feel free to interrupt at any time. We
19 have really set up in such a way that we would give some of
20 the information in response to questions.

21 It is not only a question of questions, we would
22 very much welcome your suggestions. We don't have all wisdom,
23 and we would be very happy to hear your ideas and suggestions.

24 The last thing I want to say is about the uranium
25 mill tailings standard. That is, that we were bound by law to

JWB

1 issue on May 8th -- to promulgate last May 8th, the standards
2 for active piles. We have just begun to work on them. There
3 may be some feeling on some people's part that these standards
4 which we are now proposing for inactive piles will set a
5 precedent for the active piles, and that we will necessarily
6 make the active piles conform to them in some way, or be more
7 stringent or less stringent.

8 All I can say is that that is not true. We intend
9 to look -- the active piles are quite a different situation,
10 and we intend to look at them de novo, and to try to do as
11 best as we can to make sensible standards.

12 It may indeed come out that they will be very close --

13 COMMISSIONER GILINSKY: Wouldn't you expect that
14 you would do better on the active piles than on the older
15 ones?

16 DR. ROSENBAUM: What does "better" mean?

17 COMMISSIONER GILINSKY: To be able to enforce a
18 stricter standard?

19 DR. ROSENBAUM: I don't know, because we have not
20 just gone through the staff work. I don't know. There is
21 no point in my speculating. I don't have any basis on which
22 to judge. I am just saying that philosophically we do not
23 feel bound in any way to do anything but the best we can;
24 and that these standards are not going to be sort of based
25 on the inactive standards. It is a different kind of problem

1 with different opportunities to do things, and different
2 financial responsibilities. We are just going to look at the
3 problem and see what we think is in the public interest.

4 COMMISSIONER GILINSKY: Fine.

5 DR. ROSENBAUM: It might come out that way, but it
6 isn't prejudged to be that way.

7 The first person who will begin the briefing is
8 Mr. Allan Richardson, somewhere. Why don't you come on up
9 here. He is head of the General Standards Branch and who has
10 been in charge of developing both the guidance for occupational
11 activity, and also for the uranium mill tailings standard.

12 Is somebody manning the slides?

13 DR. RICHARDSON: Yes.

14 (Slide.)

15 I have put this slide up, which you don't have, so
16 that I can tell you what I am not going to talk about in my
17 prepared presentation. It will give you some idea of what
18 we are prepared to talk about, if you want to ask extra
19 questions.

20 I am going to skip Items 1, 3, and 4, which are
21 rather major items, and get directly to talking about the
22 recommendations -- which is what the balance of the list
23 consists of.

24 A lot of the recommendations are based on findings
25 from those -- especially Items 3 and 4 -- and I will have to

1 ask you to take those on faith, and then we can go back to
2 them later. So can we go to slide one?

3 (Slide.)

4 This is a summary of the proposed changes. I will
5 just read through it quickly, so that you will have a feeling
6 for what we are up to; and then when we go to each individual
7 one you will have some idea of the total context that we are
8 talking about.

9 In any system of radiation protection, there are
10 three basic principles. The first is that the exposure needs
11 to be justified. The second is that you need to minimize the
12 exposure. The third is that you impose some kind of a limit
13 on individual risk, because the first two principles don't
14 automatically ensure that. That is what these first three
15 requirements do.

16 We are not proposing very much in the way of changes
17 in those. The 1960 guides required that exposure be justified;
18 it's not always clear how that is done, but it is still a
19 requirement.

20 We are adding some language which points out that
21 alternatives to radiation exposure should be considered
22 explicitly. That was implicit before.

23 Under the "minimization of exposure," which has
24 been, in some radiation protection circles, called the
25 "optimization of exposure," which sometimes has an unfortunate

1 inverse connotation. That was required by the 1960 guide.
2 That is what we have known through the years as ALAB or ALARA.
3 We are now explicitly saying that this is an operation which
4 is carried out on the collective dose, which is the only way
5 you can sensibly do it.

6 Item 3 is the limitation of exposure to individual
7 workers. It is split there into three parts. We are proposing
8 some changes there. We are proposing to abandon the 3 rems per
9 quarter, and 5(N-18) cumulative limits, which have been
10 broadly interpreted as being 5 rems a year on the average;
11 and replacing it with a single 5-rems-per-year limit -- or
12 proposing to do that.

13 CHAIRMAN AHEARNE: Without any cumulative?

14 DR. RICHARDSON: Later on I will talk about, there
15 will be an admonition to keep lifetime doses within a limit,
16 a 100-rem limit, but that comes in a different part of the
17 guidance.

18 The partial body limits, just as an aside, all
19 exposure is of course not to the whole body. There are cases
20 in which you breathe or ingest radionuclides and get higher
21 doses to individual organs, so that there is a need for limits
22 for the individual organs, some of which are more radio
23 sensitive than others are.

24 In the past, this has been done by setting limits
25 for individual organs, and limiting the dose to the organ

1 which came closest to its limit, and ignoring the rest of the
2 organs. It's called the so-called "critical organ" approach.

3 We are proposing a change to something called a
4 "summation of risk" approach, in which each of the organs is
5 given a weight which is proportional to the fraction of the
6 whole-body risk which comes from that organ.

7 We are changing some of the names of the organs that
8 are listed specifically, and dropping some that don't seem to
9 be needed any longer. I would say that on the average the --
10 and we will talk about this in more detail later; this is a
11 rather controversial part of the guidance -- that this approach
12 leads to more restrictive limits, and a far more rational
13 system. I won't say any more about it now.

14 Another aspect of current guidance is that internal
15 and external exposure -- "external exposure" being governed
16 by the whole-body limit, the 5-rem limit; and "internal
17 exposure" being governed by the individual organ limits --
18 have been limited independently. So somebody could get 5 rems
19 of whole-body exposure, theoretically, and also get the lung
20 limit.

21 We are proposing now, since we now have weighting
22 factors for the individual organs under the summation-of-risk
23 approach, that the sum of the risks be limited from both
24 internal and external exposure.

25 Item 4 there is new. In the past, there have been

1 no specification and guidance of minimum radiation protection
2 requirements. We are proposing that there be three ranges of
3 increasing stringency of instruction on the risks of radiation
4 and radiation protection principles, on supervision of radia-
5 tion protection and the application of radiation protection;
6 of monitoring and recordkeeping -- and that is where the life-
7 time dose gets covered. I will talk about that in a lot more
8 detail in a few minutes.

9 Item 5, we are recommending to the agencies --
10 proposing to recommend. Pardon me if I don't always say
11 "proposed."

12 CHAIRMAN AHEARNE: That's an understandable problem.

13 DR. RICHARDSON: We are proposing that the regula-
14 tory agencies establish limits lower than 5 rems for specific
15 classes of workers or work situations when they think this is
16 appropriate. This was not done in the 1960 guide.

17 Item 6 under the intake guides, we are proposing
18 a methodological change, a minor one here, from radioactivity
19 concentration guides, to radioactivity intake factors. I am
20 not going to talk about that very much. It is tied up in the
21 means for carrying out Recommendation 3(b).

22 The exposure of miners, we are proposing no change.

23 Item 8 is a potentially extremely controversial one.
24 We are proposing that exposure of the unborn be limited. We
25 are proposing four alternatives for public consideration, and

1 we will talk about those in a few minutes.

2 Item 9, and the last one, the only change -- the old
3 guidance permitted agencies to exceed the guidance. We are
4 now making it explicit that they ought to tell people why they
5 are doing it when they do it.

6 The next slide, please.

7 (Slide.)

8 DR. ROSENBAUM: Let me say one thing about the
9 exposure of the unborn, in utero exposure. In the 1960
10 guidance, there were two classes of people, or "pre-people,"
11 who were protected. In the first place, the people themselves,
12 the workers, were protected against cancer, supposedly, by
13 limiting the dose which they could get. But in addition,
14 restrictions were put on a gonadal dose. The reason for that
15 is to protect against mutations, and therefore the protection
16 that is being offered is not for the worker, but for people
17 not only yet unborn but yet unconceived.

18 Any time you put restrictions on a worker, it
19 restricts his ability to earn a living. Therefore, the
20 precedent was set already in 1960 that workers could be
21 restricted not for their own benefit only, but for the benefit
22 of people yet to be born.

23 However, there was a class which wasn't covered at
24 all. That is, people who were conceived but not yet born.
25 We know a great deal more about health effects now in 1980

1 than we did in 1960. The largest single source of data on
2 radiation health effects is the Japanese survivors. The data
3 from the Japanese survivors shows little, if any, evidence of
4 any genetic damage at all. I don't mean by that to suggest
5 that there's any proof that there isn't any, but certainly not
6 any proof that there is.

7 On the other hand, it shows very high effects on
8 children who were in utero at the time. Perhaps the most
9 prominent of those effects, but certainly not the only one,
10 is microcephaly. "Microcephaly" is literally very small head
11 size, and it is very, very highly correlated with severe
12 mental retardation -- very severe mental retardation.

13 There are other effects from in utero radiation --
14 childhood leukemia, for example, after children are born, and
15 other sorts of genetic effects. The summation of these
16 effects, it seems from the data, seems to be a very much
17 larger problem than the genetic effects which seemed very
18 serious to the people in the late '50s who were drawing up
19 what became the 1960 guidance.

20 So when I came to this job a little over a year ago,
21 this was not part of the occupational package, but was
22 scheduled for a further action after this package. It seemed
23 to me, in conscience, that we ought to bring it out in the
24 public and have a public debate about what, if anything, ought
25 to be done about it. What we have done is to propose -- which

1 we will show you -- four alternatives. These aren't the only
2 possible alternatives, and no doubt other people will suggest
3 other reasonable possibilities at the hearings.

4 That's all I had on that.

5 CHAIRMAN AHEARNE: Go ahead, Allan.

6 DR. RICHARDSON: Let me move on now to some consid-
7 erations that shaped our thinking about how to put the guidance
8 together as a whole, not just the question of whether the number
9 should be "5 rems," or "9," but how should the guidance
10 operate.

11 There are a couple of striking facts about radiation
12 exposure of the work force that are important, I think. One
13 of them is, we did a survey of radiation workers^s for the
14 year 1975. I think we looked at something like 350,000
15 records out of a little over a million estimated numbers of
16 workers.

17 We find that about 95 percent of workers get less
18 than 500 millirems -- less than one-tenth of the maximum
19 permitted by the guide. We also have concluded, after talking
20 to -- I haven't put up a slide which shows all the agencies
21 on our interagency working group and how this thing has moved
22 forward, but we have a group of about 10 agencies that have
23 been working on this for a number of years. We have become
24 convinced that there are justified tasks that exist that require
25 doses on the order of a few rem. All right, that's a dichotomy.

JWB

1 Another observation, after looking at the risks
2 associated with average exposures, average exposures by the
3 way for the roughly 1.2 million workers in 1975 were about
4 120 millirem, a very low number.

5 The risk that is associated with that is quite small.
6 It is actually less risk than the risk of accidental death in
7 the safest of all trades. We can show you some information
8 about that later.

9 On the other hand, the maximum permitted lifetime
10 radiation risk -- that is 5 rems per year from age 18 to age
11 65 -- is not small. It is on the order of something between
12 5 and 10 percent chance of a premature death due to cancer,
13 radiation-induced cancer. It is an exceptional circumstance.
14 I don't think any of us could find a worker who had gotten
15 5 rems every year of his working life, but it is theoretically
16 allowed by the guide.

17 It is a risk which is from one to three times,
18 depending on which risk model you use, higher than the risk
19 of accidental death in the most hazardous of occupations --

20 DR. ROSENBAUM: The average.

21 DR. RICHARDSON: The average risk. That is, miners,
22 construction workers, agricultural workers. So it is some-
23 thing which has to be dealt with.

24 Could I have the next slide, please?

25 (Slide.)

JWB

1 COMMISSIONER GILINSKY: "Average" means simply you
2 are averaging over a large group?

3 DR. RICHARDSON: Averaging over all miners,
4 averaging over all agricultural workers, and so on, and
5 comparing that to the maximum risk permitted under the
6 guidance. That's something like 235 rems over a lifetime.

7 DR. ROSENBAUM: We don't have the information to
8 compare the highest possible risk under the guides with the
9 most dangerous miners' occupations, or the most dangerous --
10 because there aren't such statistics.

11 COMMISSIONER BRADFORD: But how meaningful is it to
12 say that the highest possible exposures exceed the average
13 risk of death than others? I mean, the average itself
14 obviously is made up of the number of highs and lows.

15 DR. ROSENBAUM: It is not all that meaningful, I
16 quite agree. It certainly hasn't been a very important part
17 in the decision-making. It is just an attempt to give some
18 perspective in terms of other industries. It would be much
19 more sensible to compare the average nuclear risk with the
20 average in the most hazardous industries, and the highest
21 possible nuclear risk with the highest risk for miners and
22 people like that; but we simply don't have the data for the
23 higher risk. There are no statistics compiled, so there is
24 no way to do that.

25 DR. RICHARDSON: It may be more pertinent to look

1 at the absolute risk, which is on the order of 5 to 10 percent,
2 or I guess it is actually 4 to 7.

3 COMMISSIONER GILINSKY: Well, it is not an irrele-
4 vant number for someone who is engaged in this occupation --

5 DR. ROSENBAUM: No, it's not irrelevant at all.

6 COMMISSIONER GILINSKY: -- and might be subjected
7 to these sorts of numbers. I don't know what the risk is.

8 DR. ROSENBAUM: It is very important.

9 DR. RICHARDSON: All right, what do we conclude
10 from that? We concluded that individual and collective risks
11 should be minimized. That's a motherhood statement. They
12 should be limited to values, at worst, no greater than those
13 from other occupational hazards.

14 In order to do this, we concluded that we should
15 design the guidance so that workers are permitted doses up
16 to 5 rems, which appear to be necessary in some cases, only
17 when clearly necessary; and that there be some kind of
18 administrative controls -- some kind of a structure -- that
19 would keep the vast bulk of workers operating under limits
20 which are, in effect, for them much lower.

