UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

SUBCOMMITTEE ON TRANSPORTATION OF RADIOACTIVE MATERIALS

Room 1046
1717 H Street, N. W.
Washington, D. C.

Wednesday, October 29, 1980

The meeting convened, pursuant to notice, at 8:35 a.m.

PRESENT:

CHET SIESS, Chairman
STEVE LAWROSKI
DADE MOELLER

CONSULTANTS:

L. SHAPPERT
Z. ZUDANS

GOVERNMENT REPRESENTATIVE:

P. BOEHNERT

* * *

C O N T E N T S

P R O C E E D I N G S

MR. SIESS: The meeting will come to order.

The is a meeting of the Advisory Committee on Reactor Safeguards Subcommittee on Transportation of Radioactive Materials.

My name is Chester Siess. I am Chairman of the Subcommittee. The other ACRS members present today are on my left is Steve Lawroski and then Dade Moeller. Then we have two consultants to the ACRS present, Larry Shappert and Zenons Zudans.

The purpose of the meeting is to discuss with the NRC staff possible activity by the subcommittee or by the ACRS to review the transportation certification process for package design. We will be dealing with people from the Transportation Certification Branch.

The meeting is being conducted in accordance with the requirements of the Federal Advisory Committee Act and the Government in the Sunshine Act. There will be a transcript kept and it will be made available in the usual manner. I will ask everybody that speaks to please use the microphone so that the reporter can hear you and also please identify yourself so that the record will show who spoke.

The designated federal employee for the meeting is Mr. Paul Boehnert on my right.

The rules for participation in the meeting have

been announced in the Federal Register notice. If there are any questions I will try to answer them.

I guess I should ask the subcommittee members if they have any questions, but I suspect they have got the same questions I have. They don't know exactly what the question is and we won't know it I think until we hear from the staff. So if you have no objection, I will call on Richard Cunningham, Director of the Division of Fuel Cycle and Material Safety the open the meeting and tell us what we are going to be talking about.

OPENING REMARKS OF

RICHARD CUNNINGHAN, DIRECTOR

DIVISION OF FUEL CYCLE AND MATERIAL SAFETY

MR. CUNNINGHAM: Thank you very much, Dr. Siess.

I am Richard Cunningham, Director of the Division of Fuel Cycle and Material Safety. I have with me at the table here Mr. Donald Nussbaumer, who is Assistant Director for Material Safety, and Mr. Charles McDonald, who is Director of the Transportation Certification Branch.

We want to thank you, Mr. Chairman, and members of the subcommittee for entertaining our proposal to do an independent review of our transportation package certification process. We have a briefing prepared which will give background information on the total transportation program we have had with NRC and from that focusing down

upon those activities in which we would like you and your subcommittee to do an independent review.

As you will see, there are many things going on in the transportation area in NRC. As you are well aware, we have environmental reviews in process. We have completed some. We have research ongoing on the basic criteria for package safety. There are efforts going on with the control of both NRC and DOT. There are reporting requirements and there is a full list of other things.

Transportation safety, of course, is, as you well recognize, is extremely important. There are hundreds of thousands of packages shipped every year not all of which are subject to NRC review but a significant portion of the more hazardous packages are.

Since many of these packages are in the commercial transport system, the transportation of nuclear materials represents of course an area where the public comes very close to the nuclear industry itself. For some people it is the closest they come in many respects.

We must assure safety in transportation and package certification is an extremely important part of that. It not only affects of our ability to maintain a viable nuclear power industry but also our nuclear medicine program in this country which every hospital has depends on an adequate transportation system.

If something happens that disrupts this transportation system it could have serious effects on many nuclear programs.

Therefore, Mr. Chairman, we were very interested in having an independent review of how we certify packages to ensure that they meet the requirements of our existing regulations.

As I said at the outset, we have a briefing package prepared and this will give you background and will focus in on what it is we would like the committee to do.

For that briefing I will turn it over to Mr. Nussbaumer to start the briefing. I think he will call on Chuck McDonald as time goes on.

We also, Mr. Chairman, have members of our staff behind you. We have staff whose specialities are things like heat transfer, criticality and structural engineering and we may call on them from time to time to say something.

Thank you, Mr. Chairman.

MR. SIESS: Mr. Nussbaumer.

PRESENTATION OF DONALD NUSSBAUMER,
ASSISTANT DIRECTOR FOR MATERIAL SAFETY,
AD-MATERIALS SAFETY AND LICENSING BRANCH

(First slide)

MR. NUSSBAUMER: Dick Cunningham has already covered the purpose of the review which is the first

viewgraph in your package.

(Slide)

The second viewgraph describes the activities of the Transportation Certification Branch. The principal activity, of course, is to review package designs for type B and fissile type A packages in terms of the requirements of Part 71 and, if they are found acceptable, to issue a certification that the design in fact meets all of the regulatory requirements.

As Dick Cunningham indicated, we do not have review responsibility at the present time for all packages. We have an overlap of responsibility with DOT and partition this through a memorandum of understanding whereby the DOT regulates the type A and LSA packages which are those that handle the materials of lower potential hazard and the NRC regulates the type B packages.

As you know, the type B packages are those which must be designed to withstand not only normal conditions of transport but also the hypothetical accident conditions set out in Part 71.

The second activity that we are involved in is one of improving and maintaining a review base. What we mean by that is maintaining state-of-the-art calculational methods and computer programs to verify the applicant's analyses in the areas of structural, criticality, shielding and heat

transfer.

Also part of maintaining the review base is to conduct studies to resolve specific and generic problems. Specific problems often come up on individual reviews of container designs where we need either testing capabilities or special expertise that is not available on the staff. We have a technical assistance contract with Lawrence Livermore to provide that service to us.

The next item is the Modal Study which I will get into in a little bit more detail later since the subcommittee asked for us to address this.

Then finally to give you some idea of our resources, for FY 81 the Commission has devoted 17 staff years to transportation certification. Of that approximately seven man-years will be devoted to actual review of package designs, about one and a half man-years to maintaining the technical base and the remaining staff is supervision and management overhead.

Our contractual support dollars, principally used for maintaining our calculational methods, is budgeted at $305,000.

(Slide)

We have presently certified about 275 package designs as meeting the requirements of Part 71. Our workload runs about 190 package certification actions each

year. This includes new package design amendments and renewals as well as what we call the user registry which is a computerized listing of persons who are registered to use the various package designs.

As I am sure you know, the package designs vary all over the lot from those used to ship bulk radio pharmaceutical materials up to the spent fuel casks. They range from weights of 50 pounds to over 85 tons. So we are dealing with a wide variety of designs, some of which are demonstrated by testing and others which are demonstrated by analytical analysis because of the impracticality of testing.

MR. MOELLER: Excuse me. Could you define for us what a design is? I find it difficult to think immediately in terms of 275 different designs.

MR. NUSSBAUMER: Yes, a design is a particular package configuration along with the associated contents. In a given category, for example, in radiography you might have a dozen different designs of radiography cameras. In the spent fuel shipping area, for example, I think we probably have maybe six or seven different designs of spent fuel casks. Some are for truck shipments and some are for rail. Some have a water medium as a coolant and others have air. So each one of those is a design. Each one of those has a separate certification which references drawings, you know, by which it is constructed and authorized contents.

MR. LAWROSKI: They are basically different for PWRs and BWRs?

MR. NUSSBAUMER: The cask is the same but the contents would vary, yes.

MR. MOELLER: That helps. I guess I was just wondering if there was some generic approach to that where you would approve generically a range of designs and then if they fit within any of them they would be certified.

MR. SIESS: Your criteria are generic but if a package differs in any visible feature from another one it is a different design; is that right?

MR. NUSSBAUMER: That is correct.

MR. MOELLER: That is helpful.

MR. NUSSBAUMER: The industry really hasn't gotten the standardization yet if that is what you are looking at.

MR. SIESS: How many different manufacturers are there for those 275 different designs that went through?

MR. NUSSBAUMER: Oh, I really don't know. I would guess probably maybe 50 to 75 manufacturers. The number of manufacturers increases as you move into the smaller packages. As you might guess, the number of manufacturers for spent fuel casks is quite limited. I think there we have maybe two or three.

MR. LAWROSKI: Does that include shipment of waste material as well or is it just type fissile materials?

MR. NUSSBAUMER: Waste material that constitutes a type B quantity in curies would be covered by these certifications, yes. The waste material of course, most of the waste material presently falls into the lowest speicific activity category and those packages do not require prior review and they are not covered by our regulations, as I mentioned earlier.

MR. SIESS: Now, does your package certification cover procedures as well as the physical characteristics of cask and contents? I mean procedures now for sealing, inspecting, QA procedures and so forth?

MR. NUSSBAUMER: It has to be an approved QA program in order to ship the package. It is associated with the package. Then in addition the Part 71 regulations have a series of operational checks that have to be made on each package before shipment. That is a requirement.

MR. SIESS: Such things as to what torque a bolt is tightened to as a part of the certification?

MR. NUSSBAUMER: Not in all cases. No. that is part of the QA program normally. The QA program runs separate from the certification.

MR. LAWROSKI: I would like to follow up a little bit more what constitutes what may be shipped in these things. There is fissile material, that is clear. Does this include radiographic devices? What is the criteria for

having to have a certified package?

MR. NUSSBAUMER: The amount of radioactive material to be shipped. In other words, there are certain quantities which are called type A quantities. Anything above those quantities if you want to ship requires a type B package. Anything less than the type A quantity you may ship in a so-called type A package.

MR. ZUDANS: It is measured in curies, isn't it?

MR. NUSSBAUMER: In curies, yes. So that if you have a so-called type B quantity of radioactive material then you have to have a type B package that is authorized for that type form and quantity of material.

MR. SIESS: Now, did I hear you say that all of the packages that you are talking about now have to be certified for accident conditions as well as normal transport?

MR. NUSSBAUMER: Yes.

MR. SIESS: Now, another question. The radiographic device in which the source is shipped with it, each of those devices is considered then a package?

MR. NUSSBAUMER: Each device where the design is different, yes.

MR. SIESS: But I mean the whole radiographic device because the source is a part of it that is shipped with it?

MR. NUSSBAUMER: Yes, that is the way they ship it. Sometimes they put these devices in an overpack, you know, in order to meet the standards, but basically the device and the source are shipped together.

MR. SIESS: How many different models of those are there?

MR. NUSSBAUMER: Oh, there are probably I would say maybe a dozen, about 12 to 15, something like that.

MR. LAWROSKI: Would normally the resin that are used at the power plants, the spent resin, would it require the certified package?

MR. NUSSBAUMER: Normally I think that is the case because they are tying up an activity that they don't qualify for the lowest specific activity category.

MR. SHAPPERT: How frequently are the packages recertified?

MR. NUSSBAUMER: Every five years. Certification is good for five years and then at the end of that period they have to come in and get it renewed.

MR. LAWROSKI: What responsibility do you have with respect to the form, the physical form of the radioactive material being shipped? Are you responsible, for example, of seeing to it that it has no free liquid as a part of the certified package?

MR. NUSSBAUMER: The applicant has the flexibility

of designing his package to meet whatever form he wants to ship. This is from a transportation standpoint now. There may be requirements at the receiving end as to form and he has to meet those also. The only restriction we have on form in the regulations at the present time is on plutonium which we say has to be shipped as a solid and on high level waste which the regulations say have to be shipped as a solid.

MR. SIESS: Well, we have been reading about solid waste packages reaching disposal areas with free liquid in excess of what it should have and that has always been presented in the context of the receiving station and presumably their storage in long-term isolation. Isn't that also a transportation problem if there is liquid leaking out of these things along the way?

MR. NUSSBAUMER: If it is leaking out of the package, yes, it is a problem. What I am saying is that if the package is not designed and authorized for liquids and then free liquids are shipped, then it is a violation of the package certification. The waste burial grounds where these low-level materials are shipped have requirements in their license if they are not to receive an bury any liquid radioactive material.

MR. SIESS: Even if it is contained within the package?

MR. NUSSBAUMER: Right. So you could have a situation where the package authorized the liquid but it wasn't authorized for receipt at the burial ground.

MR. SIESS: They have rejected packages not necessarily because there was liquid on the outside but because there was liquid on the inside?

MR. NUSSBAUMER: That is true, and they have also rejected them because the packaging was not put together properly and was leaking in transit.

MR. SIESS: I understand there are a couple of shipments standing sitting around that nobody will let them cross their state and they are sort of a man without a country.

MR. NUSSBAUMER: The lower level waste problem with packaging is one that we have under study. I should point out that these are not type B packages we have certified. These are the so-called LSA packages for which the requirements are not too detailed.

MR. SIESS: Are those DOT certified packages?

MR. NUSSBAUMER: Well, they are packages that are covered by the DOT regulations but there is no prior review of the design of those kind of packages. It is up to the shipper to design and meet the requirements. Once he thinks he has done that, then he is free to go ahead and ship. There is no government review of the design before he can

use it like there is for a type B package.

MR. LAWROSKI: Well, some of those about which we have been reading, as Dr. Siess points out are in no-man's land right now, are they not a part of this problem of your package.

MR. CUNNINGHAM: There are two parts to the problem. One is the dewatering of the resins where it isn't necessarily leaking out of the package. That is strictly, as I understand it, a requirement of the state laid on the waste disposal operation. They don't want water in the packages.

MR. LAWROSKI: I thought that was one of your criteria, too, that it was not to have free-standing liquid.

MR. CUNNINGHAM: Not from the transportation standpoint. Now, the bulk of the problems with packages where there have been leaks have been associated with the type A packages and a good portion of those have been associated with waste originating in medical or biomedical research. Animals, the simulation of fluids and things of that sort. There is a problem with the dewatering of reactor resins. They may seem dry but when they start shipment and with vibrations and so forth water and so forth may leak.

For the type B package of course from the transportation standpoint, if a person requesting package

certification indicates that there is going to be water in it and designs to contain that insofar as the package goes during the transportation process we would have a basis for improving that. That doesn't necessarily mean that that would be acceptable to the waste burial ground.

MR. SIESS: You mentioned that there were certain packages for which there were criteria but which meeting the criteria was simply left up to the shipper. I assume that distinction is made at least in part on the curie content of the package.

MR. NUSSBAUMER: That is correct.

MR. SIESS: Has it been based to any extent to a risk assessment, even though the curie content is low the number of shipments is extremely large? Has anybody made a probablistic type risk assessment, the probability consequences type thing to indicate that those are less of a hazard to the public than the small numer of larger curie shipments?

MR. NUSSBAUMER: I think that has been done in a number of areas. You see, our regulations are patterned after those of the International Atomic Energy Agency. These concepts, you know, about what kind of packages require prior review, what kind don't and what kind have to meet accident conditions were the subject of panels that were convened by the IAEA quite a few years ago, 15 or 20

years ago, and they came up with these concepts which the United States adopted and a number of other countries have adopted.

In addition, we recently, as you know, looked at this whole area in our environmental impact statement on transportation of radioactive materials by air and other modes. The general rationale is that for type A packages where the quantity of material is limited so that even if released in an accident the resulting hazard potential is low, that the design of those packages should not have to have any prior review.

MR. SIESS: As I recall, that study said that barring accidents the greatest contribution to dose to the public was the class A package, radio pharmaceuticals, for example.

MR. NUSSBAUMER: Right. The greatest contribution was the normal transport of the type A packages because they are so numerous.

MR. SIESS: Now, if you include accidents, especially if you include sabotage, and I am thinking of the urban transportation study, you can get accidents with extremely great consequences.

MR. NUSSBAUMER: True.

MR. SIESS: Exluding sabotage the probability is exceedingly low. So that that contribution to risk I am not

quite sure how it came out. Of course, the problem with sabotage is that nobody is able to put a probability on it because it doens't fall within that range. But I would suspect by leaving out sabotage in terms of total risk the accidents don't add that much to it. There are thousands of type A packages being shipped and occasional accident because of the low probability.

MR. NUSSBAUMER: That is correct.

MR. SIESS: See, what I am getting at is I am sure that anything that was done 15 or 20 years ago by a committee did not involve any kind of probabilistic risk assessment because in those days we didn't have it or we didn't do it. One thing that you can get out of that risk assessment is deciding where you can do the most good in your effort.

MR. CUNNINGHAM: I think, Dr. Siess, there have been a number of studies done on type A packages which comes under DOT jurisdiction. We are not entirely satisfied that we are aware but should be on the degree of containment for these type A packages and the question of whether or not they should survive some types of accidents or some malicious tinkering with those packages.

We are beginning discussions with DOT to determine where we should be going with the type A packages. This will go on over the next few months. We already have a

meeting arranged with DOT. I think that is something that is coming in the future and is a little bit different from the immediate questions we have before this subcommittee on the type B packages.

MR. SIESS: Well, your immediate question is certifying packages for accidents. It will eventually narrow down to that. I guess what is in the back of my mind is that the analysis of the accident design in the package to withstand the accident is a fascinating subject. We have done it on reactors for quite a few years. We have postulated nice great big accidents and have spent millions of millions of dollars in research and millions and millions of dollars in people's money to protect against those so-called high consequence and relatively low probability accidents.

About a year and a half ago we found out that we would have been a lot smarter if we had concentrated on some other things which were much more likely although the consequences are probably not so great. We are getting into the same situation here, you know, like that plutonium package thing that we went through where an awful lot of money and effort was spent on developing a package against a highly improbably set of circumstances where the greatest societal doses come from thousands and thousands of little packages that get shipped and never see an accident of

people getting exposed on airplanes and trucks and so forth. I am not saying the exposures are harmful, but if I look at man-rem, that is where all the man-rem are.

I think that somewhere we have got to be sure that we don't get so fascinated and so involved in accidents that we are overlooking areas where we could do a lot more good to protect the public against things they don't normally think about. We tend to respond to public fears. I realize we have created them; they haven't.

MR. ZUDANS: May I ask a question, Mr. Chairman?

MR. SIESS: Yes, Zenons.

MR. ZUDANS: In the case of shipping either the A or the B package who has the responsibility for the consequences if anything happens? Is that the shipping agency that has it or the DOT or the licensing agency? I assume that there are some consequences.

MR. SIESS: With the Price-Anderson; is that what you are asking?

MR. ZUDANS: I don't know whether that is Price-Anderson.

MR. SIESS: That is in debate now, isn't it?

MR. ZUDANS: Does that have to do with shipping or just the nuclear power plants?

MR. SIESS: I don't know.

MR. NUSSBAUMER: Well, the Price Anderson covers

the transportation to and from an indemnified facility. So any transportation to and from a power reactor, for example, would be covered by Price-Anderson insurance.

MR. ZUDANS: But not from a manufacture to a hospital?

MR. SIESS: But for the other categories there is no government insurance that backs that up so that the financial responsibility is something to be determined by the courts in each case depending on the circumstances. It depends on who was responsible. Was the container not put together properly, did the shipper, you know, not follow his requirements or was it the carrier that was at fault? Once that is determined, then that responsibility is fixed. It is kind of a drawn-out process.

MR. ZUDANS: What kind of involvement does NRC have if it had certified the particular package that was used in shipping and it underwent an accident? Are you in any way involved in consequences?

MR. NUSSBAUMER: Well, our main involvement in an accident would be to two functions: one, to respond and give assistance; and, secondly, to investigate and see whether there were any violations of our requirements or not.

Are you asking whether the NRC as an agency might be held responsible for an accident?

MR. ZUDANS: Because you certified it.

MR. NUSSBAUMER: I think that would depend on the particular circumstances of whether the package that was certified, you know, indeed met all the requirements and then failed, or whether there were some requirements that were violated which caused the failure or, you know, resulted in the release.

MR. SIESS: I think it would be hard to find responsibility here. Obviously NRC is accountable if it sets criteria and certifies packages. Responsibility in terms of financial I guess would be settled by a court again as to whether you can sue the government or the government will let you sue them and so forth.

One other quick question. You may have this answered later, and if you do we will wait, but in your certification procedure you do issue sort sort of a document like an SER I assume.

MR. NUSSBAUMER: We will cover that later but I will be happy to address it now.

MR. SIESS: The question was, do you have something like the standard review plan?

MR. NUSSBAUMER: No, we do not.

MR. SIESS: Okay. Larry.

MR. SHAPPERT: Just a comment about the last question. The certification process simply says that the package does meet specified criteria in the regulations.

That is what NRC attests to once they convince themselves that that occurs. It doesn't necessarily guarantee that package not leak under any and all circumstances.

MR. SIESS: But those criteria are presumably designed to protect the health and safety of the public or otherwise they can't really be justified.

MR. SHAPPERT: But nobody can be 100.000 percent sure that it won't leak under certain conditions.

MR. NUSSBAUMER: We are not saying, by the way, that a package design or a package that meets our Part 71 requirements will survive any and all accidents. We think the probability of surviving severe accidents is high, but it is conceivable there could be accidents where it would fail even though it met the requirements.

MR. SIESS: But you are satisfied that a package that meets your criteria will survive normal transportation handling without endangering the health and safety of the public?

MR. NUSSBAUMER: I think that is right.

MR. SIESS: Your concern that you are bringing to the committee here, as I understand it, does not have to do with certification from normal transportation but certification for accident survivability? That is your concern today, is it not?

MR. NUSSBAUMER: No, I don't think we are limiting

it that way. What we are asking for is a review of the entire certification process.

MR. LAWROSKI: Let me get clear with respect to this so-called standard liquid. Do you have different criteria from those that the people have responsible for the burial of say it is radioactive waste?

MR. NUSSBAUMER: The basic criteria for transportation of liquid is containment during normal and accident conditions. The criteria for the burial ground, the reason they are concerned about the liquid is that it facilitates migration of the material in the soil and therefore they prefer that it be solid.

Maybe the problem here is that we don't couple the transportation requirements with the receiver requirements.

MR. LAWROSKI: That is what I am trying to get at. How come there isn't communication between the two of you?

MR. SIESS: Steve, I can easily see it being uncoupled. You could have a transportation requirement where a metal drum would be sufficient, but for long-term isolation at the burial site they might want to encase it in concrete. I man, we say them doing that at Ossa where certain drums were put into concrete barrels essentially. I can see a distinction, but I am just wondering, I think like Steve is, wouldn't it be better if somebody were looking at

the waste from the time it left the place where it was generated to a few years in the future, including the transportation.

I can understand that the Transportation Certification Branch has certain responsibilities but NMSS must have a broader one.

MR. CUNNINGHAM: Certainly it does and certainly this issue is being looked at, but I don't know that you can get to it through the certification procedure. When a package is certified to contain a certain type of material in a certain chemical and physical form, whether it contains liquids or not, we don't necessarily know that that package is going to be used to transport waste to a burial ground and for that exclusive purpose. It may be used for a variety of reasons.

Therefore, we have got to look at the certified package on the basis of what it is going to contain. The requirements or the limitations we might place on waste that goes into a burial ground have to do with the burial ground itself and reflecting back into the waste generator. You can lay on requirements at the burial ground and you can lay on requirements at the waste generator more easily than you could get to that problem directly through the certification process.

MR. LAWROSKI: You just said something different

from what I thought I heard earlier, that part of the waste package is the material that is involved and you cannot separate it.

MR. CUNNINGHAM: You must consider the material that goes into the package, the chemical and physical form of the material, to do a certification.

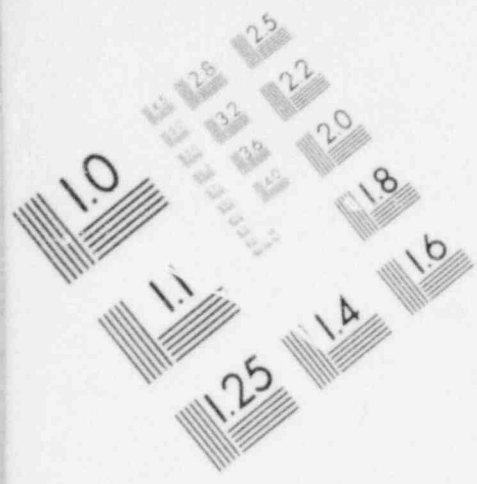
MR. SIESS: It works both ways because you might have a requirement for transportation that is much more severe than the requirement for burial. The surface activity which is not going to change on burial could be too high for transportation but quite adequate for burial. I can see reasons for separating them.

