



**UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
WASHINGTON, DC 20555 - 0001**

February 8, 2012

MEMORANDUM TO: ACRS Members

FROM: Christopher L. Brown, Senior Staff Engineer /RA/
Technical Support Branch
Advisory Committee on Reactor Safeguards

SUBJECT: CERTIFICATION OF THE MINUTES OF THE MEETING OF THE
SUBCOMMITTEE ON RADIATION PROTECTION & NUCLEAR
MATERIALS REGULATORY GUIDE 7.7 ON JANUARY 18, 2012,
IN ROCKVILLE, MARYLAND

The minutes for the subject meeting were certified on February 8, 2012. Along with the transcripts and presentation materials, this is the official record of the proceedings of that meeting. A copy of the certified minutes is attached.

Attachment: As stated

cc w/o Attachment: E. Hackett
C. Santos

cc w/ Attachment: ACRS Members



**UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
WASHINGTON, DC 20555 - 0001**

February 8, 2012

MEMORANDUM TO: Christopher Brown, Senior Staff Engineer
Technical Support Branch
Advisory Committee on Reactor Safeguards

FROM: Michael Ryan, Chairman
Radiation Protection & Nuclear Materials Subcommittee

SUBJECT: CERTIFICATION OF THE MINUTES OF THE MEETING OF THE
SUBCOMMITTEE ON RADIATION PROTECTION & NUCLEAR
MATERIALS ON REGULATORY GUIDE 7.7 ON JANUARY 18
2012, IN ROCKVILLE, MARYLAND

I hereby certify, to the best of my knowledge and belief, that the minutes of the subject meeting on January 18, 2012, are an accurate record of the proceedings for that meeting.

RA	<u>02/ 08 /12</u>
Michael Ryan, Chairman	Date
Subcommittee on Radiation Protection & Nuclear Materials	

Certified By: Michael Ryan
Certified on: February 08, 2012

Issued on : February 8, 2012

**ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
MINUTES OF THE MEETING OF THE SUBCOMMITTEE RADIATION PROTECTION &
NUCLEAR MATERIALS
REGULATORY GUIDE 7.7
ON JANUARY 18, 2012, IN ROCKVILLE, MD**

INTRODUCTION

On January 18, 2012, the ACRS Subcommittee on Radiation Protection & Nuclear Materials held a meeting in Room T-2B1, 11545 Rockville Pike, Rockville, Maryland. The purpose of the meeting was for the staff to brief the Subcommittee on staff's development of draft final revision 1 of regulatory guide (RG) 7.7 "Administrative Guide for Verifying Compliance with Packaging Requirements for Shipping and Receiving of Radioactive Material." The RG provides guidance for approval of applications for packages used to transport radioactive material (other than irradiated nuclear fuel) under 10 CFR Part 71. Mr. Christopher Brown was the designated federal official for this meeting. The subcommittee received no request from the public to make oral statements. The entire meeting was open to the public. The subcommittee chairman convened the meeting at 1:30 pm and adjourned at 3:04pm.

ATTENDEES:

ACRS Members

M. Ryan, Subcommittee Chairman
H. Ray, Member-at-Large
J. S. Armijo, Member
S. Schultz, Member
D. Bley, Member
J. Sieber, Member
G. Skillman, Member

ACRS Staff

C. L. Brown, Designated Federal Official

NRC Staff

Bernie White
Mike Waters
Earl Easton
Sara Depaula
Eli Goldfeiz
Kim Hardin
Kim Rodriguez
M. Sampson
M. Gordon

SUMMARY OF THE MEETING

Major Issues discussed during the meeting are described in the following Table.

Table 1. Major Issues Discussed During the Meeting

Major Issues Discussed	
Issue	Reference Pages in Transcript
1. Discussion of why the NRC reviews DOT's transport packages. A discussion of the MOU between NRC and DOT for package revalidations was discussed.	11-14, 31
2. Member Skillman asked about the use of industry codes that are accepted by the NRC staff to evaluate the mechanical design of transportation packages.	27-29
3. Members Skillman asked for the staff to cite the regulation that discusses the prevention of harm or compromise beyond the package design requirements. Motion in transport and ensuring that the package has not been degraded during transport were discussed.	42-57, 73
4. Members asked why NUREG/CR-3019 (welding criteria) and NUREG1609 (standard review plan) were not referenced. Member Shultz suggested that it might be useful for the staff to incorporate and appendix that lists a number of resources used by the NRC staff and stakeholders during the evaluation.	74, 77-78

Table 2. Action Items

Action Item	Reference Pages in Transcript
The staff agreed to report to the ACRS DFO on how they addressed issues 3 and 4 listed above.	

BACKGROUND MATERIALS PROVIDED TO THE SUBCOMMITTEE

1. Draft Final Revision 1 of Regulatory Guide (RG) 7.7 "Administrative Guide for Verifying Compliance with Packaging Requirements for Shipping and Receiving of Radioactive Material."

NOTE:

Additional details of this meeting can be obtained from a transcript of this meeting available in the NRC Public Document Room, One White Flint North, 11555 Rockville Pike, Rockville, MD, (301) 415-7000, downloading or view on the Internet at <http://www.nrc.gov/reading-rm/doc-collections/acrs/> or it can be purchased from Neal R. Gross and Co., 1323 Rhode Island Avenue, NW, Washington, D.C. 20005, (202) 234-4433 (voice), (202) 387-7330 (fax), nrgross@nealgross.com (e-mail).

Official Transcript of Proceedings

NUCLEAR REGULATORY COMMISSION

Title: Advisory Committee on Reactor Safeguards
Radiation Protection and Nuclear Materials

Docket Number: (n/a)

Location: Rockville, Maryland

Date: Wednesday, January 18, 2012

Work Order No.: NRC-1398

Pages 1-82

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DISCLAIMER

UNITED STATES NUCLEAR REGULATORY COMMISSION'S ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

The contents of this transcript of the proceeding of the United States Nuclear Regulatory Commission Advisory Committee on Reactor Safeguards, as reported herein, is a record of the discussions recorded at the meeting.

This transcript has not been reviewed, corrected, and edited, and it may contain inaccuracies.

1 UNITED STATES OF AMERICA

2 NUCLEAR REGULATORY COMMISSION

3 + + + + +

4 ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

5 (ACRS)

6 + + + + +

7 RADIATION PROTECTION & NUCLEAR

8 MATERIALS SUBCOMMITTEE

9 + + + + +

10 WEDNESDAY, JANUARY 18, 2012

11 + + + + +

12 ROCKVILLE, MARYLAND

13 + + + + +

14 The Subcommittee met at the Nuclear
15 Regulatory Commission, Two White Flint North, Room
16 T2B3, 11545 Rockville Pike, at 1:30 p.m., Michael T.
17 Ryan, Chairman, presiding.

18 COMMITTEE MEMBERS:

19 MICHAEL T. RYAN, Chairman

20 J. SAM ARMIJO, Member

21 DENNIS C. BLEY, Member

22 HAROLD B. RAY, Member

23 STEPHEN P. SCHULTZ, Member

24 JOHN D. SIEBER, Member

25 GORDON R. SKILLMAN, Member

1 NRC STAFF PRESENT:

2 CHRISTOPHER BROWN, Designated Federal Official

3 CHRIS ALLEN, NMSS/SFST

4 SARA DePAULA, NMSS/SFST

5 EARL EASTON, NMSS/SFST

6 ELI GOLDFEIZ, NMSS/SFST

7 MATTHEW GORDON, NMSS/SFST

8 KIM HARDIN, NMSS/SFST

9 KIMBERLY G. RODRIGUEZ, NMSS/SFST

10 MICHELE SAMPSON, NMSS/SFST

11 MIKE WATERS, NMSS/SFST

12 DOUG WEAVER, NMSS/SFST

13 BERNARD WHITE, NMSS/SFST

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C-O-N-T-E-N-T-S

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P-R-O-C-E-E-D-I-N-G-S

1:30 p.m.

CHAIR RYAN: The Subcommittee will now come to order please. Now this is a meeting of the Advisory Subcommittee on Radiation Protection and Nuclear Materials.

I'm Mike Ryan. I'm Chairman of the Subcommittee. The Subcommittee Members in attendance are Sam Armijo, who will be joining us shortly, Harold Ray, Dennis Bley, John Stetkar is not yet here, Dick Skillman, Stephen Schultz, our newest member and welcome again formally on the record, Stephen.

MEMBER SCHULTZ: Thank you.

CHAIR RYAN: You're welcome, and Jack Sieber are here in attendance.

The purpose of this Subcommittee meeting is to receive an information briefing on staff development of Draft Final Revision 1 of Regulatory Guide 7.7 entitled Administrative Guide of Verifying Compliance with Packaging Requirements for Shipping and Receiving of Radioactive Material.

The Subcommittee will hear presentations by and all discussions with representatives of the NMSS staff. The Subcommittee will gather information, analyze relevant issues and facts, and

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1 formally propose positions and actions as appropriate
2 for deliberation by the full committee.

3 Christopher Brown is the designated
4 Federal official for this meeting. The rules for
5 participation in today's meeting have been announced
6 as part of the notice of this meeting published in the
7 Federal Register on December 23rd, 2011.

8 A transcript of the meeting is being kept
9 and will be made available as stated in the Federal
10 Register notice.

11 It is requested that speakers first
12 identify themselves and speak with sufficient clarity
13 and volume so that they may be readily heard.

14 We ask at this time that you silence your
15 cell phones and other electronic devices into the
16 vibrate or no-noise mode.

17 No one from the public has requested time
18 to make any oral or written statements to the
19 Subcommittee. We will now proceed with the meeting,
20 and I call upon Mike Waters from the NMSS staff to
21 begin. Mike.

22 MR. WATERS: Good afternoon, Dr. Ryan, and
23 members of the Subcommittee. I'm Mike Waters. I'm
24 Chief of the Licensing Branch of the Division of Spent
25 Fuel Storage and Transportation, NMSS, and on behalf

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1 of NMSS management we appreciate the opportunity to be
2 here to discuss our draft Registration Guide 7.7 and
3 receive any feedback from the members.

4 I don't think we've engaged ACRS recently
5 in any transportation guidance or regulations matters,
6 so opening remarks, I just wanted to provide a very
7 quick review of our regulatory responsibility and then
8 turn it over to Bernie with regard to Reg Guide 7.7
9 who's done all the work on this guidance document.

10 In short, NRC shared responsibility with
11 the Department of Transportation in regulating the
12 safety of transportation of radioactive materials.

13 Physically NRC certifies and inspects Type
14 B packages for the larger source materials as well as
15 Type A-F packages which are fissile material packages.

16 Right now we have approximately over 90
17 certificates issued to different certificate holders
18 and approximately 400 registered users in the U.S. for
19 these packages.

20 To give you an idea of the diversity of
21 the activities in package technologies, we approve and
22 inspect packages for - you have six fresh fuel and
23 spent fuel which supports the entire nuclear fuel
24 cycle.

25 We also approve packages for shipment of

1 medical isotopes and powerful radiography sources, use
2 in the construction industry as well as variety of
3 radioactive waste packages for various types of
4 radioactive waste forms from the users in the United
5 States of radioactive material.

6 These packages not only support the
7 private sector but also supports missions of other
8 Government institutions. For example, the packages
9 are used to dispose of legacy wastes - legacy waste
10 from the Department of Energy as well as disposition
11 of older Naval nuclear reactor missiles in return high
12 enriched foreign fuel from foreign countries to the
13 United States.

14 Finally I'd like to note that NRC and DOT
15 collaborate closely with our counterparts in foreign
16 countries who regulate transportation to countries'
17 radioactive materials as an international commerce,
18 and we strive to accept practical, to maintain
19 consistent standards and practices in regulating the
20 transportation of radioactive materials.

21 With that said, with this large diversity
22 of technologies and uses, it's all regulated under 10
23 CFR, Part 71, from the NRC standpoint as well as
24 regulatory guides. Reg 7.7 is one important component
25 of the Reg Guide series, and to conclude, we're happy

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1 to be here to discuss this. I'll turn it over to
2 Bernie if there are no further questions to begin the
3 presentation.

4 CHAIR RYAN: Mike, just one quick question
5 for again introductory clarification. You deal with
6 the packages' requirements for shipping and receiving
7 not for disposal or are there some multiple use
8 containers that you deal with that are for disposal as
9 well?

10 MR. WATERS: Well right now we don't have
11 - we are not certified - the multi-purpose canister
12 known that DOE has had. We do certified canisters for
13 spent fuel for both storage in a Part 72 and
14 transportation of Part 71, so there's an active
15 business we're in. It was one class of transportation
16 packages.

17 As you may know, DOE is attempting to pass
18 and get the Department of Energy to design a canister
19 that could be used for all three for storage,
20 transportation as well as for final disposal in a
21 geological repository.

22 CHAIR RYAN: But that's all within the
23 wheelhouse of your organization, correct?

24 MR. WATERS: The consideration of a
25 disposal canister would be in conjunction with our

1 sister division, SFAS, as it performed under Part 63,
2 under repository requirements, is we had Yucca
3 Mountain for whatever future repository we have.