21 Now there are different ways to do --

22 COMMISSIONER GILINSKY: May I ask a question at
23 this point?

24 DR. RICHARDSON: Yes.

25 COMMISSIONER GILINSKY: I know you said you were

1 going to skip the important background sections, but --

2 DR. RICHARDSON: You wanted to talk about that some
3 more?

4 COMMISSIONER GILINSKY: I would like to ask one
5 question.

6 DR. ROSENBAUM: We are willing to go into anything
7 you want.

8 COMMISSIONER GILINSKY: I gather this is all based
9 on a linear model?

10 DR. ROSENBAUM: Yes, sir.

11 COMMISSIONER GILINSKY: How does one get from
12 limiting risks to annual dose limits? Why would one impose an
13 annual dose limit, as opposed to a cumulative dose limit?

14 DR. ROSENBAUM: Why would you want to impose it?

15 COMMISSIONER GILINSKY: Yes.

16 DR. ROSENBAUM: First of all, imposing an annual
17 dose limit automatically imposes a cumulative limit.

18 COMMISSIONER GILINSKY: I understand that.

19 DR. ROSENBAUM: It's true that it makes a difference
20 when you get the dose, because if you get the dose -- all this
21 is very model dependent. Ordinarily people consider most
22 cancers to have a latency period sometimes of 10 to 15 years
23 say for lung cancer.

24 COMMISSIONER GILINSKY: I guess I was trying to get
25 a better idea of what your model is.

1 DR. ROSENBAUM: Well, the point is that if someone
2 gets -- if someone would have had just a lifetime dose and
3 they were to get it at age 20, it would be much more serious
4 than if they would get it at age 60, for two reasons. One,
5 if they were to get cancer from it, they would be likely to
6 get cancer earlier, and therefore lose much more of their
7 life.

8 Two, the chances of somebody getting it when they
9 were 60, if there's a 10- or 15-year latency period, there's
10 quite a sizeable chance that they will die from other causes
11 since most of it would show up 20 or 25 years later, before
12 they ever got the cancer, and therefore the chances of them
13 getting cancer from it are much less, at all. And if they
14 do get cancer from it, then they lose much less of their life.
15 So on both accounts, it makes a great deal of sense not just
16 to have an overall lifetime limit, but to have a yearly limit.

17 Is that a satisfactory answer?

18 COMMISSIONER GILINSKY: Yes.

19 DR. RICHARDSON: You mentioned in part of your
20 question: How do we calculate these risks? We will talk
21 about it more later, but briefly we use a life table analysis
22 and we take into account the latency period, and the risk of
23 competing death, and the length of the expression period for
24 cancers; and we have used the BEIR I risk estimates up until
25 now.

1 COMMISSIONER GILINSKY: But even taking those sorts
2 of things into account, it wouldn't really make a great deal of
3 difference if you doubled the dose one year and had zero the
4 following year.

5 DR. ROSENBAUM: It wouldn't make so much of a
6 difference if those two years were together. In other words,
7 it wouldn't make much difference if you had a two-year limit
8 instead of a one. And indeed, that's sort of the thinking
9 that we did to do away with quarterly limits. At the present
10 time, there are quarterly limits of 3 rem per quarter, which
11 allow 12 rem a year.

12 If the dose in a short enough time like
13 people did in Hiroshima and Nagasaki, then you may have a very
14 serious dose-rate effect. That's quite possible. But there
15 is no evidence that I know of that there is any difference in
16 dose-rate effect between spreading it out over three months or
17 a year, or two years for that matter.

18 CHAIRMAN AHEARNE: At these low levels?

19 DR. ROSENBAUM: At these low levels, yes. So the
20 year seems to be a convenient period for administration.

21 COMMISSIONER GILINSKY: Also, we have been using it
22 for a long time.

23 DR. ROSENBAUM: And it seems -- and for the reasons
24 I've just mentioned to you, one doesn't want to spread it out
25 over too many years, because the risk does change from year to

1 year as you get older.

2 DR. RICHARDSON: Well, moving on, the guidance
3 proposes two different mechanisms for basically imposing ALARA
4 on doses above and beyond the 5 rem limit. One of them is a
5 tiered system of minimum radiation protection requirements,
6 which I will talk about next; and the other is an admonition
7 to the regulatory agencies to set limits that are less than
8 5 rem when it is justified to do so.

9 We chose to leave -- one of the other alternatives
10 would be to set such limits ourselves as part of the guidance
11 for different classes of workers. We decided that that was
12 not an appropriate thing to do in guidance; it should be left
13 to the regulatory agencies.

14 I have talked about limiting excessive lifetime dose,
15 and I will talk more about it in the minimum radiation
16 protection requirements. We have also concluded that there is
17 no need to continue the 12-rem annual dose limit, which is
18 the 3-rem quarterly limit as it is now expressed.

19 Next slide, please.

20 (Slide.)

21 All right, these are the first two recommendations
22 and I think they speak for themselves. The first requires for
23 justification of exposure; and the second, for minimization of
24 the collective dose.

25 Next slide, please.

1 (Slide.)

2 This is a summary of the minimum radiation protection
3 requirements. I just put it up here so you could get an
4 overview of what they contain. We are proposing three ranges,
5 A, B, and C, that are respectively up to one-tenth of the
6 radiation protection guide, from one-tenth to three-tenths,
7 and from three-tenths up to the radiation protection guide.

8 In the first range -- there are four different types
9 of things covered by the requirements: education requirements,
10 supervision requirements, monitoring, and records.

11 Education requirements are what is appropriate for
12 the range. Supervision is interesting. There we propose that
13 in Range A only through generic requirements. An example of
14 workers in Range A are dental technicians or transportation
15 workers. Packaging requirements on radioactive materials are
16 a generic requirement for dose limitation. Shielding require-
17 ments and the like on X-ray diagnostic machines are an example
18 of generic requirements.

19 At the level of Range B, we propose that there should
20 be professional radiation protection supervision on the job.

21 And at the level of Range C, that this be extended
22 to individual tasks for high-dose jobs.

23 CHAIRMAN AHEARNE: Now over in the far right-hand
24 lower column, you mention you are going to include Range B
25 doses in C.

1 DR. RICHARDSON: Once a worker has been exposed in
2 Range C, we propose that his Range B doses from that time
3 forward only be kept track of.

4 I think the rest of that is self-explanatory. Can
5 we have the next slide.

6 (Slide.)

7 Here is the statement of the minimum radiation
8 protection requirements for Range A. I don't think I need to
9 say very much about them.

10 The monitoring requirement there is simply a require-
11 ment to know enough about the exposure conditions to ensure
12 that the doses are in Range A.

13 Next slide, please.

14 (Slide.)

15 Range B has two important requirements. First, that
16 the professional radiation protection supervision be present.
17 Second, that individual monitoring and annual recordkeeping
18 take place.

19 CHAIRMAN AHEARNE: Now by your "professional"
20 provision, do you go into further detail, or do you intend to,
21 as to what that would mean?

22 DR. RICHARDSON: No. We've avoided doing that.
23 There are going to be some medical applications where there
24 are very few employees where it would not be appropriate to
25 hire a health physicist, and where there is going to have to

1 be provisions for either additional training of employees in
2 health protection or consultative services. But there are
3 only approximately 2 to 3 percent of all workers in Range B.

4 Next slide.

5 (Slide.) ,

6 Range C, which is the highest doses, which are a
7 little bit less than 2 percent of all workers, calls for close
8 supervision on a task-by-task basis of high-dose jobs, and
9 lifetime dose records once you enter the range.

10 Finally, that every reasonably achievable effort be
11 made to maintain doses to less than 100 rem over a lifetime
12 to workers.

13 Next slide.

14 (Slide.)

15 And here is the recommendation that agencies
16 establish lower limits when it is appropriate. And a clarifi-
17 cation in the last sentence, that the ranges specified by A,
18 B and C are not intended to specify those lower limits.

19 Next slide, please.

20 (Slide.)

21 Partial body exposure is a complex subject, and I
22 don't want to take any more of your time with it than is
23 appropriate and necessary. There are several -- there are
24 many issues. I've put four of them up here. I've already
25 mentioned the question of whether internal exposure should be

1 limited by individual organ limits, or by the sum or risks to
2 all organs.

3 There is the further issue of whether somatic and
4 genetic risks should be treated separately or together. For
5 instance, in ICRP current guidance they are treated together;
6 we have not done that.

7 CHAIRMAN AHEARNE: Are you in debate with ICRP on
8 this?

9 DR. ROSENBAUM: Let me answer that. We don't "debate"
10 with ICRP. They have a different role to play than we. We
11 read what they do and take it into consideration.

12 CHAIRMAN AHEARNE: But you don't attempt to change
13 what they do?

14 DR. ROSENBAUM: Well, we have no mechanism to change
15 what they do. We don't have anybody on ICRP, and in fact when
16 we were offered -- essentially offered -- the ability to put
17 somebody on the ICRP, I decided we couldn't possibly do it
18 because of limitations of travel, among other things, which
19 we don't have the luxury of either staff or travel money to
20 do that sort of thing.

21 DR. RICHARDSON: I have informally discussed these
22 proposals as they have been developing with the President of
23 the ICRP, and they have no difficulty with them, for what
24 that's worth. They believe that they are consistent.

25 All right, I think the rest of that speaks for

1 itself, and then we have already talked about it a little bit.

2 Can we have the next slide?

3 (Slide.)

4 This is a complex slide, and I apologize for it.
5 This shows most of the system for limitation of individual
6 risk and partial body exposure.

7 There is under "A," a list of individual organ limits.
8 We have chosen to continue the 5 rem limit to the gonad and
9 to the lens of the eye, because there seems to be no good
10 reason to change it.

11 We are proposing that the limit to the hands be
12 lowered to 50 rem. And we are proposing that non-stochastic
13 and non-lethal cancer risks be limited by a single limit for
14 any organ of 30 rem.

15 We are proposing that the risk from partial-body
16 exposure of individual organs be also limited -- and this will
17 usually be controlling -- by the sum of the weighted risk to
18 the individual organs, with the weight taken in proportion
19 to their contribution to whole-body cancers.

20 I have a table of those weights. It is basically
21 the same set of weights that the ICRP uses, with the genetic
22 weight taken out and the rest of them renormalized.

23 And then finally, the proposal at the bottom that
24 internal and external doses be -- that the sum of the risks
25 be limited.

1 Next slide, please.

2 (Slide.)

3 The Unborn. Here are four of the considerations that
4 affect the choice of recommendations, the possibilities -- the
5 first being whether they should be voluntary or mandatory
6 limits. That is intimately tied up with the right-to-work and
7 equal opportunity questions.

8 The next question, which is a difficult one, is
9 whether the guidance should apply to a period of known pregnancy,
10 to periods of suspected pregnancy, or simply to all fertile
11 women. It is particularly important, because the most sensitive
12 period is early in pregnancy when, although pregnancy may be
13 suspected, it probably is not known.

14 That leads to another question. That is: Should
15 the limitation be expressed in terms of something like some
16 short-term dose rate, like a monthly dose rate, which would
17 serve to protect the unknown fetus? Or should it be done with
18 an annual dose as all the other limits are?

19 And then finally -- and this is the equal opportunity
20 question -- should the limits for male and females arbitrarily
21 be made the same?

22 Next slide, please.

23 (Slide.)

24 This lists four alternatives. The first two are
25 voluntary; the second two are mandatory. Of the first two,

1 the first one is an annual limit -- I'm sorry, it's a limit
2 during any known or suspected pregnancy. Since it is a
3 voluntary limit, it can be applied to a suspected period of
4 pregnancy also.

5 The second one is the same, but it adds a voluntary
6 limitation on dose rate.

7 The third one is essentially the second made
8 mandatory.

9 And the final one is the least restrictive limita-
10 tion that we could think of that applies equally to male and
11 female, and provides the same level of protection to the
12 unborn.

13 CHAIRMAN AHEARNE: But as you say, it essentially
14 greatly reduces the maximum exposure.

15 DR. RICHARDSON: It would affect the whole guidance.

16 DR. ROSENBAUM: Let me talk to that point a bit,
17 because I think it is important. I think the fourth choice
18 there, while it is there, it really begs the question. The
19 real question is: Because women bear children and men do not,
20 what does that imply about setting a different level of
21 dose limits for women, or at least women who can bear children,
22 than men? And lowering the whole structure doesn't change the
23 fact that whatever level you set the structure, at least
24 within the models that we use, the risk will still be greater
25 for the children.

1 By the way, I should point out that the risk to the
2 unborn is far greater than the risk to the mother, or to a
3 male in the same situation, far greater. The most sensitive
4 time of a human being's existence to radiation is early in
5 its fetal development.

6 CHAIRMAN AHEARNE: By "early," is the Japanese data
7 sufficient that you can pin that down? Are you talking about
8 months? Weeks?

9 DR. ROSENBAUM: Yes. We would be happy to -- Bill,
10 could you bring up -- I'd like to interpose that slide.
11 This is Dr. William Ellett, head of the Bioeffects Branch.
12 Do you have the slide there with you?

13 DR. ELLETT: Yes. Could we have that second stack
14 of slides, the one marked 8-A?

15 (Slide.)

16 This is the record for the single endpoint microce-
17 phaly, small heads, that Dr. Rosenbaum mentioned, 52 cases
18 observed at Hiroshima.

19 DR. ROSENBAUM: That's the right slide.

20 DR. ELLETT: It is the right slide, but just --

21 DR. ROSENBAUM: Upside down.

22 (Discussion off the record.)

23 DR. ELLETT: Let's get X-Zs, first (indicating).
24 This (indicating) is increasing dose, going back in the chart.

25 DR. ROSENBAUM: In red.

1 DR. ELLETT: This is actually the air dose, if you
2 will (indicating). This is the percent in each interval of
3 time of gestration here. These are the weeks, post-conception,
4 from zero to 36-plus.