MR. LAWROSKI: But I can see also reasons for somebody getting together, too. Certainly the things that have received the publicity from the standpoint of containing stuff that was not solidified or at least the liquid wasn't bounded adequately, it failed long before it ever got to the place to be stored.

MR. CUNNINGHAM: You mean the package failed?

MR. LAWROSKI: Yes.

MR. CUNNINGHAM: We are very well aware of this. This, incidentally, is the reason we amended our rules about a year ago which give us authority to inspect our licensees to determine that they are meeting the type A packaging



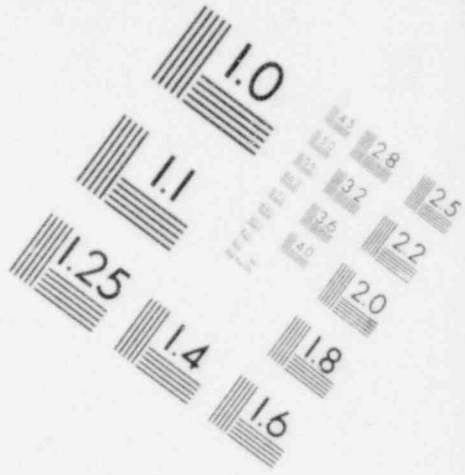
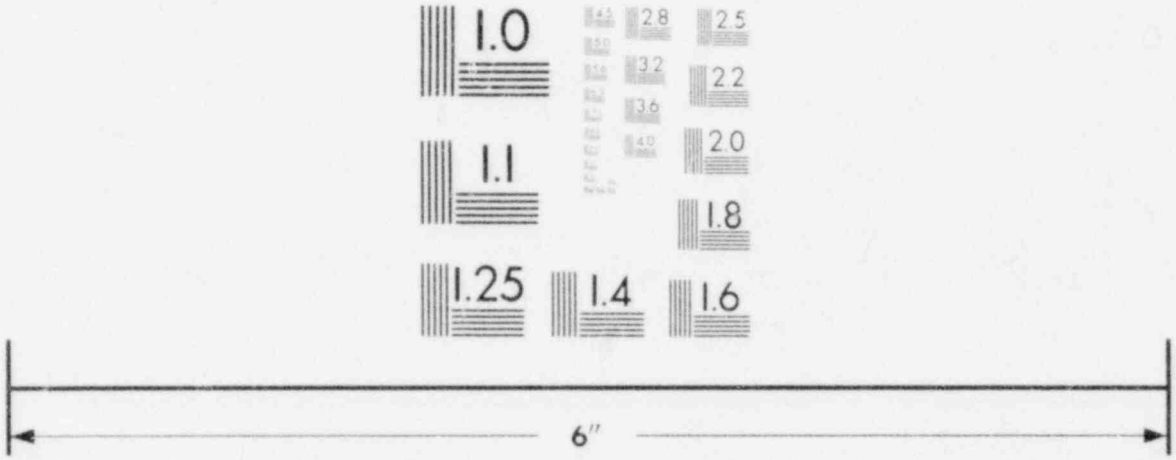
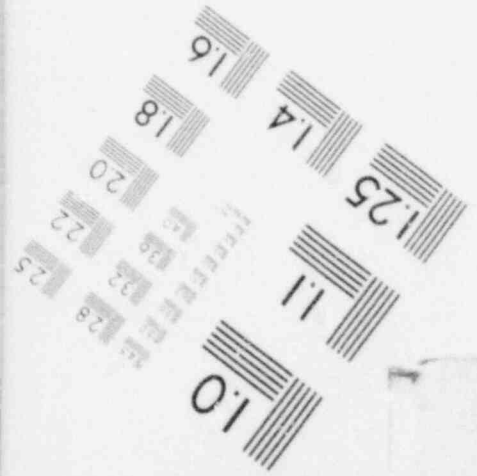
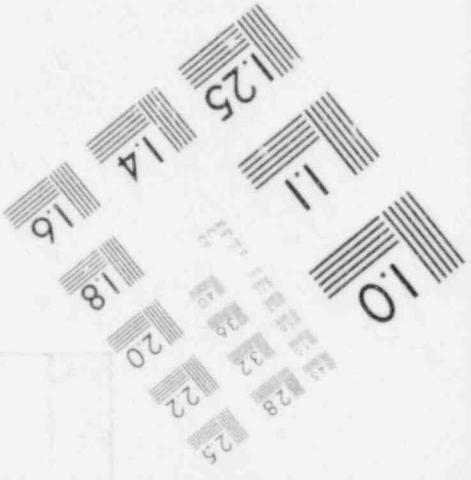


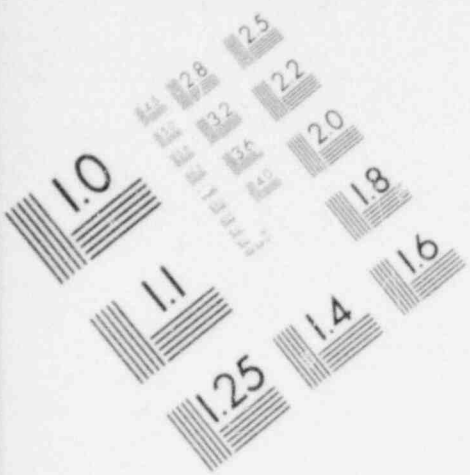
IMAGE EVALUATION
TEST TARGET (MT-3)



MICROCOPY RESOLUTION TEST CHART







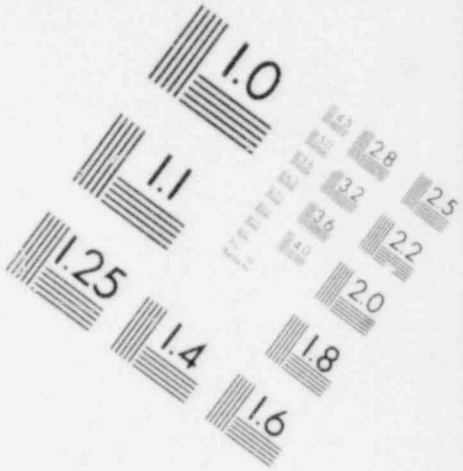
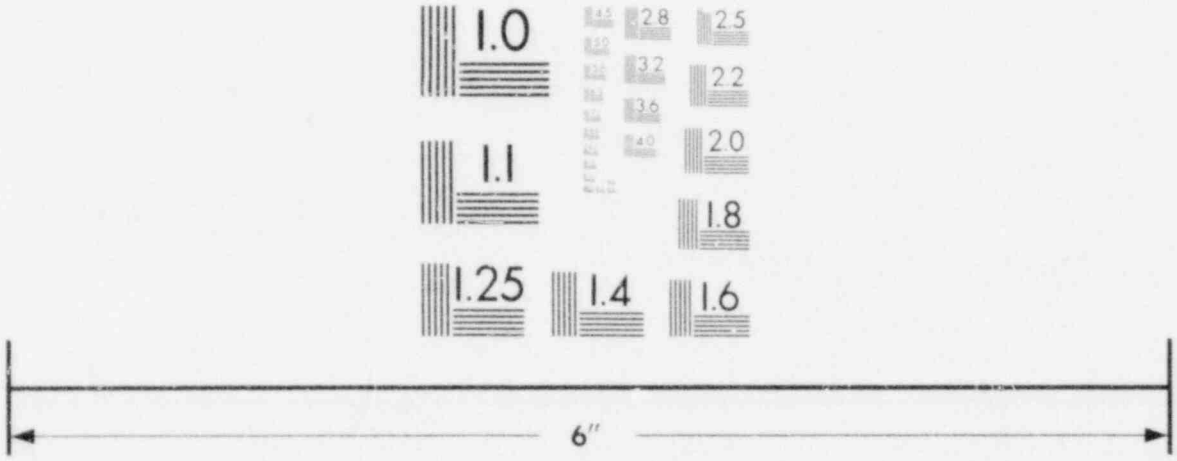
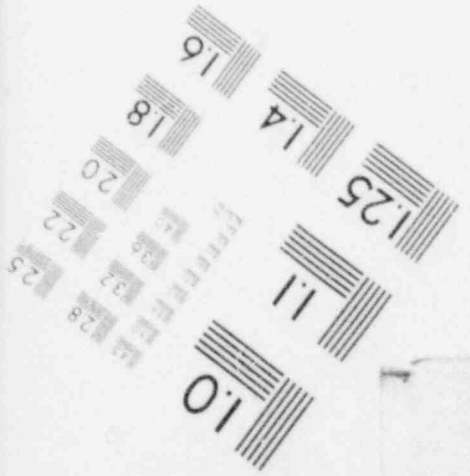
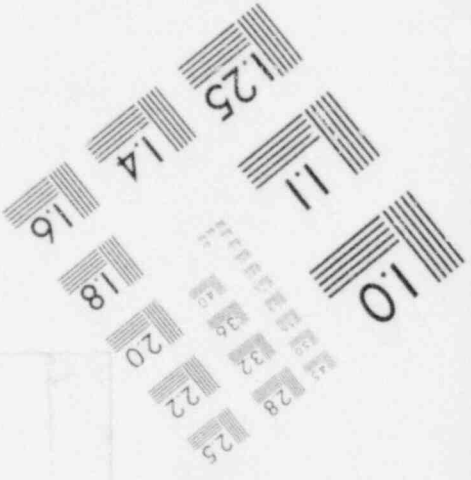


IMAGE EVALUATION
TEST TARGET (MT-3)



MICROCOPY RESOLUTION TEST CHART





requirements. So that now we are going to the licensee's site and inspecting the make-up of those type A packages. Before that time we did not have that authority and we were able really to get our hands on it and we weren't able to enforce it. We do have that program in place now.

MR. SIESS: Well, I think you made the point that some of the packages that have been rejected at burial sites were rejected simply because they had liquid in them and not because liquid had leaked. In other words, they were perfectly safe for transportation since it was not leaking out during the week or days were required to transport it but were rejected for burial because the leakage presumably could not necessarily be contained indefinitely. You could rescue the drum and then have a leachable material, right?

MR. NUSSBAUMER: That is correct.

MR. SIESS: If they leaked during transportation they probably don't meet your criteria.

MR. NUSSBAUMER: That is correct.

MR. CUNNINGHAM: That is definitely correct if it is a type B package. If it is a type A package it really doesn't meet DOT's requirements.

MR. LAWROSKI: It certainly wouldn't meet the burial people's requirements either.

MR. SIESS: Yes, but that is because it is not in an appropriate form when it reaches them and not because it

was unsafe in transit.

MR. NUSSBAUMER: What we had here in the low-level waste area was really a disregard of both the shipping regulations and the burial ground regulations by a number of shippers. Both we and DOT and the burial grounds have taken corrective action with the shippers on a case-by-case basis through civil penalties and through cut-off of further shipments to burial grounds to try and correct this problem and I think we have gotten their attention.

MR. ZUDANS: Are the burial grounds equipped to repackage the material that arrives there, say, a package certified by NRC but not acceptable for burial?

MR. SIESS: That is why they rejected them.

MR. ZUDANS: But they cannot repackage them is what I am asking.

MR. NUSSBAUMER: They could.

MR. CUNNINGHAM: It varies somewhat. The Barnwell burial ground is very well equipped to open packages and repackage them. They really have a curie program down there where they will do inspection of packages on some sort of statistical basis.

The burial ground at Beatie is not so well equipped. What they do if they get a bad package in there is put an overpack on it and return it to the manufacturer. They have buried some with some modifications that I am not

too well aware of because it is in the agreement state, but they aren't as well as equipped as the Barnwell site. The Hanford site, oh about six or seven months ago they were not equipped but my understanding was that they were going to get some facilities to do a better job of handling that. I think the Washington site is in an agreement state and it is moving our of out line in our division.

MR. ZUDANS: That is interesting. Who oversees the entire process from the origin to the burial ground? Is there a single agency that has the overall responsibility?

MR. CUNNINGHAM: No. It is somewhat fragmented particularly because of the agreement state program. We have responsibility to inspect packages as they are made up by our licensees provided that they are in nonagreement states or are licensees that are not subject to the terms of agreements like on a power plant.

DOT does inspections during the transport of the packages because they are concerned with conditions of carriage. DOT inspections go beyond just the packages themselves. They will look at the brakes of the trucks, the tie-downs and things of that sort.

When it gets to the burial site it is mainly an agreement state problem because the burial sites happen to be located in agreement states. The burial sites that we have are located in agreement states. Now, if the burial

site were not located in an agreement state NRC, of course, would have some responsibility at the site itself.

We have though, as a point of fact, since last November up until last June, had inspectors at two burial sites at the request of the states. We have had them at both Beatie and Hanford. We do with the cooperation of the states carry out inspections on the burial sites under the terms of the agreement.

MR. ZUDANS: That is the only interfacing you have with the state, just creating inspections, or do you have some regular interfacing where you compare regulations of sites and regulations of transportation?

MR. CUNNINGHAM: Very definitely. We have several things. In the first place, our Division of Waste Management has had a rather intensive effort over the last year or so in renewal of all the three burial ground licenses to be sure that, first, they are consistent with good practice and, secondly, that they are also consistent with regulations that we now have under development, Part 61, on low-level waste burial, and to also try to get some degree of consistency from one burial licensee to another. There are differences, of course, but we are looking at a national problem and we would like to see them as consistent as is reasonable from one burial ground to another. That is one type of effort.

We certainly work closely with DOT in this whole program and, Don, you might want to say something about the state surveillance program that we have.

MR. SIESS: Well, let me try to summarize this and maybe get us back on the track. I think it is clear that there are or should be two different kinds of criteria: one for safe transportation and the other for safe burial. In some cases the requirements for transportation might be more restrictive than those for burial in terms of surface activity. In other cases the reverse would be true.

If all packages were designated or intended to be buried then presumably you could have one set of criteria, including the most restrictive for the two sets of conditions. But, as you pointed out, not all packages are eventually going to be buried. Everything that is buried probably has to be transported, but everything that is transported is not buried.

So if you have that situation and you don't want to certify all transportation packages for eventual burial you end up with separating the criteria with one set for transportation and another set for burial. If those packages meeting the transportation criteria do not meet the burial criteria then the burial site has to upgrade the package to meet it or combine them into another package or something of that sort.

Your concern here is the transportation part and your present practice is to certify the transportation packages for transportation conditions both normal and accident, right.

MR. CUNNINGHAM: That is correct.

MR. SIESS: For example, radiographic sources are probably never going to be buried and their criteria must relate to transportation exclusively and not worry about burial although I don't think there would be any problem.

MR. NUSSBAUMER: Another point on this business of coupling transportation with receiving is that, you know, there is also the matter of the size and the weight of the container. I mean, the shipper and the receiver both have to agree on the size and the weight of the container in terms of the receiver's capabilities for handling it and we don't normally get into that area either. That is something that the designer has to take into account when he designs the package of how broadly is it to be used and to try and stay within some kind of bounding conditions for the receiving facility in terms of weight and size.

So we could get ourselves really bogged down if we got too far into trying to make the package compatible with all of the receiver requirements.

MR. ZUDANS: Are you not involved in the licensing process of these burial sites?

MR. SIESS: No, that is waste management. We are dealing with a different division here, aren't we?

MR. ZUDANS: Well, I meant NRC. I didn't mean this division.

MR. CUNNINGHAM: Certainly from an NRC standpoint and even from the office which we are part of we are involved in licensing waste management sites or developing the criteria for disposal sites. As it so happens, as I said before, the actual licensing of the existing sites takes in agreement states.

MR. ZUDANS: That means that you are or the NRC as such is informed about transportation certification requirements that you develop and also about burial requirements because you are involved in that process maybe through other divisions.

MR. CUNNINGHAM: That is correct.

MR. ZUDANS: It could be possible to have a common point of view.

MR. SIESS: There is a once removed situation if you go to the type A packages under DOT and agreement states. NRC has been involved in studing the criteria but the involvement in enforcing them is once removed I would say. You are getting closer into it now with recent events, but you were quite well removed from it for a while.

MR. CUNNINGHAM: That is correct.

MR. SIESS: Okay, let's go on. I am not sure just where we are on the agenda, but I am sure you know.

(Slide.)

MR. NUSSBAUMER: This next slide merely shows the spread of work. In other words, under the column "Final Actions" on an annual basis it gives you some idea of the number of designs we have looked at in each of the various categories indicated.

As you might expect as far as numbers are concerned, most of the actions are in the amendments and registrations and renewals. Most of the review time, if you are talking about actual package review, is in the more severe hazard category of spent fuel, plutonium and high-level waste.

MR. SIESS: What does registration mean again?

MR. NUSSBAUMER: Once we certify a package design the regulations permit any licensee to use that design provided he registers with us his intent to do so and certifies that he has a copy of the certificate, the application and all the supporting documents for that package so he knows what it is all about.

The registration serves a secondary purpose in that if some problem is discovered with a particular package at some later date we have on record those people who are using that package and we can contact them directly.

MR. SIESS: Does he have to have a QA program that is reviewed by the NRC?

MR. NUSSBAUMER: He has to have an approved QA program to ship on any package, yes.

MR. SIESS: Do you do the QA program of approval?

MR. NUSSBAUMER: Yes, we do.

MR. SIESS: So it is sort of like an end stamp situation?

MR. NUSSBAUMER: Yes.

MR. SIESS: He qualifies then basically on a QA program and having the documents?

MR. NUSSBAUMER: Right.

MR. SIESS: That takes an awful lot of your time I see here, 40 percent of the review time.

MR. NUSSBAUMER: That is because of the large numbers more than the act of time on any individual action. The regulations provide that every licensee who ships must have an approved QA program.

(Slide.)

The next slide is designed to give you some indication of the computer programs we use for our review process. The basic system is one called SCALE. Listed below at the bottom of that slide are the various programs that are a part of SCALE and that we use. They relate to criticality, shielding and the heat transfer.

MR. SIESS: So you have an independent capability for evaluating the package?

MR. NUSSBAUMER: Yes, we do.

MR. SIESS: Do the applicants utilize these same computer programs or are these used as checks on their analyses?

MR. NUSSBAUMER: Some applicants do use them. Basically they are checks on their analyses.

MR. SIESS: It seems to me that if an applicant knew you were using a particular set of programs to certify a package that they would use the same programs.

MR. NUSSBAUMER: In which case it simplifies the review considerably.

MR. SIESS: It also reduces the degree of checking independently.

MR. NUSSBAUMER: Right.

MR. SIESS: Where they don't use the same program what is their reason? Are your programs as good and as complete as theirs?

MR. NUSSBAUMER: We think they are.

Could you like to comment on that?

MR. SIESS: I think that is part of the basic question here.

MR. McDONALD: It is the applicant that would have the option of the methods of his demonstrating that his

package met the requirements. In those cases where they do use the programs and analysis that we are familiar with, why then it is basically a matter of checking the input and the results of his analysis and that does reduce the review time.

Now, he may not have the programs that we do have like in heating. He may be more familiar with TUMP and have that and use that program or other heat transfer programs or other criticality codes. These are not the only ones and we do not restrict him to a particular way of doing things. We do not essentially tell him how to do it but we do have the capability to check his analysis by these programs.

MR. ZUDANS: Do these programs, both the ones used by you and the licensees undergo any kind of validation process or certification process?

MR. McDONALD: In order to use the program it would have to be applicable to the particular case that you are applying it to, a model. It if is a criticality program that you should have it benchmarked to an experiment that is appropriate to that particular case.

MR. SIESS: Now, you are asking us for help in reviewing the procedures. What would be helpful is to get fairly clear the scope. Are you looking for review of the whole process or chiefly of the techniques and methodology within the process such as analysis versus tasks or one analysis versus another analysis? Are you looking for

advice on the whole system of review, certification, renewal, inspection and QA?

MR. NUSSBAUMER: Do you have a slide?

MR. SIESS: If you are going to get to it later that is all right, but I think it is helpful to know what we should be listening for.

(Slide.)

MR. SIESS: If you look at your first slide it says a certification process, and that could be interpreted very broadly or very narrowly or anywhere in between. We will eventually do the interpretation I guess but we would like to have your interpretation.

MR. NUSSBAUMER: I think our main interest is in the area of whether or not the review process, the technical aspects of it primarily provide reasonable assurance that the designs we review meet the requirements. Any comments about the review process from an administrative standpoint, that is whether we should have renewals or not, you know, would be welcomed.

I think the main focus that we are interested in is, you know, how do you feel about the technical aspects of our package certification program.

MR. SIESS: That is helpful, although I can't guarantee that either the subcommittee or the full committee would limit itself that way. I guess I would be inclined to

put it on all of the procedures that that give us some assurance that the packages will not be a hazard to the health and safety of the public. That is really what we are after.

MR. NUSSBAUMER: Sure. I didn't use reasonable assurance. I guess I should have.

MR. CUNNINGHAM: I would like to qualify that somewhat, Dr. Siess. What we are looking for is whether or not the packages as we review them are likely to meet the requirements of the regulations.

Now, in this briefing we will get into the Modal Study which you asked for because we are not satisfied that the regulations don't need to change also and there is some research going on there.

What we are immediately interested in, and we would welcome anything else that would be given us, but what we are immediately interested in is whether or not we meet the requirements of the regulations. It is a fine point but there is a distinction there.

MR. SIESS: By requirements of the regulations you mean the prescriptive requirements of the regulations?

MR. CUNNINGHAM: That is correct.

MR. SIESS: The basic requirement of the regulations is that these not represent an undue hazard to the public.

MR. CUNNINGHAM: That is correct.

MR. SIESS: You define that in terms of accidents at least and then even in terms of normal transportation, but anything that is qualified for an accident will almost certainly would be qualified for normal transportation. You define that for accidents in terms of certain physical effects.

MR. NUSSBAUMER: Yes.

MR. SIESS: Fire, pressure impact and so forth.

MR. NUSSBAUMER: Right.

MR. SIESS: We could keep those separate I think.

(Slide.)

MR. NUSSBAUMER: The next slide merely indicates what we use our technical assistance contract for. As I think I mentioned earlier it is mainly to do some confirmatory testing on our part of certain materials or components of packages that we get in where the design is a little tricky or to provide engineering anlaysis in certain specialized areas that are important in a given package design. Then also to do some fairly limited scope technical studies which are related to transportation and safety.

(Slide.)

The next slide then gives some examples of the kind of work that we have done under this technical assistance contract.

MR. ZUDANS: Could I ask a question?

MR. NUSSBAUMER: Yes.

MR. ZUDANS: You don't do any of the engineering analysis in-house?

MR. NUSSBAUMER: We do the engineering analysis of the applicant's submittal in-house but sometimes there are specialized areas where we would like to get outside consultation and that is the purpose of having this technical assistance contract that we can call on these people for expert technical advice in certain areas.

MR. SIESS: Who is the contractor?

MR. NUSSBAUMER: Lawrence Livermore at the present time.

MR. ZUDANS: Is that because some of the package complexity exceeds the capability that you have?

MR. NUSSBAUMER: Yes, basically that is right.

MR. SIESS: To what extent then does Lawrence Livermore do an independent review? I mean, do you just simply state a question to them or do you ask for something very specific in the way of technical assistance?

MR. NUSSBAUMER: It is usually quite specific. We give them the problem and ask them to, you know, provide advice on it.

MR. SIESS: You define the problem?

MR. NUSSBAUMER: We define the problem, yes.

MR. ZUDANS: Do you also define the environment that the package sees or do they define it for you?

MR. NUSSBAUMER: Well, the basic environment that the package sees is covered in the regulations. What we are trying to do is confirm that the design will withstand that environment.