4 Right now I do not believe DOE is really
5 actively engaged in that phase. I think they're back
6 to exploratory work as well as exploring of the
7 disposal options in general.

8 CHAIR RYAN: Thanks. That's helpful to
9 give some of the newer members some of the breadth of
10 the things you touch in our organization. Thank you.

11 MR. WATERS: Thank you.

12 CHAIR RYAN: Bernie.

13 MR. WHITE: Good afternoon. I'm Bernie
14 White. I'm a Senior Project Manager in Division of
15 Spent Fuel Storage and Transportation at NMSS. I've
16 done a little bit of everything at NMSS as a Technical
17 Reviewer for 15 and then spent five years as a
18 Technical Assistant to our Division Director before
19 becoming a Senior Project Manager back in August.

20 I've got a little bit depth of everything
21 there.

22 The first slide is just some
23 abbreviations. I tried to shorten some of the slides
24 so I didn't spell everything out. I think most of
25 these will be familiar to you all, so I don't plan on

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1 going over them. If you have any questions at any
2 time, feel free to interrupt me and ask me. I have no
3 - I'm more than willing.

4 The overall presentation outline, I
5 thought you'd give you a quick background on Part 71.
6 Thanks to Mike, I think I can eliminate maybe - Mike
7 Waters, I can eliminate maybe one slide, so maybe he
8 saved me about three minutes' worth of talking.

9 They give you a background of Reg Guide
10 77, what it was prior to its current draft revision.
11 Talk about the update to the Reg Guide, how it fits in
12 with other documents that we have or in the future
13 will have had, and you'll see what I mean by that when
14 I to there.

15 A little more in-depth discussion then
16 about the Reg Guide, admittedly it says Administrative
17 Requirements. You'll notice that some of the things
18 in there are not administrative requirements, but in
19 certain areas, for example, like our preliminary
20 determinations, things you do when you first fabricate
21 a package.

22 Marking the package is a administrative
23 requirement, but it's also one of three things they
24 have to do including some testing, so I didn't want to
25 pick and choose between what I gathered, so it's

1 little more than just administrative, but it does add
2 guidance out to the licensees where there is no
3 guidance at this point - guidance to the licensees,
4 there is no guidance at this point.

5 I have quite a few public comments I
6 included. I honestly didn't know what to expect or
7 what you guys were looking for in public comments. We
8 can spend as little or as much time with them as you
9 would like.

10 Then I've got two slides which has some of
11 the upcoming interactions we may have with you this
12 year. I use the word may because we're looking at
13 tentative dates late calendar year '12. Any delays in
14 it would be pushed over to next year, so I've got a
15 couple of slides on that.

16 As Mike said, we co-regulate
17 transportation with Department of Transportation.
18 Here's the differentiation. Mike talked a little bit
19 about what they do, what we do. DOT regulates
20 carriers, import/export of radioactive material and
21 packages for small quantities of radioactive material,
22 what we call Type A quantities. I'll get to what a
23 difference in Type A and Type B quantity on either the
24 next slide or the next, next slide.

25 We regulate Type B packages, the larger

1 quantities and Type A fissile packages. While DOT
2 does regulate import/export, they send a lot of their
3 packages over to us for technical review, so we would
4 review the - do the technical review on we call them
5 revalidations, packages that have a Certificate of
6 Competent Authority in a different country and they
7 want to either transport to the U.S., from the U.S.,
8 or transit within the U.S., so they want a Certificate
9 of Competent Authority from DOT.

10 We would do the technical review and then
11 make a recommendation to the Department of
12 Transportation on whether to revalidate it or not.

13 As Mike said, we're the lead agency for
14 the inspection of NRC certificate holders or actually
15 holders of Certificates of Compliance for fabricators,
16 licensees, shippers, carriers, etcetera.

17 MEMBER BLEY: So that division of
18 responsibility is set up through some Memo of
19 Understanding?

20 MR. WHITE: Yes, there's a Memo of
21 Understanding I think dated maybe 1974 which
22 delineates this. You know, very little has changed in
23 the transportation regulations big picture since then.
24 We changed a lot of the minutia of the regulations,
25 maybe the drop test heights and, you know, things like

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1 that. We've added some tests, but as far as the big
2 picture regulations, very little has changed since
3 then.

4 MEMBER BLEY: Okay. Thanks.

5 MEMBER SIEBER: Are there any state laws
6 that are more restrictive than Federal laws or DOT or
7 NRC?

8 MR. WHITE: I don't know that answer. I'm
9 going to turn Earl Easton who's our expert on staff.

10 MR. EASTON: Hi, Earl Easton. I'm with
11 the same division Bernie is. States and localities
12 can impose additional requirements, but the
13 requirements can't conflict with Federal requirements
14 or there's a preemption procedure that DOT, someone
15 can apply to DOT, and they can get the state and
16 locals revalidated, so they're allowed to do
17 additional things like for example, time of transit
18 and that sort of thing, but they can't be in
19 contradiction to DOT requirements.

20 CHAIR RYAN: Earl, correct me if I'm
21 wrong, but my experience is the bulk of them are in
22 that category, Dennis, of when and where a package can
23 travel as opposed to what the actual package or its
24 transport unit may look like.

25 MR. EASTON: Right, the states also have

1 a role in routing. DOT has routing criteria to pick
2 preferred routes for high quantities, route control
3 quantities, and the states have a role where they can
4 go in and actually designate through a process in the
5 regulations what routes.

6 Now DOT does look at the different states
7 and makes sure the routes line up, otherwise that
8 would be contradictory to the whole scheme.

9 MEMBER SIEBER: But they do not get
10 involved in certification of packaging or external
11 radiation, you know, external to the package itself
12 but still part of the vehicle?

13 MR. EASTON: There are certain things that
14 are sacrosanct to the Federal partners. Packaging is
15 one. The general markings and placardings and
16 labelings of packaging and the radiation level from
17 packaging and contamination level. Those are all
18 Federal standards which the states really can't go in
19 and put something more strict on.

20 MEMBER SIEBER: I know that there are
21 quite a few truck drivers who carry their own meters
22 and do their own measurements after the vehicle is
23 loaded to make sure that they comply. Okay. Thank
24 you.

25 MR. WHITE: As I mentioned, I'll talk a

1 little bit about what a Type A and Type B quantity is.
2 If you look in the back of Part 71 there's Table A-1,
3 and this is just a very small snippet, but for each
4 new client there is a Type A-1 and Type A-2 quantity.

5 Type A-1 quantity is the amount of
6 material that's authorized up to that value for a Type
7 A package. For example, Cobalt 60 for special form
8 material, the Type A quantity is .4 terabecquerels or
9 11 curies.

10 If it's greater than 11 curies, it will be
11 in a Type B package. We call that a Type B quantity.
12 For normal form - for Cobalt it's the same. If you
13 look down to Stronium-90 - I'm sorry, not Stronium-90,
14 Cesium-137, the special form quantity is 2
15 terabecquerels whereas the normal form quantity is .6
16 terabecquerels, so those are two values depending upon
17 what form of the material is.

18 Let me get - special form material is
19 material that meets requirements that are in Part 71.
20 There are certain tests that the material has to
21 undergo by itself, drop test, fire test and I can't
22 recall all the different tests, but maybe puncture
23 test. It has to have something dropped on it. It has
24 to meet these tests by itself without - leaching
25 tests.

1 If it's not special form, by rule, it's
2 normal form, so either it has a designation or it
3 doesn't.

4 Background of these packets, we approve
5 package designs. Safety is in the package design
6 because of the way it's designed and the different
7 tests and the criteria it has to meet after the
8 different tests.

9 Part 71 contains package approval
10 standards, so there are a lot of regulations that are
11 - that used to be a lot of regulations were not
12 performance-based. You had to do A, B, C, D, E. Part
13 71 is a performance-based regulation, so they designed
14 the package and then showed that the performance of
15 the package meets the regulations.

16 Because of the way packages are designed
17 and the safety is in the package and how the package
18 is used, there's a general license criteria. There's
19 general licensing Part 71 that any licensee of the
20 Commission can use a package if it does A, B, C, D, E,
21 and those things are listed in Part 71.

22 For example, they have to have a QA
23 program that meets the requirements of Part 71. They
24 have to have package drawings. They have to have
25 operating procedures and a few other things along

1 those lines.

2 CHAIR RYAN: I guess that kind of - the
3 operating procedure is really they become an
4 authorized user for a particular transportation
5 package.

6 MR. WHITE: Right. That's another - yes,
7 you have to write in and ask to be a registered user
8 as we call it, so we know who's making shipment or who
9 has the ability to make shipments.

10 CHAIR RYAN: Just a clarification for some
11 of the other members, if you have an internal part of
12 the cask. In other words, there's a special basket
13 that contains the "waste package". The baskets and
14 some of those kinds of things can be part of the cask
15 itself rather than the waste package.

16 MR. WHITE: Yes.

17 CHAIR RYAN: The waste package is the
18 thing that a licensee turns over to the shipper. I
19 guess I'm trying to make the point there's a very
20 clear line between a waste package and what might be
21 holding the waste package in place in a transport
22 unit.

23 MR. WHITE: Right. We would consider
24 what's holding the waste to be - like for example,
25 there's an inner container that the waste is in and

1 that's pulled out of the package and disposed of. We
2 would call that part of the contents.

3 CHAIR RYAN: Right.

4 MR. WHITE: And then there's the packaging
5 which is what contains the contents.

6 CHAIR RYAN: Got you, well said.

7 MR. WHITE: And they would find terms in
8 Part 71.

9 MEMBER BLEY: I'm just curious. Since you
10 approved these in kind of a generic way, is there some
11 way that you've assured that there are no
12 transportation routes which are not part of what you
13 regulate that could introduce something more severe
14 than you test for?

15 MR. WHITE: We - the tests that - and I
16 had a feeling we were going to get into this, so I
17 brought some back-up slides which have some of the
18 different -

19 MEMBER BLEY: I was just out by Taos, and
20 I want to cross the second bridge over with a U.S.
21 highway, and I said, well, it's a lot higher than most
22 things I've ever seen.

23 MR. WHITE: It's pretty impressive isn't
24 it?

25 MEMBER BLEY: Yes, it is. I didn't know

1 there was a Grand Canyon on the Rio Grande.

2 MR. WHITE: The way Part 71 is set up and
3 the fact that it's performance-based, there are - let
4 me make sure I can save a copy for myself. There are
5 tests that the applicant has to do before we give him
6 the certificate.

7 There's tests for normal conditions of
8 transport which is what we consider the sorts of
9 things the package would see when it's normal - in
10 normal route.

11 If you turn back to Slide 4 of the back-up
12 slides I just handed out. These are the different
13 tests for normal conditions of transport.

14 For example, they have to evaluate the
15 package sitting out in the hot sun. They have to
16 evaluate if it's going through North Dakota in the
17 wintertime; reduced internal/external pressure,
18 increased external pressure; vibration as it sits in
19 the back of the truck going down the road; water
20 spray. If they're picking up the thing to put it on
21 a truck and they drop it, those normal-type things
22 that are into the transportation.

23 The sort of things you're talking about
24 accidents. You slip to the next slide, that gives the
25 different hypothetical accident conditions tests, and

1 I didn't write out all tests, all the different
2 criteria.

3 Like, for example, I had to do a free drop
4 test. That's a 30-foot drop onto an unyielding
5 surface, and correct me if I'm wrong, Earl, but these
6 were designed to bound 99 percent of all - or 99.9
7 percent of all events that a package would see.

8 The reason for that is the energy that
9 goes from the drop into the package because it's an
10 unyielding surface, all the energy of the drop goes
11 into a package.

12 If a package falls off a bridge, a ten-
13 foot bridge, a 20-foot bridge, a 40-foot bridge, it's
14 going to fall on a road surface which is not
15 considered an unyielding surface. You have
16 deformation of the surface it falls onto.

17 So those are the ways we try and get
18 around - and I don't use the words get around, but we
19 try to assure that a package in an accident, in a
20 realistic accident, would not see forces more severe
21 than in the hypothetical accident conditions.

22 Let me just run through the tests real
23 quick. The crush test is only applicable for packages
24 who float. They have a density of less than one gram
25 per cubic centimeter.

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1 Puncture test is a 40-foot drop onto a
2 puncture pin. It's a six-inch diameter pin. It has
3 to be - and all these have to be in the most damaging
4 orientation.

5 Thermal test is a 30-minute test in a 1475
6 degree fire. It burns when the fire is put out. It
7 needs to continue burning. You can't put it out, and
8 then there's an immersion test for fissile packages
9 and an immersion test for all packages.

10 The immersion test for fissile packages is
11 50 meters, 100 meters? Fifty meters for fissile
12 material packages, and then I think it's a three-foot
13 - is it one meter for all packages?

14 MR. EASTON: Fifteen.

15 MR. WHITE: Fifteen feet. I'm going by
16 memory here, and my memory is not that good. I'm
17 sorry. Immersion-type tests, Earl.