5 For each of these intervals, this is the percentage
6 of newborn that showed microcephaly (indicating). It turns
7 out that it is very much concentrated in exposures to the
8 curve of somewhere from the 5th to the 11th week. There is a
9 window for the embryo that is starting those developmental
10 processes that lead to the brain and the skull.

11 The small skull is probably more a result of the
12 small brain than a direct end point. Both the BEIR III report
13 has this, and we did it ourselves independently. We looked at
14 the dose response for this most sensitive period from the 5th
15 to the 11th week. Could we have that next slide?

16 DR. ROSENBAUM: Before you go on, I just wanted to
17 point out one thing about that: That a number of those
18 humps go up to 100 percent, a fairly wide range. That is to
19 say, it no longer is a probablistic thing at all, but 100
20 percent of the children were born with microcephaly and
21 therefore almost certainly severely retarded. "Severely
22 retarded" means something like you can't write your name when
23 you are 18. It is really severe.

24 DR. ELLETT: And they didn't look for "less severe"
25 degrees.

1 DR. ROSENBAUM: The Japanese only monitored very
2 severe retardation.

3 DR. ELLETT: Could we have Slide 8-B, please?

4 (Slide.)

5 Could we have that twisted 90 degrees?

6 DR. ROSENBAUM: I knew it.

7 (Laughter.)

8 CHAIRMAN AHEARNE: That's Murphy's law.

9 (Laughter.)

10 DR. ELLETT: Air dose is here (indicating), but pay
11 more attention if you would, please, to these doses here
12 (indicating). This is the interuterine dose (indicating),
13 the dose to the fetus (indicating), and this is the frequency --
14 these are different dose ranges here (indicating); it's a bar
15 graph, really. These are dose ranges.

16 This (indicating) is the frequency of the cases.
17 Now once you got up to something like 32 rad gamma, 3-1/2 rad
18 neutron, you had 100 percent. This is for the most sensitive
19 period.

20 Here (indicating) are the controls. They were seen
21 in both studies, about 3, 4 percent down here (indicating).
22 This is a little bit of data here for this first step, 0 to 10,
23 but the average doeses there are quite small. It's 1.2 rad
24 gamma, .1 rad neutron. The neutron doses were not particularly
25 high inside the body. This is something that we had missed

1 before in previous analyses.

2 This first step may not be statistically significant.
3 Actually you get 11 percent incidence here. If it had been 12,
4 it would have been statistically significant. It is borderline;
5 it's pretty close.

6 Here (indicating) it isn't significantly above
7 expected all the way out. What is a little bit spooky about
8 this is, if you draw a line here (indicating) from the zero
9 dose non-exposed controls to up here where they had the 100
10 percent, it falls awfully close to the middle of these steps.

11 Now a linear response isn't what you particular
12 expect for this sort of thing. In animals they see it sometimes;
13 more frequently they see a non-linear response. It depends on
14 the end point you're talking about at the time of exposure.
15 For this data and some other things, we have some real
16 concerns about in utero exposure -- more so than we have had
17 before.

18 The BEIR I Report is rather sanguine about this, as
19 long as you're under 5 rem per year. The BEIR III Report is
20 not that way at all. It says: Caution, except when mother's
21 health is involved for exposures more than a few times
22 background.

23 COMMISSIONER GILINSKY: What is the date of this
24 work?

25 DR. ELLETT: It's in your handout. The update of

1 that is in a Terogenics -- Teretology, and --

2 (Pause.)

3 DR. ROSENBAUM: While he is looking that reference up,
4 let me say a couple of things about this.

5 One, you can see why we are concerned. At doses in
6 which people would have only a very small chance of cancer, in
7 utero exposure means 100 percent chance of very severe mental
8 retardation, so it's a very severe effect.

9 I think that there is just no statistical, or
10 otherwise, doubt about this data at all. The one difference
11 that one can say is that the Japanese exposure took place almost
12 instantaneously, and therefore it may be to some extent dose-
13 rate dependent. We have looked at other data from animals and
14 other things in making our own guidance; but in looking at this
15 data myself, I couldn't see how we could ignore bringing up
16 this issue in the occupational guidance.

17 I don't consider it a matter of women's rights, at all.
18 In all fairness, half the children being born with microcephaly
19 and retardation will be women. So it's not the issue at all.

20 DR. ELLETT: The data itself is from Teretology.
21 It's from a paper by Miller and Mauhill, Occupational Institute
22 of Health, 1976. They have a whole series of papers going back
23 to at least 1972 and 1968 on this topic.

24 COMMISSIONER GILINSKY: Why did it take so long to
25 understand this, or at least observe it?

JWB

1 DR. ROSENBAUM: I think it had been observed
2 scientifically. I don't know why it took so long to be brought
3 up publicly. I just did it as soon as -- I just put it into
4 the process as soon as I saw it. I had a number of --

5 COMMISSIONER GILINSKY: What about the scientific
6 papers in 1976?

7 DR. ROSENBAUM: I don't know why. That was the
8 latest. They go back quite a long way.

9 DR. ELLETT: I think the real difference was, when
10 we started the BEIR Study, we insisted that the BEIR people
11 use the organ dose rather than the air doses for this. At
12 Oak Ridge they did a magnificent job in getting doses to
13 different organs of the body, including what the interuterine
14 dose was.

15 These doses, we always said: Well, gee, the neutron
16 dose is pretty high. This must be due to neutrons. And that
17 is pretty much stated in the papers going back to '72.

18 The problem is that the neutrons were much more
19 absorbed than the gamma rays. The neutron doses were only
20 one-thirteenth of the gamma doses. So it is very hard now to
21 abscribe all this damage to just the neutron component. I
22 think that is where we misjudged the thing.

23 DR. ROSENBAUM: We have also --

24 DR. ELLETT: In looking at the dose in air, and not
25 the dose at place of entrance.

1 DR. ROSENBAUM: We have also done careful statistical
2 analysis of the difference between Hiroshima which had such a
3 large neutron component, and Nagasaki, which was largely gamma,
4 to see if in fact most of it came from the neutrons. That's
5 not the way it looks when you do a careful analysis.

6 COMMISSIONER GILINSKY: Well, are these expressed --
7 Oh, they're expressed in rads. There isn't any factor that
8 takes account of the different --

9 DR. ROSENBAUM: No, no. You could adjust them by
10 whatever RBE, multiply the neutron. The neutron dose is
11 given explicitly. You could convert it to rem by multiplying
12 the neutron number by any Q that you like.

13 COMMISSIONER GILINSKY: It looks as if the gamma
14 and the neutron components are roughly comparable in rem.

15 DR. ELLETT: Yes, roughly I think so.

16 DR. ROSENBAUM: If you look at the difference between
17 Hiroshima and Nagasaki as an experiment, the different effects,
18 it is difficult to make a case that it's primarily neutrons.
19 I can just tell you that from the data. That doesn't prove
20 anything, but it is very difficult from that data -- which was
21 most of what we have -- to make such a case.

22 Let me point out that this same issue has been brought
23 up very strongly in the medical field partly by the work of
24 Alice Stewart, such that 10, 15 years ago women in their
25 first pregnancies were routinely X-rayed to see the size of

1 the pelvic canal and the position of the baby. It was a routine
2 thing, without any second thought about it. Now, women who are
3 pregnant are never X-rayed unless there is a compelling reason
4 to do so, even though the doses to the fetus are quite small
5 and much smaller than these that we're talking about here,
6 and also that the doses are given -- and the X-rays are almost
7 never given in the most sensitive period, but are often given
8 in the 7th or 8th month where the sensitivity is much less.

9 Nevertheless, the medical community has decided that
10 women who are pregnant should never be X-rayed unless there is
11 a compelling medical reason to do so, and I think it is part of
12 the same thing.

13 COMMISSIONER GILINSKY: Wouldn't there be records
14 for women who had been X-rayed in the early months of pregnancy
15 that one could use to develop a corresponding set of results
16 for the U.S. population?

17 DR. ROSENBAUM: Let me discuss that. Alice Stewart
18 has done some of that in Britain. I have not gone over her
19 papers myself, and therefore I don't know how good they are.
20 But certainly they have had an enormous effect.

21 We are negotiating a contract right now with the
22 Mayo Clinic which has an enormous --

23 CHAIRMAN AHEARNE: The entire health records --

24 DR. ROSENBAUM: -- the entire health records of
25 almost a million people. What's more, they have birth-to-death

1 records of a large part of it. People are born in the Mayo
2 Clinic, their pediatrics is done their, and they grow old and
3 die in the Mayo Clinic.

4 COMMISSIONER BRADFORD: And they get out.

5 DR. ROSENBAUM: Excuse me?

6 COMMISSIONER BRADFORD: They get out.

7 (Laughter.)

8 DR. ROSENBAUM: In between, yes, they get out.

9 But epidemiology is a very difficult thing to do in
10 a way that will prove anything. An enormous number of studies
11 have been done at great public expense -- epidemiology studies,
12 which are a waste of public funds. They don't show anything.
13 And I want to be very careful not to add to the list of things
14 that are a waste of public funds.

15 We are looking very carefully right now at the
16 backup data to the Mayo Clinic Study which was published
17 already. Was it in Science? Or the New England Journal of
18 Medicine?

19 DR. ELLETT: The New England Journal of Medicine.

20 DR. ROSENBAUM: In the New England Journal of
21 Medicine, on leukemia, which said essentially there was no
22 evidence of any harm below 300-rem lifetime dose. I don't
23 know whether -- we haven't done enough analysis of that in
24 great detail. We went out to the Mayo Clinic, several
25 people, Bill Ellett and I, among them, and talked to them in

1 great detail, and we now have received, or are about to receive,
2 their backup data, and we are going to make a careful analysis
3 of that paper.

4 We are also making an analysis now of the possibility
5 of using their records to look at this in utero dose exposure.
6 If it seems that we can get an answer one way or another out
7 of the records, then we will fund such a study.

8 COMMISSIONER GILINSKY: Have there been any animal
9 experiments on this effect?

10 DR. ROSENBAUM: Yes. There's been a lot of animal
11 experiments on the effects, and I would be glad to have
12 Dr. Ellett discuss them in some detail. But it is difficult
13 to extrapolate numerically from animals to people, though, to
14 look at types of effects.

15 COMMISSIONER GILINSKY: But is the effect observable?

16 DR. ROSENBAUM: Yes; strongly.

17 DR. ELLETT: I would like to add that there have
18 been some studies -- I won't swear how good they are -- on
19 diagnostic X-rays, and they did not observe the sort of thing
20 that we see in Hiroshima and Nagasaki. So we don't understand
21 the reason for this. They weren't looking for this as a
22 particular end point. They observed microcephaly, but not at
23 the prevalence you see here; but these studies were not
24 designed for this sort of thing, so I don't want to jump to
25 conclusions one way or the other. It may well be worth the

1 time and money to do something more definitive on this.

2 DR. ROSENBAUM: Let me just add one thing. We have
3 just gone through a reorganization in my little kingdom over
4 there. One result of the reorganization is that we have formed
5 a Statistics and Applied Math Division -- something akin to
6 what I tried to do at the AEC, which eventually became the
7 Statistics Group at NRC.

8 I believe that we will have a very considerable
9 capability in that regard to do work -- path-breaking work --
10 which is what is needed to handle these kinds of questions,
11 and we will be looking very carefully at the data.

12 As an example, the person who has been chosen,
13 though not yet certified, by whatever the Civil Service
14 Commission is called these days -- they keep changing names on
15 me -- the Office of Personnel Management, is Dr. Donald Ruben
16 who is to be the Director, who is the current Editor-in-Chief
17 of the Journal of the American Statistical Association, and
18 now head of the statistical activity at the Educational Testing
19 Service in Princeton, which is one of the largest such
20 practical statistic apply programs in the world, and we have
21 already begun to bring in statisticians not only from the
22 United States but from around the world. And I think because
23 of that, we will have the capability to go into these sorts
24 of statistical questions in a great deal of depth, and to try
25 to make as much of the data as we can. But it is very difficult

1 to get hard answers from epidemiology, except in overwhelming
2 cases like shipyard workers who spend most of their lives
3 working with asbestos or something like that. But at low
4 effects, it is very difficult.

5 I don't want to make any promises, except that we
6 will try very hard to get every bit of information there is
7 out of the data.

8 CHAIRMAN AHEARNE: Dr. Ellett, you were going to
9 comment on the animal experiments.

10 DR. ELLETT: Well, I don't really think there is
11 that much more to add from what they have. There has been a
12 lot of animal work that's reviewed very well in the latest
13 UNSCA report.

14 What happens is, an embryo progresses in a sequence
15 of various stages in pregnancy. Now this is speeded up in
16 animals as compared to man, but when you look at the time-
17 different organ generation starts, organ genesis, and give
18 you the dose at that time, you get effects in those organs
19 which are startling.

20 In fact, they use radiation as a tool to study
21 embryology, to find out what the sequence of events are.
22 I will say that in animal studies they have been unable to
23 demonstrate a threshold, and nervous tissue seems to be a
24 particularly sensitive end point.

25 DR. RICHARDSON: If we could go back to the first

1 stack of slides, it is number 14 next.

2 (Slide.)

3 Perfect. This is a set of miscellany. I am not
4 going to talk about No. 6. I will give you a moment to read it.

5 (Pause.)

6 Number 7 continues the existing recommendation for
7 miners.

8 CHAIRMAN AHEARNE: That's not a change?

9 DR. RICHARDSON: That's not a change.

10 Number 9 is not really a change except for the last
11 line. By "miners," we mean -- well, it says "younger than
12 eighteen" up there.

13 The next slide, please.

14 (Slide.)

15 This lists the things that are not covered by the
16 recommendations, although some of them are mentioned in the
17 recommendations in passing.