MR. ZUDANS: In other words, the accident conditions are fully covered in the regulations?

MR. NUSSBAUMER: Yes.

MR. SIESS: We have made that separation that an adequate package is one that meets the regulations. Whether the regulations are adequate is another question.

MR. NUSSBAUMER: That is right.

MR. SIESS: I think we have agreed to separate those two at least for the purpose of that.

(Slide.)

MR. NUSSBAUMER: The next slide deals with the Modal Study. The concept in doing such a study we have entertained for some time now and only recently have been able to get the funding to begin.

What we would like to do is examine the accident environments for each mode of transport and devise accident tests for each mode along with post-test acceptance standards.

The reason this came to light was that in much of

the correspondence we received and in many of the hearings and public meetings we have attended the general public doesn't understand the current Part 71 criteria. In other words, they have difficulty in understanding that a 30-foot drop onto an essentially unyielding surface is a severe condition. It doesn't sound too severe to them based on the speed at which trucks travel. In some case they haven't felt that an half hour fire test is really a severe environment. They don't understand, you know, how the sequencing of the test provides a really severe impact on the particular container design.

Based on our experience with the plutonium package certification project we felt it would be worthwhile to take a look at developing standards which are modal dependent. We also had the problem with the railroads on the spent fuel shipping casks where they felt that Part 71 standards were not stringent enough for rail transport because of the variety of impact and thermal conditions.

MR. SIESS: This is a technical assistance contract you have on this slide?

MR. NUSSBAUMER: I am sorry. This is a research project being run by our Office of Research.

MR. SIESS: We are on slide?

MR. NUSSBAUMER: We are on slide 8.

MR. SIESS: Did you discuss the previous slide?

MR. NUSSBAUMER: Just very briefly. I would be happy to go back to it. I just wanted to give some examples in the previous slide of how we have used our technical assistance contract.

MR. SIESS: That would involve Lawrence Livermore, too?

MR. NUSSBAUMER: Yes.

MR. SIESS: Now, the Modal Study is research, right?

MR. NUSSBAUMER: Right.

MR. SIESS: Has that contract been let?

MR. NUSSBAUMER: Yes, it has. It is just getting underway.

MR. SIESS: Oh, I have got it right here, Reediehall, Edgars & Associates?

MR. NUSSBAUMER: Yes, that is right.

MR. SIESS: Will you tell me who they are and where they are?

MR. McDONALD: The contract was awarded to Reediehall, Edgars & Associates. They are located in Columbus, Ohio. They are a consulting firm. They have also several other subcontracts I understand for certain phases of this study.

MR. SIESS: What is their field?

MR. McDONALD: Their field would cover the

structural, just all phases. They will have areas that do not have the expertise and they will be getting the expertise.

MR. SIESS: Basically what is the company's area of expertise? I think it is structural, isn't it?

MR. McDONALD: Structural, packaging, physics, nuclear physics work and general consultant service.

MR. MOELLER: While we are covering the various contracts that you have, I am not sure which group has done it, but I have these two reports, NUREG CR-0744 and NUREG CR-0742.

MR. SIESS: What are the titles?

MR. MOELLER: The title of the first one is "Identification and Assessment of the Social Impacts of Transportation of Radioactive Materials in Urban Environments."

MR. SIESS: That is part of the environmental ---

MR. NUSSBAUMER: That is part of the urban study.

MR. SIESS: That is part of the urban study.

MR. MOELLER: Are you the ones that are arranging for these studies or did arrange for these contract operations?

MR. NUSSBAUMER: Not our organization. The urban study environmental impact statement on transportation through urban areas, that project is being handled by our

Office of Standards Development.

MR. SIESS: That is what we have reviewed in the past, Dade, remember?

MR. MOELLER: Yes. I found certainly these reports to be interesting and I wondered how you were factoring the results of these studies into your own work? I am a little bit, I guess I probably realized it, but I am a little bit surprised that it is being done by another group. I mean, are you right onboard on what went on these contracts and are you factoring the results into your work?

MR. NUSSBAUMER: We have a staff member that is following that very closely. The result of that will be a draft environmental impact statement which will be published for public comment and there could even be hearings on it. I don't know. Then following that, you know, the results would be considered in connection with our ongoing transportation program.

MR. MOELLER: Well, I note in looking at the social impacts they did consider routine transport without incident as well as accidents and they also considered sabotage and what the public's views are on these subjects. So I am glad to hear that you are onboard and I would be interested in knowing how and in what manner you plan to implement their findings.

MR. SIESS: I think that is a matter -- I am not

sure which subcommittee is following the urban studies. We were for a while here. We just haven't heard about it for so long.

MR. LAWROSKI: How long has this Modal Study been underway?

MR. NUSSBAUMER: It just started last month I think it was.

MR. LAWROSKI: I thought you had something going on the Modal Study that Mr. Larsonal showed some time ago.

MR. SIESS: That is what he is talking about. That for the review of the transportation of radioactive materials by air and other modes that we have been reviewing in the past. That was the first impact statement. Then it went into the urban transportation which was primarily concerned with spent fuel and sabotage.

MR. LAWROSKI: Yes, I remember that, but there was still another one though..

MR. SIESS: That is in research.

MR. NUSSBAUMER: The Modal Study is not connected with any environmental statement. That is a separate technical study to examine whether or not we should come up with standards which are modal dependent rather than one set of standards that apply to all modes.

MR. SIESS: Well, the Modal Study must have come out at least in part from the plutonium package study.

MR. NUSSBAUMER: Yes, it did.

MR. SIESS: A real hard look was taken at air transport developing some extreme accident conditions.

MR. NUSSBAUMER: Right. It was that plus the problem ---

MR. LAWROSKI: It had an earlier start in that connection with the problems of through which routes can you ship spent fuel.

MR. SIESS: We have got to keep things separate. The environment study, the impact of transportation, came out of standards development and I think involves research. It has been looking at just that, the routing, the impacts on the public, risk benefit, et cetera. That is going on separately from this.

Now, when we did the plutonium package thing in response to a Congressional mandate the accident environment for an air shipment was examined in considerably more detail and a new set of criteria were developed that were much more severe than anything we had dealt with before.

The question then arose apparently as to whether the rail and truck modes might not have specialized conditions that could be defined in the extreme somewhat like the aircraft crash. So a research project is now underway. The title is "Definition of Bounding Physical Tests Representative of Transport Accidents, Rail and Truck."

MR. ZUDANS: There are only two modes considered, rail and truck.

MR. SIESS: The air is already done.

MR. ZUDANS: What about the ship, is that no place considered?

MR. NUSSBAUMER: We have not limited it yet, but we are starting out with the road and rail because that is the way things are moving to the largest extent right now. It is a multi-year study so we may get around to looking at the water shipping at a later date. There is no pressing need at the moment to do that.

MR. SIESS: So they are looking at two things now. One is whether they need a different set of tests.

MR. ZUDANS: And that is in the bounding sense?

MR. SIESS: That is what they are looking at right now. The other question, they one they are addressing to us today is how well do the procedures for evaluating packages against the existing tests work.

Now, I raised the question when I was first approached on this whether it is premature to look at the adequacy of their procedures for evaluating packages against existing criteria if the criteria are likely to change.

MR. ZUDANS: Tha is a long-term undertaking.

MR. SIESS: Everything is a long-term undertaking in this business. I haven't seen anything settled in less

than five years.

The answer I got, and we will probably hear it again today if I ask the question, is that they feel the Modal Study probably will not come up with any great differences in criteria compared to the ones they have now. It might be a 40-foot drop instead of a 30-foot drop, or something like that. But the question of evaluating a cask, for example, against a 30-foot drop, whether it is a 30 or 40 or 50-foot drop, is basically the same procedural question. One of them is test versus analysis, conservatisms and analysis, independence, et cetera.

Certainly the question of timeliness is one that we will have to consider, depending on what effort the committee may have to put on it. That is looking ahead a little bit.

MR. LAWROSKI: Just to get back to the question you asked earlier about whether they had looked at the relative risks involved in it, now we are down to a very specific type of material that is being shipped which in terms of number of shipments is rather few compared to the thousands of the pharmaceuticals and radiographic sources and so on that are shipped.

MR. SIESS: The number of shipments are small and the number of curies is a lot larger. Well, spent fuel right now isn't being moved very much, but it is not going

to be too long before there is going to be a lot of spent fuel move somewhere. Spent fuel pools will only hold so much.

MR. ZUDANS: When we reviewed the plutonium package case I remember there were tremendous numbers of studies on rail transport both in this country and the other countries. How is factored in in this research you are going to do? What does it differ by? There are many rail transport studies already made.

MR. NUSSBAUMER: Yes, there are some studies. Of course, the hearing record of the ICC case on the spent fuel has a lot of technical information in it and none of that will be overlooked. That will all be considered. The assignment under the contract is to pull that together and come up with some modal dependent standards for package design but that has not been done yet.

MR. SIESS: Let me address the subcommittee. We are going to have some questions to answer here. What the staff is trying to ask us to do is very specific and I will say very narrow in one sense. They want us to look at one particular aspect of the regulatory process.

Now, in the discussions so far we have been looking at various aspects of the regulatory process which I think is appropriate.

The question that is going to be facing the

subcommittee and eventually the full committee is do we want to do anything in the way of an independent review or an independent check of what they are doing and, if we do, where do we stop.

The ACRS in the past few years has been getting into a number of areas like this which are quite different from its original areas of interest and expertise which related primarily to reactor safety. Just how far the committee wants to go in this area will be up to the committee.

I think you have to realize that although you may ask us to make a very limited but difficult review, the committee may say, no, it doesn't want to or it may say, yes, it does, but it is not going to stop there.

MR. CUNNINGHAM: If I may say, Dr. Siess, that is a point well taken. Certainly the committee may in the course of this briefing and what happens subsequently want to expand its review beyond the scope of those issues that the staff would like to committee to address immediately.

I had hoped though that since considering the field in its entirety is a very complex issue we would like the committee to look at our immediately questions in addition to anything else that they choose to look at.

MR. SIESS: Well, I might point out that the committee has gone both ways. On the plutonium package

which was clearly a very narrow question and one which on a risk basis was probably negligible we put a tremendous amount of effort of the subcommittee on it, not so much of the full committee because we did a good job in the subcommittee, and we came up with very specific recommendations. There was a very specific outcome. The package was designed and it is presumably being used and the Congress was satisfied.

So that is an example of a very narrow study where I think we made quite a contribution and provided quite a bit of independent review although you got a further independent review from the National Research Council.

At the other extreme we have been looking at the environmental impacts of transportation of radioactive materials by all modes. That was requested of us by the Commission, and I will have to admit by a Commission that no longer exists, but we were asked by the Commission to following the studies that were being made and to be prepared to comment on their outcome when a rule was proposed.

Now, we followed it. We got involved to a certain extent. We had a number of consultants that were involved it in and I think gave the staff some good advice. No rule was ever proposed on that. This is out of the Office of Standards Development and not of your office. No rule was

ever proposed and, if I am correct, the ACRS was never asked to comment as a collegial body. That is very board because that involved in one way or another every aspect of transportation except the question we raised earlier about disposal sites. But it did raise every aspect of transportation, environmental impacts, societal impacts and transportation routes. The urban study is still going on but that has never come to any final decision by the ACRS. In fact, the full committee I don't think has ever been involved except to hear some presentations.

So these are essentially the extremes. One is so comprehensive so as to be almost meaningless. I shouldn't say that, but I haven't seen much meaning out of it. The other is very specific. This is much closer to the plutonium package type review than it is to the other, what you are really asking for now.

MR. CUNNINGHAM: I think that is correct. If I may say, Dr. Siess, you are entirely right on how this Modal Study came up. At this plutonium package certification or at some point during the course of this things we began to look at our other modes of transport and recognized that the present criteria that flowed out of IAEA was developed in the late Fifties or early Sixties and it was just time to take a look at these other things.

Questions have been raised as to why we look at

these type B packages and the other modes of transport. Dr. Lawroski has raised this. Certainly there are problems in transportation that also bear examination. We have questions that come up on how we are looking at the certification process.

To give you an example, there are some important package certifications that are going to come up in the future that the public is going to look very hard at. I think the fact that the public is going to look at it drives us to make sure that they are safe. Just two examples, there are going to have to be containers designed to transport the TMI waste if we can ever find a home for that waste. That is one area. Congress is now passing legislation to solidify the NFS high-level waste. Those most be transported. We are going to have to design packages, or somebody is going to design packages and we are going to have to certify those packages. All these are going to be subject to very careful scrutiny.

We want to be sure that what we are doing, our branch, is an adequate technical job.

MR. SIESS: I still have a problem in the back of my mind, and there are many problems facing you like there are many problems facing the Commission in general, and I am not at all sure that we are working on the most important problems as far as the public health and safety is concerned.

There are number of things driving us. There is legislation which presumably is for the public health and safety, but I will be frankly honest I don't think it is always is driven by that desire. There are other legal requirements satisfying lawyers for hearing boards that are not necessarily contributing that much to the public health and safety.

I realize that simply risk benefit analyses and finding out which areas will provide the greatest reduction in risk at the most economic cost in terms of all resources doesn't necessarily satisfy people that are driven by other considerations. Societal concerns are not negligible, let's fact it, although societal concerns and societal health are not necessarily the same.

I don't know. I just wonder sometimes whether we are putting our effort on the right things. I gave you simple example earlier. I don't want to apply it directly, but for years we put a tremendous amount of effort on large LOCAs and ECCS in spite of the fact that risk assessments had said that they are not the greatest danger to society. It took Three Mile Island to turn us around and we are not turned around yet.

Let's try to narrow this down to what you really want us to look at. You are getting closer and closer to it and by giving us the whole picture you have opened a number

of areas for us to ask questions on but you are zeroing in on the specifics. So I would say proceed and let's try to scope in mind because somewhere we are going to have to start again.

MR. LAWROSKI: Before he picks up, can you give a spectrum of things that you plan to ship that are involved in that?

MR. NUSSBAUMER: In the Modal Study?

MR. LAWROSKI: No, the one before.

MR. NUSSBAUMER: Well, the spectrum would run all the way from the small type B packages for radiographic sources and bulk pharmaceutical products all the way up to spent fuel and high-level waste.

MR. SIESS: It is from there up to spent fuel casks.

MR. LAWROSKI: Well, I wasn't sure from some of the words. I looked like it was narrowing down.

MR. ZUDANS: Really, Mr. Chairman, what you commented raised my question more than what I heard. When we did the plutonium package the main issue was really the criteria itself, the criteria development.

MR. SIESS: Well, we looked at how it satisfied the critiera.

MR. ZUDANS: That, of course, too. Now, here the Part 71 is really very simple in its present form. I am

just wondering what is it that we can do to improve it?

MR. SIESS: Well, let's go ahead and listen to them. The thing is on the plutonium package, on the qualifications of the plutonium package, that was done 99 percent by a physical test. You are going to find out, if you are not already aware, that other packages are qualified 99 percent by analysis. Maybe not 99 but it is pretty high in terms of prototype packages.

Now, some packages there have been tests made and you correlate it with analysis, but you can't say like for the plutonium package that it was really qualified 99 percent by test.

MR. ZUDANS: That would mean then that our attention would be addressed to analysis methods.

MR. SIESS: We are going to hear more, but I want people to be thinking about is, first, whether we can help the staff, whether we should help the staff, how we can help the staff and in connection with all of those what scope. My feeling is if we are going to be of much help to them the scope has to be either very broad or very narrow.

Dade.

MR. MOELLER: I agree that we need to focus in and I appreciate your guidance. On this Modal Study I wanted a little more informatio.. I gather, in other words, that in looking back over the history of transportation of

radioactive materials and particularly in terms of your regulation of such activities you have seen a need for a comprehensive look at the total situation and the Modal Study is doing that.

In looking at it though it seems to combine apples and oranges. I guess I wanted to raise a question as to why perhaps it wasn't subdivided? For example, to develop accidents tests for each mode of transport, that seems to be a clear-cut, you know, chanallenge or task to do.

Now, points two and three to develop the post-test acceptance standards and to determine the types of shipments to which the tests and the standards should be applied, those seem to go together.

The last one, and I think I have heard from you of something you are going on each of these then, but now the last one to identify and evaluate operational controls, have you told us anything on that? I wonder, the same group then that is doing the first three items will also do that one, and that seemed to me to be quite different and would maybe require different talents. I just wondered what you are doing in that area.

MR. SIESS: What does operational controls mean? Is that the physical controls or the procedural controls?

MR. NUSSBAUMER: It is both procedural and physical. It is kind of wide open actually.

MR. SIESS: Do you talk of both or is it the QA procedure?

MR. NUSSBAUMER: I think that would be included.

MR. MOELLER: Plus the routes you take.

MR. SIESS: Well, I am sure this doesn't have anything to do with routes.

MR. MOELLER: I think it does. That is an operational control to me.

MR. NUSSBAUMER: The best example I can think of again is in the plutonium package situation where we required the plutonium package to be shipped in the aft-most portion of the plane and because of the longitudinal thrust problem that we had great difficulty in coming up with a standard on it. It is that kind of thing that we will be looking at. I mean, that is an example of the kind of thing we will looking at to see whether you could get substantial increase in safety by some fairly simple operational control.

MR. SIESS: But operational control here does not mean routing?

MR. NUSSBAUMER: Routing?

MR. SIESS: Yes.

MR. NUSSBAUMER: No, I don't think we have that in mind.

MR. SHAPPERT: A question or a point. It seems to me that one example of this might be if you found in

transporting from California to Morris, Illinois, that a spent fuel cask went through Los Angeles and passed over a overpass that was maybe three tiers high, and they do that, the question is, No. 1, should you write regulations that say that all packages then must then be from a 90-foot drop because that is the distance, or do you route around that and not even expose it to that kind of criteria, or do you say the probability is so low of an accident at that elevation that the 30-foot free fall is still adequate?

So it seems to me that thos things are intertwined and are the type of questions that you might be addressing in this particular Modal Study.

MR. NUSSBAUMER: Of course we would also be considering that kind of situation, Larry, in coming up with the environmental situation the cask might see on highway transport. You know, that would be one of the considerations in that area.

MR. MOELLER: Well, I guess I am troubled a little bit or, you know, I just don't understand it because Chairman Siess has been saying, and I agree with him, that we need to look at the relative risks of each of the steps in the operation and then know where we need to place emphasis and know again where we can get the maximum return for the least money spent.

Well, now, if operational controls, if that is not

going to include what route the shipment takes or the point that Larry just raised, I am troubled.

Now, is something else doing that for you and they are fully integrated with your operation so that all of this can be put together.

MR. NUSSBAUMER: What I was saying was that I think the point on the three-tier bridge, that is the kind of a thing that would be taken into account in arriving at the basic design standards.

MR. SIESS: If you approach that like we approached the plutonium package you not only take the 90-foot drop but you would assume that they might make a four-level overpass somewhere and it would be 120 foot. You know, that is what everybody did on the air crash. We did put some bounds on how fast that thing could hit, you know, but it was extreme.

Now, if the Modal Study is going to talk about really bounding tests it has really got to talk about bounding accidents and this is not going to be easy. That is why it is researched. You are talking about the tail of the curve, darn it, and where do you cut off the tail of the curve. The tail of the curve doesn't go to infinity but it goes a lot farther than anybody would like to go.

The risk assessment is going to have to be in here somewhere because we can sit around this table and think of

accidents forever. There is going to be some limit. You can make it on an engineering judgment basis or a risk assessment basis because Congress said to consider the risk of a high-flying aircraft. We did not do that one on a probabilistic basis. Well, not completely. It clearly had some probabilistic aspects but they were certainly not explicit. DOE wanted to do it explicitly on a probabilistic basis but we did not.

The staff is going to ask us before they get through to do something that is based on the present criteria without worrying about those criteria and that is one of the questions. It is still a very important question of whether the ACRS wants to get involved in this at whatever level of effort is required prior to having established new criteria that might come out of it. That would depend somewhat on the judgment of what we can contribute and whether those new criteria are likely to be significantly different. Whether they are likely to be different or not will affect the validity of the procedures they are using now.

If we can decide that an analytical evaluation of the ability of a cask to withstand a 30-foot drop is adequate then we probably to the degree of the analytical ability will be able to make the same calculation that a 90-foot drop is equally applicable, or we might say, no,

that is pushing it outside the ability of the analysis. This is one kind of question we will be considering.

I think I would like to declare a break now so that some of the people can get coffee. We will take about 10 minutes. I think the next item starts getting into a more specific area.

(Whereupon, a brief recess was taken.)

MR. SIESS: The meeting will reconvene.

Mr. Nussbaumer, won't you please continue.

MR. NUSSBAUMER: The next viewgraph just shows some of the highlights of the Part 71 regulation. I don't know whether or not we need to go over the regulation with this group.

Under normal accident conditions, we are interested in three main objectives: containment, adequate shielding, and subcriticality in the case of fissile material. Then there are two sets of operating requirements which we already have discussed. One is the QA/QC plan which each licensee must have in order to ship. The second are a series of operational requirements specified in the regulation of specific things that a licensee must do in terms of inspecting the package for safety before he makes a shipment.

The basic burden of showing that the regulation is met rests with the applicant. He must submit to us what we call a safety analysis report, which demonstrates that his design meets all of the pertinent requirements of Part 71.

He may prove out his design by actually testing a prototype, or in some cases, a scale model; engineering analysis, by comparing his design with other approved designs, which is essentially an engineering assessment; or any combination of the above items.

For the smaller packages, such as radiography cameras, it's usually more straightforward and in some cases cheaper just

to go ahead and test it. So in those cases the application contains a description of the test requirements and results.

But for the larger packages, such as the spent fuel casks and some of the Type B resin shipping containers, where it really is not practical to test a prototype, the assessment usually is done by engineering analysis.

MR. LAWROSKI: In your previous slide, I don't understand why heat dissipation wouldn't be one of the requirements for certain kinds of material being shipped.

MR. NUSSBAUMER: It's a very important consideration.

MR. LAWROSKI: I see that it is not included, but subcriticality is.

MR. NUSSBAUMER: The reason we did not list it is because it contributes to one of the three items here, usually to the containment and in some cases to the sheilding.

In other words, that has to be taken into account in arriving at the conclusion that you have adequate containment and shielding. That's why we did not list it, but it is a very important consideration.

MR. SIESS: What is the distinction between containment and sheilding? Is it that in containment the contents get out and in shielding it is only the activity, the radiation that gets out?

MR. NUSSBAUMER: Right.

In the case of shielding, any reduction in the effectiveness

of the shielding would produce an external radiation field around the cask, which might be unacceptable.

MR. LAWROSKI: But in the case of an Alpha, you may not have much of a shielding problem. But you considerable heat problem.

MR. NUSSBAUMER: A container problem.

Exactly.

MR. SIESS: It's only important if it ruptures. I mean, just the heat itself is of no concern.

MR. LAWROSKI: But it could be, if I were shipping a large amount.

MR. SIESS: Let's follow that up a minute.

Do you think the heat itself would be of concern?

MR. LAWROSKI: Yes.

MR. SIESS: From fire? From what?

MR. LAWROSKI: No.

The dissipation of the heat of the nuclear reaction.

MR. SIESS: His point is that heat is important if it will reduce the sheidling, lead to criticality or breach the containment. But the heat per se, if it doesn't do any of those things --

MR. NUSSBAUMER: Often, where we feel the heat will affect the internal materials of the package, we will put a heat limit on it -- you know, a so many watt limit on the contents.

MR. SIESS: The three things that are listed here are criteria, not conditions. That is, you want to contain it;

you want to keep the radiation down; you don't want it to be critical.

MR. NUSSBAUMER: Right.

These are objectives.

MR. SIESS: Actually, criticality I guess is important only if that increases the radiation or breaches the containment, too. Isn't that it?