18 MR. EASTON: Well there's several
19 different immersion tests depending on the packaging.
20 Spent fuel has a deep immersion test which is 200
21 meters so that if you were shipping spent fuel over
22 the Continental Shelf and wanted to recover it, the
23 assumption is if it's not on the Continental Shelf you
24 may not want to recover it, and then there's lesser
25 tests, 15 feet for fissile material and there's a

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1 number of immersion tests in the regulation depending
2 on what type of package, what type of contents.

3 MEMBER SIEBER: Now my question has more
4 to do with the construction of the package, but if
5 you're shipping spent resins, you put it in an inner
6 container, a high integrity container which has a
7 shield on top of it. The package is the inner
8 container and the shield, right?

9 MR. WHITE: The package is the packaging
10 which is what the inner container goes in as well as
11 the contents.

12 MEMBER SIEBER: Right, but not the shield?

13 MR. WHITE: If it's part of the contents,
14 it's part of the package.

15 MEMBER SIEBER: Well when you ship it, the
16 shield goes with it. When you get to the disposal
17 site, the inner part comes out.

18 MR. WHITE: Right. That would be part of
19 the contents, and the packaging is what it goes in.
20 The package is both the contents and the packaging.

21 MEMBER SIEBER: Okay, so the drop test,
22 for example, would include the shield.

23 MR. WHITE: Yes.

24 MEMBER SIEBER: And that's where the
25 strength is. It's in the shield as opposed to the

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1 package.

2 MR. WHITE: Well typically for packages
3 like that they would have what's called impact
4 limiters on the end, something that like different
5 types of woods, aluminum honeycomb, and the idea there
6 is that they would take the forces in the drop, so you
7 have less G - less forces going into the package
8 itself to deform it.

9 MEMBER SIEBER: Penetration resistance is
10 in the shield.

11 MR. WHITE: Exactly, yes, it's in the
12 package. Whatever the pin would see on the outside
13 and what's into it through the contents, yes.

14 MEMBER SIEBER: Thank you.

15 MR. WHITE: Did that answer your question
16 too? Okay. And the final note is that general
17 licensees have to use the package in the manner in
18 which it was approved, and that might seem like a
19 minor point, but you don't know how many people come
20 in and they say well we want to put this material in
21 the package and they test it with that material, and
22 then they come in for an amendment and they want to
23 use a material that has less strength and then so then
24 we have to ask them well how do you know how this
25 would withstand the different accident conditions and

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1 the different tests that it has to undergo.

2 MEMBER SIEBER: What can you do in the
3 situation - you can tell me whether it's legal or not
4 - where you have a high integrity container that has
5 resins in it that you need to get rid of some hot
6 thing that you put down in the middle of the package.
7 You use the shielding from the resin plus the outer
8 shield?

9 MR. WHITE: If the package is approved in
10 that manner, that would be fine.

11 MEMBER SIEBER: Like it has to be
12 specifically in the package certification.

13 MR. WHITE: Yes, it does. The package
14 certification includes the contents of the package,
15 the draw - the package drawings, so those are the two
16 areas in which we would make sure that that was
17 covered.

18 MEMBER SIEBER: So for somebody to do that
19 when it's not in the certification, that would be a
20 violation.

21 MR. WHITE: If they shipped it -

22 MEMBER SIEBER: Even though you meet all
23 the external requirements.

24 MR. WHITE: If they shipped it and it was
25 not in part of the contents, yes. Now you can come in

1 for amendments once the package is approved and people
2 do it all the time to add different contents,
3 different this, different that, but they have to make
4 sure that whatever they add or whatever they change in
5 the packaging it still meets Part 71.

6 MEMBER SIEBER: Okay. Thank you.

7 MR. WHITE: There are three basic safety
8 functions for a package: shielding, containment,
9 subcriticality. That might seem odd especially those
10 of you who may be structural engineers because
11 structural engineering is a big part of the package,
12 but the structural engineering goes to ensure that
13 when they do the shielding analysis or do the
14 containment analysis or the criticality analysis that
15 it meets those provisions within Part 71, so the
16 structural analyst would look at the drop test, for
17 example, look at the forces on different areas.

18 If there is a bolted lid closure, they
19 would look at the forces in that area to make sure
20 that the bolts don't break, that you don't have the
21 lid separation, when you do a leak test or a
22 containment analysis that it remains intact as it
23 should.

24 We look for margins for the tests after -
25 we look for safety margins relating to these three

1 after the test - hypothetical accident conditions and
2 normal conditions of transport.

3 Now each different areas have their own
4 set of margins. For example, in shielding, there's
5 limits for dose rates that you have to meet during
6 normal and accident condition transport.

7 Containment, there are limits within part
8 71 for leakage and then the package has to remain
9 subcritical, and there is a number of ways we look at
10 the subcriticality, flooded, etcetera, depending upon
11 whether there's normal or accident.

12 CHAIR RYAN: But in terms of shielding, if
13 there's a waste package that is somewhat smaller than
14 the interior diameter of the cask you typically take
15 credit for spaces that keep the package at some set
16 distance from -

17 MR. WHITE: If they were going to put
18 dunnage in there to keep it at that, yes, and some
19 packages do. Not all of them do it.

20 In general, most of them that there are
21 large gaps they do put dunnage in there to take up the
22 space to make sure that the package stays - or the
23 contents stays within a certain spacing within the -

24 CHAIR RYAN: Yes, consistent with the
25 safety analysis of the shield.

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1 MR. WHITE: Right, exactly, yes.

2 CHAIR RYAN: All right.

3 MEMBER SKILLMAN: Question please.

4 MR. WHITE: Sure.

5 MEMBER SKILLMAN: What are the
6 requirements for the codes that are acceptable to the
7 NRC for the mechanical design?

8 MR. WHITE: We don't specify that codes in
9 Part 71 that an applicant has to meet. As a general
10 rule, there are a number of codes and standards they
11 do specify.

12 For example, spent fuel packages are made
13 the ASME code. A lot of welding is done to the - it's
14 AWS. We have packages that are made. They use ASTM
15 standards for materials, but we don't have a set
16 listing of codes that they are required to use. They
17 provide us with the codes and standards they intend to
18 use, and then we look at whether or not they're
19 acceptable for the design, and I'm hesitating a little
20 bit because the packages that we evaluate are so
21 dissimilar.

22 Some of them are the size of a woman's
23 purse and some of them are large spent fuel rail
24 packages, and so Part 71 applies to both. That would
25 be all the different codes of standard - or all the

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1 different types of packages.

2 MEMBER SKILLMAN: Let me ask the question
3 in the other form. Are there codes that NMSS will not
4 accept?

5 MR. WHITE: I honestly do not know that
6 answer. I'm looking out to see who we have in the
7 audience. I don't believe - looking out. We have a
8 couple of materials . I don't think we have any
9 structural people out there.

10 MR. WATERS: This is Mike Waters. I think
11 the majority of the code sets the standards we do
12 accept, and some of those are actually defined and
13 they have a Reg Guide series we have in Series 7 what
14 codes we accept.

15 I think - as Bernie hesitates, I think
16 there may be portions of a code -- codes we say was
17 that really designed for transportation. We have some
18 reg in the ANSI codes that were more specific for
19 nuclear applications and we have some ASTM and ASME
20 pressure vessel codes that may not necessarily had
21 transportation in mind but just say the principles
22 apply and accept the majority of that, so I think to
23 some degree in review standards which are defined in
24 the Reg Guides as well as the staff's guidance review
25 we'll list the parts of the code that we take

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1 exception to when we need an alternative solution.

2 Did that summarize that, Matt?

3 MR. GORDON: I think so.

4 MR. BROWN: Hey, Matt, can you come to the
5 mic and give your name.

6 MR. GORDON: I think technically speaking
7 the staff accepts foreign codes under certain
8 circumstances, but because we're not as familiar with
9 those codes, they receive so much scrutiny that
10 applicants simply do not employ them, so if I answered
11 your question de facto, we do not accept foreign
12 codes, but we will consider them. My name is Matthew
13 Gordon.

14 MEMBER SKILLMAN: Thank you.

15 MR. WHITE: And we also do quality
16 assurance inspections of the fabricators and
17 certificate holders to make sure that they are using
18 the QA program appropriately in the design,
19 fabrication, and use of the packages.

20 CHAIR RYAN: Bernie, just on the
21 inspection side of that point you're making, does your
22 group do the inspections or do you have other folks
23 that you rely on for inspections.

24 MR. WHITE: The answer is yes. Usually
25 the quality assurance inspections out of headquarters,

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1 the regions do most of the actual use inspections.

2 CHAIR RYAN: Okay, so it's a regional and
3 headquarters combined effort.

4 MR. WHITE: Right.

5 CHAIR RYAN: All right. Thank you.

6 MR. WHITE: Just some pictures of a couple
7 of the different tests for hypothetical accident
8 conditions. On the left is the 30-foot drop test. On
9 the right is a puncture test, and on the bottom is
10 just a picture of a fire test to give you a sense for
11 what these look like.

12 CHAIR RYAN: There's a guy under that 30-
13 foot drop test in that picture.

14 MR. WHITE: I think that was long before
15 that. I think he left before they dropped it.

16 CHAIR RYAN: Let's hope.

17 MR. WHITE: I can tell you it wasn't me.

18 A little bit of background to Reg Guide 77, DOT
19 regulations for radioactive material do not apply to
20 all NRC licensees. There are a handful of Federal
21 agencies that do not have to meet DOT regulations.

22 Back before DOT used to regulate
23 intrastate commerce, there was a large number of
24 licensees that DOT regulations did not apply to.

25 In Part 71, 71.5(b), we imposed DOT

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1 regulations on those licensees, so we say even though
2 you're not subject to them, you have to do the actions
3 as if you were subject to them.

4 MEMBER BLEY: I'm just curious how that
5 works then. Does DOT ensure that they're meeting the
6 regulations or do you somehow?

7 MR. WHITE: I believe it would be us.

8 MEMBER BLEY: It would be you.

9 MR. WHITE: Because they're following the
10 NRC regulation which is imposed upon them not the DOT
11 regulations, but they have to do the actions, for
12 example, placarding, marking, things like that.

13 Back before, like I said, before DOT
14 regulated intrastate commerce, this was a very large -
15 this is a large number of licensees. Now it's a very
16 small handful.

17 The draft Reg Guide 7.7 was issued in
18 August 1977 was never issued in final. I'm kind of
19 getting to the whole point about the DOT. It's kind
20 of odd the way it fits, but the Reg Guide endorsed the
21 ANSI standard which no longer exists. The ANSI
22 standard was withdrawn.

23 The ANSI standard had a method for
24 compliance with 71.5(b). It talked about appropriate
25 package selection, preparing the package for shipment,

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1 and completing shipping papers, placarding, and
2 incidents - and actions to take in the event an
3 incident occurs.

4 Some of these items are now - you know,
5 are currently under NRC. For example, the applicant
6 has to prepare - the shipper has to prepare the
7 package using the NRC Certificate of Compliance, the
8 operating procedures that the certificate holder has
9 developed based upon the operating procedures we see,
10 a number of things that are in NRC purview, shipping
11 papers, accidents, actions in the event of an incident
12 occurs maybe within the state or DOT purview.

13 Since the ANSI standard was withdrawn, we
14 didn't want to endorse an ANSI standard that no longer
15 existed. In addition, we didn't just want to issue
16 this reg guide in final with this issue in Part 77
17 because some of the actions in there are not NRC - are
18 not regulated by the NRC, and we wouldn't want DOT or
19 somebody else to put words in our mouth and visa
20 versa. We wouldn't want to put words in their mouth.

21 So what we did was we took some of the
22 guidance that was in the old standard about package
23 selection and things like that and we updated it to
24 include the administrative requirements in Part 71
25 that are within NRC purview.

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1 We tried to make is useful for people who
2 - or for licensees who do infrequent shipments or are
3 new to Part 71. It only applies to packages that NRC
4 has jurisdiction over, Type B packages, Type A fissile
5 packages, so we had two previous reg guides, Reg Guide
6 7-1 and Reg Guide 7-3, that we incorporate into Reg
7 Guide 7.7 because we thought having it all in one
8 place would be a better, more useful tool for our
9 licensees and applicants.

10 So the revised reg guide contents contains
11 items for shipment and planning. If you're a new
12 shipper and you have something you want to ship, how
13 do you go about doing that. We have to figure out
14 what's a Type A or Type B package, what kind of
15 package - whether there's a package authorized to ship
16 it.

17 If you're a new shipper and you're
18 fabricating your own packages, what do you have to do
19 to get those packages accepted for use, along those
20 things, so it includes package and preliminary
21 determinations.

22 We call it preliminary determinations, we
23 also call them an acceptance tests, things you have to
24 do when you first fabricate a package.

25 Loading the package, preparing it for

1 transport, and then reports and records are required
2 after the shipment. You know, you have shipping
3 papers, you have a number of different records you
4 have to keep in the event that there is something that
5 went wrong with the shipment, so we cover a majority -
6 some of these items as well in the NUREG guide.