18 "Emergency exposure limits" are not covered by the
19 recommended guides. The same for "accidental overexposures."
20 We feel that that is a matter for regulatory agencies to deal
21 with.

22 "Medical exposures of patients" is a very interesting
23 item. One could make the case that it is possible that there
24 is as much medical exposure of workers from required X-rays
25 as there is from occupational exposure, because when you

1 consider that there's about a million radiation workers out
2 there getting an average of about 1/10th of a rem a year, it
3 doesn't take very many of the much larger -- perhaps 50 to 100
4 million workers in the non-radiation workers in the work force
5 as a whole getting required back X-rays, or whatever, or food
6 handling X-rays, to add up to a dose that might be bigger than
7 the total occupational work force. That is a comment in passing,
8 and we also comment in passing that there is already federal
9 guidance on the use of diagnostic X-rays for non-medical
10 purposes and for screening purposes.

11 "Normal background exposure" of course is not
12 covered.

13 COMMISSIONER GILINSKY: No recommendation.

14 DR. RICHARDSON: We're not recommending that background
15 be changed.

16 "Radon decay product exposure of miners" is already
17 addressed by guidance which was updated in 1970. We're going
18 to look at it again after we get finished with this exercise.

19 "Guides for time periods other than one year" are
20 only mentioned in passing.

21 COMMISSIONER GILINSKY: Would you say a word about
22 the exposure to miners? Are the rules or the standards in some
23 way comparable in terms of risk?

24 DR. RICHARDSON: They're probably higher, perhaps as
25 much as a factor of 2.

1 COMMISSIONER GILINSKY: Which are higher?

2 DR. RICHARDSON: The four working level months per
3 year, depending on what risk estimate you use --

4 COMMISSIONER GILINSKY: Higher than --

5 DR. RICHARDSON: 5 rems per year.

6 COMMISSIONER GILINSKY: -- than the 5 rems per year.

7 DR. ELLETT: I could quantitate that a little bit,
8 if you'd like.

9 DR. RICHARDSON: Yes, go ahead.

10 DR. ELLETT: If you use the BEIR III risk model,
11 a miner that is employed for 30 years at 12 working level
12 months per year has about a 9 percent chance of death due to
13 lung cancer. Somebody getting 5 rems a year for 47 years has
14 about a 6 percent chance.

15 COMMISSIONER GILINSKY: The 9 percent was for how
16 many years?

17 DR. ELLETT: 30, which is probably as long as most
18 miners are employed in the mines.

19 COMMISSIONER GILINSKY: And how did you come up with
20 the 47 years?

21 DR. ELLETT: That is 18 to 65 for the radiation
22 worker.

23 COMMISSIONER GILINSKY: I see.

24 DR. RICHARDSON: So the annual risk is about twice
25 on that basis. The lifetime risk is roughly comparable.

1 Roughly. 50 percent more, but not --

2 DR. ELLETT: Seeing as how these numbers were set
3 pretty much without risk estimates, it is amazing that they
4 turned out to be within a factor of two, really.

5 DR. RICHARDSON: The last one is of significance.
6 We have said --

7 COMMISSIONER GILINSKY: Let me just ask you again
8 about that. Do miners typically come close to that limit?
9 You were saying that -- So really the numbers are more
10 different even than was suggested here a minute ago.

11 DR. ELLETT: That's true, and the miners probably
12 get more gamma rays than the average radiation worker, or the
13 average nuclear worker for that matter.

14 DR. ROSENBAUM: Mining in general -- not only
15 uranium mining -- is quite a high-risk occupation.

16 COMMISSIONER GILINSKY: That is covered by your
17 guidance, ultimately?

18 DR. RICHARDSON: Yes.

19 DR. ROSENBAUM: Yes.

20 DR. RICHARDSON: The guide was established in 1970,
21 and it is for four working-level months per year. That is
22 a measure of exposure to radon decay products.

23 CHAIRMAN AHEARNE: And you say it will turn into
24 a re-examination?

25 COMMISSIONER GILINSKY: It sounds pretty important.

JWB

1 DR. ROSENBAUM: Yes.

2 DR. RICHARDSON: The last item is the question of
3 dosimetric conventions -- how deep do you measure the dose?
4 What metabolic models do you use for ingestion -- swallowing
5 or breathing radionuclides -- and figuring out where they go
6 and what organs get dosed.

7 What parameters do you use to express the average
8 worker, called "reference man" here. What quality factors
9 do you use? And so on and so forth.

10 We have said that the factors in these recommendations,
11 the factors recommended by the ICRP may be used; and that if
12 we felt that there was a need to issue further guidance on
13 any specific issues, we would do so. But we have not done so
14 for anything specific in these recommendations.

15 The next slide, please.

16 (Slide.)

17 This is the last one. David --

18 COMMISSIONER HENDRIE: Does that last line take us
19 all into the new radiation exposure units, then?

20 DR. RICHARDSON: We didn't say anything about units.
21 "Units" was not on that list.

22 COMMISSIONER HENDRIE: Oh. Okay.

23 DR. RICHARDSON: I said "conventions," and "metabolic
24 models."

25 DR. ROSENBAUM: I have been trying to discipline

1 myself, but I've been unable to do that.

2 (Laughter.)

3 DR. RICHARDSON: We are leaving that to the Bureau of
4 Standards.

5 CHAIRMAN AHEARNE: Recalibrating.

6 DR. RICHARDSON: David tells me that this schedule
7 is optimistic and he's probably right, because I have always
8 been optimistic in the past and proven wrong. But this does
9 correspond roughly to what he said to you at the beginning of
10 this presentation.

11 I think that if we don't reach any real snags, we
12 should be able to meet that schedule. That's all I have.

13 CHAIRMAN AHEARNE: In the Interagency Work Group, do
14 you have to have agreement?

15 DR. RICHARDSON: No.

16 DR. ROSENBAUM: Under the guidance authority we don't
17 have to have anything. We could simply give it to the
18 President, who could sign it if he wants to put it in the
19 Federal Register.

20 As a matter of practice, in fact it is a good idea
21 to try to get as much agreement as you can.

22 CHAIRMAN AHEARNE: Certainly, but obviously on some
23 of these issues there is going to be some significant
24 contention, so you are just going to have to go out --

25 DR. ROSENBAUM: Yes. Mr. Costel can sign the thing

1 and send it to the President any time he so chooses. He doesn't
2 need anybody else's agreement to do that, to recommend it to
3 the President.

4 We have prepared now to go either into the technical
5 bases of any of these things -- including the health effects
6 data -- to whatever degree you would like; or, to the worker
7 exposure data, how the population breaks down, who is exposed
8 and by how much and so forth; or, to move on to uranium mill
9 tailings; or to talk a little about the high-level waste, what-
10 ever your pleasure is.

11 CHAIRMAN AHEARNE: I would, I guess for myself,
12 propose -- unless some of my colleagues have burning questions
13 on this -- recognizing the importance, but our staff will be
14 looking at it and we will want to think through it more
15 carefully, and there is a long period as you have pointed out
16 for going through it -- to move on to the mill tailings.

17 DR. ROSENBAUM: All right.

18 CHAIRMAN AHEARNE: Thank you very much. And as you
19 know, I am delighted to see this.

20 (Pause.)

21 DR. ROSENBAUM: Let me say one word of apology to
22 the world.

23 CHAIRMAN AHEARNE: They're not all here.

24 DR. ROSENBAUM: But they're all listening.

25 (Laughter.)

1 DR. ROSENBAUM: We are very late with these standards.
2 We were, as I said, required to promulgate the ones we are
3 discussing today, which are the standards for inactive piles,
4 last November 8th, and we were required to promulgate the
5 standards for active piles last May 8th. And it will be quite
6 some time -- we'll try to give you a schedule for this, but the
7 active piles are just beginning, and it might take a year-and-
8 a-half or two years to actually promulgate them.

9 DR. LICHTMAN: I would like to remind you that EPA's
10 program for developing --

11 DR. ROSENBAUM: I didn't introduce you. This is
12 Dr. Stanley Lichtman, who has been in charge of the standards.

13 DR. LICHTMAN: Our program for developing these
14 standards was being carried out at the direction of the
15 Uranium Mill Tailings Radiation Control Act of 1978, which
16 directed EPA to write standards for remedial action programs
17 at a number of inactive processing sites, almost all of which
18 are uranium processing sites. There is one at Cannonsburg of
19 a slightly different character.

20 In addition, writing standards for active processing
21 sites, those which are operating now and those which may operate
22 in the future.

23 Initially I will talk only about the program for
24 inactive sites. As David said, we have made more progress on
25 that.

1 The remedial actions for these sites -- and 25 of
2 them have been designated by DOE to date -- remedial actions
3 will be selected and performed by DOE according to our standards,
4 and with the concurrence of NRC. So NRC has a considerable
5 role in this program, and in fact it has very recently -- NRC
6 has -- undertaken a role with respect to a uranium mill at
7 Edgemont, South Dakota, which is comparable --

8 CHAIRMAN AHEARNE: "Undertaken" isn't probably quite
9 the complete description of it.

10 DR. LICHTMAN: Well, I guess you're in the evalua-
11 tive stages.

12 CHAIRMAN AHEARNE: Well, I was more -- it wasn't sort
13 of that we --

14 DR. LICHTMAN: Oh, it's not that you undertook it;
15 right.

16 CHAIRMAN AHEARNE: -- eagerly sought this role.

17 DR. LICHTMAN: In any case, it is a very similar
18 job there to what DOE will be doing around the rest of the
19 country. And in both cases, our standards will be the touch-
20 stone according to which the actions are carried out.

21 Now we have conceived of a standard, or two
22 conceptual kinds of standards. One of them are cleanup
23 standards for contaminated open lands and buildings. These
24 are places where tailings may have blown or been conveyed and
25 left on open land -- land which is not occupied by a building;

1 or else tailings have been used rather extensively in some
2 places, as you probably know, in the buildings themselves, in
3 the foundations or in the building materials.

4 The second conceptual element are disposal standards
5 for disposal of the tailings piles themselves, or the bulk of
6 the material. So first I would like to -- Can I have the
7 second slide, please?

8 (Slide.)

9 I would like to address the cleanup standards, which
10 we have already proposed in the Federal Register, and you have
11 copies attached in the handout I gave you. And for reasons
12 explained in those Federal Register notices, we also declared
13 the cleanup standards immediately effective as interim
14 standards, primarily so that cleanup could begin as soon as
15 possible.

16 These cleanup standards, the specifications that we
17 list as the cleanup standards, we are asking that the remedial
18 action program provide reasonable assurance that these
19 conditions are met. These words are carefully chosen, they
20 are something other than "proof"; and the point here is that
21 we expect -- we expect, we urge -- in every way we can say it,
22 we will use that word "reasonable," that as we develop the
23 standards to be highly protective, but it would only be
24 feasible to apply such standards if one didn't have to prove
25 that every square inch of the world were decontaminated to that

1 level, but rather that one could use reasonable procedures.

2 We are encouraging all the agencies involved to
3 approach it that way. So the first standard for cleanup of
4 open land, the key figure there is 5 picocuries per gram. We
5 want contaminated open land, the tailings contribution, cleaned
6 to a level of 5 picocuries per gram of radium 226. There are
7 certain thicknesses specified there.

8 COMMISSIONER GILINSKY: I don't understand why you
9 phrase it this way. What is it in terms of how much radon is
10 escaping from the surface?

11 DR. LICHTMAN: Well, that would be an alternative,
12 but we feel that's a much more complicated kind of determina-
13 tion. That a more direct determination is in terms of a
14 property of the material itself. The radium --

15 COMMISSIONER HENDRIE: It's easier to take a sample
16 of the dirt in the lab and account for an activity level, and
17 infer from that.

18 COMMISSIONER GILINSKY: But this is under some
19 covering layer?

20 DR. LICHTMAN: Not necessarily. As is indicated
21 here, it is the same 5 picocurie per gram number but we
22 consider -- but the standard applies only to thicknesses of
23 material that are greater than 5 centimeters, if they occur
24 near the surface; or 15 centimeters' thickness if it occurs
25 below one foot from the surface. So it is the quantity of

1 the material, as well as the concentration that counts for
2 something in determining the hazard it presents.

3 DR. ROSENBAUM: Let me say something about that.
4 It is difficult enough in the field, which is what this has to
5 be done for, to make radium measurements that will have a great
6 deal of credibility at such low levels.

7 If one were to ask in such a large number of
8 circumstances that this will represent, for radon emanation
9 measurements, it would be difficult to get credible measurements
10 at all. In our own field measurements which we do at ORP out
11 of our laboratories by putting a box over the ground and
12 carefully monitoring what comes out, it is very difficult to
13 duplicate the measurements with two boxes beside each other
14 even apparently doing the same thing. And there are very many
15 techniques about to do this.

16 There are lots of compounding things that make
17 technically field measurements of radon emission very
18 difficult. So I don't think it would be a workable standard
19 to do that.

20 DR. LICHTMAN: Let me say further that that would
21 only address one hazard of the material, which would be the
22 radon emission. There is also gamma radiation to consider.

23 Moreover, the standard doesn't say how it will be
24 implemented. One could work out various surrogates for
25 determining that.

JWB

1 COMMISSIONER GILINSKY: Well, but behind this there's
2 got to be some standard or objective for how much radon you
3 are willing to put up with leaving the ground at that point.

4 DR. ROSENBAUM: Sure. But, after all, the radon is
5 a decay product of the radium. It's a direct decay product,
6 and therefore it is not very difficult to go from a radium
7 concentration in some average way through the thickness of
8 soil to a radon concentration with some error, of course.

9 CHAIRMAN AHEARNE: Well, underlying this is there,
10 then, some backup calculation that says: Here is what is an
11 acceptable radon level above the ground?