MR. NUSSBAUMER: Yes, I think that's right, except that the regulations happen to say that it has to be subcritical at all times, so that then becomes an objective for us. But in a generic sense you are right.

MR. SIESS: He does not say that heat is not important. But mechanisms that would breach containment, increase radiation or cause criticality are not listed. These are the phenomena and not the mechanisms.

Heat they consider a mechanism that could lead to a violation of one of these criteria.

MR. NUSSBAUMER: Yes.

MR. SIESS: Is that clear. You are not concerned that the heat might set the boxcar on fire.

MR. NUSSBAUMER: (Nods negatively.)

MR. ZUDANS: But it would degrade the material and reduce the containment.

MR. NUSSBAUMER: In regard to setting the boxcar on fire, there are carrier requirements in DOT regulations which relate

aph 5

to surface temperature of packages and so on, from the standpoint of protection of operating personnel and prevention of fires.

MR. SIESS: I guess a better example would be setting an airplane on fire. I think I'd be more excited about that than a boxfire, because I do ride airplanes and don't ride boxcars.

(General laughter.)

MR. ZUDANS: It is a very subjective evaluation.

(General laughter.)

MR. SIESS: Now, your safety analysis report is addressed to a package design?

MR. NUSSBAUMER: Yes.

MR. SIESS: It is not specific to a manufacturer. That's part of what you called registration?

MR. NUSSBAUMER: Registration applies to the user. Any organization can sponsor a package designed with this for certification, whether or not they are a licensee.

MR. SIESS: Do you issue some kind of safety analysis evaluation in connection with the registration -- you know, make a finding that that user is competent and capable?

MR. NUSSBAUMER: No.

We issue a safety evaluation report in connection with certifying the design. As far as the registration goes, we check to see that the licensee has an approved QA program. But if he is licensed to handle the material that he is shipping, then we assume that he is able to comply with the operational

requirements of Part 71 in terms of checking the various .ckage features for adequacy before he ships the material.

MR. SIESS: Who approves the QA program?

MR. NUSSBAUMER: NMSS.

MR. SIESS: Does I & E have any role in this?

MR. NUSSBAUMER: I & E's role is basically inspection and enforcement.

MR. ZUDANS: So, a package could be used by many licensees for the transportation and only a single certification then would be involved?

In other words, the manufacturer of the package is the one who has to go through the process of demonstrating that the package satisfies the requirements. Once that is done, he can sell that package to anybody he wants. But that does not automatically authorize the purchaser to use that package for shipping.

MR. NUSSBAUMER: That's correct.

MR. ZUDANS: You would have to clear that purchaser to use that package for shipping?

MR. NUSSBAUMER: That's correct.

MR. ZUDANS: You would have to clear that purchaser by showing or by convincing yourself that the QA program is adequate?

MR. NUSSBAUMER: Yes.

MR. ZUDANS: That is the only qualification of the user?

MR. NUSSBAUMER: He also has to register with us and certify that he has a copy of the certificate, the application and all the related documentation on the package, so that we know he understands how the package is put together, of what it consists, its basis, and so on.

MR. SIESS: And his operation then is audited to see that he is complying?

MR. NUSSBAUMER: Yes.

MR. SHAPPERT: But he also has to have a license to handle the material.

MR. NUSSBAUMER: Oh, yes, when you are talking about licensees.

MR. ZUDANS: And you have a complete record of everybody who uses a given package?

MR. NUSSBAUMER: Yes.

MR. SIESS: Now, as I recall the studies that were made in connection with the environmental impact, there was some thought that the greatest risk was produced not by deficiencies in the package design but by deficiencies in the actual use of it. Now that really has to come under your registration in the QA program and the I&E activity, doesn't it?

MR. NUSSBAUMER: Yes.

MR. SIESS: Even if the package is a good one, if somebody does not tighten up the bolts you have a problem, or leaves out a little ring or something like that.

MR. NUSSBAUMER: That's what stimulated our putting formalized QA requirements in Part 71, that very point.

MR. SIESS: Now, is there any attention given, when you do certify package designs, to those features of the package that make it easier to do it wrong than to do it right, or vice versa?

I'll admit that you can't design a foolproof package and by that I mean something that will work no matter what kind of fool puts it together. But is that addressed in your certification or do you simply assume it is a perfect package and look at how it resists the forces?

MR. NUSSBAUMER: It's addressed, but not in any refined way. In other words, if the reviewer sees something that obviously would be difficult to handle and might lead to an improperly prepared package, we would challenge it, and we have done so. But in terms of refined analysis in this area of, I don't know what to call it, let's say human engineering, we have not really focused on that to any extent.

MR. SIESS: Well, it would be an event-free type of thing that did take into account the probability of error.

I've seen examples of this and they show very clearly where the effort should be placed in the QA program, or where the effort should be placed in the inspection program, on qualifications of people to cut down that source of error or danger.

MR. NUSSBAUMER: I think I have to say that we have

not gotten into that area in any great detail. For good or for bad, we have relied mainly on the operational control requirements that are specified in Part 71 which say that prior to first use and prior to every use there are certain findings that the licensee has to make about the package which relate to containment, shielding, thermal properties and so on. The feeling has been that if the licensee does that properly, then he will end up with a safe package. But we have not looked behind that.

MR. SIESS: I can think of an example where obviously if you left out an "O" ring, for example, from a certain package, it would not be very good. But I can think of a design where you can almost tell from the way you tightened the bolts or just by looking at it that you have left it out; and there are others where the only way you would know you have left it out is to take it apart and look.

It seems to me if that is important -- and from all I recall of the environmental impact study it seemed to be important, it seemed to be the largest source of difficulty -- there are ways to design things to make mistakes difficult or to make mistakes easy to detect. If that is an important factor, that might be an important part of the package qualification. There are a couple of "ifs" in there, of course. But, again, this overall view is one I am trying to bring out. Do you see?

MR. NUSSBAUMER: What we have focused on is requiring the licensee to have in his QA program a set of operating

procedures, detailed operating procedures which are designed to cover the use of his particular package or a particular package design. I think you raised a very good point about looking at this more from an engineering standpoint as well.

MR. SIESS: The probability that somebody will fail to follow an operating procedure I am sure is much higher than the probability that a package will fail when subjected to a 30 foot drop, for example.

That is a purely subjective judgment, but Murphy's Law bears it out.

MR. NUSSBAUMER: In the next slide we get into some of the guidance that we have available.

There are three basic areas. The regulation itself provides guidance for the applicant and the staff by showing what is required. We have a series of existing regulatory guides which are used by both applicants and staff. Finally there are guides that are under development, and we will give you some examples of these.

MR. ZUDANS: I'm trying to see if I see anything wrong in the category of guidance, or is it a regulation?

MR. NUSSBAUMER: It's actually a regulation, but in the sense of designing a package, we thought it provided guidance to the applicant as to what is required.

MR. SIESS: Let's see. Part 71 is still pretty much a what rather than a how-to, isn't it?

MR. ZUDANS: Exactly.

MR. SIESS: I hope it stays that way.

MR. NUSSBAUMER: The next slide shows some of the existing regulatory guides. The principal one as far as the review is concerned is the format guide, which outlines the kind of information in some detail that we expect to see in an application addressing all of the various points in the regulations.

The next slide shows some of the guides that we have requested our standard people to develop. They are in various stages of development.

MR. SIESS: Excuse me. It looks to me like the requested guides and the existing ones -- are they mostly related to spent fuel casks?

MR. NUSSBAUMER: Yes. I think the greatest proportion of those would be related to spent fuel, right.

MR. SIESS: I know there is one on tie-downs for truck and rail transport. I just saw a report recently of some tests that were made at Savannah River with rail mounted casks. Is that DOE?

MR. MC DONALD: Yes. That was at Research, NRC.

MR. SIESS: That was our research?

MR. MC DONALD: Yes.

It may have been a cooperative effort with DOE. Was DOE in that too, Bill? Was that a joint effort?

MR. SIESS: This green one (indicating) was for DOE.

aph 12

This is where they took three casks, two rail cars to report to DOE from Savannah River.

The question was I know is doing work here. You work with them on these things, I assume.

MR. MC DONALD: Yes.

MR. SIESS: Do you have input into it or mainly just get the output?

MR. MC DONALD: Did you want to address that, Bill?

MR. LAHS: I'm Bill Lahs in Research.

Those tests were a cooperative effort where DOE essentially provided the money for the test and NRC the quality certification from the Sandia Laboratory.

The report you see there was a DOE report. We have a similar report from Sandia which uses that data. They were tied in very closely.

MR. SIESS: Am I correct that the SANDIA report will include analyses?

MR. LAHS: Yes.

MR. SIESS: Do you have that now?

MR. LAHS: I have a draft.

MR. SIESS: Thank you.

MR. NUSSBAUMER: The next slide is a schematic of the application review process. When an application is received, it is given a pre-acceptance review for completeness.

MR. MOELLER: Excuse me. Back on the guides, who has

decided that the reg guides that you have are adequate, since all or most of the new ones or the ones underway are directed toward spent fuel?

In other words, who has done the comprehensive review of the existing guides to see if there are voids or problem areas? Do you do that?

MR. NUSSBAUMER: Our staff does that in consultation with Standards people.

MR. MOELLER: Are any of the existing guides under revision?

MR. NUSSBAUMER: I don't believe so. No.

We just finished a revision of the format guide, 7.9.

MR. SIESS: I might mention in connection with your request to ACRS for help on this and the ACRS's previous activity in these areas the following. We don't review Division 7 regulatory guides. We do review all Division 1 regulatory guides.

I mention this as an indication of our scope in the past, which I think is changing. I am not asking to review Division 7 regulatory guides or Division 4 guides or any others.

But we had at one time what we called a Regulatory Guides Subcommittee. It is not called Regulatory Activities. It did not review anything but Division 1 reg guides. That was sort of an agreement on the scope.

So I'd say, speaking for myself and maybe for some of the others, we are not that familiar with Division 7 guides. Maybe if

we are going to get into this, the first thing we ought to do is start looking at it.

We all should have a complete set of reg guides. But I file everything but Division 1 in a different place, and I won't say where.

(General laughter.)

MR. MOELLER: Well, as Dr. Siess points out, we have, of course, been branching out. For example, we have reviewed some of the reg guides on the ALARA criteria.

MR. SIESS: Wasn't that a Division 4?

MR. MOELLER: It's 8.1.

MR. SIESS: But not as a matter of course. Things do come up.

This would be the same thing here, of course.

MR. NUSSBAUMER: On the application review process, as I said, basically we do a pre-acceptance review for completeness. If it's not complete, then we return it. If it is complete, we enter it into the system. It's assigned to a project manager who, in turn, assigns the various technical elements of the review to people in the appropriate disciplines and involving those separate reviews. The project manager then pulls it all together and either recommends an approval, a denial, or a request for additional information. As the information is supplied in response to a request for information, it goes through the same process.

MR. ZUDANS: How many times would you recycle it for additional information before you say nay?

MR. NUSSBAUMER: Very few get through the first time. I would say our standard review chart has three cycles in it. I think I would say two or three for the smaller, more simpler packages, and maybe twice that for the larger packages.

MR. SHAPPERT: What is the charge? How much is it?

MR. NUSSBAUMER: The application fee?

MR. SHAPPERT: Yes. You said that your standard review charge has three cycles kind of built into it.

MR. NUSSBAUMER: I said chart.

MR. SHAPPERT: Oh, I'm sorry.

MR. SIESS: Suppose after the modal study you decided that instead of a 30 foot drop, it ought to be a 35 foot drop. Would you have to review every package that you certified and how long would that take?

MR. NUSSBAUMER: That depends on whether we decide to backfit or not.

In some cases in the past in a number of areas we decided to grandfather what already had been approved because we did not feel that for those situations there was a significant hazard.

If we decided to re-review them structurally against some new structural standard --

MR. SIESS: Suppose it was a heat standard or any other

standard?

MR. NUSSBAUMER: That's really hard to estimate because each design is different and the standard would affect it in a different way.

MR. SIESS: But do you analyze, for example, on a cask and a 30 foot drop criterion, do you determine whether or not it will meet the 30 foot drop or do you determine what drop it would meet?

Do you see the distinction?

MR. NUSSBAUMER: Yes.

Basically, we verify the applicant's analysis, which is usually in terms of demonstrating that it meets the 30 foot drop. We normally don't go beyond that in trying to determine what drop it would meet.

MR. SIESS: The same would be on, say, a temperature or burn test.

MR. NUSSBAUMER: Yes.

MR. SIESS: You would have analyzed or tested to the particular criterion. If that criterion were changed, you would start over?

MR. NUSSBAUMER: As I said, we have an option of grandfathering it or requiring the applicant to send in an additional analysis showing that it meets the new criterion; or, if it does not, making appropriate modifications.

MR. SHAPPERT: I think there might be a distinction

between the impact assessment and, say, the temperature assessment in that, as was said, I think most of the applicants analyze on the basis of a 30 foot freefall and show that the package passes it.

I think in the case of the heat transfer analysis, frequently you will find the entire analysis there which shows what temperatures are arrived at in the gasket area and in the source inside, and so forth. And they look at those temperatures.

So, I suspect, in the case of backfitting, one might look at what happens in the temperatures, and that information is there.

MR. SIESS: Now, assume you change the drop requirement and the applicant has to submit a new analysis, and he makes it by the same computer code he used before or whatever. Would that be very easy for you to check -- if he's using a pre-qualified computer analysis but is just putting in a different number? Would your job be fairly easy in that case?

MR. NUSSBAUMER: It can be a lot simpler, yes.

MR. SIESS: Suppose instead of changing the drop from 30 to 35 feet that somebody comes up and says well, it's still a 30 foot drop onto an essentially unyielding surface. I believe that's the rule now. Let's say they decide it should be a 90 foot drop, but they define the surface somewhat differently than "essentially unyielding," or the soil having a CPR of so much. This would be a different story, wouldn't it?

MR. NUSSBAUMER: I would think so.

MR. SIESS: They have to make a completely different set of assumptions and you would have to check them all out.

MR. NUSSBAUMER: It would be a whole new ballgame to me.

MR. ZUDANS: In case of the fire test, percentagewise with the packages you are going through, how many are qualified by testing and how many are by analysis?

MR. NUSSBAUMER: Do you want to make a guess on that?

MR. MC DONALD: I don't know. Maybe 10 percent or 20 percent.

Some of these packages have similar characteristics. When you do a fire test, one of the methods of demonstration would be by comparison to another test. So if you have a drum-type package with vermiculite insulation, one might use another test that was conducted with vermiculite to show that his package was satisfactory.

Normally they will not get into the testing unless there is something they need to demonstrate.

MR. NUSSBAUMER: What's the ratio in testing to that?

MR. MC DONALD: Well, I don't know. Is it maybe 20 percent?

MR. SIESS: Qualified by test?

Would this be mostly the smaller packages?

MR. MC DONALD: Yes, the smaller packages. Twenty percent probably would be a fair estimate, say one out of five.

MR. SIESS: What about the drop test?

MR. MC DONALD: You will find normally most of your small packages will be by drop test, then comparison to other packages.

MR. SIESS: And penetration, crush?

MR. MC DONALD: On the puncture, there are some analyses and some guidance that can be used for doing analysis for puncture tests. The difficulty, too, is where you come into a cumulative sort of thing. You look at the test and then it is compounded -- the free drop, the puncture, followed by the fire test in the most damaging orientation.

MR. SIESS: Is that in the Part 71 package now?

MR. MC DONALD: Yes, that's in Part 71 now.

MR. SIESS: Do you define the most damaging sequence or do they have to?

MR. MC DONALD: They would have to determine what would be most damaging.

MR. SIESS: Do they have to permute them by analysis, by test?

MR. MC DONALD: By analysis. It's much easier to do it by analysis. Then you can look at various configurations and various insults on the package. If you go into a testing program, one of the first determinations you should make is what is that most damaging insult to that package from the free drop puncture.

MR. SIESS: I know that there were one or two actual drop tests made. Are those within the framework of the present

certification or were those just experimental some years ago?

In other words, of the spent fuel casks, how many have been qualified by test?

MR. MC DONALD: Some have been qualified by model testing, by scale test, and using thumb scale testing up to the full size. The six or seven at listing designs were in current use. There have been no full-scale tests of those designs, that I am aware of. It was in the obsolete cask testing program in which they subjected large packages to full-scale drop tests, and then, of course, the Sandia-DOE test, the rail crossing test, and that sort of thing.

MR. SIESS: Do those have analyses?

MR. MC DONALD: They did do analyses, scale modeling prior to doing those.

MR. SIESS: What about the rail tests, the collision tests that they made? Did somebody make analyses there to show that the analysis would have predicted what happened?

MR. MC DONALD: There was some analysis. I believe that the analysis was rather limited and it was basically of scale model testing, of building scales and testing the scale models and then building up to the full-scale test.

There are a lot of things moving around here, and it's difficult.

MR. SIESS: I was specifically asking about the two tests, the rail crossing test and the one they ran into a bridge

pier.

Did anybody in advance or afterwards make an analysis that said that we could predict that behavior?

MR. MC DONALD: I would say basically on scale models. There was limited analysis.

MR. SIESS: The tests were made on full-sized casks and the analysis, I don't know what you mean by scale model analysis.

MR. MC DONALD: By scale modeling to predict what would happen on full scale.

MR. SIESS: But you have a full scale test.

MR. MC DONALD: Yes.

MR. SHAPPERT: There were analyses made beforehand with the idea of trying to predict what would happen. The full-scale tests then came afterwards and they saw what happened. There was pretty reasonable agreement between the analyses that were made beforehand and the results afterwards.

This is in a film that Sandia put out on the results of those tests. I don't know how detailed the analyses were, but they were based on small model tests that ran into the bridge abutment and so forth.

MR. SIESS: Do you mean there were some small model tests?

MR. SHAPPERT: Yes.

MR. SIESS: Did they use those to develop an analysis then to predict the actual full-scale?

MR. SHAPPERT: That's right.

MR. ZUDANS: Have there been any significant accidents that in a way would represent a test with casks?

MR. SIESS: Has any cask ever been dropped 30 feet?

MR. MC DONALD: Probably the most significant one was the shipment going into Oak Ridge. That took evasive action when the truck ran into a ditch. The cask left the vehicle and slid down the ditch several hundred feet. There was some abrasion to the outside of the cask, but that was about the extent of it.

The most severe test on a cask has been on a cask design that DOE has conducted, where you have deliberately run the cask into a barricade or you have run a locomotive into a cask at a railroad crossing or something of that nature.

MR. SIESS: Does anybody know where those original criteria, well, I won't say original criteria, present criteria came from?

MR. NUSSBAUMER: In Part 71?

MR. SIESS: Uh-huh.

For example, let's just take the 30 foot drop.

How long has that been around?

MR. NUSSBAUMER: There is an advisory document to the IAEA regulations which explains the rationale and basis for all of these various requirements. I don't recall at the moment just how they arrived at the 30 foot drop.

MR. SIESS: It's nine meters. I just can't believe

how 30 feet would come out of it.

MR. SHAPPERT: I might shed a little light on it.

Back in the early sixties, the requirement was a 15 foot drop. That was the predecessor. That I think was arrived at in this country by rather subjective means.

In the early years, it was finally determined that maybe that was not severe enough, and the intent was to provide some sort of theoretical basis so that analyses could be performed and not require testing all of the time. Thus the solid unyielding surface was analyzed so that all of the energy goes into (deprimation?) of the package. When this rather subjective evaluation was looked at on the 15 foot drop, there were places where the cask was actually considerably above that and could drop more than that, though not on unyielding surfaces. I think in that timeframe, in the early sixties, the 15 foot drop was then transferred to a 30 foot drop.

Subsequently, the IAEA met. It was discussed on an international basis and they made some evaluation as to how the regulations had performed up to that time, and they continued to study the problem and agreed that the 30 foot drop covered most of the accidents that they have been able to look at. They seem to be doing a pretty reasonable job and are producing packages that should meet 99-plus percent of the accidents.

MR. SIESS: So, what you really are saying is the 30 foot drop is twice the 15 foot drop.

MR. SHAPPERT: I don't know that it wasn't that subjective.

MR. SIESS: And that the essentially unyielding surface was chosen because it was very easy to define analytically.

MR. SHAPPERT: Yes.

MR. SIESS: That's helpful, too. It is much more easy to define it analytically than it is physically.

MR. SHAPPERT: That's the intent.

MR. CUNNINGHAM: There certainly is a certain amount of subjectivity to these tests and some of them may have withstood the test of time, or may not, with these accidents.

Nevertheless, this is why we started the modal study, to give a firmer technical base on what these tests should be.

MR. SIESS: To find out where they fall on the probability curve.

MR. LAWROSKI: Larry, some of these numbers may have started out with what were the kinds of conditions that they e d to run into at the fuel receiving points. Those are the kinds of heights you would get involved with.

MR. SHAPPERT: The one I recall specifically was off-loading a ship, so it is the same kind of thing there.

MR. SIESS: It's strange, because in a BWR plant it is 120 feet from the floor down to the rail car, or is in some I've seen. If I were just looking at that--because now we're talking about single failure proof cranes and all of that stuff to be sure it doesn't drop; but if I just looked at the height a cask

could sit above a hard surface and just looked at the plant, why there it is, about 120 feet.

MR. ZUDANS: The flight recorder testing requirements, were they before or after these? They are very similar, if you remember.

When we did the work on plutonium, that's how we started out reviewing what they did. They were exactly the 30 foot drop, exactly the fire, exactly everything.

MR. SIESS: And they had no basis for it whatsoever.

MR. ZUDANS: Not really, no.

MR. SHAPPERT: But flight recorders do survive aircraft accidents.

MR. ZUDANS: That's correct.

MR. SIESS: Some of them.

MR. SHAPPERT: I think most of them do.

MR. SIESS: No, their rate of survival was not good enough for a plutonium package. It was like 1 percent or a 2 percent failure. On a probablistic basis their failure rate was higher than the devil.

MR. ZUDANS: The flight recorder requirement is different. It can break apart.

MR. SIESS: It didn't kill people. It just told you why they got killed.

MR. NUSSBAUMER: Let me put up the next slide.

The next slide lists the documentation of the review.

Each case is individually docketed, with the application and the applicant's safety analysis report and all subsequent correspondence relating to that case filed in the same folder.

The review is documented both by internal technical memoranda by each of the reviewers in their own technical disciplines, giving their analysis of the assigned case. Then that information is drawn together in a safety evaluation report prepared by the staff which accompanies the certificate and copies of both the certificate and SER are placed in the public document room.

MR. ZUDANS: Do you have a computerized data base that could instantly answer questions, like who has this type of package?

MR. NUSSBAUMER: Yes, we do. We also publish periodically in the NUREG Report a listing of all the certificates that we have issued. Then we have a second report which is a computerized data base on each package, which gives a brief description of the package design, the authorized contents, and so on. The main purpose of that is to let people know in the states and other people, you know, if they have a particular model, they can go to this NUREG document and get some information about what the container looks like and what the basis was for approval.

MR. SIESS: Do you have anything like an LER, Licensing Event Report system, for shipping packages?

MR. NUSSBAUMER: Not really.

There is a requirement in Part 71 that says any licensee who discovers any deficiency in the package where it would affect its compliance with the regulation should or must report it to the NRC. But we have gotten very few reports under that requirement over the years.

MR. SIESS: Do you think that means they have not discovered deficiencies? You'd almost have to assume that, because I assume there is a penalty for not reporting them.

MR. NUSSBAUMER: Yes.

MR. ZUDANS: With respect to that data base, do I understand you correctly that what you have is a data base for a qualified package?

MR. NUSSBAUMER: That's right.

MR. ZUDANS: That contains technical information on it? Do you have a data base for older users?

MR. NUSSBAUMER: Yes.

MR. ZUDANS: A separate data base?