7 MEMBER ARMIJO: Bernie, are there
8 literally hundreds of these packages?

9 MR. WHITE: The answer is yes. We have -
10 what did you say, about 90 certificates? There are
11 some certificates where there are thousands of
12 packages.

13 For example, UF6, there are thousands of
14 UF6 packages.

15 MEMBER ARMIJO: Different types.

16 MR. WHITE: There are about 90, probably
17 maybe 100, different package types. We may have a
18 couple of certificates that have more than one package
19 on it, very similar, but they're a little different in
20 what they look like.

21 CHAIR RYAN: And out of the 90, just to
22 give some perspective, how many are frequently used,
23 half that?

24 MR. WHITE: Probably all of them, and
25 honestly, we don't keep track of those things.

1 CHAIR RYAN: Okay.

2 MR. WHITE: If you look at the types of
3 packages that we have, they're a radiography camera,
4 radiography package. They're used all the time. You
5 have six packages that are used all the time.

6 Pellet and powder packages for fresh fuel,
7 to make fresh fuel assembly, are used all the time,
8 fresh fuel assembly package.

9 Now the ones that aren't used all the
10 time, we do have a lot of spent fuel packages. I
11 can't say how often they're used.

12 Now we know some of them that have foreign
13 research reactor fuel are used quite frequently. You
14 have a couple of those, so the number that are - we
15 have - a lot of them are used quite frequently and
16 some that are not as frequently.

17 CHAIR RYAN: I can remember the days that
18 steam generator disposal that that was sort of a
19 unique one-off package.

20 MR. WHITE: Right.

21 CHAIR RYAN: And, you know, you have
22 really complicated transport because you're in the
23 open ocean and you have to go down past all the
24 states, so that -

25 MR. WHITE: That used to be regulated by

1 NRC under the old LSA and that was pushed off the DOT
2 in the I think the '90s when we did the rulemaking in
3 the '90s.

4 I was around when we did a couple of the
5 old steam generator and reactor vessel shipments.

6 CHAIR RYAN: Yes. Thanks.

7 MR. WHITE: Sure.

8 CHAIR RYAN: I guess it's important, I
9 mean at least it seems to me that even though there
10 are those complicated circumstances, there's really a
11 fairly clear path kind of embodied in this reg guide
12 and lots of other documents on how to get there. Is
13 that a fair comment?

14 MR. WHITE: Yes, there -

15 CHAIR RYAN: Even though it can be very
16 complicated, it's not arcane . I mean you know how to
17 get the job done and go from A to Z because you've got
18 some guidance documents that help everybody stay on
19 the highway.

20 MR. WHITE: Right. There are a lot of
21 guidance documents for preparing an application for a
22 certificate whether it's NUREGs, SRPs, reg guides, we
23 have a number of documents for those.

24 Admittedly we have fewer for some of the
25 more administrative things like this, and that's what

1 this was intended to do. You know, if you had
2 something you want to ship but you don't know how to
3 do that, this kind of - it doesn't give you a step-by-
4 step well look in this document for this certificate,
5 but it does tell you how to go about doing that.

6 Another thing we recommend is if you've
7 never done this and are uncomfortable with it, hire
8 somebody who has done it before, so - because there
9 are a number of companies who will go out and broker
10 shipments and actually make the shipments for you.

11 So the relationship - Reg Guide 7.7 is
12 kind on the middle there on the right-hand side. As
13 I said earlier, we incorporated Reg Guide 7.1 and Reg
14 Guide 7.3 into that.

15 We referenced Reg Guide 7.4 which is
16 currently before the ACRS for review. Reg Guide 7.4
17 is - endorses ANSI N14.5 which is the ANSI standard
18 for a leak testing of packages that we have reviewed
19 and has been in use for many, many years in different
20 revisions.

21 It endorses the I believe 2008 version of
22 that ANSI standard, and the idea is to take some of
23 these items from 7.1, 7.3 and incorporate into Reg
24 Guide 7.7 and then some of the basis in Reg Guide 7.7
25 the applicant could use to develop their acceptance

1 test and operating procedures when they submit an
2 application to us.

3 Reg Guide 7.1 is an administrative guide
4 for packaging and transporting radioactive material.
5 It was published in June of 1974. It endorses an ANSI
6 standard which was withdrawn.

7 It based the contents of it where it
8 talked about procedure for package selection and
9 labeling. Again labeling is the DOT portion, so we
10 talk a - we talk in this about the package selection.

11 Reg Guide 7.3 is procedures for picking up
12 and receiving packages of radioactive material. We
13 felt it best to have all of these in one reg guide as
14 opposed to having two or three different reg guides
15 that a licensee or a certificate holder or an
16 applicant would have to go out and use.

17 It was published in May of 1975, and it
18 was designed back then to minimize - you know,
19 minimize exposure and contamination in the event
20 something occurred during shipment.

21 Now this is back in the '70s. There were
22 not as many shipments. We didn't have as nearly as
23 much experience with shipments or improving packages
24 as we do now.

25 It had procedures in for receipt of

1 packages. It talked about notification and receipt.
2 When you get a package in, you have to notify the
3 shipper that you've gotten it. If you're notified
4 that you have a shipment, you know, that comes into
5 say your front door, you want to wait a weekend or two
6 to go get it, we've had that happen before.

7 It talks about monitoring of packages
8 whether it's looking at the dose and the dose rates
9 from the package and then whether there's any
10 contamination on the package, and if there's a
11 problem, who you would notify and what you would do in
12 the event that there - say you got a package in that
13 the dose on the surface of the package exceeded the
14 limits in Part 71, or it had contamination that were
15 above the limits in Part 71.

16 So Reg Guide 7.7, we incorporate a lot of
17 this as well as new material. Some of the new
18 material is in the shipment planning, and I've covered
19 some of this already. We talk about if you have, you
20 know, contents that you want to ship, how would you
21 got about doing that. You look for a package that may
22 contain or already have it authorized contents. If it
23 doesn't you'd want to come - you or the certificate
24 holder would come to the NRC and ask for an amendment
25 to authorize that.

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1 It talks about the packaging and
2 preliminary and routine determinations you made.
3 Routine determinations are things you would do to make
4 sure the package in good physical condition, make sure
5 that there are no - nothing but superficial scratches.
6 For example, if it's got a big hole in the side of the
7 package, things along those lines.

8 It talks a little bit about loading the
9 package. Loading the package is done in accordance
10 with operating procedures. When we get an application
11 in for a Certificate of Compliance, it has - we call
12 them generic operating procedures because they don't
13 go step by step - unbolt, you know, unscrew this bolt,
14 unscrew this bolt. It doesn't go through - it doesn't
15 always go through the exact set of steps that are
16 needed to prepare a package for shipment, but it gives
17 us a sense for when they do write the detailed
18 operating procedures we know what they're going to say
19 in terms of the steps and what's important in terms of
20 preparing that package for shipment, so it hits the
21 highlights for us, and then some of the reports and
22 records -

23 Some of these I'll talk a little bit more
24 in depth about than others.

25 MEMBER SKILLMAN: Would you go back

1 please.

2 MR. WHITE: Absolutely.

3 MEMBER SKILLMAN: Let me explain two
4 different kinds of packages. One is a package that
5 contains material that the staff and industry does not
6 want to have leaked anywhere in its transportation
7 path and is described as packages a container of
8 significant mechanical integrity that has an over pack
9 to absorb the g-loading should the package become
10 free, and the inspection by the receiving organization
11 is a receipt inspection that confirms that nothing has
12 leaked and the radiation levels are what they should
13 be.

14 In that particular scenario, the receipt
15 inspection is fairly cut and dry. It didn't leak,
16 it's intact, has no puncture marks, the over pack
17 seems to be pristine or in the same - if you took
18 photographic images, it's the same as when it left the
19 shipping point of origin.

20 Now I'd like to contrast that with a
21 truckload of new fuel, GE commonly ships in wooden
22 containers. The receipt inspection for that load, for
23 that cargo, is different. Those containers are opened
24 and there is a receipt fuel inspection.

25 MR. WHITE: Right.

1 MEMBER SKILLMAN: But unless there has
2 been some intervention by somebody who is particularly
3 alert, there may not be any knowledge of what those
4 fuel assemblies experienced while in transit, run over
5 a curb at 85 miles an hour, sideswiped another
6 vehicle.

7 When the vehicle shows up, it might have
8 a dent on a rim or it might have a scrape mark on the
9 side of the trailer, but unless one is particularly
10 discerning, one would not know whether that fuel had
11 been subject to a different loading than that for
12 which it was designed, particularly for transport.

13 So where in the reg guide have you
14 considered that some packages simply need to
15 demonstrate integrity where other packages may need to
16 demonstrate that the objective of the shipment has not
17 been harmed beyond its design requirements?

18 Here's an example. You have a tractor-
19 trailer show up and you've got some bent rims and
20 there are no accelerometers on fuel package, and you
21 say what happened to that fuel?

22 MEMBER ARMIJO: Get a new fuel guy, Dick,
23 because where I worked we always put accelerometers on
24 them.

25 MEMBER SKILLMAN: And I was part of

1 receiving GE fuel that had none which is why I'm
2 asking the question because -

3 MEMBER ARMIJO: And I also worked at GE,
4 so it must have been a bizarre shipment.

5 MEMBER SKILLMAN: Yes.

6 MEMBER ARMIJO: Because there's too much
7 money at stake.

8 MEMBER SKILLMAN: I know. That's why I'm
9 asking the question, but I think it's just a general
10 topic. Some packages need to arrive intact, and
11 that's fine.

12 Others might need to arrive with a
13 different set of requirements.

14 MR. EASTON: Let me try to address that.
15 That the difference between the Type B package and a
16 Type AF package. Type AF package is spent fuel. If
17 you look at the A-1 and A-2 values - I'm sorry, fresh
18 fuel.

19 MEMBER SKILLMAN: I'm talking new fuel.

20 MR. EASTON: I misspoke. Type AF package
21 is fresh fuel. If you look at the table that Bernie
22 was referring to, A-1, A-2, fresh fuel has a limited
23 A-2, so there is no containment requirement.

24 In other words it's safe if it gets out.
25 Type A package is not one that is accident resistant.

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1 A Type B package is one that is accident resistant,
2 and that's because of the quantity involved, so when
3 you're down in a Type A package and you're approving
4 a Type AF package, you do all the tests, but your
5 criteria is that it doesn't go critical, not that it
6 doesn't provide containment, so hopefully the idea
7 that you're using a Type A package and a Type B
8 package, you have enough knowledge to know that there
9 are different contents and there are different
10 requirements. Is that what you're getting -

11 MEMBER SKILLMAN: Well first I respect
12 your answer, but let me push your envelope a little
13 bit, so I get this package that's dandy. It's a Type
14 AF and it hasn't leaked, and so I feel good, but I've
15 shaken it to the core and when I finally load it in my
16 reactor, it falls apart because it was brutalized in
17 shipment, so why isn't part of this regulatory guide
18 the monitoring of its, if you will, its gross motion
19 so that the receiver knows that fuel is intact.

20 MR. WHITE: It's not required by Part 71.
21 Part 71 looks at going from Point A to Point B. When
22 it gets to Point B, if it's - if it meets the
23 requirements of Part 71, it still must meet whatever
24 the license requirements are at the site it gets to.

25 If a reactor - I would presume if a

1 reactor got a fuel assembly in that put it in and it
2 fell apart, it might not meet the requirements of its
3 Part 50 license or - and I'm not a Part 50 guy, so
4 bear with me.

5 MR. EASTON: I hear you.

6 MR. WHITE: There's something on the part
7 50 side that it would not meet as opposed to Part -

8 CHAIR RYAN: I guess I'm taking an
9 interesting question from Dick's comment. He's saying
10 a package looks right, but he's not going to know
11 something is wrong internally without accelerometer
12 information until he's opening the package and in his
13 fuel pool. That's a bad place to find out about it.
14 I guess I'm taking away that you're raising a question
15 should there be a requirement even for fresh fuel to
16 have some confirmation that during transport there has
17 not been abuse through over-acceleration.

18 MEMBER SKILLMAN: It isn't my goal to give
19 you heat, but when I read your reg guide, when I read
20 the draft and the mark-up, that requirement is to make
21 sure it hasn't done and it hasn't done that, and it
22 hasn't leaked, and a neutron absorber is in place and
23 it's been loaded property, and I say to myself, gee
24 whiz, I would think one of the things we'd like to do
25 is to make sure that if the final use of the

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1 transported commodity may have a fission produce leak
2 in the future, we ought to make sure that it's tight.

3 MR. EASTON: And just keep in mind that
4 there's another party involved in this between the NRC
5 licensee. It's called a carrier. We exempt from NRC
6 safety regulations carriers.

7 Carriers, if something happens to a load
8 during shipment like suspected damage or leaking,
9 they're obligated under DOT regulations to report it,
10 but we're probably one of the only areas where we
11 license something and then immediately turn it around
12 to a party that's not an NRC licensee who we exempt
13 from our regulations. That's how we do packaging.