12 DR. LICHTMAN: Not quite. Not quite. Yes, there is
13 a backround -- of course there have been estimates of what
14 kinds of radiation hazards material of this character and
15 concentration presents, but it's a continuum. There is no
16 clearcut place at which one deals with an acceptable -- one
17 finds an acceptable level. So one also has to consider how
18 difficult it is to find the material and to clean it up,
19 how extensive a problem that is.

20 COMMISSIONER GILINSKY: Well, you must have started
21 by saying: We're willing to put up with so much radon leaving
22 the ground.

23 DR. ROSENBAUM: Let me say, that's not the way
24 things work -- not the way things work with us. That's not
25 how we start.

JWB

1 One would like -- in the first place, every one of
2 these actions, or at least many of them, are taken under
3 different laws. In each case we try to interpret the intent
4 of Congress in making that law -- and they are not necessarily
5 consistent with one another, nor are the laws, in terms of
6 intent.

7 In this case we were dealing with the Uranium Mill
8 Tailings Radiation Control Act of 1978, which deals only with
9 material -- in this case, the inactive piles -- material
10 which comes from piles which provided all, or virtually all of
11 the material to the Federal Government. And perhaps because
12 of that reason, Congress seemed willing to have the things
13 cleaned up very well at public expense. The expense here is
14 90 percent borne by the Federal Government, and 10 percent by
15 the state; except in the case of Indian Reservations where it
16 is 100 percent by the Federal Government.

17 It was our having read the law and the history of
18 the law, it was our belief that if Congress had intended that
19 we should make the lowest standard which was reasonably feasible
20 and say we should clean it up as much as it could be cleaned
21 up without getting to the point where you couldn't find
22 whether the material was there, or whether -- you wouldn't be
23 able to believe your measurements as to whether it was
24 cleaned up -- and it's much more driven that way than it was
25 the other way.

300 - TH STREET, S.W., REPORTERS BUILDING, WASHINGTON, D.C. 20024 (202) 554-2345

1 CHAIRMAN AHEARNE: Are you saying, Dave, that this is
2 driven by measurementability?

3 DR. ROSENBAUM: It is driven partly by the ability
4 to find the material in the field and measure it, and to verify
5 that you've done it, and that it's feasible to actually carry
6 out the standard.

7 The cost was not such a driving factor in this case,
8 because Congress said they wanted to pay for whatever was
9 necessary to clean these things up very well.

10 But let me say something in general about that,
11 because it bears on the whole way radiation standards are made,
12 at least by us. There isn't an acceptable level of risk.
13 The various guides, standards, advices to states, and other
14 such things we've put out to the public vary enormously in
15 the risk that they subject people who are covered by those
16 documents to. The tightest one that I am aware of, the most
17 protective, is 40 CFR 190, which limits the most exposed
18 person around the nuclear fuel cycle facility to 25 millirem a
19 year.

20 For example, our advice to the State of Florida
21 about cleaning up homes on phosphate lands which had radon in
22 them, if it were followed, roughly would subject the people
23 to probably 100 times the risk -- and a great many more people;
24 this isn't the most exposed person -- than we allow people
25 living near nuclear fuel cycle facilities.

1 So that there isn't any such path that one decides
2 what is a tolerable level of risk, and then demands that things
3 meet that. That is not what has happened at all.

4 If we had the power to and were to demand that homes
5 be free of radon so that the people in them would suffer no
6 more than the equivalent of 25 millirems per year, it would --

7 CHAIRMAN AHEARNE: Devastate the conservation
8 program.

9 DR. ROSENBAUM: -- radically change the -- it would
10 do away with the conservation program, and radically change
11 the nature of housing in the United States. It would probably
12 call for demolition of millions of buildings -- at least
13 millions.

14 So there is no consistency at all in the level of
15 risk, even in our own little shop, of the level of risk that
16 we allow or suggest, or recommend that people be subjected to.
17 Therefore, we don't go about it that way by saying this is a
18 tolerable level of risk.

19 COMMISSIONER GILINSKY: You are saying that you have
20 driven these standards to the limits of measurability of
21 radium 226?

22 DR. ROSENBAUM: Not in terms of laboratory measure-
23 ments. That's not what I meant at all. I meant in terms of
24 practical application in the field. There's no sense in making
25 a standard in which people who have to carry it out in a

1 reasonable way out in the middle of New Mexico around Grandstone,
2 New Mexico or something, I'm going to be able to in good faith
3 do a reasonable job with the sort of people they're going to
4 have there and the sort of measuring instruments they have,
5 and to be able to tell within reason whether they're meeting
6 the standards or not.

7 COMMISSIONER GILINSKY: Well, still, I mean let's
8 say portable instruments.

9 DR. LICHTMAN: Well, there is some controversy among
10 the agencies as to exactly how to implement this, and whether
11 it can be done with standard survey techniques and hand-held
12 instruments. We are exploring that. We have formed an
13 interagency --

14 COMMISSIONER GILINSKY: So this does not --

15 DR. ROSENBAUM: It's the other way. DOE has
16 complained that they may not be able to meet even this in
17 the field; that this is too stringent.

18 COMMISSIONER GILINSKY: They won't be able to
19 measure?

20 DR. ROSENBAUM: They won't be able to measure
21 accurately these levels, and therefore the standard isn't
22 meaningful.

23 DR. LICHTMAN: Well, using survey instruments.
24 Everybody recognizes that you can pick up a sample and process
25 it in the lab to much lower levels.

1 Let me say that we didn't only set the standards on
2 those grounds, but also I want to emphasize, by examining the
3 health consequences of these levels and determining that any
4 hazard associated with them is certainly not unusual. That is
5 to say, this is several times the average of concentration of
6 radium in normal soils. It is something like 5 to 10 times
7 the average concentration, but it is not unusual to find
8 places with higher numbers than this. So there is no reason
9 to think of the limited areas that would be cleaned up to the
10 levels for proscribing places to be avoided. In fact, that
11 is one of our goals, if it was practical to achieve, that these
12 be places that one need not avoid and could be put to public
13 use.

14 So it does seem to us that it is possible to achieve
15 all these things with a reasonable cleanup program, and that is
16 what we have tried to do.

17 DR. ROSENBAUM: Just to emphasize, I didn't mean
18 that we didn't do a health-effects calculation. I meant that
19 the way of thought wasn't what you suggested, that we first
20 set an acceptable level and then saw what it would take to
21 meet them. We did do health effect calculations and satisfied
22 ourselves that the health risk was acceptable. Those are
23 available.

24 COMMISSIONER GILINSKY: Well, let me just pursue this
25 a little for a moment. If the means for cleaning it up is to

1 be a covering of topsoil, or clay, or whatever, over a pile,
2 how can you ever --

3 DR. LICHTMAN: Oh, no, no, it isn't that.

4 DR. ROSENBAUM: These aren't piles; these are clean
5 up of open land.

6 DR. LICHTMAN: Let me explain. This is for cleanup.
7 I distinguish between "cleanup" and "disposal" standards. This
8 is the cleanup of contaminated land which is not the site of
9 a tailings pile.

10 COMMISSIONER GILINSKY: I see.

11 DR. LICHTMAN: This is other than dealing with the
12 pile itself.

13 DR. ROSENBAUM: This is just windblown --

14 DR. LICHTMAN: This would be blown material. It might
15 be -- you know, if you decide to move a tailings pile, you
16 might then apply this to the ground that's left.

17 DR. ROSENBAUM: You can imagine, for example, if
18 you had to survey 100 square miles and send samples back to
19 the lab if you couldn't do it with a hand-held instrument.
20 You wouldn't be able to verify it very well.

21 COMMISSIONER GILINSKY: If there are areas presumably
22 in those neighborhoods where a natural concentration might be
23 greater than this, what would you do about that?

24 DR. LICHTMAN: Well, the standard applies to the
25 material from uranium mill tailings, as it says.

1 COMMISSIONER GILINSKY: And is that readily identi-
2 fiable?

3 DR. LICHTMAN: Well, the question of "readily," I'm
4 not sure that there ever really will be terribly --

5 COMMISSIONER GILINSKY: I mean, would you know that
6 you're dealing with --

7 DR. ROSENBAUM: Theoretically there's a different
8 isotopic mixture.

9 DR. LICHTMAN: If push comes to shove, you can tell
10 the difference. I think normally that's not what the issue
11 will be: There are some cases where a load of material exists
12 somewhere, and one wonders what is it, where did it come from.

13 COMMISSIONER GILINSKY: It might be in the mining
14 business.

15 DR. LICHTMAN: This is refined material. However,
16 the uranium has been extracted from this. If one does an
17 isotopic analysis, you find peculiarities. You can determine
18 that it's tailings rather than something else.

19 CHAIRMAN AHEARNE: Okay, how about buildings?

20 DR. LICHTMAN: Standards for the cleanup of buildings
21 address the two primary hazards of the material, which are the
22 radon emitted into the building, and secondarily it turns out,
23 the gamma radiation.

24 CHAIRMAN AHEARNE: How does that radon background
25 compare with the fluctuation that you might find in background?

JWB

1 DR. LICHTMAN: You will certainly find normal houses
2 with no tailings that have these levels.

3 DR. ROSENBAUM: You find them in the East, too.

4 DR. LICHTMAN: We are applying the standards to
5 places that have tailings, however. These standards apply to
6 buildings that have tailings.

7 CHAIRMAN AHEARNE: I know David would be very
8 interested in that.

9 DR. ROSENBAUM: Let me say that if one makes a
10 reasonable effort to remove any tailings that are there and
11 still the level is above the levels that are set, then you
12 have already complied with the law. The law only applies to
13 uranium mill tailings from designated sites. If the levels
14 are higher for other reasons, it has nothing to do with that.

15 CHAIRMAN AHEARNE: I know you have looked at this a
16 lot, but what is the rough average that you expect when you
17 say the "East"?

18 DR. ROSENBAUM: The "average" is in great dispute,
19 because there have only been many 15 or 20 homes that have
20 been monitored carefully for a whole year in the world, but
21 the average we use is .004 working levels as a typical house.

22 However, the Department of Energy, the MSOL Labs
23 in New York City, have done some things in and around New York
24 City and in New Jersey, not a place one ordinarily would mine
25 uranium, and have found quite a few houses above .01, and some

1 even I think above .02. In places like Butte, Montana, one
2 finds many houses above .1, and much higher than that.

3 There are -- and we have only begun to look around
4 the country. There are houses in some of these mining districts,
5 particularly if they are buttoned up, in which the miners are
6 in more danger at home than they are in the mines, even with
7 the current levels.

8 DR. LICHTMAN: Something to realize about radon is
9 that it has a high risk factor associated with even normal,
10 natural levels.

11 COMMISSIONER GILINSKY: What are the levels in the
12 houses where tailings have been used for foundations or
13 whatever?

14 DR. ROSENBAUM: Oh, there are some very high levels,
15 as you will see.

16 CHAIRMAN AHEARNE: .47.

17 DR. LICHTMAN: Well, many such houses have been
18 found in Grand Junction to fall below these remedial action
19 levels. Of course many fall way above.

20 COMMISSIONER GILINSKY: What is "way above"?

21 DR. LICHTMAN: Well, easily 10s of times this number.

22 CHAIRMAN AHEARNE: I think .47 is the highest number.

23 DR. ROSENBAUM: I mean, there is a famous fire
24 station in Salt Lake City which had 1.5 working levels, and
25 that is a fire station people live in. Firemen sleep there.

1 DR. LICHTMAN: Well, that was not an annual average,
2 but they did get measurements up that high.

3 COMMISSIONER GILINSKY: Could you define a "working
4 level"?

5 DR. LICHTMAN: I'd rather not try to pop it off, but
6 what it is is the amount of --

7 DR. ROSENBAUM: I'll pop it off. It's the amount
8 of alpha energy -- it has to do with the amount of alpha
9 energy emitted from short-lived -- he's going to look it up
10 and see if I'm right -- short-lived radon daughters. One
11 working level is 1.5×10^5 MEV of alpha energy total emitted
12 from short-lived radon daughters. It is the concentration
13 that gives -- the concentration in the air per liter of air
14 that gives 1.5×10^5 MEV of alpha energy from short-lived
15 radon daughters.

16 DR. LICHTMAN: It's 130 billion electron volts.

17 DR. ROSENBAUM: It's 1.3, then.

18 DR. LICHTMAN: And it comes out to exactly the same
19 thing.

20 COMMISSIONER GILINSKY: It gives that position in
21 some unit of time?

22 DR. LICHTMAN: It is any combination of short-lived
23 radon decay products, which are the ones that we are concerned
24 about, that the hazard is associated with in one liter of air
25 that will result in the ultimate emission of alpha particles --

1 which are again the thing we are interested in -- but the total
2 energy of 130 billion electron volts.

3 DR. ROSENBAUM: So it is 1.3 instead of 1.5.

4 DR. LICHTMAN: So it is a measure of the concentration
5 of the hazardous radionuclides, mainly -- the shortlived ones
6 that give off alpha radiation.

7 COMMISSIONER GILINSKY: So it's a measure of the
8 concentration in air?

9 DR. LICHTMAN: In air.

10 DR. ROSENBAUM: In air, and these are short-lived
11 radionuclides. They are what take you from radon down to
12 lead 210 -- from radon 222 to lead 210, the alpha emitted in
13 that chain. There are beta links, too, but --

14 COMMISSIONER GILINSKY: How do you describe the
15 standards on someone? I suppose you're only allowed to be in
16 that environment for a certain length of time?

17 DR. LICHTMAN: No. This is designed for buildings,
18 and one can characterize what the occupancy of a building is
19 likely to be, what fraction of the time people spend in buildings.
20 So we have folded all that in in determining what is an
21 appropriate standard.

22 COMMISSIONER GILINSKY: Can you convert that into a
23 dose to the lungs in terms of millirems for a person who
24 spends X number of hours, or half that time in that building?

25 DR. ROSENBAUM: Bill?

1 (No response.)