MR. NUSSBAUMER: Yes, a separate data base which lists all of the persons who are registered to use each particular package design.

MR. ZUDANS: Do you not track how many times the package is used?

MR. NUSSBAUMER: No.

MR. ZUDANS: I think what the Chairman suggested, LER

type of information, would be fantastic.

MR. SIESS: You know, the present criteria have served us well. There have been accidents and packages have survived.

I assume that Type A packages, because of their numbers, must be involved in an awful lot of automobile, truck, motorcycle accidents, whatever.

But that's not what we are talking about now. We are talking about Type A fissile packages.

MR. NUSSBAUMER: That's right.

MR. SIESS: But even spent fuel casks have been involved in accidents.

Do you have a good data base of accidents that have involved shipping packages?

MR. NUSSBAUMER: We have a pretty good data base on the fact that an accident occurred and a certain package was involved in it. But I think it does not go much beyond that in terms of analyzing what caused it if something did happen to a package

MR. SIESS: Are those investigated by somebody?

MR. NUSSBAUMER: Not in all cases.

Anything involving packages we regulate are investigated by our inspection and enforcement staff. But not all of the Type A or LSA incidents are investigated. If it appears that there is no real safety problem and somebody cleans up the material and so on, oftentimes it is not investigated.

MR. SIESS: When I&E inspects and finds a deficiency,

are you notified of this?

MR. NUSSBAUMER: It depends on how serious it is.

We get copies of all the inspection reports, naturally. But it is something that is quite serious, then we would expect to get a phone call.

MR. SIESS: By serious, do you mean in terms of a QA or QC breakdown?

MR. NUSSBAUMER: QA or QC material leaking out in transit, that kind of thing.

MR. SIESS: I'm still thinking back to a relation of physical design and mistakes people make. If you knew all the things they did wrong, the next question would be for you or somebody to design them out, or to design some of them out since you obviously can't design everything out.

When we say the record has been good, is that subjective or could you really back that up with numbers if somebody pinned you down?

MR. NUSSBAUMER: I think we can back it up with numbers.

Of course, what we have seen in the last year or so is, I don't know whether or not it is an increase, but it appears to be an increase in packaging defects in this LSA and Type A waste category of shipping.

MR. SIESS: What is LSA?

MR. NUSSBAUMER: Low specific activity.

MR. CUNNINGHAM: When we say the record has been good,

what we are talking about is survival of Type E packages that are involved in an accident. It does not necessarily mean the record has been good insofar as the licensees who have prepared these packages, particularly the Type A packages.

MR. ZUDANS: Has anyone from NRC, from any division, sent investigators in cases of Type B accidents?

MR. NUSSBAUMERS: Yes.

MR. ZUDANS: Just like FAA does, then. And you receive those reports. Are those reports recorded someplace? In other words, if an accident like that occurred, you would send out an inspector and he would find out something, whether it was a legitimate accident, a poor design, or what. That information would come back and in the sense of LER would assist you by reviewing the next package and maybe improving the current design. Where is that information stored? Do you get it automatically?

MR. NUSSBAUMER: We get the inspection reports, but as far as a systematic review of these kinds of occurrences, with time, that is a function at our new office of AEOD, Analysis and Event Reporting Office, will be taking on.

MR. ZUDANS: They are looking at incidents in the transportation area?

MR. NUSSBAUMER: They plan to cover the whole gamut, yes.

MR. ZUDANS: That is at (Michaelson's,) isn't it?

MR. SIESS: And they will be looking at precursors of lessons, lessons learned.

MR. NUSSBAUMER: Yes, I presume so.

MR. ZUDANS: But I suspect that is not their highest priority right now, as it should be.

MR. SIESS: Could you document the statement that there has been no exposure to the public from transportation accidents, or what exposures there have been?

MR. NUSSBAUMER: There have been exposures, I mean, just through normal transport.

MR. SIESS: I said accidents.

MR. NUSSBAUMER: Oh, accidents.

MR. SIESS: Call them abnormal exposures.

MR. NUSSBAUMER: Only to the extent that the accident is investigated and the inspector on the scene makes some kind of assessment, which in most cases they do.

MR. SIESS: Do you have those recorded in such a fashion that if somebody said how (many are laying around) as a result of transportation accidents that you could come up with some kind of number?

MR. NUSSBAUMER: It would be very difficult to come up with a number that could be substantially substantiated in any firm way.

MR. LAWROSKI: They must have some kind of data. I am reading from a footnote which says, according to the DOT,

"Of the more than 32,000 hazardous materials incident reports submitted to the DOT during the five year period 1971-1975, only 144 were noted to involve radioactive materials. Of these 144 incidents, only 36 showed any release of contents or excess radiation levels."

MR. SIESS: Keep on reading. "In most cases, releases involved minor contamination from packages of low specific activity materials, exempt materials, or Type A."

This is to be expected. There are many times more Type A LSA stuff.

MR. NUSSBAUMER: You see, it is very difficult to get from the low level contamination in excess radiation levels to exposure of people.

MR. SIESS: Everybody does it.

MR. ZUDANS: That indicates that Type A is being monitored very closely if such information as you have just mentioned is available.

I was wondering whether Type B is monitored in that same fashion and, if so, where the records are kept.

MR. NUSSBAUMER: I am saying that Type B is more closely monitored and the records are better, I believe, for Type B packages than they are for type A. First of all, we don't regulate Type A and we don't investigate all Type A package incidents.

MR. SIESS: Every once in a while I read about somebody

who lost a source out of the radiographic device that was found along the side of the road, and a guy carried it around for a couple of days. I assume those are pretty well documented.

MR. NUSSBAUMER: Yes.

MR. SIESS: That was a transportation accicent, I would have to assume, if it is by the side of the road.

MR. NUSSBAUMER: Well, not necessarily. The typical case with radiography, where the source, the so-called source pigtail, becomes detached from the cable and someone picks it up is --

MR. SIESS: I'm not talking about that. I'm talking about what I read about, findings on the side of the road. Do you classify that as a transportation accident?

It may not have been retracted at the site if it fell out of the transportation, or it may have worked its way out through the vibrations.

MR. NUSSBAUMER: We have had situations where the packages were not tied down on the truck and whole packages have fallen off. But I don't recall any where the source actually got out of the package as a result of that. But we have had cases during the operation where the source has gotten detached.

MR. SIESS: My only source of that kind of information is PNOs.

MR. MOELLER: I have a question.

I know that the NRC has contracted from time to time,

aph 34

about a year or two ago, for people to take measurements on airplanes to see how well the stacking of the packages in the plane was being done to conform with the dose limits for the passengers and so forth. Reports came out with data. Do you have similar data of surveys of radiographic sources that have been shipped?

In other words, I'm asking what percent of the packages comply to what degree with the dose limits. If they are all meeting 50 percent of the dose limit, then that would be interesting.

MR. NUSSBAUMER: We do have data in that regard, data on transportation by truck. We get a lot of data through contracts with the state people. We call them transportation surveillance contracts, where the state will monitor shipments. They will have the police with instruments stopping vehicles. They will monitor truck depots. They will monitor some of the small carriers that move radiopharmaceuticals from the airplane to the hospital, both with film badges and instruments.

My recollection is that, overall, they found the individual packages to be in compliance with the radiation levels. They found some noncompliance with people not following the so-called transportation index -- that is, putting too many packages on a truck and increasing the radiation level in the driver's compartment beyond the regulatory limit.

They also have found a lot of labelling problems.

MR. MOELLER: In 10-CFR-71, I believe, if I recall correctly, there is an exemption for physicians transporting radioactive pharmaceuticals.

MR. NUSSBAUMER: That's correct.

MR. MOELLER: What sort of doses could be involved there? To what extent does this exemption apply? What does it actually permit them to do and what do they actually do?

MR. NUSSBAUMER: The purpose of that exemption is to exempt the physician so that when he is going, say, from his office to the hospital or from one hospital to another, usually with a diagnostic quantity of material, he can just carry that in his own vehicle in a container without worrying about labelling and all the other requirements. The basis for it is the small quantities of activity involved. They are usually microcurie quantities. It also is short half-life material as well, so that if something did happen, there would be no long-term problem there.

That is a provision that I believe has been challenged in the revised Part 70. When we publish our comments, we are going to have to take another look at that area.

MR. SIESS: Does that conclude your slide presentation?

MR. NUSSBAUMER: I have a last slide here, about which we introduced discussion about what we would like the ACRS Subcommittee take a lock at.

We mentioned the technical review adequacy, adequacy of the guidance to the applicants, we discussed the regulatory guides

to some extent, and then, finally, are we documenting the review process in an adequate manner.

MR. SIESS: What does the second one mean -- reg guides?

MR. NUSSBAUMER: Yes, adequacy of the regulatory guides that both the staff and the applicants use.

MR. SIESS: You said you don't have a standard review plan?

MR. NUSSBAUMER: No, we do not.

MR. SIESS: It seems to me that a standard review plan has certain desirable features. It also has some undesirable features. It sets up a series of necessary steps which I think is a desirable thing. But unfortunately, those steps are not always sufficient, which I think is undesirable. If you adhere to it rigorously to the extent that they are not sufficient, it is not good.

When your staff makes the review, it's then guided by the regulations and the regulatory guides?

MR. NUSSBAUMER: And the standard format and content guide.

MR. SIESS: Now, the standard format, of course, that sort of was the first step in the standard review plan --

MR. NUSSBAUMER: Yes.

MR. SIESS: -- or vice versa, I'm not sure which came first.

MR. NUSSBAUMER: I think it was a first step. From that you build on that as to what's acceptable in each area that you

identify you want information on.

We had done some of that in the format guide.

MR. SIESS: Could you hand us that in a review plan?

Is there any reason you could not have a standard review plan? Would it have to be so different for so many different kinds of packages that it would become unwieldy?

MR. NUSSBAUMER: Well, it would have that problem associated with it.

I don't think we are opposed to a standard review plan, and what we have done up till now is we have used the standard format and content guide, which does a little bit more than just ask for information. It also indicates in some areas what's acceptable. We use that in conjunction with the regulatory guides as the primary guidance for the staff. But we are not opposed to having a standard review guide.

MR. SIESS: Every requirement of the regulations would then be addressed in the standard format or the regulatory guide?

MR. NUSSBAUMER: That's right.

MR. SIESS: Is there one standard format for all applications, or is it different for a drum type package or a spent fuel cask?

MR. NUSSBAUMER: No. There is one document for all designs, but it takes off on different tangents.

MR. SIESS: I was thinking, if you could have one

standard format, then you could have one standard review.

Have you thought of standard review plans?

MR. NUSSBAUMER: Yes, we have.

MR. SIESS: And you consciously decided no?

MR. NUSSBAUMER: We haven't made a decision.

MR. SIESS: You have not decided it's bad, but you haven't decided that it would be an improvement over what you are doing?

MR. NUSSBAUMER: That's correct.

MR. SIESS: The first item, adequacy of technical review, there you are thinking primarily of the actual technical steps that we are going through to determine whether it meets the particular requirements, whether it's analysis of casks, the degree of independence of your analysis, your check, the degree of thoroughness, including procedures, their procedures, required procedures for putting the package together, tying it down -- this includes all of those aspects?

MR. NUSSBAUMER: Yes.

MR. SIESS: The documentation I cannot get particularly excited about. That's just the way my mind goes. But I have never seen a dearth of documentation in this agency. But somebody else may have some concerns about documentation.

MR. MOELLER: Well, that depends again on what they mean by it.

What Dr. Zudans was mentioning, having an LER system--

MR. SIESS: I think they're talking about the licensing. The LER is an important part of it, though, an experience data base.

MR. MOELLER: Can you do good licensing if you don't have that?

MR. SIESS: No. I think it's an issue, but I don't think it's what they had in mind when they said documentation.

MR. ZUDANS: Because they do have what you would call a package qualification data base. That package qualification data base certainly could benefit by accumulating with it for each package whatever experiences are significant.

MR. SIESS: I think experience is a great teacher and we have a lot of different packages. They are all being used. They are running around the country by airplane, by rail, by truck. But there are a certain number of accidents, and your data base of events may not be much help in telling you what is good. When a package survives perfectly, you don't know just how good it is.

But, any time something goes wrong and some deficiency, even a small one shows up, that is a part of the learning process. I think that can be very valuable. You may not want to backfit it, but it may just give you some clue as to an improvement that can be made or a slight change in the criteria.

I doubt if you could ever relax criteria on the basis of that kind of experience unless it has been very extensive so

that it is statistically valid and can be reviewed on a statistical basis. But you can certainly revise criteria. You can learn from bad experience, but you don't learn an awful lot from good experience.

MR. NUSSBAUMER: I agree with that comment.

There are programs, very initial ones right now, that are being developed to accommodate that for transportation. But I think it will be some time before we have them in place.

MR. LAWROSKI: Has your branch asked the probablistic analysis systems branch to make a risk assessment, a relative risk assessment, for the things that are involved in transport, to put some numerical capabilities, risk comparison assessments, on this?

MR. SIESS: The environmental impact study did some of that stuff. It wasn't done package by package. It was not done in terms of package design so much as for the whole system, normal transport versus accident, sabotage, and so forth.

MR. NUSSBAUMER: Probablistic analysis staff was involved in the generic EIS on transportation.

MR. SIESS: But what has not been done is a reliability evaluation, qualitative reliability evaluation of specific packages, even against the framework of the criteria as they are now.

The other thing gives you the whole spectrum of loadings and evaluates packages against that. But I don't think anybody

sat down and looked for the weak spots, you know, what does the (fault tree) look like, what does the (event tree) look like, and so on. I think it will show that the human error is going to be dominant. It might be the human error of analysis, but I suspect it is the human error in just putting the packages together and loading them on the truck, and so forth.

MR. ZUDANS: I have one more question.

I am really still on the same question.

In the case of an accident with a Type B package, do I understand you correctly that someone will send an inspector from NRC to the site?

MR. NUSSBAUMER: (Nods affirmatively.)

MR. ZUDANS: The person who goes out there will write the report. Will that report eventually be sent to you?

MR. NUSSBAUMER: Yes.

MR. ZUDANS: If you get it, how do you store it? Where do you put them? Are they separate, associated with the specfic designs, or do you just file all the occurrences in a single file and that is where they reside?

MR. NUSSBAUMER: Where are you keeping them now, Chuck? I think they are put in one incident file. Is that correct?

MR. MC DONALD: On the incident reportings, DOT requirements are if there is even suspected contamination or something in the transport failed, you must make that report to the Department of Transportation. They actually compile all that

information in Sandia Laboratories. That is a data base where they are tracking all of the incident data.

MR. SIESS: I'll bet you there is a bigger correlation with the user than there is with the packager.

MR. MC DONALD: Well, the experience is, as far as the Type B package, for accidents, we have not had a loss of containment as such. Where you do have a containment, the loss from a Type B package has been where somebody left out a gasket or put in three-quarters of a gasket, or they did not take the survey of the package before they entered it into the transport system. That is the type of problem experience has shown.

When an incident happens such as you mentioned, the (Yellow Case?) spills, this was one of the branch activities. We had a contract which at this time was with Stanford Research Institute to go out and look at that incident and see what mechanics and what forces were involved in that particular incident. We did that in Colorado and we also did it in the Wichita, Kansas, accident.

The reports come in, say, as to reduced effectiveness of a package. There have been very few of those. That is a requirement of Part 71. That type of report would essentially go to the docket file of that particular package design, and, of course, members in the branch would be aware of that item. Part of the followup on that is to take corrective action to see if there is a generic problem which should be applied to other designs, or perhaps should go to a particular design.

aph 42

MR. ZUDANS: So you do have a pretty substantial feedback already.

The Sandia data base, is it strictly for A and LSA or for all of them?

MR. MC DONALD: That would be everything.

I & E also compiles information, also annually, which is sent to some congressional committees as to what has been the transportation experience for the last year.

MR. SIESS: Have you ever learned anything from that? By learn I mean found out something that inspired you or required you to take some action.

MR. MC DONALD: I think what we learned was the writing of these certificates, being very clear and making sure they communicate well with the licensee so that he has a good understanding of what he can and cannot put into the package, and the procedures.

I think there is learning involved in this.

MR. SIESS: You are saying that you are learning that procedural mistakes are more common than others, then?

MR. MC DONALD: Yes.

MR. SIESS: Procedural difficulties.

MR. ZUDANS: I have just one more question.

Does Sandia issue periodic reports analyzing that information which they put on a data base?

MR. MC DONALD: It has been -- these numbers that you

have now, I think you quoted the '71-'75, there is later information than that. That has been updated. That is older information.

MR. SIESS: Let me try to summarize something and raise some questions.

On your first slide you had a statement of what you were seeking, a review to obtain an independent evaluation of the transportation certification process to determine if the review procedures provide a reasonable assurance that regulations, that is, existing regulations, will be met. You expanded and elaborated on it in the last slide you had up on the adequacy of the technical review. I will put some emphasis on technical. Also there was the guidance to applicants and staff, which is partly procedural and partly technical in the documentation.

The ACRS I believe has the capability to do a reasonably good technical review. This is not the area of expertise that ACRS members necessarily were chosen for. But I think our experience with the plutonium package and so forth indicated that we do have a fair variety of expertise on the committee. We can ask pretty good questions, at least, and sometimes help with the answers. We do have or can obtain consultants who can supplement that particular background.

What other mechanisms have you considered for obtaining this independent evaluation that you feel you need?

One obvious one, I guess, is to go to an outside contractor, not necessarily a national lab. You could go to

other outside groups. I presume you could go to the National Research Council, as you did on the plutonium package, and I thought you got some pretty good advice from them. They asked some questions we didn't think of.

Have you considered other sources before you decided to come to the ACRS?

Were we the last resort or the first resort?

MR. CUNNINGHAM: I think I can say that there are several considerations. The ACRS certainly isn't the last resort by any means.

We first considered going to a place like Sandia or some of the other companies that are in this transportation business. The immediate problem there is the specter of a conflict of interest. We want to avoid that of course.

MR. SIESS: Well, they are shippers and they are users

MR. CUNNINGHAM: And they have contracts with others who may be shippers or users.

We did not explore this in any detail, to put out proposals for bids on contracts to see if we could arrive at this. We just essentially, based on what we knew, decided this probably was going to be a long process.

We could go to the Academy of Sciences, as we did in the plutonium package. We felt they could field a group of consultants which could look at this. But, again, we felt from a procedural standpoint that the ACRS probably could do about the

same thing that the Academy of Sciences could do and probably could do it a little quicker and with less administrative burden, certainly on us and perhaps on many others.

So we arrived at this by the process of elimination. I can't say that we went through any detailed analysis to try to get it. But we felt that our experience with the ACRS in plutonium package certification certainly was good. It was very helpful to us. We felt that the type of thing we are requesting of the ACRS has very many similarities to the plutonium package, and it is something you probably could do if your workloads and schedules would permit you to do it.

MR. SIESS: Just as a matter of procedure or protocol, I might mention that our previous involvement with the plutonium package, our previous involvement with the environmental impacts of transportation--both came as a result of a specific request from the Commission. I don't know how much we stand on ceremony. Our congressional charter says that we advise the Commission on the license applications, safety standards, research by another (state) or another action of Congress, and such other matters as the Commission may request. From a formal point of view, those were requested by the Commission.

Have you discussed this sort of thing with the Commission, not necessarily the ACRS involvement, but the need for an independent review? Was this taken to the Commission at all?

MR. CUNNINGHAM: It has not been taken up with the Commission as such.

I believe the Director of the NMSS has discussed it with the Chairman. But I don't have a feeling for the detail.

The simple answer to your question is we have not reviewed this proposal with the Commission.

MR. SIESS: I am not saying that the ACRS would refuse to do it unless requested by the Commission. But I did want to point out that it has been that way in the past.

MR. CUNNINGHAM: Yes, and certainly if the ACRS feels it needs some request from us, I'm sure we could take that up.

MR. SIESS: Now I did not say that.

MR. CUNNINGHAM: I understand that.

MR. SIESS: And I'm not sure we do need it. The ACRS has not been particularly bashful about looking at whatever it wanted to look at, whether or not the Commission asked it.

Another procedure just sort of passed through my mind, and I am not sure whether it is practical at all. This would involve an outside contractor with almost ACRS supervision of it.

It just seemed to me somewhere within the spectrum of possibilities and I do not have the slightest idea of how it would work or whether it would work. I don't have too much feel for how detailed this has to get. I am sure this means that to do this properly we not only have to review flow charts and discuss

further these interactions and LER type approaches and feedback from experience, but it has to look fairly closely at the way the criteria are satisfied, the analysis versus tests. It probably has to review reg guides much more detailed than any of us have done so far in this area. In other areas we have looked at reg guides right down to the last comma.

I think it would mean reviewing some of your SERs, some of the licensee SARs, calculations, comparisons, et cetera, at various levels. There is not an awful lot of this kind of detail that ACRS members are going to be able to do, and unless we get more consultants, our consultants may tend to get overburdened; and I am sure some of this in effect could be contracted out simply by engaging consultants to put in more detailed type. A certain amount of effort might be done by our ACRS Fellows, if we have people who are competent in a particular area and who are available. These are people who devote full-time to something.

Do you agree that the kind of things I think we should do are the kind of things you think we should do?

MR. CUNNINGHAM: Yes, sir. That sounds like it.

MR. NUSSBAUMER: I would see no difficulty with that.

MR. SIESS: Do you see the scope as I do?

MR. SHAPPERT: (Nods affirmatively.)

MR. SIESS: I do not have the slightest idea how much time Shappert, Zudans, or other consultants may be able to put

in on this. I would guess it is not an awful lot more than ACRS members can.

Zenons is involved in a number of activities already and Larry, well, I don't know about you.

MR. SHAPPERT: I am fairly well committed.

MR. SIESS: Well, we could look for consultants with that background.

MR. ZUDANS: I think that there is a first step in this process that maybe you people would have to do, assemble the package of all of the documents that you think are pertinent and then see how big that package is. We measure it in inches.

(General laughter.)

MR. SIESS: Well, there are two measures: one is inches and the other is hours per inch.

MR. ZUDANS: If it comes to measuring in feet--

MR. SIESS: Well, the total stack is going to be feet or meters. Sampling is the difficult part of this. Anything we do will have to be an audit type thing. I would think we would look at details on an audit basis and try to address what you are doing and why you are doing it and roughly how well it is working.

We'll have to have subcommittee meetings from time to time to have discussions among ourselves. I think we would probably want to get licensees in to explain what they are doing, and I think we need to do a little bit of thinking not just on what has

been done but on what might be coming up, are people designing new spent fuel casks.

MR. LAWROSKI: What are some of the standards committees and the professional societies doing relative to some of this?

I know at one time the (ACHE) would have been interested in the matter of shipping spent fuel. Some of our consultants here, and some at Dupont, were heavily involved in trying to set criteria or furnish criteria for shipping casks, spent fuel shipping casks.

But I don't know what is now going on because of the moratorium on reprocessing.

MR. SIESS: Are there any standards that have been developed by industry?

MR. MC DONALD: Yes, there are.

The American National Standards Institute has an N-14 Committee which is concerned about transportation, and there are a dozen or more standards being developed by various committees.

MR. SIESS: What kinds of standards are these?

Sometimes those simply come out as criteria. You already have criteria.

MR. MC DONALD: They have a standard -- looking at one is that water transport; they are looking at emergency response, quality assurance, ancillary features for a cask, some on packaging of biological materials.

MR. SIESS: But mostly in terms of criteria, not descriptive?

MR. MC DONALD: The one that has been most useful to us and which we have adopted is in our reg guide 7-4, some leak test requirements of satisfying containment and determining loss of material from vessels. That has been a very useful standard for the staff.

MR. SIESS: It's a test standard?

MR. MC DONALD: Yes, a test standard.

MR. SIESS: Is there a fire test standard, for example?

MR. MC DONALD: No.