14 We just assure that during transportation
15 the package provides criticality safety shielded in
16 containment, and we rely on someone receiving a
17 product to have some sort of inspection in place to
18 make sure that their product meets the specifications
19 that they need. That's how -

20 MEMBER SIEBER: And that's outside of Part
21 of Part 71.

22 MR. WHITE: Yes, it is.

23 MEMBER SIEBER: The receipt inspection,
24 and part of that is a commercial interest, a million
25 dollars for a fuel assembly. Put a couple of them in

1 a package, you don't want to spend that money
2 foolishly. That's why there is a receipt inspection
3 where you can detect that. If you report any physical
4 damage there may be to the assembly, but Part 71 is
5 just for the safety of the public with regard to the
6 shipping from the shipper to the receiver.

7 MR. WHITE: And to make sure that the
8 receiver knows what he or she is getting. When the
9 receiver gets a package in, they want to make sure
10 they do the measurements on it to know whether there's
11 contamination or high radiation. You just want them
12 to open the bolts and go, wow, and get a blast of
13 stuff in the face, so you want to make sure that they
14 know what they're getting on their end before they
15 open the package and what they're dealing with.

16 MEMBER SKILLMAN: I understand the
17 commentary.

18 MR. WHITE: And I appreciate you comment
19 as well.

20 MEMBER SKILLMAN: I'm asserting my
21 comment. I believe that if the regulatory guide is to
22 be whole, then for a package of fissile material where
23 future integrity is important that knowing its motion
24 history en route is as important as knowing when it
25 shows up it has integrity. It's not just enough to

1 say, gee whiz, it looks fine. The over pack is not -
2 the over pack has not been compromised and the wall of
3 the container is nice and shiny.

4 If I'm shipping a form that may be new
5 fuel and if for whatever reason the smart people
6 involved have not required accelerometers, it seems to
7 me that the reg guide ought to at least point to that
8 and say you better make sure that you've taken due
9 diligence to ensure that you know the motion history
10 of the package. That's my comment. Thank you.

11 MEMBER ARMIJO: Dick, but that - I want to
12 get back to the fuel thing. It's really a purchasing
13 requirement that, you know, you, as a purchaser of the
14 fuel, that would be one of the things on your
15 requirement that there be assurances that when you
16 receive it, it's been shipped properly.

17 I know accelerometers are routinely put
18 on. I don't know about that particular shipment.
19 They're routinely put on and, of course, the big issue
20 there is, you know, packages have fallen off trucks,
21 and nobody told - the guy that was moving it didn't
22 tell anybody, but there was - accelerometers said it
23 was there. You do the receiving inspection, you check
24 the spacers and make sure they're not crushed and
25 everything else, but that's in the commercial end of

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1 it rather than the safety end of it.

2 MEMBER BLEY: A couple of things about
3 that. I sort of think, like Dick, if this stuff can
4 end up in the reactor and you can have problems with
5 it later. While that's probably commercial, it's
6 borderline on safety, but I'm wondering if not having
7 a requirement like this is because of the way we've
8 divvied up the regulatory responsibility with some of
9 it belonging to one agency and some to another.

10 This sounds like stuff that would in
11 principle belong to the shipping which would be DOT,
12 and I don't see anything in the cited regulations that
13 are cited in 71.5 that would really apply to that
14 except the accident one, and it just seems like maybe
15 it's a gap somewhere in here.

16 MEMBER SKILLMAN: That's how I feel. I'm
17 not sure it's a draconian change. It just seems to me
18 -

19 MEMBER ARMIJO: I think it's being done
20 anyway. I don't know whether it's under a regulations
21 related to you as the operator of the power plant to
22 assure that you're putting fuel in there that is -
23 will meet all the functional requirements and that's
24 why you have receiving inspections, but I know it's
25 done, and I know the shipper at least when I was

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1 active in it, it's one of the things you do to make
2 sure that -

3 CHAIR RYAN: It seems to me that if the
4 reg guide could be modified in some small way to just
5 recognize that there is this connection to other
6 requirements, be they commercial or otherwise, that
7 might have an effect on safety.

8 MEMBER ARMIJO: The receiving inspection,
9 the licensee has the obligation to assure that the -

10 MR. WHITE: Well if there was a tie there
11 to some of these things we've touched on like the
12 receipt inspection and any other measurements that
13 might be related to, you know, confirming its quality
14 during transport might be helpful.

15 MEMBER ARMIJO: I'd like to thank NMSS in
16 advance just for considering it. It seems to me that
17 it's something that might be worth a second thought.

18 MR. WATERS: I think - we will consider it
19 and we'll talk to our counterparts to get a better a
20 better understanding for example in the receipt of
21 fuel. I think from a safety aspect, obviously we
22 focused on the safety during the transportation, those
23 who handle it. Obviously your concern, for example,
24 is safety under Part 50 requirements, and there are
25 requirements under Part 50 and all those requirements

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1 that Part 50 licensed to follow to make sure fresh
2 fuel is safe when you handle it and you put in the
3 reactor to operate, so those licensees too where
4 beyond fresh fuel there's all kind of sources being
5 possession licenses for our resources, so maybe a
6 point or two in consideration of that regulation as
7 far as condition of the material may be something we
8 can consider and get back to you on.

9 CHAIR RYAN: And I think there are like,
10 for example, medical radiators with high concentrated
11 cobalt pencils and so. There's other examples of high
12 activity shipments might need this kind of extra
13 attention.

14 MEMBER SKILLMAN: Yes, that's my thought.
15 The type of logic that I'm trying to gently
16 communicate may not be limited just to new fuel.
17 There may be other applications where the receipt
18 person would say, boy, am I glad I know that that
19 thing has been shaken beyond its design basis or
20 shaken beyond its limits so that the receiver knows I
21 had better be mighty careful when I open this thing,
22 and the telegraph may be the accelerometer or some
23 other device that communicates some other physical
24 feature that had to do with the motion in transit.
25 Thank you. That's my -

1 CHAIR RYAN: Jack.

2 MEMBER SIEBER: I just would make a
3 comment that my understanding of a regulatory guide is
4 to list one rather detailed acceptable way to comply
5 with a specific regulation, in this case Part 70 which
6 has to deal with packaging, shipping, and receiving,
7 and the regulations that recover - that determine what
8 performance fuel is in a plant is under Part 50, and
9 I don't think you can modify this regulatory guide to
10 address Part 50 issues. You have to stick to - you
11 can only provide advice on the regulation that the
12 regulatory guide references.

13 MR. WHITE: Right, and we can go back and
14 look at Part 71 to see if there is - I use the word a
15 regulatory hook there to tie in with Part 71. There
16 may be.

17 MEMBER SIEBER: There may be.

18 MR. WHITE: Off the top of my head I can't
19 think of one, but that doesn't mean that there isn't.

20 MEMBER BLEY: 71.5 is close I would say if
21 there is anything.

22 MEMBER SIEBER: The receipt inspections of
23 new fuel are pretty thorough.

24 MEMBER ARMIJO: Very thorough, and like
25 you say, they -

1 MEMBER SIEBER: Shipment damage I think -

2 MEMBER ARMIJO: Very expensive, things
3 you're shipping and a lot of care is taken, and it's
4 required. It's already required by the regulations.

5 CHAIR RYAN: I guess, and I appreciate
6 that, but I'm still holding the question that I think
7 Dick is raising is it tied together in the guidance
8 document as tightly or as clearly as might be helpful
9 to explain it. I don't know.

10 MEMBER ARMIJO: Yes, I think it is, but
11 you'd have to look at the -

12 CHAIR RYAN: That's really the essence of
13 your question, is that right, Dick?

14 MEMBER SKILLMAN: Well, no, not quite.
15 What I'm suggesting is if we're going to have a
16 regulatory guide that talks about requirements for
17 shipping and receiving to the same extent that the
18 receiving requirements for the package in Reg Guide
19 7.7.2 leakage and that type of thing, I raise the
20 challenge should it include something having to do
21 with motion in transit because I think while it's
22 simple to say the reg guide really ensures that there
23 is no leakage during shipment to protect the public,
24 there may be a greater functional requirement to
25 ensure that in the process of shipping that whatever

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1 it is that's in that package has not been degraded so
2 it's end use is compromised, so I guess I got my story
3 and sticking to it here.

4 I think there is -

5 MEMBER ARMIJO: If that was the only
6 regulation we had, Dick, I would agree with you, but
7 we have other regulations that are far more
8 restrictive in Part 50 on the responsibilities of the
9 fuel manufacture and the responsibilities of the
10 licensee who receives the fuel and is going to operate
11 it are very, very demanding.

12 MEMBER SKILLMAN: But the staff is
13 revising a regulatory guide that, in fact, points to
14 this type of package, so I'm kind of befuddled why one
15 wouldn't say there is no great intellectual leap to
16 include at least a pointer to this type of thing in
17 this regulatory guide update because it may apply to
18 more than just fuel.

19 It could apply to medical isotopes,
20 control blades or a lot of delicate -

21 MR. WHITE: Spent fuel potentially.

22 MEMBER SKILLMAN: So that's my point.

23 CHAIR RYAN: Well, maybe the members of
24 the staff could take that away and think about it,
25 maybe there's a simple fix to that.

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1 MEMBER BLEY: Let me ask you a question
2 because I'm not wholly conversant on Part 71. The
3 three safety functions - shielding, containment, and
4 subcriticality - are those taken right out of the rule
5 or is that an interpretation of what you need to do to
6 meet the rule?

7 MR. WHITE: The criteria that a package
8 has to meet after the tests for normal conditions of
9 transport or hypothetical accident conditions are -
10 must remain subcritical.

11 There are dose limits or dose rate limits,
12 I'm sorry, on the side of the package, different ones
13 for normal accident conditions and then there is
14 criteria for leakage from the package in Part 71.

15 MEMBER BLEY: But nothing there about
16 integrity of the ship device other than those three.

17 MR. WHITE: There are - in Part 20 there
18 are some receipt - there are receipt -

19 MEMBER BLEY: In Part 20?

20 MR. WHITE: I think Part 20 has some
21 things on receipt of packages.

22 MR. WATERS: For the large part there are
23 specific safety standards, and as long as the NOI's
24 reconfiguration to the extent that those limits are
25 perhaps affect a package you have to do that, but if

1 there's any other issues outside of transportation, I
2 think that where it becomes compartmentized.

3 CHAIR RYAN: What are the requirements or
4 where are the requirements spelled out that determines
5 that whatever is in the package that undergoes the
6 accident and gets damaged is still fit for its
7 purpose?

8 MEMBER BLEY: That's a good point. A lot
9 of times there are counterparts - I'm very confident
10 in Part 50 it's mentioned. It applies not just to the
11 radioactive material but just components used
12 elsewhere and how do you know it's not damaged when
13 you received it. Fuel is a -

14 MR. WHITE: See that would not be in Part
15 71 because that would be in the -

16 CHAIR RYAN: But that's really Dick's
17 question.

18 MR. WHITE: Part 30 or whatever part it
19 applies to whether it's radioactive material or fuel.

20 CHAIR RYAN: Dennis has asked Dick's
21 question in a different way. If you have an accident
22 on a transport package and whether there's an
23 accelerometer or not or whatever else it might be for
24 measuring devices, how do you determine, you the
25 owner, what's going to be in transport that's fit for

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1 purpose. Is there any reg guidance that would head
2 you in that direction, and if there is, it seems
3 reasonable, and I think this is what Dick is asking,
4 is that that separate guidance under fit for purpose
5 question ought to at least be referenced and
6 recognized in this reg guide.

7 MR. WHITE: If there is, we could very
8 easily put a pointer into that guidance. I don't know
9 whether there is or there isn't. We can call our Part
10 50, Part 30 -

11 CHAIR RYAN: That might be a helpful tie
12 actually if that can be done.

13 MR. WHITE: Sure, we can absolutely put a
14 pointer into that.

15 CHAIR RYAN: All right.

16 MEMBER SKILLMAN: I'm fine.

17 CHAIR RYAN: Fair enough, but that does
18 get to the root of your question, correct?

19 MEMBER SKILLMAN: It points in the right
20 direction.

21 CHAIR RYAN: Okay.

22 MEMBER SKILLMAN: Thank you.

23 CHAIR RYAN: Thanks very much.

24 MR. WHITE: Back to Reg Guide 7.7, some of
25 these things we've talked about it before, you know,

1 radioactive material identification, package
2 selection. The third bullet, if you're going to ship
3 to somebody, to a licensee, you just can't call and
4 say are you a licensee, and they say yes. In this day
5 and age you have to verify that they actually have a
6 license for what you are going to ship to them and the
7 quantities, and the radioactive material and the
8 quantities you're going to ship to them.

9 There is a provision in Part 71 for
10 unknown materials or quantities particularly in the
11 contents. Some of the high integrity containers, the
12 resin beads, you don't know exactly what's in there.