2 DR. LICHTMAN: People have done that --

3 DR. ROSENBAUM: The answer is "yes."

4 DR. LICHTMAN: It is controversial. Bill Ellett,
5 who is the head of our Bioeffects Branch, doesn't like us to
6 even talk about it.

7 Bill, do you remember what the number is?

8 DR. MILLS: It is about .5 per rad working level month,
9 and you will have to explain to them what a "working level
10 month" is. But if you take .5, that is the National Academy
11 of Science number. So one working level month will give you
12 .5 rads.

13 COMMISSIONER GILINSKY: To the lungs?

14 DR. MILLS: It is to the lungs, but it is to the
15 average lungs; not the lungs -- which makes a difference --

16 DR. ROSENBAUM: Let me say, that's not as important
17 as you might think, because the health data on which standards
18 are based is in terms of measurements -- measurements were made
19 in terms of working levels. So the health effects are directly
20 given from a certain amount of working level, and you don't
21 really buy anything by converting those working levels to dose
22 to the lung, or the epithelium of the lung, because the data
23 themselves are in terms of working rads.

24 DR. LICHTMAN: We have a footnote on the subject in
25 the Federal Register notice, if you care to refer to it.

1 COMMISSIONER GILINSKY: Thank you.

2 DR. LICHTMAN: So that in determining the risk to
3 the lowest degree reasonable, we have experience from the
4 Grand Junction program, which was very useful for us in
5 deciding what that lowest practical level is.

6 Moreover, we recognized that there will be excep-
7 tional cases that, try as hard as you may, you may not be able
8 to get a house down to this level by removing tailings, let's
9 say. And as I indicate later, we have built in a provision
10 for exceptions.

11 Now the third element at the bottom of the page is
12 kind of a catch-all standard. We designed the first two
13 standards by considering the hazards of uranium mill tailings
14 which, after all, are a fairly definitive kind of material.
15 You know what's in it, by and large, which varies in concen-
16 tration from place to place, but as I indicated the Cannonsburg,
17 Pennsylvania, site has a little bit different kind of history.
18 It wasn't a uranium mill; it was some sort of a processing
19 facility. And on the possibility that there might be unusual
20 substances there the hazard of which might not be dominated
21 by radium 226 and its decay products, we wrote a standard --
22 the third entry there -- which says, in effect, if you find
23 other things, the total risk that you allow from the site
24 should not exceed the risk you would get from radium 226 and
25 its decay products, if only under the first standards.

1 Now the status of our disposal -- next slide, please --
2 (Slide.)

3 I would like to address the disposal standards now,
4 the status of which is somewhat different from the cleanup.
5 Cleanup standards have been proposed; they're before the
6 public. We have a comment period which is remaining open on
7 them while we continue to develop disposal standards.

8 Our objective is that we will propose disposal
9 standards within a couple of months, announce a comment period
10 at that time to run jointly for the cleanup and disposal
11 standards, and then hold joint hearings on them and publish
12 a joint EIS on both the standards. We split the package at
13 one point in order to get the cleanup standards out as quickly
14 as possible, but we intend to recombine the project and deal
15 with them jointly as soon as the disposal standards are
16 issued.

17 The draft disposal standards, which I am going to
18 discuss here, are before the Commission Staff now for their
19 comments, and they are before the other agencies in our
20 Interagency Working Group. They are also before our Assistant
21 Administrator.

22 COMMISSIONER GILINSKY: Now how do you --

23 DR. ROSENBAUM: We hope to get it out in October.

24 COMMISSIONER GILINSKY: How do you determine that
25 the annual releases will in fact not exceed those numbers?

1 DR. LICHTMAN: Well, two ways. Let me emphasize
2 those underlying words. We are asking for a "reasonable
3 expectation" that the conditions below will be met for 1000
4 years.

5 COMMISSIONER GILINSKY: What I'm asking is: Can you
6 measure it?

7 DR. LICHTMAN: Yes, you can measure it, but it is
8 not clear to me that a measurement that you make at a given
9 date is the ultimate way of providing that reasonable
10 expectation, which is what the standard requires.

11 COMMISSIONER GILINSKY: I'm not trying to press you
12 on whether you can --

13 DR. LICHTMAN: People have made flux measurements of
14 tailings piles --

15 COMMISSIONER GILINSKY: -- going back to our earlier
16 conversation --

17 DR. LICHTMAN: -- just as they make flux measurements
18 off a piece of ground, as Dave talked about.

19 DR. ROSENBAUM: But they're not very reliable.

20 DR. LICHTMAN: They're not very reliable, and they
21 change with the weather.

22 DR. ROSENBAUM: Let me say, yes, they do change with
23 the weather considerably. They change with how wet the soil
24 is, and the wind, and the atmospheric pressure, and everything.

25 When you're talking about something that's 1000 years

1 here, or in the case of the high-level waste standard perhaps
2 much longer than that, 10,000 years maybe, then there is no
3 way to enforce the standard in the sense that you can go to a
4 house after you've cleaned it up and make some measurements to
5 see if the gamma levels are higher or lower than the standard
6 to see if you have complied.

7 There is no certain way to project the future. The
8 only thing that one can expect is that one takes measures
9 which the best scientific examination would lead one to believe
10 would comply with the standard in the future. There is no
11 way we are going to know for sure, whatever we do, 700 years
12 from now the standard will have been complied with, unless we
13 wait 700 years and measure it.

14 So we have to make some kind of reasonable scientific
15 projection, and that is the essence of what the "reasonable
16 expectation" is.

17 COMMISSIONER GILINSKY: No; I understand that. I
18 was just asking about today.

19 DR. ROSENBAUM: You can measure it, but I think that
20 if one were, for example, to cover, as one alternative to cover
21 a tailings pile with certain types of material to a certain
22 depth, and take certain other actions to ensure it wouldn't
23 blow away and stuff, and take care of water runoff and things,
24 that that would be a better way to have a reasonable expecta-
25 tion that it would meet the standard for 1000 years, than going

1 out with a box whose measurement would depend probably on where
2 you put it on the piles -- and these things, have you ever seen
3 a uranium mill tailings pile? These are enormous things.

4 COMMISSIONER GILINSKY: But I am still curious to
5 know whether it can be measured.

6 DR. ROSENBAUM: It can be measured, but not very
7 reliably in the field. That's my impression.

8 COMMISSIONER GILINSKY: So it would be done on the
9 basis of some calculation?

10 DR. ROSENBAUM: It will be done on the basis of
11 models. One can get an estimate, certainly, of whether it is
12 very high or very low; but I think that basically these
13 standards will have to be satisfied by measures which, when
14 examined carefully by technical people, seem to provide a
15 reasonable expectation that they meet the standards.

16 One could then go out and measure after these measures
17 had been taken to see if you got readings that were higher.
18 That might be worthwhile doing. But Stan's point is very
19 important: The actual reading you get on a day in a particular
20 place depends on the place, and very much on the weather.
21 Very much. And the weather that's been in the past few days --

22 COMMISSIONER GILINSKY: Well, if they take a lot of
23 readings they ought to know it would be above this number.

24 DR. ROSENBAUM: That's right. If you take a lot of
25 readings and they were all above the number, you would have to

1 worry. That's right.

2 DR. LICHTMAN: Right. I think it can be literally
3 carried out by measurements that one can determine for a given
4 year, even, that the annual average won't exceed 2 picocuries
5 per meter squared. But the essence of the standard, in my
6 view, is the full language -- the reasonable expectation that
7 for at least a thousand years that will prevail. And there is
8 no way you can decide that aspect of it by making a series
9 of measurements.

10 There is some novelty to this requirement. We'll all
11 have to work hard to develop ways to implement it.

12 The reason we picked a thousand years, rather than
13 some other number, is because it seemed the longest doable
14 practical time for this program. I emphasize that. This is a
15 remedial action program; it's not a start-from-scratch program.

16 The second -- the following two requirements are
17 for protection. The first requirement protects releases to
18 the air of radioactivity. We have no need to address gamma
19 radiation releases, we think, because we believe that imple-
20 menting these three standards will, in almost every way we
21 can think of implementing them, also screen out the gamma
22 radiation.

23 The remaining hazards to be addressed are water
24 protection for radiological and non-radiological contamination.
25 The standards which you have available to you now through

1 that package that we sent, I didn't want to write down all
2 the numbers here, but they specify that for that same period
3 there should be a reasonable expectation that releases to
4 groundwater will not either cause the concentration in ground-
5 water of certain specified substances to exceed specified
6 levels; or, if they are already exceeding those levels, that
7 the concentrations not increase because of releases from the
8 tailings.

9 So these are conditions that apply to releases of
10 tailings after they are disposed of. They do not try to
11 rectify the past. But it says what conditions should be
12 satisfied after one disposes of the tailings.

13 Similarly, releases of toxic substances or radio-
14 activity to surface water should not degrade the surface water
15 as the condition.

16 Now we recognized, in developing these standards,
17 that we have a wide variety -- the next slide, please --

18 (Slide.)

19 -- that this is a remedial program for existing
20 conditions which occur under a wide variety of circumstances in
21 different climates and different quantities of tailings,
22 tailings of somewhat different concentrations, in different
23 water environments and so forth. And that if we are going to
24 write what we believe are strict standards that are necessary
25 to protect health, that there has to be some flexibility

1 applied to them as well for those exceptional cases for which
2 the standards would be unreasonable.

3 We have identified some exceptional circumstances
4 and given criteria under which the standards need not be met.
5 Among those are requirements where meeting the requirements of
6 the standards would endanger public health or safety -- such
7 as one, in deciding whether to move a uranium tailings pile in
8 order to meet the standard, if that should be required anywhere,
9 one should also consider the safety hazard of moving the
10 material, which might be a factor that would lead you to make
11 another decision. Or, in some instances the tailings are very
12 precarious in their present location, and it is difficult to
13 get equipment in, and the workers might be endangered, and one
14 might decide then not to move them for that reason.

15 Another reason would be that if environmental
16 protection itself would be better served in not cleaning up
17 open land -- say if tailings were spread in not very high
18 levels over a large amount of desert soil where vegetation is
19 scarce and takes many hundreds of years, really, to restore,
20 or if there might be some very scarce vegetation there, or some
21 rare creatures, one should have the flexibility of deciding
22 that environmental protection would be better served by not
23 cleaning that material.

24 Thirdly, if the costs of cleaning buildings should
25 be unreasonably high in some instances -- unreasonably high,

1 considering the context in which we made these judgments as to
2 what would be unreasonably high, and compared to the benefit.

3 So, for example, if one had a house in which the
4 indoor radiation levels were slightly exceeding the standards --
5 and I emphasize it must be "slightly" -- and the costs would
6 be very high to remove whatever remaining material there was, or
7 even to find it perhaps that was causing the excess, one might
8 justify not doing it.

9 In any case, these actions should be documented.
10 DOE -- the next slide, please.

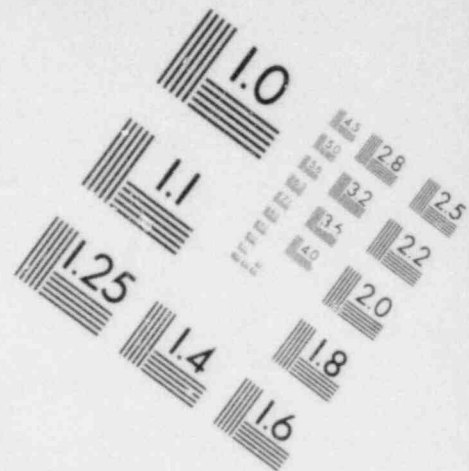
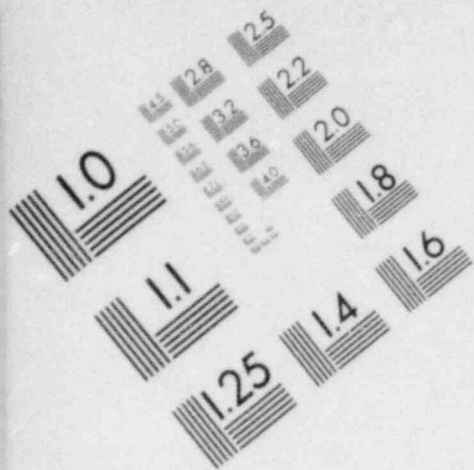
11 (Slide.)

12 DOE in identifying these exceptions should choose and
13 perform remedial actions that come as close to meeting the
14 standards as is reasonable under the exceptional circumstances.
15 They should notify the private owners and occupants of
16 affected properties, and ask them for comments if they have any;
17 and they should notify EPA when they take exceptional remedial
18 action so that we can track our own standards, and their
19 practicality, and learn from the experience.

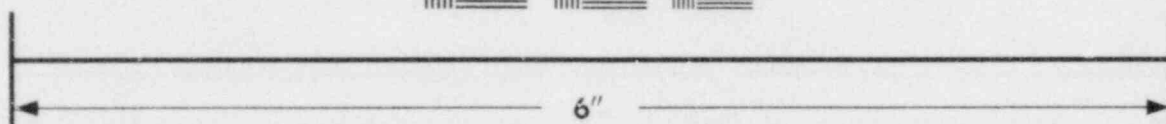
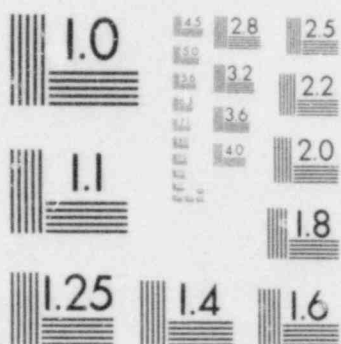
20 Next slide, please.

21 (Slide.)