MR. SIESS: Is there an ad hoc fire test standard, something that is simply developed by what you will accept?

MR. MC DONALD: No, not that I am aware of.

MR. SIESS: So everybody goes his own way and you have to evaluate it?

MR. MC DONALD: Well, by furnace test, by open fire test, or by analysis.

MR. SIESS: And time and temperature are specified in the criteria, are they not?

MR. MC DONALD: Yes, they are.

There is one other effort that is underway now. It is just starting under the ASME. It is a new group. (NUPAC) will be looking at containment vessels, criteria for shipping, shipping casks. There are several task groups under the ASME group: a

task group on materials, a task group on design and fabrication, I believe a task group on inspection, and a task group on actual design.

MR. SIESS: These would be aimed at how to meet your criteria. Your question, of course, is how do you know when they meet your criteria.

MR. MC DONALD: Well, the in-point from all this work would actually be to have the riteria for shipping casks to either be separate from the ASME code, as we know it now, or to be interjected into the existing ASME code.

MR. SIESS: It is essentially vessel design?

MR. MC DONALD: Yes, vessel design.

MR. SIESS: Containment strength design.

MR. MC DONALD: Yes, containment system is what we would be focusing on.

MR. SIESS: It would be designed to acceptance, and if you were satisfied that those design criteria would lead to an acceptable cask, then you could accept the assurance that they were designed by that procedure, except that you would have a third party inspection. Or would there be a third party inspection involved?

MR. MC DONALD: The shipping cask would be somewhat different from a utility in that you have an owner and, essentially, an owner-user. On a shipping cask you have an owner and maybe various users.

How we treat the actual owner certificate or the N-stamp, I'm not sure that is completely worked out yet. It is a little more complicated.

MR. SIESS: On something like shipping casks, you said there were two or three designs, I believe.

MR. MC DONALD: Yes.

MR. SIESS: Is there some industrial group that is active in that area now that it would be worth talking to?

MR. MC DONALD: It is rather limited in the U.S. We have the General Electric Company, the designer-owner of the cask; N-L Industries, the designer-owner of the cask made just within the last several weeks or months has gone out of business; we have the Nuclear Assurance Corporation, which had purchased designs from Nuclear Fuel Services and from N-L Industries, essentially an operator and lessor or casks; we have Trans-Nuclear, Incorporated, of New York, that has two cask designs, and these casks are of European design and are fabricated in Europe.

MR. SIESS: Is anybody designing casks now looking to the future, or are they just sitting by and waiting?

MR. MC DONALD: The designs that we see now are all steel construction. We have one in-house by the Nuclear Assurance Corporation, a new design on a new concept. Previous concepts have been the steel, uranium, or steel-lead type casks. Now they are going into an area of all steel casks. There is all steel

and some are using actually cast iron casks, meehenite, apparently rather ductile material that would be used for shipment and storage of fuel. This is the trend in Europe, to go to this type of thing.

MR. LAWROSKI: Have you had a request to review that particular cask developed in Germany?

MR. MC DONALD: We do not have now, but we may have. I understand that DOE is interested in looking at that concept for transport and storage, possibly as an alternative in the U.S.

MR. SIESS: Getting to the area of a different type of package, a drum over-pack type thing, is there one or more predominent designer-manufacturers of those?

MR. MC DONALD: It's rather limited. There is NUPAC in Takoma, Washington, Nuclear Packaging, Incorporated, which is a designer service.

MR. SIESS: What I'm getting at is if we were reviewing this, we probably would want to talk to representative manufacturers. But we don't want somebody who has just done two or three ten years ago and isn't in the business now.

MR. MC DONALD: Right. These people are actively engaged in design and fabrication of packages.

MR. LAWROSKI: Is N-14 active now?

MR. MC DONALD: That's a good question. The chairmanship of the N-14 was the American Insurance Association, and that may be changing. I don't know if it is still going to sponsor

N-14 or not.

MR. SIESS: Whic is N-14?

MR. MC DONALD: That's on transportation. That's ANS, yes.

MR. SHAPPERT: I think at the end of the year they will be phasing out that sponsorship. It may be taken over by ANS.

MS. MC DONALD: That's what I heard.

MR. SIESS: Is that a committee that AIA has been sponsoring?

MR. MC DONALD: Yes.

MR. SIESS: Are the insurance people active or interested in these things?

MR. MC DONALD: Yes, they have shown interest up to this time.

MR. SIESS: Are they providing technical guidance to people, or just oversight?

MR. MC DONALD: Well, I think basically it is a catalyst to have the industry prepare the standards and come forth with guidance.

MR. SIESS: I assume that you are represented on these standard writing committees?

MR. MC DONALD: Yes.

MR. LAWROSKI: But you have not yet had a request from abroad to look at these so-called cast iron ones?

MR. MC DONALD: No, we have no formal request. We are aware of the cask. We have seen films of the tests and have had some briefings on those particular tests. But we have no formal application for review.

MR. ZUDANS: Are these restressed cast iron?

MR. MC DONALD: Meehenite, modulars.

MR. LAWROSKI: Is it just cast iron or does it contain carbon nodules? From the tests that they have made and assurances of some of the people, it is encouraging, to say the least.

MR. MC DONALD: They dropped them at minus 40 degrees. They cool them down and have put them through some impact tests. This is in Germany.

MR. LAWROSKI: They've essentially put them through the kind of tests that you have talked about.

MR. SIESS: Those are IAEA standards. They are international standards and everybody uses the same thing. If we are right, we are all right; if we are wrong, we are all wrong.

MR. LAWROSKI: I was just wondering whether they have yet requested NRC.

MR. SIESS: They said no.

MR. LAWROSKI: He said not yet.

MR. SIESS: That's the same as no.

(General laughter.)

MR. SIESS: Well, gentlemen, the subcommittee has to decide whether we want to take on this task. I think we understand

the objective of it. The scope I think will have to be worked out. The methodology and procedures will have to be worked out.

I don't think it is a small task and we may want to involve other members of the full committee in the subcommittee activity. There are a couple I have in mind, including one member emeritus, maybe, who could contribute significantly.

Of course, if we decide that we will agree to respond to the staff's request, our action would be to make a recommendation to the full committee. The full committee either would agree or disagree, or ask questions, or it may raise enough questions that we will want to meet again to answer them. I don't know.

The question of whether we would do something without the Commission asking us or whether we would want a Commission request again is something the full committee needs to decide.

Before we try to reach a subcommittee position, there is another matter that is at least partly procedural and partly technical.

We have had a request from Mr. Richard Blackman, who is a steward from the National Treasury Employees Union, I believe. He would like to make a statement at this point. He has informed me that it does involve a matter of differing professional opinions.

There are certain formal responsibilities of ACRS in connection with that, but I'm not sure what they are and I don't care.

Sir, you may have the floor. You can use the lectern or the microphone over there if you would rather sit.

STATEMENT OF RICHARD BLACKMAN,

CHIEF STEWARD, CHAPTER 208,

NATIONAL TREASURY EMPLOYEES UNION.

MR. BLACKMAN: Mr. Chairman, esteemed Committeemen, Mr. Cunningham, my name is Richard Blackman and I am a member of the staff.

I am here before you as the Chief Steward of Chapter 208 of the National Treasury Employees Union. I represent the preponderance of the employees of the Commission.

I want to bring to your attention a matter directly impacting on safety in transportation of nuclear materials.

Over a period of many months, some of my constituents have filed formally differing professional opinions with the staff. Those served filings remain unrequited.

I commend to this body considering this issue to take into consideration those filings. I have every confidence that NMSS can provide you the documentation. I hope you will consider and prompt, if you will, that the staff will resolve those outstanding differences.

Thank you for letting me make this statement.

As an aside, I might be able to offer some illumination on the question of the 30 foot drop test you expressed concern about earlier.

That started in Alexandria, Egypt, in the late fifties. The Egyptians broke into our consulate.

MR. SIESS: In 1950.

MR. BLACKMAN: In the fifties.

MR. SIESS: It was 1950.

MR. BLACKMAN: They broke into our consulate in Alexandria and pushed a safe out the third floor window. The safe fell and upon impact all the drawers popped open. The populace scurried away with the documents.

So, Russ Waller, who was a member -- and I guess he still may well be -- from State Department on the Inter-Agency Advisory Committee on Security Equipment brought the matter onto the table. He asked for a 30 foot drop test for security containers.

I was representing the Secretary of Army, and I concurred. Bob Seidel concurred for the Atomic Energy Commission.

Richard Armstrong, of the Bureau of Standards, concurred for his agency and he indicated that he had the facilities to conduct the 30 foot drop test.

The unyielding surface there was a six inch reinforced concrete slab. Subsequent to that, then, generally, in all the specifications that we wrote, a 30 foot drop test was incorporated, and it has generally been bought by the balance of the government for the other purposes.

Thank you, Mr. Chairman.

MR. SIESS: Thank you.

I am always pleased to know the high esteem in which reinforced concrete is held -- until you put it into a container.

Mr. Cunningham, do you know about the documents that were referred to?

MR. CUNNINGHAM: No, Mr. Chairman, I don't.

I think it would be helpful if the union would identify those documents for us. I don't know specifically what he has in mind when he says they are unresolved differing professional documents.

MR. SIESS: I hope you will explore that.

I don't believe the procedures require you to turn them over to the ACRS, but I do believe the procedures permit people to bring these matters to the ACRS in various ways. You can consider this one being brought to the ACRS, and we will request the documents from you. Okay?

MR. CUNNINGHAM: Yes, sir.

We will certainly provide to the ACRS any documents it requests.

MR. SIESS: I don't think we need anything more formal than that.

MR. CUNNINGHAM: No. We will provide them.

MR. SIESS: But I think the procedures do provide that they go to the ACRS on any differing professional opinion. I am not going to stand on any ceremony about which path it goes through.

If you would send those to Ray Fraley, we would appreciate it. He will certainly examine them and we will call it to the attention of the full committee as necessary. We will see that it is taken care of.

Let's say the question is do we recommend to the full committee that the ACRS undertake this review, which I think has been described. Steve, do you have any opinions on whether or not we should do so?

MR. LAWROSKI: Well, I presume we're talking to the more narrow part of the certification, namely those that are concerned with the Type B and certain ones of the Type A, but not all of your packaging. They've asked us to restrict it to those Type A fissile and Type B, which includes spent fuel casks, and also they've asked us to restrict it to the existing criteria, a restriction which, if we take on the job I would accept initially but would not guarantee that we might not have some concerns about changing criteria.

MR. CUNNINGHAM: Certainly, Mr. Chairman, I have just asked to restrict it to the existing criteria because now and for the next several years this is probably the criteria by which we are going to judge our packages. Obviously we are working on a data base for new criteria and to the extent that the ACRS wants to become involved in that, we would welcome it.

MR. SIESS: But I would think chat any review we could make based on existing criteria which would review the

adequacy of the procedures would apply equally well to new criteria which would be developed under those procedures. But I don't think we would get so detailed that our comments would not apply to other criteria that might be developed. I hope we wouldn't.

MR. LAWROSKI: I think if we stuck with those and did not get ourselves involved with the other myriad of packages which may have to be developed for other applications, that it is appropriate for this. Certainly the matter of spent fuel is something this committee should be handling, including its transportation, which is of concern to us.

MR. SIESS: I would like to see, at least initially, what we say we will do to be fairly limited, with the understanding that what we eventually will do may not be so limited. This is, if you ask us for advice in a very specific area, you may get it in a broader area. But I would say that our obligation would be to provide it in a specific area; but if we decided to get broader, you couldn't turn us off.

MR. CUNNINGHAM: We understand that, Mr. Chairman, but we still would want the advice in the specific area.

MR. SIESS: You will take more if you have to.

MR. CUNNINGHAM: We would welcome more.

MR. SIESS: I would think that our obligation would be limited, but our scope would not.

Dade, what do you say?

MR. MOELLER: I think I agree with the general trend of your comments and those of Dr. Lawroski.

While I am mindful of the workload that we have, I'm also aware that one of our prime responsibilities is to advise the Commission, which to me includes the Commission staff, on questions where they request such advice. This is a matter of vital interest to the public, and I think if we, in interacting with the staff on this matter, can not only help assure the public as well as help assure the staff that the procedures that they develop meet the criteria, then we will be helpful and I think we should try to be.

MR. SIESS: I would like to ask the consultants who are here two questions. One is what is their advice to the subcommittee on undertaking this. The second is to what extend do they think they might be able to participate or would want to participate.

Larry?

MR. SHAPPERT: I think it is certainly an appropriate question. I also believe that you have rather described the request pretty well, as I see it, based on the review this morning.

I think it is not a trivial undertaking at all, and would probably be limited only by the depth to which the committee wished to pursue it.

I think personally that I would be available to offer whatever advice the subcommittee or committee would like to request of me, the details of which I think would depend upon what were

the results of our individual meeting, how deeply one wants to get involved.

It would be pretty easy to commit almost full-time to something like this if you wanted to do that.

MR. SIESS: Zenons?

MR. ZUDANS: Well, there is no general disagreement

I think I must say that you described it pretty well. There is only one area where I feel at least as strong as you do, maybe even stronger. I think if this review is to provide any service or some service to the public in terms of safety, I can't see how we could review just the procedures and not involve the criteria very profoundly.

MR. SIESS: Well, we will involve the criteria, but they will be the current criteria.

MR. ZUDANS: Well, a review of criteria, I meant.

MR. SIESS: I think the approach I would take is this. We should look at the procedures to see how well they work to license packages and users that will meet the current criteria.

Now if the criteria change, I think if their procedures are good, if the process is good, it will work equally well with different criteria. I think I will place that limit on it.

I don't want to get into the criteria when there is a year and a half research project now underway.

When the modal study is finished, they may come back to us and ask for advice on setting criteria.

MR. SHAPPERT: These regulations are also underway in the international arena, and those are expected to be out in several years. So there is a rather substantial effort going on as to the adequacy of those regulations.

I think I would agree that one ought to be able to separate the two.

MR. SIESS: We have to. Otherwise we can't do it, because the criteria are going to take longer than this. But I think we have to do it in such a way that it is independent of the criteria. We have to be satisfied that the packages will meet these criteria and if the procedures are good enough, that any new criteria, new packages, or whatever procedure is followed, will guarantee that those packages (be the criteria.) Otherwise we cannot undertake it.

MR. ZUDANS: I am not in disagreement that they can be separated. I am only saying that as we proceed to look deeper into the procedures, things like can you really do a qualification on a (fire) by analysis, things of that nature, and we may have to also factor the criteria in and see whether they make sense in terms of the procedures. I mean that you can do, not that you are doing.

MR. SIESS: I think we should look at the procedures with the idea that they must be adequate to meet extended criteria or quantitatively different criteria. It is conceivable to me that we might say yes, this will work for a 30 foot drop but

it would not work for a 60 foot one. Now if that is true, fine, it's all right for a 30; but we'd say look, when you get to a 60 foot drop, start over, and keep the changing criteria in mind and not come to a conclusion that yes, this procedure will work for a drop test without any qualification, if there is need for a qualification.

MR. ZUDANS: The answer to the second part of your question is yes, I could make some time available.

MR. SIESS: I mentioned outside contractors and supervising it. But there is another possibility which is this.

As we get into this, there may be certain things that we want done by, say, our consultants, that would require the use of other people in their organizations, et cetera. I am sure the ACRS budget has enough money to pay for our consultants, but this is getting a little bit beyond that.

Do you have funding if we need to do that?

MR. CUNNINGHAM: We don't have it in this budget, as such, in our $300,000. But I am sure that if you get into this, we can go to Mr. Dirks in (EDO) who will consult with the Comptroller, and I think some arrangements might be made.

MR. SIESS: We might even be able to get it. But I am just thinking that we might need funds if we might need technical help beyond what we would normally expect of consultants, or more funds than we would have budgeted for consultants.

MR. CUNNINGHAM: I suspect if we are not talking about

millions of dollars that this is something that can be arranged. I might add that if we should go the contract route, as opposed to having consultants, unless you have a better arrangements to get contracts out of the street than we do, it's a horrendous job.

MR. SIESS: I doubt if we have any better ones, and I'm not sure that we would need to. But I can just see the possibility that we might need more in-depth review than any consultant normally could do and we might want some way to contract or arrange for a larger amount of his time than we normally would have budgeted. But it may not turn out to be that big a deal.

Now the consensus is that we should recommend this to the full committee. I will do it next week. I'll try to have something in writing with Paul's help on what we understand is the scope, although I think the first step of the subcommittee is better to define the scope, both the potential greater scope and the obligatory limited scope, so that we have an objective.

On timing, I don't know what you had in mind. I visualize that a reasonable review of this, considering all the other things we have to do, is something that could be done wi year and possibly less than a year.

Is that within your framework of time?

MR. CUNNINGHAM: That's in our framework, Mr. Chairman.

MR. SIESS: If it's much more than a year, we would be dragging things out, and yet we can't do things too fast.

MR. CUNNINGHAM: Presumably, as this goes on, we will get answers to some of our questions.

MR. SIESS: Oh, there will be a constant interaction.

MR. ZUDANS: A qualifier on timing is how much time it will take you to assemble all of the documentation.

MR. SIESS: Well, they can start off with samples.

MR. ZUDANS: I would take issue with starting out with samples. I would like to see the entire documentation of their procedure assembled.

MR. SIESS: That's probably a roomful. There are 275 license applications that they processed in the last year.

MR. ZUDANS: No, I don't want those.

MR. SIESS: Do you mean for a single case?

MR. ZUDANS: They have regulatory guides, they have a standard format and content guide, and so on.

MR. CUNNINGHAM: I don't think that's a problem.

MR. SIESS: Yes, that stuff we want. In spite of what I said, I do have reg guides. But we should collect a package from you of standard format, the complete Part 71 which we mostly have, and so on. Paul will work with you to get that.

MR. CUNNINGHAM: Sure. I foresee no problem.

MR. ZUDANS: That's not a problem?

MR. CUNNINGHAM: No.

MR. SIESS: I think we might want either members or fellows, I have an idea that if we can get a fellow on this, he

can go out to your shop and go through one file completely. We can get some feel for it. Then we can pull out some of that and look at it.

MR. CUNNINGHAM: Certainly we would be happy to have anybody come out and we will make our files accessible and the people working in the various disciplines accessible.

MR. SIESS: What I'll have to do when we go to the full committee is this.

Oh, are we still an ad hoc subcommittee?

MR. BOEHNERT: No, I think we're a subcommittee.

MR. SIESS: We're a generic subcommittee. But I'm not really sure who all the members are, though I'm sure it's more than those present.

We'll look at the membership to see that we have the proper people. I'd like suggestions from anybody present, consultants, subcommittee members, and staff, as to possible consultants. We may know better as we get into this.

Steve, do you have a question?

MR. LAWROSKI: Yes.

Beyond the spent fuel matter, I have another question.

MR. SIESS: We are not limited to spent fuel, you know.

MR. LAWROSKI: I know. This is what I'm getting into.

With respect to something like the drop test, which is 30 feet or whatever, is that something that you think in terms of only applying to some of the things to be shipped as opposed,

for example, to the one that comes to mind here, which is contaminated reactor components. The shipping package for that I don't think has to be the same kind that you would insist upon for spent fuel. The criteria should be quite different.

MR. CUNNINGHAM: Well, if it is a Type B quantity in that it contains a certain amount, a curie amount, of radioactivity, then it has to meet the Type B packaging requirements. To meet Type B packaging requirements, the package has to demonstrate that it will pass these test criteria.

MR. LAWROSKI: What are you talking about for a contaminated reactor component? A control rod driver assembly being shipped back?

MR. CUNNINGHAM: It could be.

MR. LAWROSKI: Do they have casks for that?

MR. MC DONALD: They might ship them in a spent fuel cask.

I think the point is well taken. It's a matter where if you are shipping that type of material, it is much easier to demonstrate that, say, you are just going to contain that mechanism in a cask; whereas if it is a fuel assembly or something, you are also looking more at containment. Where it is an irradiated component, that containment is not of particular significance. But it is important to keep that seal around the material and that is easier to do than to demonstrate containment.

MR. SIESS: But you would still want it to list--whatever it had to do, it would be a 30 foot drop, still.

MR. MC DONALD: It would be a 30 foot drop, yes.

MR. LAWROSKI: Suppose it was a piece of a pressure vessel, you know, that induced activity, that had a lot of curies.

MR. SIESS: If a 30 foot drop wouldn't make any difference, it wouldn't make any difference. If it would make a difference, it has to be there.

MR. SHAPPERT: That might be considered a special form, if it's a piece of metal which is not dispersible.

MR. SIESS: The 30 foot drop is still a criterion. Whatever you are shipping should not present a danger to the public after it goes over a 30 foot drop. The criterion is that whatever you are shipping that has radioactivity connected with it should not present a hazard to the public if it or its package or the vehicle undergoes a 30 foot drop, or a fire, or something else. If you can look at it and say that it wouldn't, then that's it.

MR. ZUDANS: But there is a difference in treatment. In one case you are not really concerned about containment only, but the shielding. But the integrity of the shielding has to be demonstrated, so you may need that.

MR. SIESS: That's right. Everything isn't important in every case, but you still have the criteria and the criteria are dependent on the form.

There is to be no damage to the public -- that is really the only criterion.

MR. ZUDANS: Now you are going to the next level. Now you would have to take the criteria and make it subject to this ultimate criterion. That's too far.

MR. SIESS: I don't have any problem separating those things out. I can see a completely different approach to it, but that's part of the procedures we are going to look at.

Who would you recommend for Chairman of this committee?

MR. ZUDANS: We have a good Chairman already.

(General laughter.)

MR. LAWROSKI: I would recommend the one that we have now.

MR. SIESS: This meeting is adjourned.

Thank you all, gentlemen.

(Whereupon, at 12:25, the meeting was adjourned, to reconvene upon the call of the Chair.)

- - -

NUCLEAR REGULATORY COMMISSION

This is to certify that the attached proceedings before the

ACRS/Subcommittee on Transportation of Radioactive Materials

in the matter of: Review of the Transportation Certification Process for Package Design

Date of Proceeding: October 29, 1980

Docket Number: _____

Place of Proceeding: Washington, D. C.

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

Mary C. Simons

Official Reporter (Typed)

Mary C Simons

Official Reporter (Signature)

NUCLEAR REGULATORY COMMISSION

This is to certify that the attached proceedings before the

ACRS/Subcommittee on Transportation of Radioactive Materials

in the matter of: Review of the Transportation CertificationProcess for package designs

Date of Proceeding: October 29, 1980

Docket Numbe :

Place of Proceeding: Washington, D. C.

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

Anne Horowitz

Official Reporter (Typed)

Anne Horowitz

Official Reporter (Signature)

I. Purpose of Requested Review

- To obtain an independent evaluation of the transportation certification process to determine if the review procedures provide reasonable assurance that regulations will be met.