13 You have a sense for how much based upon
14 maybe dose rates or based upon sampling or a number of
15 other ways.

16 We've kind of given a little bit to that
17 to give them a sense for that. Most of the reactors
18 and the ship people that do those shipments are well
19 versed in that, but we've seen more and more over the
20 last six months to a year where this has been a little
21 common than it had been in the past.

22 Preliminary determinations, if you
23 fabricate a package, you have to do what we call the
24 preliminary determinations or acceptance test to some
25 people. We also call them acceptance test to make

1 sure that the package has been constructed in
2 accordance with its design.

3 If it's got lead shielding, for example,
4 and you pull the lead shielding, you want to make sure
5 there's no air bubbles in there for radiation
6 streaming.

7 You want to look for package defects,
8 packaging defects. You want to make sure that the
9 package - everything was fabricated according to its
10 design.

11 Pressure tests, depending upon the
12 internal pressure, there's a pressure test that the
13 package has to be pressurized up to 50 percent greater
14 than its - that what it's - we call the maximum normal
15 operating pressure, MNOP, and held there for a length
16 of time.

17 The package has to be marked. You put a
18 label on it that says the model number, the gross
19 weight, and a number of other things like that.

20 Leakage tests, packages are designed to
21 have a leak rate, leak rates, depending upon what the
22 contents are and how it's evaluated.

23 There are fabrication leak rates, there
24 are leak rates that we do for periodic maintenance,
25 and then there are pre-shipment leak rates.

1 For preliminary determinations, the pre-
2 shipment leak rate, that it has to meet is depending
3 upon the design. For example, spent fuel packages may
4 be what we call leak tight, designed to be leak tight,
5 and that's a leak rate of ten minus 77 cc per second.

6 They may form a leak rate to that standard
7 for fabrication, and then if there are neutron
8 absorbers within the package, some of our fresh fuel
9 and spent fuel packages have neutron absorbers to make
10 sure that the amount of boron, the type and form of
11 the boron, the quantity of the B-10, whether it's
12 enriched or not, and that the material is consistent
13 throughout the neutron absorber.

14 Preparation for transport, there are
15 routine determinations. I talked a little bit about
16 some of these already. You look at the package and
17 make sure there's not - that there's no defects in the
18 package.

19 Sometimes they get hit by things, and
20 there's all sort of superficial scratches which may or
21 may not be okay depending upon where the scratch is.

22 You want to make sure that if there's any
23 gaskets for leak tightness that the gaskets are free
24 of defects and meet their standards.

25 You want to make sure that any part of the

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1 packaging that may need to be replaced routinely such
2 as a seal has been replaced upon whatever its
3 frequency is. They load according with procedures.

4 As I said, we get in what we call generic
5 procedures that kind of gives a sense for how the
6 package is loaded, how it's used, how it's operated.
7 We make sure that they are consistent with the
8 packaging design and how the package and contents and
9 how it was evaluated in a safety analysis report.

10 There are detailed operating procedures
11 that are based upon the ones that we see and approve
12 in Part 71.

13 CHAIR RYAN: How - just on the - I'm
14 thinking about pool loaded gas based on a couple of
15 your bullets up there. How often has the weeping of
16 say fuel pool loaded gas, you know, when they're
17 loaded in a cooler environment and they're shipped to
18 a hotter environment, sometimes they weep and they're
19 contaminated when they arrive as opposed to when they
20 left or that's been a problem in the past. Has that
21 been addressed?

22 MR. EASTON: Weeping?

23 CHAIR RYAN: Or is addressed?

24 MR. EASTON: Yes, in the case of weeping,
25 that's when you load like a spent fuel cask and made

1 a pool that has radionuclides in it and it gets into
2 the pores, and what you do you would clean it down to
3 the contamination limit and during transit, some of
4 that would work its way out of pores and result in
5 increased contamination levels, but DOT has addressed
6 that by allowing a weeping allowance so that once you
7 clean it to the regulatory limit it has to arrive at
8 its destination no more than ten times that limit.

9 CHAIR RYAN: So a weeping is actually
10 incorporated in the DOT regs.

11 MR. EASTON: These are DOT regulations and
12 not to alarm folks, these contamination levels are set
13 very, very low because they apply to all packages. If
14 I have a radioactive material package and I want to
15 ship it with food at FedEx, these have to be low
16 enough to accommodate those models, so when you're
17 doing it with large spent fuel packages, the risk is
18 probably not the same because you don't have the
19 access, but DOT does accommodate weeping.

20 CHAIR RYAN: Very good. Thanks, and
21 you've addressed that in the guidance?

22 MR. WHITE: Not in this guidance, no.

23 CHAIR RYAN: Okay.

24 MR. WHITE: Because that's in DOT
25 regulations, not ours.

1 CHAIR RYAN: Okay. It might be nice to
2 have an appendix to put all the things that are in DOT
3 that you guys don't touch on.

4 MR. EASTON: Can I just -

5 CHAIR RYAN: Sure.

6 MR. EASTON: I'll just add one other note.
7 From time to time there are other documents called
8 schedules, and we did one in the mid '90s. IAEA does
9 these type of documents that accompany the
10 regulations.

11 Basically it takes a type of packaging and
12 there are a lot of different types of packaging. It
13 lays out what can be in each type of package and walks
14 through all the packaging requirements and all the
15 DOT-type requirements so it's really like a guidebook
16 or if you're very new to it and you just have
17 something you want to ship. You figure out what it,
18 what's the quantity or concentration, line it up with
19 the package, and it will walk you through all the
20 regulations.

21 That's not really the intent exactly this,
22 but there those type of documents out there also.

23 CHAIR RYAN: Thank you.

24 MR. WHITE: It talks about the dose rate
25 and contamination measurements. Lifting and tie-

1 downs, there a number of - packages may have a number
2 of pieces or parts that could be used to lift or tie
3 down the package that was not designed to lift or tie
4 down the package.

5 In Part 71 if it was not designed or been
6 evaluated for that, it must be disabled so that you
7 cannot use it to tie the package down.

8 Sometimes, you know, like for example
9 maybe some of the impact limiters have brackets for
10 lifting just the impact limit to put it on. So, for
11 example, if it has not been evaluated, this tie-down
12 has to be disabled.

13 Number of leak tests, the pre-shipment
14 leak tests which must be done, and these - the leak
15 tests that I talk about here and the preliminary leak
16 test, this is where I have to pointer to Reg Guide 7.4
17 because Reg Guide 7.4 is the one that has - that
18 endorses the ANSI standard on leak tests, so instead
19 of elucidating it all in here, I just point to that
20 one particular reg guide.

21 Reports and records, there are shipment
22 and package records; package and shipment records on
23 what was shipped, when, from who to where, etcetera;
24 package records on fabrication, maintenance things.

25 Some are retained for the life of the

1 package. Some are retained for three years after -
2 for three years after the shipment was occurred. It
3 talks about some of those in Part 71, and then
4 deficiency reports.

5 We call these back in NMMS 7195 Reports
6 because that's the portion of the regulations that
7 talks about deficiencies. If there has been a
8 significant reduction in the effectiveness of a
9 package, conditions of approval or a certificate were
10 not observed, and this where I talked about we include
11 the drawings and the contents in the certificate.

12 If there's a part in the package that was
13 not included that should have been that's in the
14 drawings, they would have to submit a report to us
15 indicating why - what happened, why, and any
16 consequences and anything they're going to do to
17 alleviate that in the future, and then any package
18 with a - that has a defect with safety significance,
19 whatever that might be.

20 MEMBER BLEY: Can I ask you a quick
21 question about these before you -

22 MR. WHITE: Absolutely.

23 MEMBER BLEY: I mean your next slide. The
24 comments seem pretty benign to me. As I went through
25 them they seemed like either things - you said, oh,

1 yes, we should have thought of that or the places
2 where you disagreed, it didn't seem like there were
3 major disagreements. It was just you didn't think
4 there was enough need for it. Were there any areas
5 that you folks saw a significant disagreement with the
6 comments?

7 MR. WHITE: No, not at all. Most of the
8 comments that we got in that were the second kind you
9 talked about came from a group called -

10 MEMBER BLEY: They were talking about some
11 -

12 MR. WHITE: It's a group that does a lot
13 of Type A package ships, not Type A fissile but Type
14 A package, and there's a lot of things that area
15 absolutely appropriate if you're making a Type A
16 shipment, but that's not under NRC purview and that's
17 why some of those we decline to do.

18 MEMBER BLEY: I didn't want to take away.

19 MR. WHITE: You're absolutely right.

20 MEMBER BLEY: Any real disagreements here.

21 MR. WHITE: No, there wasn't. There was
22 not any real disagreement other than the fact that
23 while these apply to Type A packages - like there was
24 one comment about what if you had - what if the
25 package had dry ice. We don't have any packages for

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1 shipment of Type B quantities if you ever have dry ice
2 or you have Type A fissile, so those again are the
3 ones that are more towards the Type A package that
4 this reg guide does not apply to because it's not -
5 NRC does not review those -

6 Having said that, do you want me to go
7 through the comments? This is the part of which, I
8 will honest with you, wasn't sure what you wanted to
9 see here.

10 CHAIR RYAN: If you want to just point out
11 one or two of the ones you think are noteworthy.
12 There's no sense going through the list.

13 MEMBER SIEBER: A lot of them are
14 editorial.

15 MR. WHITE: Yes, and they are. A lot of
16 them were editorial, and that's why we accepted a lot
17 of them, and they were - and I thought they improved
18 the reg guide quite a lot.

19 CHAIR RYAN: When we have the final text,
20 so all those are incorporated, so we don't really need
21 to push through them all.

22 MR. WHITE: Like, for example, the grid
23 size. When you do the acceptance test for a package
24 for voids. One thing we accept is you made grids
25 around the surface of the package, you know, with

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1 maybe tape. You put a source inside and put a
2 detector to make sure that you know what you're
3 supposed to get. Now what you get on the detector
4 depends upon your source, the thickness, the
5 shielding, the whole nine yards, but you're looking to
6 see if there's any sharp spikes. Like there might be
7 an air bubble in the lead shielding.

8 For example, I asked what size detector
9 should be use. They said well it depends upon what
10 you're doing. We feel - we believe that if you're
11 shipping a Type B quantity of radioactive material you
12 should have and HP program that - you'll have an HP
13 program. Your HP program will be able to tell you
14 what to use.

15 Same thing for the comment about the
16 Geiger-Mueller detector and the different kind of
17 detector. We figure a good HP program should be able
18 to handle those sorts of comments.

19 Now one thing to note, and the comment was
20 made when I was sending the comments around within my
21 group, Public Comment 3 talks about radiolytic
22 decompositioning and generation of gas, and
23 essentially in Part 71 if you can generate gas, you
24 have to be able to make that there's voids to handle
25 that gas.

1 Now having said that, we also ensure that
2 if it's radiolytic decomposition that you get
3 something like hydrogen gas. You can't have a
4 hydrogen ignition when you're taking the package
5 apart.

6 Now I didn't feel that that's an
7 administrative portion. Making sure you have the void
8 is more administrative than making sure you don't get
9 hydrogen gas ignition. That's covered within our
10 Standard Review Plan and other guidance documents that
11 we have.

12 Again, Public Comment 5, the difference
13 between a damaged package and an intact package that
14 was contaminated by something else. If you have a
15 good HP - if you're receiving or shipping a Type B
16 quantity of receiving a Type B quantity of radioactive
17 material, you will have an HP program that will know
18 how to handle - if you get a package in that's wet,
19 you should know not to touch it. You want to measure
20 it, see what's there. Your HP program should be able
21 to handle that.

22 That's really the way I see the highlights
23 of the comments we got. Most of the comments were
24 editorial or didn't apply, and a lot of them we
25 accepted because they were very good editorial

1 comments, but there was nothing like we disagree with
2 the analysis you did here or there because there's no
3 analysis in this. It's very little as far as that
4 goes.

5 CHAIR RYAN: Okay.

6 MR. WHITE: Some of the future
7 interactions we may have with ACRS, another reg guide
8 I wrote, Reg Guide 3.50. It's a standard format and
9 content.

10 Let me back up a sec, we're here to talk
11 about Part 71. The group I'm in, we also do Part 72
12 which is storage of spent fuel at ISFSI, so that's why
13 you'll see some of that.

14 Reg Guide 3.50 is a standard format and
15 content guide for a licensed application for an ISFSI.
16 If you submit an application to us for a specific
17 license for an ISFSI, there are a number of pieces and
18 parts that have to be in that license.

19 A Safety Analysis Report showing that, you
20 know, for the facility, an environmental report,
21 physical security plan, finance report, etcetera,
22 etcetera, this lists some of those and how - and what
23 we expect in each of those reports.

24 As you probably remember, we revised our
25 standard review plan for dry storage casks during the

1 process of revising our Standard Review Plan for dry
2 storage facilities, so this is for - this is the
3 staff's guidance - guidance to the staff for reviewing
4 the Safety Analysis Report that comes with the license
5 application for an ISFSI.