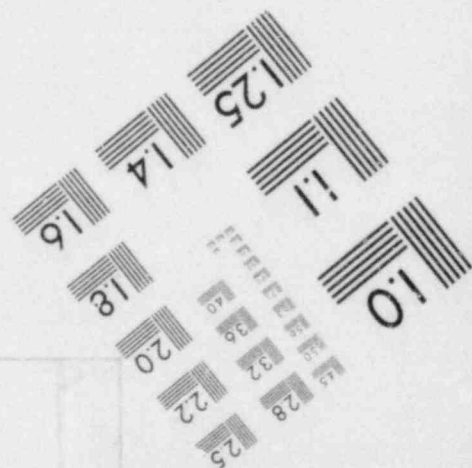
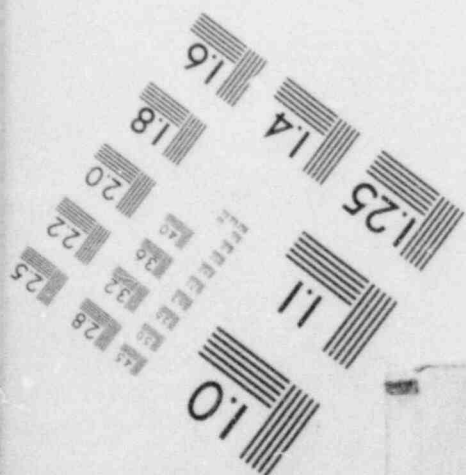
22 I would like to very briefly discuss the standards
23 for active mills. I guess we've really done that. We need
24 cleanup standards and disposal standards certainly for tailings
25 at active mills; but there is an additional element to be

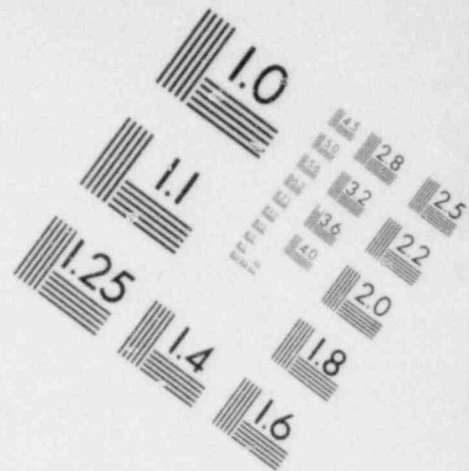
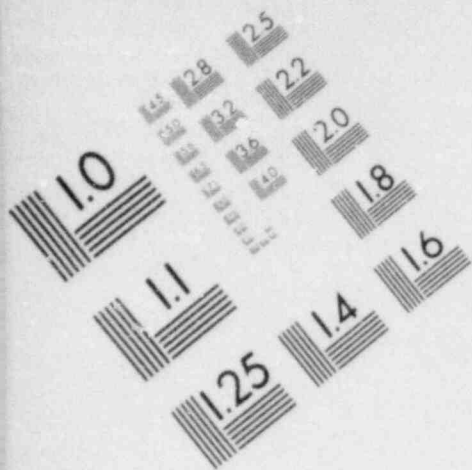


**IMAGE EVALUATION
TEST TARGET (MT-3)**

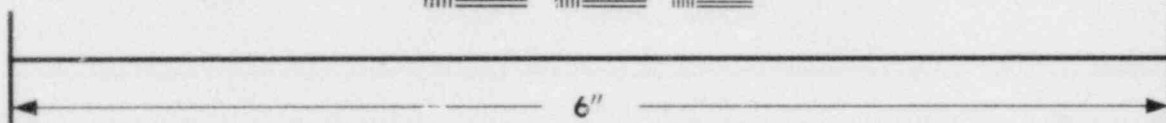
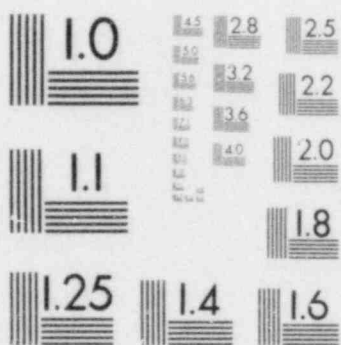


MICROCOPY RESOLUTION TEST CHART

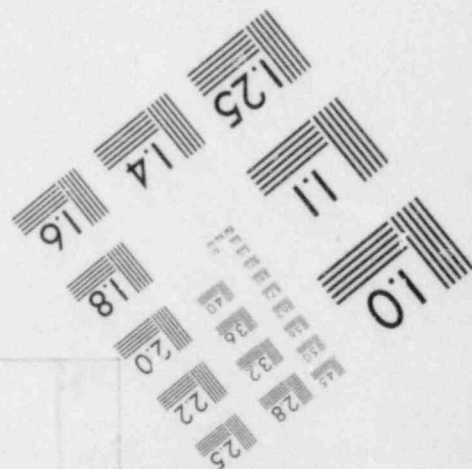
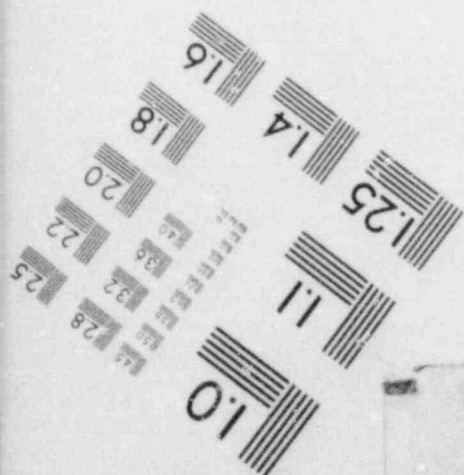




**IMAGE EVALUATION
TEST TARGET (MT-3)**



MICROCOPY RESOLUTION TEST CHART



1 addressed, which is the appropriate limits, if any, on effects
2 and emissions from tailings piles during the operational period
3 of the mill. That is something that we will want to look at
4 carefully, and it is a difficult technical problem, as you know.

5 CHAIRMAN AHEARNE: Do you expect to have any signifi-
6 cant differences in the standards you are going to propose for
7 the active sites versus those that you are here mentioning for
8 the inactive sites?

9 DR. LICHTMAN: Well, as David indicated, we are
10 trying not to have expectations. We want to look at the
11 problem from the beginning.

12 CHAIRMAN AHEARNE: Well, except that you here have ...

13 DR. ROSENBAUM: Certainly a lot of the work, the scien-
14 tific work that we have done on these will carry over to the
15 others. But standards are not made in a vacuum; they are
16 made depending on the actual circumstances and the ability to
17 carry them out, and the cost to carry them out.

18 CHAIRMAN AHEARNE: And I gather -- did I interpret
19 correctly the point you had made about the legislative history
20 of the Mill Tailings Act led you to a certain set of
21 assumptions on how to approach the inactive that may not
22 correspond and track?

23 DR. ROSENBAUM: Not necessarily. I don't know. It
24 certainly wouldn't be surprising if they were very similar, but
25 it's not -- we just have to look at the evidence carefully.

1 My staff has looked briefly at the proposals that will be
2 shortly before you, I guess, for active sites. We don't, at
3 the moment, have any disagreement with them, if that's any
4 help.

5 DR. LICHTMAN: I would like to point out that the
6 schedule for proposing the standards of September 1981 allows
7 us to take advantage of the comments we receive on the inactive
8 site package and benefit from that in approaching the active
9 sites.

10 That is all I had to say.

11 CHAIRMAN AHEARNE: Vic?

12 (No response.)

13 CHAIRMAN AHEARNE: Joe?

14 COMMISSIONER HENDRIE: No, no questions. I am very
15 pleased with the discussion. I am glad to see we are charging
16 ahead. Keep going.

17 CHAIRMAN AHEARNE: Thank you, Dave.

18 DR. ROSENBAUM: Thank you.

19 CHAIRMAN AHEARNE: David, before you disappear,
20 would you just say a few words about high-level waste and the
21 status?

22 DR. ROSENBAUM: Sure. I don't know if Dan Egan is
23 still here? Yes.

24 This is Daniel Egan who is in charge of that thing,
25 and he has got a couple of slides which would -- this is only

1 two slides, so it will be very brief. And it has the informa-
2 tion I think you wanted.

3 (Slide.)

4 MR. EGAN: Okay, what I am just going to do, rather
5 than get into any details of the action we are currently
6 developing, is just to give you an overview of what it
7 contains structurally and indicate where we are in our own
8 internal process.

9 I apologize first of all for the title, but I haven't
10 figured out any way to make it any shorter yet. As David
11 indicated before, we had two authorities to work with in this
12 area. One is to promulgate generally applicable standards like
13 the mill tailings standards. The other is to propose better
14 radiation guidance like the occupational guidance. This
15 package has both types of proposals in it. It also covers
16 both management disposal, and it considers spent fuel high-
17 level waste, both as we typically used to think of it as
18 reprocessed waste, and also spent fuel, if it is to be disposed
19 of. The standards also apply to transuranic waste above
20 100 nanocuries per gram.

21 The two parts of the environmental standards would
22 be Subpart A and B. Subpart A would apply to waste management
23 operations and storage of these wastes. 40 CFR 190, which
24 are our uranium fuel cycle standards, specifically exclude
25 operations at waste disposal sites from consideration in that

1 regulation. It is also unclear as to what types of storage are
2 addressed by 40 CFR 190.

3 What this action will do will just explicitly extend
4 the same dose limitations that are in 40 CFR 190 to these other
5 processes as well. It would include operations up to the
6 emplacement of waste in their repository, and monitoring a
7 repository before it is finally sealed, and backfilled, and
8 walked away from in the sense of being easily able to get back
9 at the waste that is placed in the repository.

10 Subpart B, which is the standards for disposal, are
11 then of course much different than standards we've developed
12 before in 40 CFR 190, or in Part A of this standard. We are
13 here discussing limits on projected releases over a 10,000-year
14 period. Similarly to the mill tailings, you are talking about
15 something that can only be implemented on the design basis
16 and through analytical models. And perhaps unlike the mill
17 tailings, in this case you have no recourse at all to
18 measurement.

19 With the mill tailings, you could theoretically go
20 out to a pile which you have stabilized and measure to see if
21 the standard was initially met. You don't have the same
22 situation with these standards. The entire process will have
23 to depend upon the analytical exercise, and verifying
24 repository design projections.

25 And of course the other part of the requirements for

1 disposal which we propose to include as an appendix to the
2 CFR language, the Federal Radiation Guidance containing general
3 principles that should be followed for disposal systems.

4 This part of the action would be promulgated somewhat
5 differently, as David explained earlier, when we finally make
6 the action final, in that the Federal Radiation Guidance of
7 course would be recommended to the President for issuance as
8 guidance. The Administrator cannot issue it directly by
9 himself; whereas the standards Subpart A and B, say, would
10 in fact be issued directly by the Administrator.

11 DR. ROSENBAUM: Let me say one word about that.
12 This complication arose very late in the process when our
13 lawyers, just a month or so ago, decided that we couldn't issue
14 the whole thing as a standard. We had to separate out part of
15 this and issue it as guidance.

16 CHAIRMAN AHEARNE: Lawyers are like that.

17 MR. EGAN: I guess I would pause for any questions
18 here. My next slide will only cover the process that we are
19 involved in, and has no substantive details of the standards,
20 per se. So if there is anything you would love to get at
21 here --

22 CHAIRMAN AHEARNE: Have you, on the seven general
23 principles, could you say a few words on what approximately
24 these are?

25 MR. EGAN: Sure. There are a couple of them that

1 are fairly straightforward, and probably would be motherhood
2 statements, if you will. Some of them can be quite contro-
3 versial.

4 The simplest one is that releases from a disposal
5 system should be reduced as low as is reasonably achievable.
6 I don't expect there to be much quarrel with that.

7 Another one that is somewhat related but again dif-
8 ferent, is that the disposal system should use multiple
9 barriers to isolate the waste; and that each of these barriers
10 should be designed to provide substantial protection, even if
11 the other barriers don't work the way they're supposed to.
12 This gets to the question of whether systems analysis on a
13 whole system is necessarily reliable over this period of time.
14 It is a definitely a conservative principle. In other words,
15 you are saying that even if you have a good site, and say a
16 good waste form, you shouldn't use a terrible canister. You
17 shouldn't take that easy step.

18 Another one would be that we believe that active
19 institutional controls to protect the disposal system should
20 not be relied upon for more than 100 years. Now that parti-
21 cular criteria, if you will, was one of those we had proposed
22 as a general radioactive waste criteria back in late '78. In
23 fact, it arose from some of the workshops we have had in that
24 program before we actually even proposed the criteria.
25 We have modified that to accentuate the word "active." A lot

1 of people criticize us, I think fairly, that knowledge, per
2 se, can be considered institutional control and can survive
3 for a long period of time. What we are specifically saying is
4 the idea of guards and fences that will forbid people from
5 going on that site don't last forever, and you shouldn't rely
6 on them to last forever.

7 Related to that -- and I go back to that one point
8 that the 100 years we measure from after the waste has been
9 disposed of. It's an introduction to the next one which says
10 that we believe waste should be disposed of promptly once
11 you've got a system that will do it. We do not believe, at this
12 point, that it is appropriate to essentially enter into what
13 amounts to non-ending storage that has to be continually
14 monitored. There have been some proposals that in fact waste
15 should not be disposed of at all; that in fact you should put
16 them in a musoleum or some other such mechanism where man
17 would commit future generations to watch them either endlessly
18 or until they eventually decayed to be innocuous, which would
19 be a tremendously long time for these materials. That is
20 principle number four.

21 Another principle is that you should locate a site
22 away from potential areas of resources -- both resources which
23 are obvious that we now consider to be resources; but also
24 away from areas where there are unique concentrations of
25 materials that may be a resource in the future, even if they're

1 not now. We don't presume that we can predict that we know
2 what is going to be a resource hundreds of years from now.

3 DR. ROSENBAUM: Let me make a comment on that. The
4 question always comes out. That requirement is not intended
5 to, per se, exclude salt domes, or salt deposits, even though
6 salt is indeed in some sense a resource. It would be possible,
7 perhaps -- obviously each site has to be looked at in
8 particular to see if it satisfies the requirements -- but it
9 would be possible, certainly, that a salt dome might satisfy,
10 or a salt deposit might satisfy the requirements for the
11 repository.