II. Activities of the Transportation Certification Branch

A. Package Certification - Review of Type B and Fissile Type A package designs against 10 CFR 71 requirements

B. Improve/Maintain Review Base

- Calculational methods/computer programs - develop/maintain
- Studies to resolve specific and generic problems
- Modal Study

C. FY 81 Resources

- Staff: 17 Staff-Yrs
- Contractual support: 305 K$

II. Activities of the Transportation Certification Branch (continued)

A. Package Certification (continued)

- Approximately 275 package designs are presently certified as meeting the requirements of 10 CFR 71
- Approximately 190 package certification actions each year (including: new approvals, amendments, renewals, and user registry)
- Package designs vary from weights of less than 50 pounds and several inches in length for radiographic devices to over 85 tons for spent fuel rail casks that are in excess of 17 feet in length and 8 feet in diameter

II. Activities of the Transportation Certification Branch (continued)

A. Package Certification (continued)

Transportation Package Review Yearly Caseload by Category

	Annual	Casework Distribution Data	
	Final Actions	Review Time	Final Actions Per Category
Spent fuel, plutonium air transport and HLW	2	22%	1%
Normal form Type B (e.g., byproduct material, contaminated reactor components)	5	9%	3%
Special form Type B, fissile Type A, and amendments to: spent fuel, plutonium air transport and HLW	22	14%	12%
Amendments to: normal and special form Type B, and fissile Type A	61	15%	32%
Registration and renewals	100	40%	52%
TOTAL	190	100%	100%

II. Activities of the Transportation Certification Branch (continued)

B. Improve/Maintain Regulatory Base

Calculational Methods/Computer Programs

- SCALE (A Modular Code System for Performing Standardized Computer Analyses for Licensing Evaluation, NUREG/CR-0200). A driver package which interfaces a number of well-established computer programs in a pre-established sequence to perform a specific type of criticality, shielding, and heat transfer analysis. Some of these programs are:
  - NITAWL
  - XSDRNPM
  - ORIGEN
  - MORSE
  - KENO
  - HEATING

II. Activities of the Transportation Certification Branch (continued)

B. Improve/Maintain Regulatory Base (continued)

Technical Assistance Contract

Provides means to obtain the following services:

- Full-scale or model testing of packages, components, or materials
- Engineering analyses and expert consultation in areas of stress analysis, pressure vessel technology, material properties and thermal analysis
- Short term, limited scope, technical studies related to transportation safety

II. Activities of the Transportation Certification Branch (continued)

B. Improve/Maintain Regulatory Base (continued)

Examples of Work Conducted Under Technical Assistance Contract

- Study of recent transportation accidents in Colorado and Kansas involving spillage of yellowcake
- Study of potential crush loads in transportation accidents
- Develop fracture toughness criteria for containment vessel materials
- Study of LSA shipment safety and identify possible improvements
- Engineering analysis and consultation in connection with review of NFS-4 cask

II. Activities of the Transportation Certification Branch (continued)

B. Improve/Maintain Regulatory Base (continued)

Modal Study of Transport Safety

- Develop Accident Tests for Each mode of transport
- Develop post-test acceptance standards based upon:
  - Degree of package integrity that is reasonable and practicable to achieve
  - Extent of potential consequences
  - Additional package and shipping costs
  - Degree of additional safety provided
- Determine type of shipments to which the tests and acceptance standards should be applied
- Identify and evaluate operational controls which could contribute to transport safety

III. Brief Summary of 10 CFR 71 Requirements

Package performance requirements for normal and accident condition

- Containment
- Shielding (applies to accident environment only)
- Subcriticality

Operating requirements

- QA/QC
- Operational controls

IV. Information Required of Applicants to Demonstrate Compliance with 10 CFR 71

Safety analysis report as required by 10 CFR 71 Subpart B - Demonstrating compliance with requirements either by:

- Test,
- Analysis,
- Comparison with approved designs, or
- Any combination of above.

V. GUIDANCE

A. 10 CFR 71

B. EXISTING REGULATORY GUIDES

C. REQUESTED GUIDES

V. GUIDANCE (CONTINUED)

B. EXISTING REGULATORY GUIDES (CONTINUED)

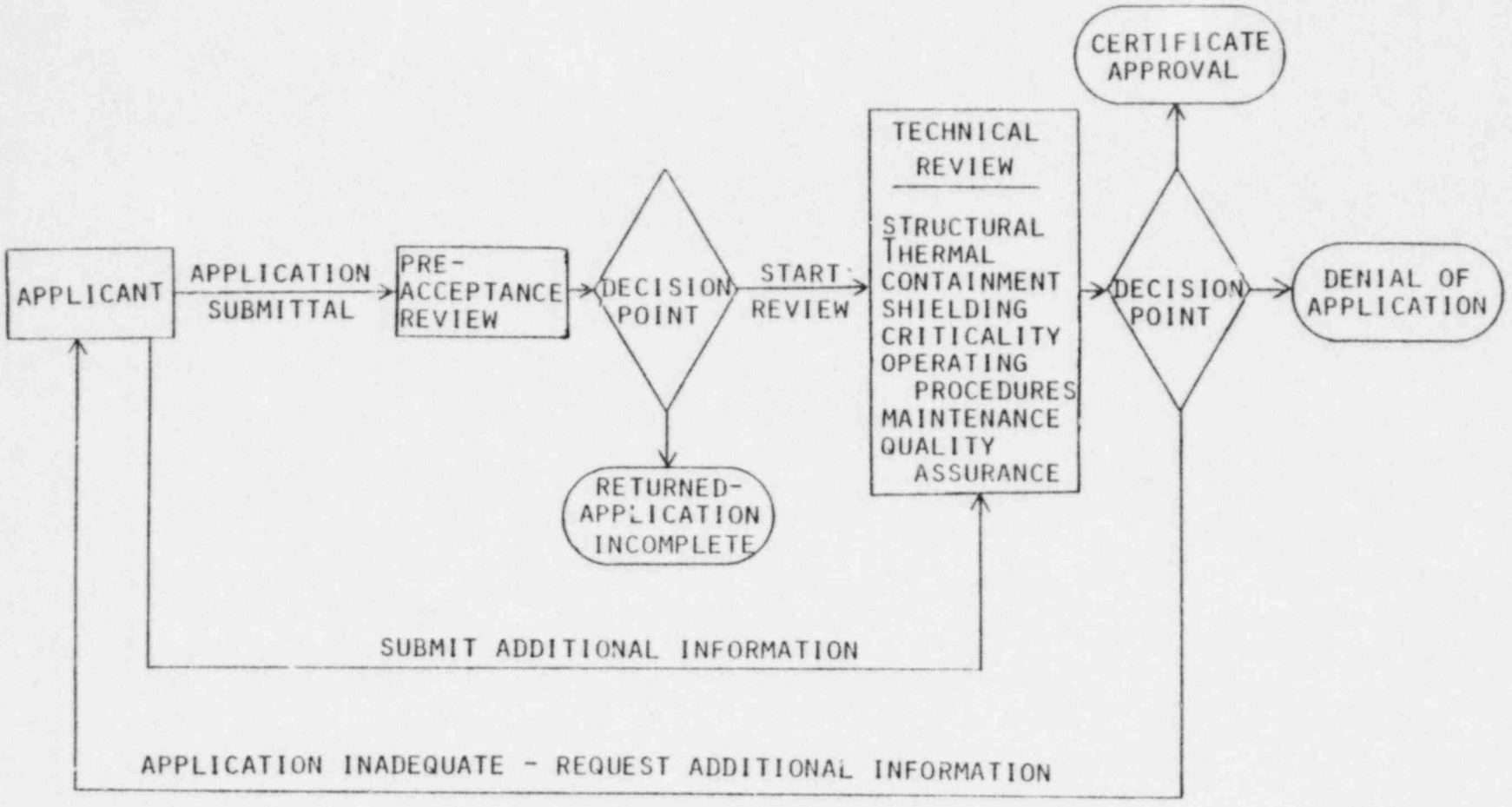
- 7.4 LEAKAGE TESTING OF PACKAGES
- 7.6 STRESS ALLOWABLES FOR SPENT FUEL CONTAINMENT VESSELS
- 7.8 LOAD COMBINATIONS FOR SPENT FUEL CASK STRUCTURAL ANALYSIS
- 7.9 FORMAT GUIDE FOR PACKAGE CERTIFICATE APPLICATIONS

V. GUIDANCE (CONTINUED)

C. REQUESTED GUIDES

- ASME PRESSURE VESSEL CODE FOR SPENT FUEL CASK CONTAINMENT VESSELS
- FRACTURE TOUGHNESS CRITERIA FOR FERRITIC STEELS
- CRITERIA FOR USE OF NODULAR CAST IRON
- SHOCK AND VIBRATION REQUIREMENTS - HIGHWAY/RAIL
- ACCEPTABLE METHODS OF ANALYSIS
- WELDING AND FABRICATION
- ANCILLARY FEATURES OF SPENT FUEL CASKS
- TIE-DOWNS FOR TRUCK AND RAIL TRANSPORT
- QUALITY ASSURANCE PROGRAM GUIDES

VI. Application Review Process



VII. Documentation of Review

- Each case individually docketed with application and applicant's safety analysis report (SAR)
- Internal technical memoranda by reviewers in each technical discipline
- Requests by NRC for additional information of applicant
- Revisions/Addenda to SAR
- Final NRC action
- Safety Evaluation Report (SER) by NRC staff to support licensing decision

VIII. Scope of Requested ACRS Subcommittee Technical Review

- Adequacy of technical review to provide assurance that existing regulations are met
- Adequacy of guidance to applicants and staff
- Adequacy of documentation

PART 71

PACKAGING OF RADIOACTIVE MATERIAL FOR TRANSPORT AND TRANSPORTATION OF RADIOACTIVE MATERIAL UNDER CERTAIN CONDITIONS *

AUTHORITY: The provisions of this Part 71 issued under secs. 53, 63, 81, 161, 182, 183, 68 Stat. 930, 933, 935, 948, 953, 954, as amended; 42 U.S.C. 2073, 2093, 2111, 2201, 2232, 2233, unless otherwise noted. For the purposes of sec. 223, 68 Stat. 958, as amended; 42 U.S.C. 2273, §§71.61—71.63 issued under sec. 1610, 68 Stat. 950, as amended; 42 U.S.C. 2201(o). Secs. 202, 206, Pub. L. 93-438, 88 Stat. 1244, 1246; 42 U.S.C. 5842, 5846.

*Amended 37 FR 3985.

Subpart A—General Provisions

§71.1 Purpose.

44 FR 63083

(a) This part establishes requirements for transportation and for preparation for shipment of licensed material and prescribes procedures and standards for approval by the Nuclear Regulatory Commission of packaging and shipping procedures for licensed materials and prescribes certain requirements governing such packaging and shipping.

(b) The packaging and transport of these materials are also subject to other parts of this chapter and to the regulations of other agencies having jurisdiction over means of transport. The requirements of this part are in addition to, and not in substitution for, other requirements.

§71.2 Scope.

37 FR 3985

The regulations in this part apply to each person authorized by specific license issued by the Commission to receive, possess, use or transfer licensed materials, if he delivers such materials to a carrier for transport or transports such material outside the confines of his plant or other place of use.

§71.3 Requirement for license.

No licensee subject to the regulations in this part shall (a) deliver any licensed materials to a carrier for transport or (b) transport licensed material except as authorized in a general license or specific license issued by the Commission, or as exempted in this part.

§71.4 Definitions.

As used in this part:

(a) "Carrier" means any person engaged in the transportation of passengers or property, as common, contract, or private carrier, or freight forwarder, as those terms are used in the Interstate Commerce Act, as amended, or the U.S. Post Office;

(b) "Close reflection by water" means immediate contact by water of sufficient thickness to reflect a maximum number of neutrons;

(c) "Containment vessel" means the receptacle on which principal reliance is placed to retain the radioactive material during transport;

(d) "Fissile classification" means classification of a package or shipment of fissile materials according to the controls needed to provide nuclear criticality safety during transportation as follows:

(1) Fissile Class I: Packages which may be transported in unlimited numbers and in any arrangement, and which require no nuclear criticality safety controls during transportation. For purposes of nuclear criticality safety control, a transportation index is not assigned to Fissile Class I packages. However, the external radiation levels may require a transport index number.

(2) Fissile Class II: Packages which may be transported together in any arrangement but in numbers which do not exceed an aggregate transport index of 50. For purposes of nuclear criticality safety control, individual packages may have a transport index of not less than 0.1 and not more than 10. However, the external radiation levels may require a higher transport index number but not to exceed 10. Such shipments require no nuclear criticality safety control by the shipper during transportation.

(3) Fissile Class III: Shipments of packages which do not meet the requirements of Fissile Classes I and II and which are controlled in transportation by special arrangements between the shipper and the carrier to provide nuclear criticality safety.

(e) "Fissile materials" means uranium-233, uranium-235, plutonium-238, plutonium-239, and plutonium-241;

(f) "Large quantity" means a quantity of radioactive material, the aggregate radioactivity of which exceeds any one of the following:

(1) For transport groups as defined in paragraph (p) of this section:

(i) Group I or II radionuclides: 20 curies;

(ii) Group III or IV radionuclides: 200 curies;

(iii) Group V radionuclides: 5,000 curies;

(iv) Group VI or VII radionuclides: 50,000 curies; and

(2) For special form material as defined in paragraph (o) of this section: 5,000 curies.

(g) "Low specific activity material" means any of the following:

(1) Uranium or thorium ores and physical or chemical concentrates of those ores;

(2) Unirradiated natural or depleted uranium or unirradiated natural thorium;

(3) Tritium oxide in aqueous solutions provided the concentration does not exceed 5.0 millicuries per milliliter;

(4) Material in which the activity is essentially uniformly distributed and in which the estimated average concentration per gram of contents does not exceed:

(i) 0.0001 millicurie of Group I radionuclides; or

(ii) 0.005 millicurie of Group II radionuclides; or

(iii) 0.3 millicurie of Groups III or IV radionuclides.

NOTE: This includes but is not limited to, materials of low radioactivity concentration such as residues or solutions from chemical processing; wastes such as building rubble, metal, wood, and fabric scrap, glassware, paper, and cardboard; solid or liquid plant waste, sludges, and ashes.

(5) Objects of nonradioactive material externally contaminated with radioactive material, provided that the radioactive material is not readily dispersible and the surface contamination, when averaged over an area of 1 square meter does not exceed 0.0001 millicurie (220,000 disintegrations per minute) per square centimeter of Group I radionuclides or 0.001 millicurie (2,200,000 disintegrations per minute) per square centimeter of other radionuclides.

(h) "Maximum normal operating pressure" means the maximum gauge pressure which is expected to develop in the containment vessel under the normal conditions of transport specified in Appendix A of this part;

(i) "Moderator" means a material used to reduce, by scattering collisions and without appreciable capture, the kinetic energy of neutrons;

(j) "Optimum interspersed hydrogenous moderation" means the occurrence of hydrogenous material between containment vessels to such an extent that the maximum nuclear reactivity results;

(k) "Package" means packaging and its radioactive contents;

(l) "Packaging" means one or more receptacles and wrappers and their contents excluding fissile material and other radioactive material but including absorbent material, spacing structures, thermal insulation, radiation shielding, devices for cooling and for absorbing mechanical shock, external fittings, neutron moderators, nonfissile neutron absorbers, and other supplementary equipment;

(m) "Primary coolant" means a gas, liquid, or solid, or combination of them, in contact with the radioactive material or, if the material is in special form, in contact with its capsule, and used to remove decay heat;

(n) "Sample package" means a package which is fabricated, packed, and closed to fairly represent the proposed package as it would be presented for transport, simulating the material to be transported, as to weight and physical and chemical form;

(o) "Special form" means any of the following physical forms of licensed material of any transport group:

(1) The material is in solid form having no dimension less than 0.5 millimeter or at least one dimension greater than five millimeters; does not melt, sublime, or ignite in air at a temperature of 1,000°F.; will not shatter or crumble if subjected to the percussion test described in Appendix D of this part; and is not dissolved or converted into dispersible form to the extent of more than 0.005 percent by weight by immersion for 1 week in water at 68°F. or in air at 86°F.; or

(2) The material is securely contained in a capsule having no dimension less than 0.5 millimeter or at least one dimension greater than five millimeters, which will retain its contents if subjected to the tests prescribed in Appendix D of this part; and which is constructed of materials which do not melt, sublime, or ignite in

air at 1,475°F., and do not dissolve or convert into dispersible form to the extent of more than 0.005 percent by weight by immersion for 1 week in water at 68°F. or in air at 86°F.

(p) "Transport group" means any one of seven groups into which radionuclides in normal form are classified, according to their toxicity and their relative potential hazard in transport, in Appendix C of this part.

(1) Any radionuclide not specifically listed in one of the groups in Appendix C shall be assigned to one of the Groups in accordance with the following table:

Radionuclide	Radioactive half-life: 0 to 1000 days	1000 days to 10^4 years	Over 10^4 years
Atomic number 1-81	Group III	Group II	Group III
Atomic number 82 and over	Group I	Group I	Group III

(2) For mixtures of radionuclides the following shall apply:

(i) If the identity and respective activity of each radionuclide are known, the permissible activity of each radionuclide shall be such that the sum, for all groups present, of the ratio between the total activity for each group to the permissible activity for each group will not be greater than unity.

(ii) If the groups of the radionuclides are known but the amount in each group cannot be reasonably determined, the mixture shall be assigned to the most restrictive group present.

(iii) If the identity of all or some of the radionuclides cannot be reasonably determined, each of those unidentified radionuclides shall be considered as belonging to the most restrictive group which cannot be positively excluded.

(iv) Mixtures consisting of a single radioactive decay chain where the radionuclides are in the naturally occurring proportions shall be considered as consisting of a single radionuclide. The group and activity shall be that of the first member present in the chain, except that if a radionuclide "x" has a half-life longer than that of that first member and an activity greater than that of any other member, including the first, at any time during transportation, the transport group of the nuclide "x" and the activity of the mixture shall be the maximum activity of that nuclide "x" during transportation.

Terms defined in Parts 20, 30 to 35 inclusive, and 70 of this chapter have the same meaning when used in this part.

(q) "Type A quantity" and "type B quantity" means a quantity of radioactive material the aggregate radioactivity of which does not exceed that specified in the following table:

Transport groups see § 71.4(p)	Type A quantity (in curies)	Type B quantity (in curies)
I	0.001	20
II	0.05	20
III	3	200
IV	20	200
V	20	5,000
VI and VII	1,000	50,000
Special form	[1]20	5,000

[1] Except that for californium-252, the limit is 2 Ci.

§ 71.5 Transportation of licensed material.

(a) No licensee shall transport any licensed material outside of the confines of his plant or other place of use, or deliver any licensed material to a carrier for transport, unless the licensee complies with the applicable requirements of the regulations appropriate to the mode of transport, of the Department of Transportation in 49 CFR Parts 170–189, and the U.S. Postal Service in the Postal Service Manual (Domestic Mail Manual), section 124.3, incorporated by reference. 39 CFR 111.1 (1974), insofar as such regulations relate to the packaging of byproduct, source, or special nuclear material, marking and labeling of the packages, loading and storage of packages, placarding of the transportation vehicle, monitoring requirements and accident reporting.

(b) When Department of Transportation regulations are not applicable to shipments of licensed material by rail, highway, or water because the shipment or the transportation of the shipment is not in interstate or foreign commerce, or to shipments of licensed material by air because the shipment is not transported in civil aircraft, the licensee shall conform to the standards and requirements of the Department of Transportation specified in paragraph (a) of this section, to the same extent as if the shipment or transportation were in interstate or foreign commerce or in civil aircraft. Any requests for modifications, waivers, or exemptions from those requirements, and any notifications referred to in those requirements shall be filed with or made to the Nuclear Regulatory Commission.

(c) Paragraph (a) of this section shall not apply to the transportation of licensed material, or to the delivery of licensed material to a carrier for transport, where such transportation is subject to the regulations of the U.S. Postal Service.

EXEMPTIONS

***§ 71.6 Specific exemptions.**

On application of any interested person or on its own initiative, the Commission may grant such exemptions from the requirements of the regulations in this part as it determines are authorized by law and will not endanger life or property or the common defense and security.

§ 71.7 Exemption for no more than type A quantities.†

(a) A licensee is exempt from all the requirements of this part to the extent that he delivers to a carrier for transport packages each of which contains no licensed material having a specific activity in excess of 0.002 microcurie/gram.

(b) Except for the requirements specified in § 71.5, a licensee is exempt from all the requirements of this part to the extent he delivers to a carrier for transport packages subject to the regulations of the Department of Transportation in 49 CFR Parts 170–189 or the U.S. Postal Service in the Postal Service Manual (Domestic Mail

*Redesignated by 38 FR 10437.
†Amended 38 FR 10437.

Manual), section 124.3, incorporated by reference, 39 CFR 111.1 (1974), each of which contains no more than a Type A quantity of radioactive material, as defined in § 71.4(q), which may include one of the following: 45 FR 20462

(1) Not more than 15 grams of fissile material; or

(2) Thorium, or uranium containing not more than 0.72 percent by weight of fissile material; or

(3) Uranium compounds, other than metal (e.g., UF_4, UF_6, or uranium oxide in bulk form, not pelletted or fabricated into shapes) or aqueous[1] solutions of uranium, in which the total amount of uranium-233 and plutonium present does not exceed 1.0‡ percent by weight of the uranium-235 content, and the total fissile content does not exceed 1.00‡ percent by weight of the total uranium content; or

(4) Homogenous hydrogenous[2] solutions or mixtures containing not more than: 38 FR 10437

(i) 500 grams of any fissile material, provided the atomic ratio of hydrogen to fissile material is greater than 7,600; or

(ii) 800 grams of uranium-235; *Provided*, That the atomic ratio of hydrogen to fissile material is greater than 5,200, and the content of other fissile material is not more than 1 percent by weight of the total uranium-235 content; or 38 FR 10437

(iii) 500 grams of uranium-233 and uranium-235; *Provided*, That the atomic ratio of hydrogen to fissile material is greater than 5,200, and the content of plutonium is not more than 1 percent by weight of the total uranium-233 and uranium-235 content; or

(5) Less than 350 grams of fissile material: *Provided*, That there is not more than 5 grams of fissile material in any cubic foot within the package.

*§ 71.8 Exemption of physicians. 37 FR 3985

Physicians, as defined in § 35.3(b) of this chapter, are exempt from the regulations in this part to the extent that they transport licensed material for use in the practice of medicine.

[1] This applies to light water and does not apply to heavy water.

[2] This applies to light hydrogen and does not apply to heavy hydrogen (i.e., deuterium or tritium).

‡Amended 38 FR 16347.

*Redesignated by 38 FR 10437.

§ 71.9 Exemption for fissile material.

A licensee is exempt from requirements in §§ 71.33, 71.35(b), 71.36(b), 71.37, 71.38, 71.39, and 71.40 to the extent that he delivers to a carrier for transport packages each of which contains one of the following: 38 FR 10437

(a) Not more than 15 grams of fissile material; or

(b) Thorium, or uranium containing not more than 0.72 percent by weight of fissile material; or

(c) Uranium compounds, other than metal (e.g., UF_4, UF_6, or uranium oxide in bulk form, not pelletted or fabricated into shapes) or aqueous[1] solutions of uranium, in which the total amount of uranium-233 and plutonium present does not exceed 1.0‡ percent by weight of the uranium-235 content, and the total fissile content does not exceed 1.00‡ percent by weight of the total uranium content; or 31 FR 9941

(d) Homogenous hydrogenous[2] solutions or mixtures containing not more than:

(1) 500 grams of any fissile material, provided the atomic ratio of hydrogen to fissile material is greater than 7,600; or

(2) 800 grams of uranium-235: *Provided*, That the atomic ratio of hydrogen to fissile material is greater than 5,200, and the content of other fissile material is not more than 1 percent by weight of the total uranium-235 content; or 38 FR 10437

(3) 500 grams of uranium-233 and uranium-235: *Provided*, That the atomic ratio of hydrogen to fissile material is greater than 5,200, and the content of plutonium is not more than 1 percent by weight of the total uranium-233 and uranium-235 content; or

(e) Less than 350 grams of fissile material: *Provided*, That there is not more than 5 grams of fissile material in any cubic foot within the package. 31 FR 9941

§ 71.10 Limited exemption for shipment of type B quantities of radioactive material.

A person delivering a type B quantity of radioactive material, as defined in § 71.4(q), to a carrier for transport in accordance with the provisions of a special permit, which has been issued by the Department of Transportation and is in effect on June 30, 1973, is exempt from the requirements in this part with respect to such shipments. The exemption granted by this section shall terminate on December 31, 1973, or on the date on [illegible]ch the DOT special permit expires, whichever is later, except as to activities described both in the special permit and in an application for a license which the person has, prior to the termination date of the exemption, filed with the Commission. If the person has filed such an application, the exemption granted by this section shall continue until the application has been finally determined by the Commission. 38 FR 10437

GENERAL LICENSES**

*§ 71.11 General license for shipment of licensed material.