6 Both of these documents still need to go
7 out for public comment. We're expecting ACRS
8 interaction later this year, probably early, mid,
9 fourth quarter of calendar year 2012, October/November
10 time range - time frame roughly, and again, as I said
11 earlier, it could be pushed back depending upon
12 whether or not we meet our internal goals for getting
13 it out to public comment, addressing, and what public
14 comments we get and how long it takes us to address
15 those.

16 We're working on a number of ISGs, three
17 of which may be - well one of which will be to the
18 ACRS this year, ISG 8 on burnup credit.

19 There's a tentative date, and my
20 understanding is an ASC meeting in June on that.
21 There's been some discussion as to whether the
22 committee may need more time to review it, but there's
23 a tentative date for June on that.

24 The other two, again like the other two
25 documents for - we talked about previously, still need

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1 to go out for public comment, address public comment,
2 but again, we're looking at late calendar year 2012
3 for these, probably the November time frame to meet
4 with the committee.

5 CHAIR RYAN: Sounds good.

6 MR. WHITE: Okay. Path forward on this.
7 We take any comments we get from you both informally
8 and formally and address them as we can, hopefully get
9 a recommendation from you that we can move forward and
10 then publish it in final.

11 MEMBER SIEBER: I still have a couple of
12 questions.

13 MR. WHITE: Absolutely.

14 MEMBER SIEBER: There's a NUREG written
15 in the late 1980s that talked about preparing
16 procedures for shipping packages, but that's not
17 referenced in this reg guide. Is there a reason why
18 you didn't reference it?

19 MR. WHITE: Actually I thought it was
20 referenced.

21 MEMBER SIEBER: I didn't find it. It's
22 CR-4775.

23 MR. WHITE: You're right, it's not.

24 MEMBER SIEBER: 1988.

25 MR. WHITE: No, it's not that we don't

1 think it's poor or anything. Maybe with the reg guide
2 - I'm familiar with that NUREG.

3 MEMBER SIEBER: Okay.

4 MR. WHITE: It might be a good thing to
5 do.

6 MEMBER SIEBER: You might want to look at
7 it.

8 MR. WHITE: Oh, I have. I have it on my
9 desk actually. I had assumed that it was written, so
10 -

11 MEMBER SIEBER: Okay.

12 CHAIR RYAN: I would suggest -

13 MR. WHITE: Yes, exactly, and I'm
14 following his comments.

15 CHAIR RYAN: So that's a second comment I
16 think we've offered to you, and the first is Dick
17 Skillman's comment on how do we know that the contents
18 of a package has survived in transport and the
19 accelerometer part of that and so forth.

20 MR. WHITE: And I've heard that from Den
21 as well.

22 MEMBER SIEBER: There is also a NUREG on
23 welding and how it's applied. I think it's 3019,
24 NUREG/CR-3019, and it's welding criteria.

25 MR. WHITE: I'm familiar with that as

1 well.

2 MEMBER SIEBER: That wasn't referenced
3 either.

4 MR. WHITE: Right, because I felt that
5 that was more of a technical nature versus an
6 administrative nature, and I realize that some of
7 these are -

8 MEMBER SIEBER: But this regulation sets
9 the boundaries on the package design also.

10 MR. WHITE: It does, right.

11 MEMBER SIEBER: And so maybe that should
12 be one of the boundaries and use that with welding
13 procedure.

14 CHAIR RYAN: That's an interesting point,
15 Bernie. I think there are others that are in that
16 category of fabricator-kind of guidance that probably
17 ought to be referenced as guidance to fabrication
18 issues and just list them in the back. That way it's
19 all in one place for the user and maybe some more in
20 there. That's not a bad idea.

21 MR. WATERS: Yes, I think that Bernie said
22 with the use of judgment here where we draw the line.
23 Again, the reg guide is focused on primarily the
24 administrative aspects for loading and preparing a
25 package, what does the package user do, not just the

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1 person who fabricates it. There is some kind of cross
2 over there.

3 Again, the design as specified in the
4 certificate user to verify the design that they have
5 to use a package and use certificates. It's up to
6 them to verify that their package meets the design
7 requirements which may specify weld mints and other
8 standards.

9 MEMBER SIEBER: Yes, that's more in the
10 actual certification.

11 MR. WHITE: Right, and Reg Guide 7.9, I
12 haven't read it recently to be honest with you. We
13 have Reg Guide 7.9 which is the standard format and
14 content for an application for package approval would
15 probably reference the operating procedures reg guide.

16 MEMBER SIEBER: You might want to check
17 that, and also in there should be included
18 restrictions on things like insolation or shock
19 absorbers.

20 MR. WHITE: Insolation.

21 MEMBER SIEBER: Insolation.

22 MR. WHITE: Like in sunlight, insolation.
23 That's what I'm asking to make sure I understand you,
24 and that would be -

25 MEMBER SIEBER: Not containing chlorides.

1 A lot of these packages are extinguished.

2 MR. WHITE: Right.

3 MEMBER SIEBER: But that's more -

4 MR. WHITE: That's more of a technical
5 nature would be in the actual -

6 MEMBER SIEBER: In the certification.

7 MR. WHITE: Right.

8 MEMBER SIEBER: But you may want to check
9 that it's some place.

10 MR. WHITE: And it should be, I agree. My
11 guess is - I know the reg guide is not - the standard
12 format and contact reg guide is not that detailed. If
13 it's in anything, it's probably in the Standard Review
14 Plans that we have for packages.

15 We have two standard review plans, one for
16 spent fuel and one for non-spent fuel packages, and I
17 know a couple of things - I know the welding reg - the
18 welding NUREG and the operating procedures reg guide
19 are in both of those.

20 MEMBER SIEBER: Well I defer to your
21 judgment.

22 MR. WHITE: I appreciate that. Thanks for
23 the comments.

24 MEMBER SCHULTZ: Bernie, with regard to
25 the NUREG referenced in the document, is the Standard

1 Review Plan document in NUREG 1609, is that referenced
2 in this document, the one that was produced in the
3 '90s? It seemed like a lot of the questions that were
4 coming -

5 MR. WHITE: I don't believe so.

6 MEMBER SCHULTZ: And comments that were
7 coming in were based upon information from that
8 document.

9 MR. WHITE: Yes, I don't believe so, and
10 part of the reason for that is it's a fine line. And
11 SRP is guidance to the staff. This is guidance to the
12 applicant - to the licensees or applicants, so we have
13 to be very careful what we put in and what we
14 reference to make sure that we're not saying that
15 something that is guidance to the staff is now
16 guidance to the applicant, but that's a point well
17 taken to look and see whether they should be.

18 MR. WATERS: Yes, I think - there's
19 interface again 1609 we're certified on the primary
20 package design, how we meet the packaging requirements
21 for certification. There's interface because part of
22 that application does include operating procedures
23 which is often a requirement to the certificate Bernie
24 mentioned, so there are these interfaces connections
25 based on the comments.

1 What we need to consider carefully is
2 given the - all the players here from the designer to
3 the fabricator to the user, general licensees, and DOT
4 and NRC and make sure there's at least coverage and
5 continuity to the extent practical but I think we'll
6 have to use our judgment because there's several dozen
7 NUREGs and several dozen standards that we could all
8 reference in this one guide.

9 We have to kind of use our judgment where
10 is the best fit here and recognize and it may apply to
11 more than one reg and maybe in that case we do do that
12 as well, so I think it's a good thing to consider from
13 our standpoint.

14 MR. WHITE: And, as I said earlier, this
15 reg guide can be used - should be used along with the
16 NUREG for operating procedures to develop the
17 operating procedures that go into the application that
18 we get for package approval.

19 MEMBER SCHULTZ: Because of all the
20 players here, it might be useful to have an appendix
21 that lays out a number of these resources that are
22 really available from the NRC to be utilized by all of
23 the different players.

24 CHAIR RYAN: Any other questions? Dennis.

25 MEMBER BLEY: No, sir. No more.

1 CHAIR RYAN: Harold.

2 MEMBER RAY: I've been pondering this
3 thing about the contents of - the integrity of the
4 contents. I guess I'm wondering if this were not a
5 radiological shipment, it was something else, would we
6 say the same thing? In other words would we have the
7 same concern about - I'm trying to figure out what
8 makes it particularly appropriate here as
9 distinguished from anything else that is vulnerable to
10 damage during shipment, and I guess I haven't come up
11 with an answer to that myself, so I just offer that as
12 a thought.

13 CHAIR RYAN: I would defer to our -

14 MEMBER RAY: Maybe it is -

15 CHAIR RYAN: A little different question.
16 That's not radiological. It was a critical component.

17 MEMBER ARMIJO: It could be a control
18 blade that gets damaged in shipment. It's the same
19 sort of thing. It's an important component. You've
20 got to do a good job of inspecting it and that's
21 covered by Part 50.

22 MEMBER RAY: Yes, I mean I think it's just
23 not clear to me why if there was something different
24 that would cause us to think it's necessary to address
25 this here.

1 CHAIR RYAN: Well, I guess I don't think
2 it needs to be included necessarily in this reg guide.
3 I think the only point is if there's a pointer to some
4 other place where that issue is covered.

5 MEMBER RAY: I don't know that it is. I'm
6 not suggesting that. I'm just saying that -

7 CHAIR RYAN: Yes, but all I'm saying is I
8 think if there needs to be a pointer in this guidance
9 to point to these other - to the issue of integrity in
10 shipment in other guidance, then so be it. Let there
11 be a pointer to say -

12 MEMBER RAY: I don't object to that. I'm
13 more thinking is there some reason for us to feel like
14 it's needed in this case that doesn't apply -

15 CHAIR RYAN: I guess my own view is I
16 think it carries its own value of making sure
17 something has integrity in shipping, whether it's a
18 control rod blade, a fuel element, or anything else,
19 and if there is guidance that gives you some help in
20 thinking that through on how to do that, fine.
21 Reference it.

22 MEMBER RAY: I don't have anything else.

23 MEMBER SCHULTZ: All set.

24 CHAIR RYAN: All set? Any other comments?
25 Chris, anything?

1 MR. BROWN: No.

2 CHAIR RYAN: So, Dick, anything - do want
3 to add anything?

4 MEMBER SKILLMAN: No, thank you.

5 CHAIR RYAN: Okay. I guess.

6 MR. BROWN: Mike, do you want to see this
7 before it's issued, before it goes out final or no
8 full committee on this?

9 CHAIR RYAN: I defer to the Committee
10 members. Do you think we're done with this and we can
11 go forward with it as is?

12 MEMBER RAY: I do.

13 CHAIR RYAN: I assume that you'll think
14 about it and address the comments we've raised during
15 this meeting.

16 MR. WHITE: Absolutely, yes.

17 MR. WATERS: We'll get back to Chris on
18 the three comments we heard, just let Chris at least
19 informally know how we're going to address -

20 CHAIR RYAN: Okay, great, and then the
21 next step will be then if we're - the Subcommittee is
22 satisfied with those - that feedback then we'll have
23 a briefing just to inform the full Committee of where
24 you are and where this is and we'll go from there, and
25 I guess all that we've heard today -

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1 MEMBER SIEBER: Do you want to go around
2 the table?

3 CHAIR RYAN: Sure. Jack. I thought we did
4 already, but we'll go around again.

5 MEMBER SIEBER: I think it's very good.

6 CHAIR RYAN: Okay. It's good. Dennis is
7 good. Harold is already good. I'm good.

8 MEMBER ARMIJO: It's really good. I agree
9 with Jack.

10 CHAIR RYAN: So then the path will take us
11 and tell the full Committee and give them a short
12 briefing on it, and on we go. Nice job. Thank you
13 very much for the thorough briefing and lots of
14 detail. It helped the discussion. Thanks very much.

15 MR. WHITE: Thanks for your comments. I
16 appreciate them.

17 CHAIR RYAN: With that, we will - are you
18 prepared to adjourn, Chris?

19 MR. BROWN: Yes, we are.

20 CHAIR RYAN: Any motion? We're adjourned.
21 Thank you all very much.

22 (Whereupon, the above-entitled matter was
23 concluded at 3:04 p.m.)