12 MR. EGAN: Yes. It is clear that salt deposits don't
13 have a problem. There are maybe certain categories of salt
14 domes that might be ruled out just because they are very often
15 used for their storage capacity. Salt domes are very frequently
16 used to store natural gas, an easy place to store things. We
17 agree that certainly our standard criteria would not cate-
18 gorically rule out anything; but it would require that that
19 principle be considered in your licensing of a repository.

20 Another principle is just that you should record,
21 and mark, and otherwise warn the future about the repository
22 as well as you possibly can. What we call "markers and
23 records." When we started this, there were some people that
24 were advocating that perhaps the safest thing to do with the
25 repository was to hide it so that nobody could ever find it.

JWB

1 We talked to some archeologists, and they said:
2 People are pretty clever about finding things. Somebody who
3 is looking would find some anomaly, maybe not knowing what it
4 was. So the idea of hiding the waste so that nobody could find
5 it wouldn't make any sense. And having agreed that you should
6 tell people, you should tell them well.

7 The last one, and the one that usually requires more
8 explanation than the others, is that we feel the waste should
9 be disposed of what we call "recoverably." We picked that
10 word to avoid the word "retrievability," which has been used
11 in a much different context. We mean that you can recover
12 the waste. We don't mean that you leave a repository open,
13 for example, so that people could walk in and monitor the
14 progress or the status of the waste in the repository. We
15 mean that you dispose of it in such a way that it is feasible
16 to unearth it, or to recover it, if you will, some unspecified
17 time in the future if somebody discovers that we did it wrong,
18 that we should not have ever put it there.

19 Mined repositories, as we typically think of them,
20 don't really have a problem of that particular type of general
21 principle, but there are disposal methods that have been
22 proposed that in fact once you implement them, the baby scream
23 is gone with the bath water. The rock melting concept is one
24 I don't even like to talk about. There was an idea that you
25 could put it in little waste canisters that would get so hot

300 7TH STREET, S.W., REPORTERS BUILDING, WASHINGTON, D.C. 20024 (202) 554-2345

1 they would melt their way to some depth, and therefore be
2 isolated. Once you do that, you can't undo it. There are
3 other examples of that type of disposal.

4 DR. ROSENBAUM: That was something I mentioned to the
5 Commission in my first week on the job when I came to talk
6 about another problem. I think it has to do with the limits
7 of predictability.

8 It is certainly true that a lot of things we believe
9 in good faith now are going to turn out to be wrong. It
10 seems to me to be good sense to be able to undo your mistakes;
11 to, if you make a mistake, to at least be able to go back and
12 fix it. I don't mean that it should be easy to retrieve it,
13 but just that it should be possible if somebody, for some
14 reason we now can't understand, finds out that we've made some
15 terrible mistake. So that's the idea behind that.

16 MR. EGAN: And having capped it at seven, I think
17 it's all right.

18 COMMISSIONER HENDRIE: For how long?

19 MR. EGAN: We have been asked that question a lot,
20 and we really don't specify. The principle says you should be
21 able to cover most of the waste. What we are arguing of course
22 is not that say a repository and some waste leeches, obviously
23 some atoms could get away from you and you couldn't get them
24 back. But it almost says that if it could be done the first
25 100 years, you would probably be --

1 DR. ROSENBAUM: Well, there's one thing that we're
2 almost certainly not wrong about, and that is the half-lives
3 of the isotopes. So that certainly if you could get them back
4 in the first 500 years, after that it is difficult. They
5 would have degraded to the point where it's difficult to imagine
6 that your mistakes would be catastrophic. I don't know exactly
7 what number it would be, but that would be one thing I do want
8 to say is fairly certain, the half-lives of isotopes.

9 COMMISSIONER HENDRIE: Does that apply to canister
10 design which is guaranteed say for 1000 years?

11 MR. EGAN: No. It doesn't apply to me, anyway.

12 DR. ROSENBAUM: I don't --

13 MR. EGAN: It applies, the canister in the waste
14 form -- you know, if the canister may fail and the waste form
15 may be subject to groundwater, and there may be some leeching,
16 it doesn't mean, you know, that I'm assuming it's all going
17 to disappear very rapidly or quickly. If the waste form leeches,
18 most of it will stay in the general area of the repository, and
19 only a small fraction of it will actually be washed away.

20 DR. ROSENBAUM: I understand your point, even if it
21 came out of the canisters and was sitting there, you might not
22 be able to get it back in any reasonable way. It may turn
23 out after further thought and in the hearings that that's not
24 a very bright idea, this retrievability, or whatever we're
25 calling it, recoverability. In that case, we'll drop it.

1 It seemed to me to be prudent, I think is the right
2 word, to try to do that if it makes sense. If it doesn't,
3 we'll take it out. I think there is ample time in the hearings
4 and everything to explore the issue of whether that makes
5 sense as a requirement.

6 COMMISSIONER HENDRIE: I guess I am more concerned
7 about the level of proof that one would be required to present
8 and establish in a litigation on this point than I am about
9 the general requirement. As an engineering principle, you know,
10 I am willing to say that if you vitrofy in reasonable ways as
11 the best evidence at hand indicates, and put it in canisters
12 and overpacks, as best-technique indicates, and keep the unit
13 loadings low so the temperatures are not very high, and you
14 stick it in a hole in the ground, why I have ultimate confidence
15 that if you are willing to spend enough money on it and do it
16 carefully and so on, why you can go down and mine out, you may
17 end up with a great volume of material, some of which is highly
18 radioactive and a great mass which is trace radioactive, and
19 now what are you going to do with that? So I'm not sure it's
20 a great idea to mine it, but the ability to mine it, I have
21 confidence.

22 Now you say: Good. Take your confidence, even, and
23 let us see you present your evidence, your testimony and your
24 evidence, and stand up in litigation and prove it in order to
25 meet a regulation on waste disposal. I'm not so sure how I go

JWB

1 about that.

2 DR. ROSENBAUM: Well, let me say two things.

3 One, all the proof in this case is going to have to
4 be done largely by models and by technical projections, which
5 probably mean computer models or some sophistication into the
6 future. So any kind of proof you are presented with is going
7 to be of a nature and therefore complicated to understand
8 how much you can believe it.

9 The other thing I would say is that one good reason
10 to drop a requirement is that it is not implementable. And if
11 it turns out that that's the sort of requirement that the
12 Commission wouldn't find possible to implement and couldn't in
13 any satisfactory way decide whether to implement it or not,
14 that would be a reason not to do it.

15 COMMISSIONER HENDRIE: It is likely to go the other
16 way, because there are certainly parties who are active in the
17 field who have an interest in preventing the implementation of
18 long-term high-level waste disposal. Now if they can get a
19 standard established which you then can't meet in some
20 appropriate level of proof in a hearing, by George, they've
21 got it made.

22 So you are going to have at least some elements of
23 the multi-party scene who will be attempting to induce
24 unmeetable standards. I have some concern.

25 CHAIRMAN AHEARNE: But I trust it isn't us.

1 DR. ROSENBAUM: I would hope that we would have
2 testimony among other people from the Commission -- that we
3 would have people speaking to the issue of whether the standards
4 will be implementable or be able to be done.

5 COMMISSIONER HENDRIE: You will have people coming
6 in and saying you have to implement something like this, and
7 whether it is implementable or not is just tough luck. If you
8 can't implement it, the whole system is bowed.

9 DR. ROSENBAUM: Well, that certainly is not our
10 attitude. But I must say, in all fairness, that this wasn't
11 developed by any conspiracy of people --

12 COMMISSIONER HENDRIE: No, I don't think it was.

13 DR. ROSENBAUM: -- with a particular interest. It
14 actually was developed by me.

15 COMMISSIONER HENDRIE: I know what you mean, and if
16 you and I were the only guilty parties, why I wouldn't have a
17 problem. And I am sympathetic to the general proposition that
18 to the extent you can provide a fall-back in case you make a
19 mistake, or find later on your knoweldge gets better and you
20 say: Gee, I should have bored them horizontally instead of
21 vertically, or squared instead of round, or what have you,
22 or in the salt instead of granite, whatever, if you can
23 retrieve it, why that is fine.

24 But what I think would be unfortunate would be in
25 the interests of trying to provide that kind of flexibility

JWB

1 and resilience in the system, one began to build in sets of
2 requirements which become available to other parties then to
3 use as, in effect, insurmountable barriers. That is one of
4 the great difficulties in trying to move forward in this field.

5 DR. ROSENBAUM: I think that is a good point, and
6 we will certainly consider that. I don't think that that will
7 affect what we will propose -- which has already been turned
8 over to David Hawkins -- but it is certainly something we will
9 consider seriously in the hearings when we go towards a final.

10 CHAIRMAN AHEARNE: Why don't you now speak to this
11 chart you have.

12 MR. EGAN: David asked me to put together a chart
13 that is in substance an outline of our own internal review
14 process, which I've done here. I want to emphasize that this
15 is not a schedule. It is not really quite cricket to add up
16 those little time periods on the right and say that it will
17 come out as a borne child at the end of that period, because
18 there are review processes, and David's own review process,
19 that are in little bullets on this chart.

20 What we have just recently completed, the agency has
21 a procedure that is set forth in its implementation of
22 Executive Order 12044. One of the initial steps is an inter-
23 agency, intra-agency work group composed of representatives of
24 all the various offices within the agency that simply help us
25 develop the standard and provide us with comments. And on this

1 issue, as you might guess, we get a lot of feedback, and a lot
2 of discussion with offices that normally don't interact with
3 us terribly heavily.

4 We just recently completed that process, and we are
5 now getting ready to put the formal package together to send it
6 to David and up to Mr. Hawkins for his consideration. And if
7 he is reasonably happy with it, he will then start the next
8 part of the process, which is the EPA Steering Committee review,
9 which is a board with senior representatives from each assistant
10 administrator's office that acts effectively as a super work
11 group. They essentially get together to meet and discuss the
12 standards, issue any action items that they feel should be
13 changed in the package, and send it back to us to go further
14 in the process.

15 Obviously at any stage in this process, there are
16 lots of opportunities for endless iterations. We think now
17 that is probably less likely because of the length of the work
18 review itself.

19 Once the steering committee is finished with it,
20 it then goes, again after Mr. Hawkins' approval, into what we
21 call our "red border review," which is not a meeting, per se,
22 but where each individual assistant administrator has to concur
23 or nonconcur with the action.

24 Once that is completed, it goes for signature to
25 the Administrator. The two time periods indicated, and which

1 we have discussions with our planning and management shop, the
2 ones on the left are the book numbers for the way the procedure
3 is supposed to work, which typically is what you might
4 achieve with minor regulations.

5 We both guessed that at least a factor of two would
6 be needed for this particular regulation, and I think the
7 possibility for iterations between those staffs may increase
8 that by some specified factor.

9 Once the Administrator has approved it and the
10 standards and guidance are proposed in the Register, we will
11 then of course start our public comment and hearing phase.
12 Now we plan to schedule that initially for 180 days. In that
13 period of time, we will hold a number of hearings on this topic
14 as well as we will on the other actions we've talked about
15 today around the country.

16 I suspect of course that the comment period will in
17 fact drag on quite a bit longer than that. A lot of issues
18 will probably come up from the hearings that people will want
19 to be pursued further.

20 Also, in parallel with all of this, at the request of
21 Congressman Udall, we are also planning to establish an
22 independent technical review of the material supporting the
23 standards by our Science Advisory Board. It is similar in
24 concept, although not necessarily similar in organization, to
25 the Lewis Committee that reviewed the Reactor Safety Study.

1 That will be ongoing approximately in parallel with all of
2 this.

3 After we get done with all of that, of course, we
4 will be revising the package. We then go through the same
5 internal review process again -- work group, steering committee,
6 red border -- and I'm sure we'll find that all the people
7 that were in the old work group have moved on, and we have
8 new people in the work group; that's the way these things
9 always work. Three months is probably what we might be able
10 to achieve, if we all love the standards after public comment,
11 which is not likely -- just because, if nothing else, the
12 complexity of the issue.

13 And then after all of this, we will promulgate final
14 regulations. And of course, since we have a split package
15 here, this is a somewhat complicated route, because you're
16 talking part of the package through a different process,
17 through the White House approval, and the other part of the
18 package would come through the Administrator.

19 That is where we are.

20 CHAIRMAN AHEARNE: Good luck.

21 Joe?

22 COMMISSIONER HENDRIE: If some of these waste bills
23 go, why --

24 DR. ROSENBAUM: We would be relieved of our duties.

25 COMMISSIONER HENDRIE: We're going to sort of run

JWB

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25

late, I guess.

CHAIRMAN AHEARNE: David, thank you very much, and all of your people. I am just delighted to see these things coming through, and I hope that we can both provide whatever assistance is appropriate, and also continue to work with you. I know we have been working fairly closely on this thing, and I thank you very much.

DR. ROSENBAUM: Yes, sir.

COMMISSIONER HENDRIE: Very good.

CHAIRMAN AHEARNE: The meeting is adjourned.

(Whereupon, at 4:29 p.m., the meeting was adjourned.)

* * *

300 7TH STREET, S.W., REPORTERS BUILDING, WASHINGTON, D.C. 20024 (202) 554-2345

NUCLEAR REGULATORY COMMISSION

This is to certify that the attached proceedings before the

Commission Meeting

in the matter of: Briefing by EPA on Draft General Standards
(OCCUPATIONAL EXPOSURES, MILL TAILINGS)

Date of Proceeding: September 3, 1980

Docket Number: _____

Place of Proceeding: Washington, D. C.

were held as herein appears, and that this is the original transcript thereof for the file of the Commission.

Jane N. Beach

Official Reporter (Typed)

Jane N. Beach

Official Reporter (Signature)

POOR ORIGINAL