24

25

Briefing on Draft Regulatory Guide 7.7

Administrative Guide for Verifying Compliance
with Packaging Requirements for Shipping and
Receiving of Radioactive Material

January 18, 2012

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Abbreviations and Acronyms

- Admin. – Administrative
- ANSI – American National Standards Institute
- Ci – Curies
- CFR – Code of Federal Regulations
- Co-60 – Cobalt 60
- Cs-137 – Cesium 137
- DOE – Department of Energy
- DOT – Department of Transportation
- GM – Geiger Mueller
- NRC – Nuclear Regulatory Commission
- QA – Quality Assurance
- RG or Reg. Guide – Regulatory Guide
- Sr- 90 – Strontium 90
- TBq – TeraBecquerel
- U – Uranium

Presentation Outline

- Background
 - Part 71
 - Reg. Guide 7.7
- Reg. Guide 7.7 Update
- Relationship to other documents
- Reg. Guide 7.7 Discussion
- Public comments
- Future Interactions

Part 71 Background

- DOT regulates
 - carriers (road, rail, air, etc)
 - Import and export of radioactive material
 - packages for small quantities of radioactive material – Type A Packages
- NRC
 - Regulates Domestic Type B and Type A Fissile Packages
 - Technical Review & Recommendation to DOT on Revalidation of Foreign Packages
 - Lead agency for inspection of NRC holders of Certificates of Compliance, fabricators, licensee shippers and carriers

Part 71 Background (2)

Part 71 Table A-1— A_1 and A_2 Values for Radionuclides

Symbol of Radionuclides	A_1 (TBq)	A_1 (Ci)	A_2 (TBq)	A_2 (Ci)
Co-60	4.0×10^{-1}	1.1×10^1	4.0×10^{-1}	1.1×10^1
Cs-137 (a)	2.0	5.4×10^1	6.0×10^{-1}	1.6×10^1
Sr-90 (a)	3.0×10^{-1}	8.1	3.0×10^{-1}	8.1
U (enriched to 20% or less) (g)	Unlimited	Unlimited	Unlimited	Unlimited

^a A_1 and/or A_2 values include contributions from daughter nuclides with half-lives less than 10 days.

^g These values apply to unirradiated uranium only.

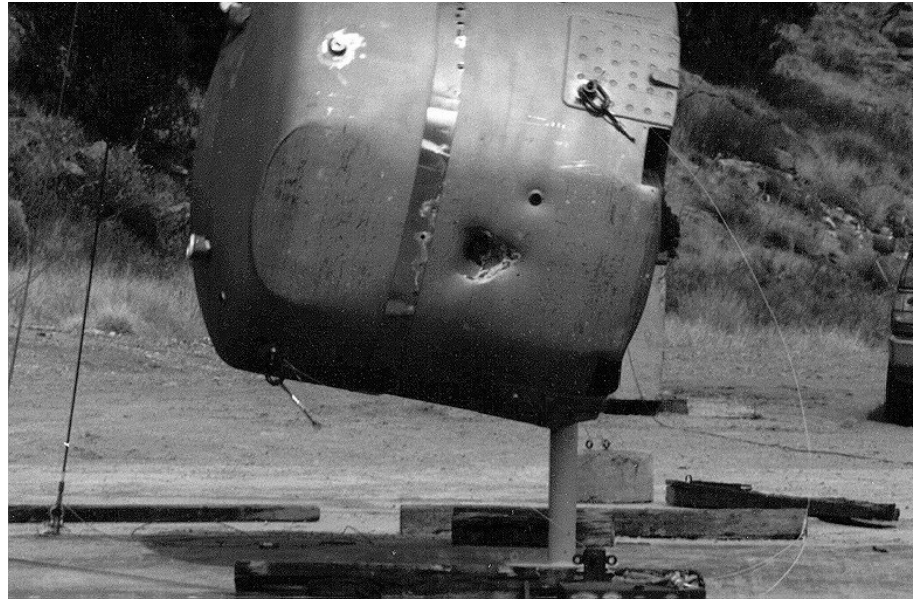
Part 71 Background (3)

- NRC Approves Package Designs - **Primary safety is in package**
- Part 71 contains package approval standards (performance-based regulation)
 - Any licensee can use NRC-approved package
 - Agreement state licensee, DOE, and international shippers also use NRC-approved packages
- Approve packages via certificate of compliance for use with General License provisions
- General licensees must use the package in the manner in which it was approved

Part 71 Background (4)

- Three safety functions
 - Shielding
 - Containment
 - Subcriticality
- Margins for safety functions after tests for
 - Normal conditions of transport and
 - Hypothetical accident conditions
- NRC approves the package design that was evaluated
- QA Inspection for package fabrication

Part 71 Background (5)



Reg. Guide 7.7 Background

- DOT regulations for radioactive material shipment do not apply to all NRC licensees
 - Mainly some federal agencies
- 10 CFR 71.5(b)
 - imposes the actions in DOT regulations on NRC licensees not subject to DOT regulations
 - applied to a larger number of licensees prior to DOT regulating intrastate commerce
- Draft Reg. Guide 7.7

Reg. Guide Background 7.7 (2)

- Draft Reg. Guide 7.7 was issued August 1977
 - Never issued in final
- Reg. Guide 7.7 endorsed ANSI N14.10.3-1975
- ANSI standard contained method for compliance with 10 CFR 71.5
 - appropriate packaging selection,
 - preparing the package for shipment,
 - completing shipping papers and
 - Actions if incident occurs during shipment.
- ANSI N14.10.3-1975 withdrawn September 1984

Reg. Guide 7.7 Update

- Guidance useful for new or infrequent shippers
- Provide information on administrative requirements for transporting radioactive material in Type B or Type AF packages
- Incorporated two Reg. Guides and added new information
- Revised Reg. Guide Contents
 - Shipment planning
 - Packaging and preliminary determinations
 - Loading package
 - Preparation for transport
 - Reports and records

Relationship to other Documents

RG 7.1 – Administrative Guide for
Packaging and Transporting
Radioactive Material

RG 7.4 – Leakage Tests on
Packages for Shipment of
Radioactive Material

Acceptance Tests and
Package Operating
Procedures

RG 7.7 – Admin. Guide for Verifying
Compliance with Packaging Requirements
for Shipments of Radioactive Material

RG 7.3 – Procedures for Picking up
and Receiving Packages

Incorporated

Referenced

Incorporated

Reg. Guide 7.1

Administrative Guide for Packaging and Transporting Radioactive Material

- Published in June 1974
- Endorsed ANSI N14.10.1-1973
- Procedure for package selection and labeling
- ANSI N14.10-1973 withdrawn

Reg. Guide 7.3

Procedures for Picking Up and Receiving Packages of Radioactive Material

- Published in May 1975
- Designed to minimize exposure and contamination
- Procedures for receipt of packages for
 - Notification and receipt of packages
 - Expeditious pickup of packages
 - Monitoring of packages, and
 - Immediate notification of problems

Reg. Guide 7.7

Administrative Guide for Verifying Compliance with Packaging Requirements for Shipping and Receiving of Radioactive Material

- Shipment planning
- Packaging
- Preliminary determinations
- Loading package
- Preparation for transport
- Reports and records

Shipment Planning

- Radioactive material identification
- Package selection
- Verification that recipient's license authorizes possession of material
- Assessing unknown materials or quantities

Preliminary Determinations

- Elimination of voids
- Package defects
- Pressure tests
- Package marking
- Leakage tests
- Neutron absorber tests (if needed)

Preparation for Transport

- Routine Determinations
- Loaded in according with procedures
- Dose rate and contamination measurements
- Lifting and tie downs
- Leak tests

Reports and Records

- Records
 - Shipment
 - Package
- Deficiency Reports
 - significant reduction in package effectiveness
 - conditions of approval or certificate not observed
 - Package defect with safety significance

Public Comment Resolution

- Received 25 comments from 2 organizations and 1 certificate holder
- Mostly clarifications and improved wording
- 65% of comments were accepted in part or in full

Public Comments (1)

Comment:

- Guidance is given for portioning the surface into a grid pattern. Further guidance on establishing the size of the grid should be given.

NRC resolution:

- Agree, the document has been revised to state “The size of the grid pattern should be such that the detector being used can easily measure essentially the entire area of an individual block of grid at one time.”

Public Comments (2)

Comment:

- Suggested that the scope of licensees' responsibility, unless the licensee is the certificate holder, should be limited to the information provided in the certificate, and for registrants to meet the conditions of the package and package SARP.

NRC resolution:

- Agree. The wording was changed to match that in §71.107 to state that the licensee, certificate holder or applicant for a certificate must establish measures to assure the package is fabricated in accordance with the packaging drawings.

Public Comments (3)

Comment:

- Licensees should also be advised that radionuclides in liquids, such as organic solvents, undergo radiolytic decomposition generating gases. There needs to be sufficient headspace to ensure the gas pressure is minimized and contained.

NRC resolution:

- Agree, the regulatory guide has been revised to read “Ensure that any system for containing liquid is adequately sealed and has adequate space or other specified provisions for expansion of the liquid, **and, if appropriate, any gas that may be generated due to radiolytic decomposition.**”

Public Comments (4)

Comment:

- Consider adding the recommendation that licensees should be aware of the package configuration prior to ordering radioactive material to ensure they have the safe means for opening the package and accessing the contents.

NRC resolution:

- Agree, the guide has been revised to add “Additionally, for first-time receipt of a package, licensees should have discussions with the certificate holder to be aware of the package configuration prior to ordering/receiving radioactive materials to ensure they have the safe means for opening the package and accessing the contents.”

Public Comments (5)

Comment:

- It would be useful for receivers if they were provided guidance on how to differentiate between a damaged package leaking its radioactive contents and an intact package that has been contaminated by liquid from another non-radioactive package that was damaged in the transport system or that is wetted by rain or condensation (common for packages that contain dry ice or water ice coolants).

NRC resolution:

- No change needed. Care should always be taken when handling any package prior completing both the radiation measurements and contamination surveys. When properly performed, contamination and radiation surveys will detect whether material on the package is contaminated or not.

Public Comments (6)

Comment:

- Consignees also need guidance on the detectors that are suitable for measuring surface radiation. Shippers commonly recommend using a side-window, energy compensated GM detector to measure radiation fields from gamma and beta emitting radionuclides because this has a suitably flat energy response for commonly shipped radionuclides and the detectors are small enough to not seriously underestimate the surface dose rate.

NRC resolution:

- The guidance was not changed. Since the regulatory guide only applies to Type B shipments and fissile radioactive material packages, (Type AF packages) the receivers should have sufficient knowledge of measuring radiation levels to distinguish between suitable measuring equipment.

Public Comments (7)

Comment:

- Consignees and carriers should be advised to take precautions to maintain exposure to ALARA when finding high radiation levels that may indicate a failure of the shielding. They may need to isolate the package, warn others in the vicinity and minimize their time and proximity to the package.

NRC resolution:

- Agree, the guide has been revised to state that “Note that radiation levels higher than expected may indicate damage to the package or contents have shifted and ALARA and good radiation safety practices should be used at all times.”

Future Interactions

- Regulatory Guide 3.50 “Standard Format and Content for a License Application for an Independent Spent Fuel Storage Installation or a Monitored Retrievable Storage Facility”
- NUREG-1567, “Standard Review Plan for Spent Fuel Dry Storage Facilities

Future Interactions (2)

- Interim Staff Guidance Documents
 - ISG-8 – Burnup Credit
 - ISG-19 – Moderator Exclusion Under Hypothetical Accident Conditions and Demonstrating Subcriticality of Spent Fuel Under the Requirements of 10 CFR 71.55(e)
 - ISG-26A – Risk Informed Shielding & Radiation Protection Review

Path Forward

- Finalize comments to ACRS Feedback
- ACRS recommendation for publishing
- NRC issue final RG 7.7

Questions/Comments

Backup slides

Series 7 – Transport Reg Guides

Guide Number	Title	Rev.	Date
7.1	Administrative Guide for Packaging and Transporting Radioactive Material	W	2009
7.2	Packaging and Transportation of Radioactively Contaminated Biological Materials	W	2009
7.3	Procedures for Picking Up and Receiving Packages of Radioactive Material	--	1975
7.4	Leakage Tests on Packages for Shipment of Radioactive Materials	--	1975
7.5	Administrative Guide for Obtaining Exemptions from Certain NRC Requirements over Radioactive Material Shipments	W	2010
7.6	Design Criteria for the Structural Analysis of Shipping Cask Containment Vessels	1	1978

Series 7 – Transport Reg Guides

Guide Number	Title	Rev.	Date
7.7	Administrative Guide for Verifying Compliance with Packaging Requirements for Shipments of Radioactive Materials (for Comment)	--	1977
7.8	Load Combinations for the Structural Analysis of Shipping Casks for Radioactive Material	1	1989
7.9	Standard Format and Content of Part 71 Applications for Approval of Packages for Radioactive Material	2	2005
7.10	Establishing Quality Assurance Programs for Packaging Used in Transport of Radioactive Material	2	2005
7.11	Fracture Toughness Criteria of Base Material for Ferritic Steel Shipping Cask Containment Vessels with a Maximum Wall Thickness of 4 Inches (0.1 m)	--	1991
7.12	Fracture Toughness Criteria of Base Material for Ferritic Steel Shipping Cask Containment Vessels with a Wall Thickness Greater than 4 Inches (0.1 m) But Not Exceeding 12 Inches (0.3 m)	--	1991

Package Tests

- Normal conditions of transport
 - Heat
 - Cold
 - Reduced external pressure
 - Increased external pressure
 - Vibration
 - Water spray
 - Free drop (0.3 t 1.2 meters depending on weight)
 - Corner drop
 - Compression test

Package Tests (2)

- Hypothetical accident conditions
 - Free drop
 - Crush test
 - Puncture test
 - Thermal test
 - Immersion – fissile
 - Immersion – all packages