A general license is hereby issued, to persons holding specific licenses issued pursuant to this chapter, to deliver licensed material to a carrier for transport, without complying with the package standards of Subpart C of this part, when either:

(a) The material is shipped as a Fissile Class III shipment with the following limitations on its contents:

(1) No single package contains more than a type A quantity of radioactive material, as defined in § 71.4(q), and 38 FR 10437

(2) The fissile material contents of the shipment do not exceed:

(i) 500 grams of uranium-235; or

(ii) 300 grams total of uranium-233, plutonium-238, plutonium-239, and plutonium-241; or

(iii) Any combination of uranium-233, uranium-235, and plutonium in such quantities that the sum of the ratios of the quantity of each of them to the quantity specified in subdivisions (i) and (ii) of this subparagraph does not exceed unity; or

(iv) 2500 grams of plutonium-238, plutonium-239, and plutonium-241 encapsulated as plutonium-beryllium neutron sources, with no one package containing in excess of 400 grams of plutonium-238, plutonium-239, and plutonium-241; or

(b) The material is shipped as Fissile Class II packages with the following limitations on the contents of each package; 31 FR 9941

(1) No single package contains more than a type A quantity of radioactive material, as defined in § 71.4(q); and 38 FR 10437

**Added 38 FR 10437.

(2) No package contains fissile material in excess of the amounts specified in the following table, and each package is labeled with the corresponding transport index:

Maximum quantity of fissile material in a single package				Corresponding transport index
U-235 (grams)	U-233 (grams)	Plutonium (grams)	Plutonium as Pu-Be neutron sources (grams)	
35-40	27-30	23-25	320-400	10
30-35	24-27	21-23	240-320	8
25-30	21-24	19-21	160-240	6
20-25	18-21	17-19	80-160	4
15-20	15-18	15-17	15-80	2

NOTE. Combinations of fissile materials are authorized. For combinations of fissile materials, the transport index is the sum of the individual corresponding transport indexes. The otal transport index shall not exceed 10.

§ 71.12. General license for shipment in DOT specification containers, in packages approved for use by another person, and in packages approved by a foreign national competent authority.

A general license is hereby issued to persons holding a general or specific license issued pursuant to this chapter, to deliver licensed material to a carrier for transport, provided the licensee has a quality assurance program, whose description has been submitted to and approved by the Commission as satisfying the provisions of § 71.51.

(a) In a specification container for fissile material as specified in §173.396(b) or (c) or for a type B quantity of radioactive material as specified in §173.394(b) or §173.395(b), or for a large quantity of radioactive material as specified in §173.394(c) or §173.395(c) of the regulations of the Department of Transportation, 49 CFR part 173; or

(b) In a package for which a license, certificate of compliance or other approval has been issued by the Commission's Director of Nuclear Material Safety and Safeguards or the Atomic Energy Commission, provided that:

(1) The person using a package pursuant to the general license provided by this paragraph:

(i) Has a copy of the specific license, certificate of compliance, or other approval authorizing use of the package and all documents referred to in the license, certificate, or other approval, as applicable;

(ii) Complies with the terms and conditions of the license, certificate, or other approval, as applicable, and the applicable requirements of this part; and

(iii) Prior to first use of the package submits in writing to the Director of Nuclear Material Safety and Safeguards or the Atomic Energy Commission, his name and license number, the name and license or certificate number of the person to whom the package approval has been issued, and the package identification number specified in the package approval.

(2) The package approval authorizes use of the package under general license provided in this paragraph.

(c) In a package which meets the pertinent requirements in the 1967 regulations of the International Atomic Energy Agency and the use of which has been approved in a foreign national competent authority certificate which has been revalidated by the Department of Transportation, *Provided*, That the person using a package pursuant to the general license provided by this paragraph;

(1) Has and complies with the applicable certificate, the revalidation, and the documents referenced in the certificate relative to the use and maintenance of the packaging, and the actions to be taken prior to shipment; and

(2) Complies with the applicable requirements of this part, and the Department of Transportation regulations in 49 CFR part 173, 14 CFR part 103, and 46 CFR part 146.

§71.13 Communications.

All communications concerning the regulations in this part should be addressed to the Nuclear Regulatory Commission, Washington, D.C. 20555, Attention: Director of Nuclear Material Safety and Standards, or may be delivered in person at the Commission's offices at 1717 H Street NW., Washington, D.C. or at 7920 Norfolk Avenue, Bethesda, Maryland.

*§71.14 Interpretations.

Except as specifically authorized by the Commission in writing, no interpretation of the meaning of the regulations in this part by an officer or employee of the Commission other than a written interpretation by the General Counsel will be recognized to be binding on the Commission.

*§71.15 Additional requirements.

The Commission may by rule, regulation, or order impose upon any licensee such requirements, in addition to those established in this part, as it deems necessary or appropriate to protect health or to minimize danger to life or property.

***§71.16 Amendment of existing licenses.

(a) Licenses issued pursuant to this part and in effect on October 4, 1968, which authorize Fissile Class II packages are hereby amended by increasing the minimum number of units specified for each Fissile Class II package by a factor of 1.25. The new number, shall be rounded up to the first decimal. In addition, the term "radiation units" is changed to "transport index" wherever used in the license.

(b) The reference to §71.7(b) in licenses issued pursuant to this part prior to March 26, 1972,** is changed to §71.9(b).

(c) The reference to §71.9(b) in licenses issued pursuant to this part prior to June 30, 1973, is changed to 71.12(b).

*Redesignated by 38 FR 10437.
**Effective date of this amendment.
***Amended 37 FR 3985.

Subpart B—License Applications

§71.21 Contents of application.

An application for a specific license under this part may be submitted as an application for a license or license amendment under this chapter and shall include, for each proposed packaging design and method of transport, the following information in addition to any otherwise required:

(a) A package description as required by §71.22;

(b) A package evaluation as required by §71.23;

(c) An identification of the proposed program of quality assurance as required by §71.24;

(d) In the case of fissile material, an identification of the proposed fissile class.

§71.22 Package description.

The application shall include a description of the proposed package in sufficient detail to identify the package accurately and to provide a sufficient basis for evaluation of the packaging. The description should include:

(a) With respect to the packaging:

(1) Gross weight;

(2) Model number;

(3) Specific materials of construction, weights, dimensions, and fabrication methods of:

(i) Receptacles, identifying the one which is considered to be the containment vessel;

(ii) Materials specifically used as non-fissile neutron absorbers or moderators;

(iii) Internal and external structures supporting or protecting receptacles;

(iv) Valves, sampling ports, lifting devices, and tie-down devices;

(v) Structural and mechanical means for the transfer and dissipation of heat; and

(4) Identification and volumes of any coolants and of receptacles containing coolant.

(b) With respect to the contents of the package:

(1) Identification and maximum radioactivity of radioactive constituents;

(2) Identification and maximum quantities of fissile constituents;

(3) Chemical and physical form;

(4) Extent of reflection, the amount and identity of non-fissile neutron absorbers in the fissile constituents, and the atomic ratio of moderator to fissile constituents;

(5) Maximum weight; and

(6) Maximum amount of decay heat.

§71.23 Package evaluation.

The applicant shall:

(a) Demonstrate that the package satisfies the standards specified in Subpart C;

(b) For a Fissile Class II package, ascertain and specify the number of similar packages which may be transported together in accordance with §71.39; and

(c) For a Fissile Class III shipment, describe any proposed special controls and precautions to be exercised during transport, loading, unloading, and handling, and in the event of accident or delay.

§71.24 Quality assurance.

(a) The applicant shall identiy his approved quality assurance program to be applied to the design, fabrication, assembly, testing, maintenance, repair, modification, and use of the proposed packaging.

(b) The applicant shall identify any established codes and standards proposed for use in package design, fabrication, assembly, testing, maintenance, and use. In the absence of such codes and standards, the applicant shall describe the basis and rationale used to formulate the package quality assurance program.

(c) The applicant shall identify any specific provisions to be contained in his quality assurance program which are applicable to the particular package design under consideration.

§71.25 Additional information.

The Commission may at any time require further information in order to enable it to determine whether a license, certificate of compliance, or other approval should be granted, denied, modified, suspended, or revoked.

Subpart C—Package Standards

§71.31 General standards for all packaging.

(a) Packaging shall be of such materials and construction that there will be no significant chemical, galvanic, or other reaction among the packaging components, or between the packaging components and the package contents.

(b) Packaging shall be equipped with a positive closure which will prevent inadvertent opening.

(c) Lifting devices:

(1) If there is a system of lifting devices which is a structural part of the package, the system shall be capable of supporting three times the weight of the loaded package without generating stress in any material of the packaging in excess of its yield strength.

(2) If there is a system of lifting devices which is a structural part only of the lid, the system shall be capable of supporting three times the weight of the lid and any attachments without generating stress in any material of the lid in excess of its yield strength.

(3) If there is a structural part of the package which could be employed to lift the package and which does not comply with subparagraph (1) of this paragraph, the part shall be securely covered or locked during transport in such a manner as to prevent its use for that purpose.

(4) Each lifting device which is a structural part of the package shall be so designed that failure of the device under excessive load would not impair the containment or shielding properities of the package.

(d) Tie-down devices:

(1) If there is a system of tie-down devices which is a structural part of the package, the system shall be capable of withstanding, without generating stress in any material of the package in excess of its yield strength, a static force applied to the center of gravity of the package having a vertical component of two times the weight of the package with its contents, a horizontal component along the direction in which the vehicle travels of 10 times the weight of the package with its contents, and a horizontal component in the transverse direction of 5 times the weight of the package with its contents.

(2) If there is a structural part of the package which could be employed to tie the package down and which does not comply with subparagraph (1) of this paragraph, the part shall be securely covered or locked during transport in such a manner as to prevent its use for that purpose.

(3) Each tie-down device which is a structural part of the package shall be so designed that failure of the device under excessive load would not impair the ability of the package to meet other requirements of this subpart.

38 FR 10437

§ 71.32 Structural standards for type B and large quantity packaging.

Packaging used to ship a type B or a large quantity of radioactive material, as defined in §71.4 (q) and (f), shall be designed and constructed in accordance with the structural standards of this section.

Standards different from those specified in this section may be approved by the Commission if the controls proposed to be exercised by the shipper are demonstrated to be adequate to assure the safety of the shipment.

(a) *Load resistance.* Regarded as a simple beam supported at its ends along any major axis, packaging shall be capable of withstanding a static load, normal to and uniformly distributed along its length, equal to 5 times its fully loaded weight, without generating stress in any material of the packaging in excess of its yield strength.

(b) *External pressure.* Packaging shall be adequate to assure that the containment vessel will suffer no loss of contents if subjected to an external pressure of 25 pounds per square inch gauge.

31 FR 9941

§ 71.33 Criticality standards for fissile material packages.

(a) A package used for the shipment of fissile material shall be so designed and constructed and its contents so limited that it would be subcritical if it is assumed that water leaks into the containment vessel, and:

(1) Water moderation of the contents occurs to the most reactive credible extent consistent with the chemical and physical form of the contents; and

(2) The containment vessel is fully reflected on all sides by water.

38 FR 10437

(b) A package used for the shipment of fissile material shall be so designed and constructed and its contents so limited that it would be subcritical if it is assumed that any contents of the package which are liquid during normal transport leak out of the containment vessel, and that the fissile material is then:

31 FR 9941

(1) In the most reactive credible configuration consistent with the chemical and physical form of the material;

(2) Moderated by water outside of the containment vessel to the most reactive credible extent; and

(3) Fully reflected on all sides by water.

(c) The Commission may approve exceptions to the requirements of this section where the containment vessel incorporates special design features which would preclude leakage of liquids in spite of any single packaging error and appropriate measures are taken before each shipment to verify the leak tightness of each containment vessel.

§ 71.34 Evaluation of a single package.

(a) The effect of the transport environment on the safety of any single package of radioactive material shall be evaluated as follows:

(1) The ability of a package to withstand conditions likely to occur in normal transport shall be assessed by subjecting a sample package or scale model, by test or other assessment, to the normal conditions of transport as specified in §71.35; and

31 FR 9941

(2) The effect on a package of conditions likely to occur in an accident shall be assessed by subjecting a sample package or scale model, by test or other assessment, to the hypothetical accident conditions as specified in §71.36.

(b) Taking into account controls to be exercised by the shipper, the Commission may permit the shipment to be evaluated together with or without the transporting vehicle, for the purpose of one or more tests.

(c) Normal conditions of transport and hypothetical accident conditions different from those specified in §71.35 and §71.36 may be approved by the Commission if the controls proposed to be exercised by the shipper are demonstrated to be adequate to assure the safety of the shipment.

§ 71.35 Standards for normal conditions of transport for a single package.

38 FR 10437

(a) A package used for the shipment of fissile material or more than a type A quantity of radioactive material, as defined in §71.4(q), shall be so designed and constructed and its contents so limited that under the normal conditions of transport specified in appendix A of this part:

31 FR 9941

(1) There will be no release of radioactive material from the containment vessel;

(2) The effectiveness of the packaging will not be substantially reduced;

(3) There will be no mixture of gases or vapors in the package which could, through any credible increase of pressure or an explosion, significantly reduce the effectiveness of the package;

(4) Radioactive contamination of the liquid or gaseous primary coolant will not exceed 10^{-7} curies of activity of Group I radionuclides per milliliter, 5×10^{-6} curies of activity of Group II radionuclides per milliliter, 3×10^{-4} curies of activity of Group III and Group IV radionuclides per milliliter; and

(5) There will be no loss of coolant.

(b) A package used for the shipment of fissile material shall be so designed and constructed and its contents so limited that under the normal conditions of transport specified in Appendix A of this part:

(1) The package will be subcritical;

(2) The geometric form of the package contents would not be substantially altered;

(3) There will be no leakage of water into the containment vessel. This requirement need not be met if, in the evaluation of undamaged packages under §71.38(a), §71.39(a)(1), or §71.40(a), it has been assumed that moderation is present to such an extent as to cause maximum reactivity consistent with the chemical and physical form of the material; and

(4) There will be no substantial reduction in the effectiveness of the packaging, including:

(i) Reduction by more than 5 percent in the total effective volume of the packaging on which nuclear safety is assessed;

(ii) Reduction by more than 5 percent in the effective spacing on which nuclear safety is assessed, between the center of the containment vessel and the outer surface of the packaging; or

(iii) Occurrence of any aperture in the outer surface of the packaging large enough to permit the entry of a 4-inch cube.

38 FR 10437

(c) A package used for the shipment of more than a type A quantity of radioactive material as defined in §71.4(q), shall be so designed and constructed and its contents so limited that under the normal conditions of transport specified in appendix A of this part, the containment vessel would not be vented directly to the atmosphere.

§ 71.36 Standards for hypothetical accident conditions for a single package.

(a) A package used for the shipment of more than a type A quantity of radioactive material, as defined in §71.4(q), shall be so designed and con-

[38 FR 10437]

structed and its contents so limited that if subjected to the hypothetical accident conditions specified in appendix B of this part as the free drop, puncture, thermal, and water immersion conditions in the sequence listed in appendix B, it will meet the following conditions:

[33 FR 17621]

(1) The reduction of shielding would not be sufficient to increase the external radiation dose rate to more than 1,000 millirems per hour at 3 feet from the external surface of the package.

(2) No radioactive material would be released from the package except for gases and contaminated coolant containing total radioactivity exceeding neither:

(i) 0.1 percent of the total radioactivity of the package contents; nor

(ii) 0.01 curie of Group I radionuclides, 0.5 curie of Group II radionuclides, 10 curies of Group III radionuclides, 10 curies of Group IV radionuclides, and 1,000 curies of inert gases irrespective of transport group.

A package need not satisfy the requirements of this paragraph if it contains only low specific activity materials, as defined in §71.4(g), and is transported on a motor vehicle, railroad car, aircraft, inland water craft, or hold or deck of a seagoing vessel assigned for the sole use of the licensee.

[31 FR 9941]

(b) A package used for the shipment of fissile material shall be so designed and constructed and its contents so limited that if subjected to the hypothetical accident conditions specified in Appendix B of this part as the Free Drop, Puncture, Thermal, and Water Immersion conditions, in the sequence listed in Appendix B, the package would be subcritical. In determining whether this standard is satisfied, it shall be assumed that:

(1) The fissile material is in the most reactive credible configuration consistent with the damaged condition of the package and the chemical and physical form of the contents;

(2) Water moderation occurs to the most reactive credible extent consistent with the damaged condition of the package and the chemical and physical form of the contents; and

(3) There is reflection by water on all sides and as close as is consistent with the damaged condition of the package.

§ 71.37 Evaluation of an array of packages of fissile material.

(a) The effect of the transport environment on the nuclear safety of an array of packages of fissile material shall be evaluated by subjecting a sample package or a scale model, by test or other assessment, to the hypothetical accident conditions specified in §71.38, §71.39, or §71.40 for the proposed fissile class, and by assuming that each package in the array is damaged to the same extent as the sample package or scale model. In this case of a Fissile Class III shipment, the Commission may, taking into account controls to be exercised by the shipper, permit the shipment to be evaluated as a whole rather than as individual packages, and either with or without the transporting vehicle, for the purpose of one or more tests.

(b) In determining whether the standards of §§71.38(b), 71.39(a)(2), and 71.40(b) are satisfied, it shall be assumed that:

(1) The fissile material is in the most reactive credible configuration consistent with the damaged condition of the package, the chemical and physical form of the contents, and controls exercised over the number of packages to be transported together; and

(2) Water moderation occurs to the most reactive credible extent consistent with the damaged condition of the package and the chemical and physical form of the contents.

§ 71.38 Specific standards for a Fissile Class I package.

A Fissile Class I package shall be so designed and constructed and its contents so limited that:

(a) Any number of such undamaged packages would be subcritical in any arrangement, and with optimum interspersed hydrogenous moderation unless there is a greater amount of interspersed moderation in the packaging, in which case that greater amount may be considered; and

(b) Two hundred fifty such packages would be subcritical in any arrangement, if each package were subjected to the hypothetical accident conditions specified in Appendix B of this part as the Free Drop, Thermal, and Water Immersion conditions, in the sequence listed in Appendix B, with close reflection by water on all sides of the array and with optimum interspersed hydrogenous moderation unless there is a greater amount of interspersed moderation in the packaging in which case that greater amount may be considered. The condition of the package shall be assumed to be as described in §71.37.

[31 FR 9941]

§ 71.39 Specific standards for a Fissile Class II package.

(a) A Fissile Class II package shall be so designed and constructed and its contents so limited, and the number of such packages which may be transported together so limited, that:

(1) Five times that number of such undamaged packages would be subcritical in any arrangement if closely reflected by water; and

(2) Twice that number of such packages would be subcritical in any arrangement if each package were subjected to the hypothetical accident conditions specified in Appendix B of this part as the Free Drop, Thermal, and Water Immersion conditions, in the sequence listed in Appendix B, with close reflection by water on all sides of the array and with optimum interspersed hydrogenous moderation unless there is a greater amount of interspersed moderation in the packaging, in which case that greater amount may be considered. The condition of the package shall be assumed to be as described in §71.37.

[33 FR 17621]

(b) The transport index for each Fissile Class II package is calculated by dividing the number 50 by the number of such Fissile Class II packages which may be transported together as determined under the limitations of paragraph (a) of this section. The calculated number shall be rounded up to the first decimal place.

[31 FR 9941]

§ 71.40 Specific standards for a Fissile Class III shipment.

A package for Fissile Class III shipment shall be so designed and constructed and its contents so limited, and the number of packages in a Fissile Class III shipment shall be so limited, that:

(a) The undamaged shipment would be subcritical with an identical shipment in contact with it and with the two shipments closely reflected on all sides by water; and

(b) The shipment would be subcritical if each package were subjected to the hypothetical accident conditions specified in Appendix B of this part as the Free Drop, Thermal, and Water Immersion conditions, in the sequence listed in Appendix B, with close reflection by water on all sides of the array and with

the packages in the most reactive arrangement and with the most reactive degree of interspersed hydrogenous moderation which would be credible considering the controls to be exercised over the shipment. The condition of the package shall be assumed to be as described in §71.37. Hypothetical accident conditions different from those specified, in this paragraph may be approved by the Commission if the controls proposed to be exercised by the shipper are demonstrated to be adequate to assure the safety of the shipment.

§ 71.41 Previously constructed packages for irradiated solid nuclear fuel.

(a) Notwithstanding any other provisions of this subpart, a package, the use of which has been authorized by the Atomic Energy Commission for the transport of irradiated solid nuclear fuel on or after September 23, 1961, and which has been completely constructed prior to January 1, 1967, shall be deemed to comply with the package standards of this subpart for that purpose, except as otherwise provided in paragraph (b).

(b) The holder (licensee) of the specific approval providing the authority specified in paragraph (a) shall, within 6 months after October 18, 1977, file a consolidated application for a superseding approval for the use of such packages, demonstrating that the packages satisfy the package standards of this subpart. If the licensee fails to submit such an application, the provisions of paragraph (a) and the authority granted by the approval to deliver the material to a carrier for transport in such packages shall expire at the end of that 6 month period. The Commission may issue a new approval superseding the existing approval, may confirm the existing approval with or without modification, or may deny the application in whole or in part and terminate the existing approval in whole or in part. If modification of the design of a package being used under the authority of this section in effect prior to October 18, 1977, is proposed by a licensee in his application for a superseding approval in accordance with this paragraph, the licensee shall designate in his application the time period needed to modify the package(s) after approval by the Commission.

§ 71.42 Special requirements for plutonium shipments after June 17, 1978.

(a) Notwithstanding the exemption in §71.9, plutonium in excess of twenty (20) curies per package shall be shipped as a solid.

(b) Plutonium in excess of twenty (20) curies per package shall be packaged in a separate inner container placed within outer packaging that meets the requirements of Subpart C for packaging of material in normal form. The separate inner container shall not release plutonium when the entire package is subjected to the normal and accident test conditions specified in Appendices A and B. Solid plutonium in the following forms is exempt from the requirements of this paragraph:

(1) Reactor fuel elements;

(2) Metal or metal alloy; or

(3) Other plutonium bearing solids that the Commission determines should be exempt from the requirements of this section.

(c) Authority in licenses issued pursuant to this part for delivery of plutonium to a carrier for transport under conditions which do not meet the limitations of paragraphs (a) and (b) of this section shall expire on June 17, 1978.

Subpart D—Operating Procedures

§ 71.51 Establishment and maintenance of a quality assurance program.

(a) The licensee shall establish, maintain and execute a quality assurance program satisfying each of the applicable criteria specified in Appendix E, "Quality Assurance Criteria for Shipping Packages for Radioactive Material," and satisfying any specific provisions which are applicable to the licensee's activities including procurement of packaging. The description of the quality assurance program shall include a discussion of which requirements of Appendix E are applicable and how they will be satisfied.[1] A description of that program shall be filed, in accordance with this section, by January 1, 1979,* with the Director, Office of Nuclear Material Safety and Safeguards, Nuclear Regulatory Commission, Washington, D.C. 20555. If a person has filed such a description, the continued use of his existing quality assurance program is authorized until the acceptability of the program has been finally determined by the Commission.

(b) The provisions of this paragraph deal with packages which have been approved for use in accordance with this part prior to January 1, 1979,* and which have been designed in accordance with the provisions of this part in effect at the time of package approval. Notwithstanding the provisions of paragraph (a) of this section, such packages shall be deemed to have been designed in accordance with a quality assurance program which satisfies the provisions of paragraph (a) of this section.

(c) The provisions of this paragraph deal with packages which have been approved for use in accordance with this part prior to January 1, 1979,* have been at least partially fabricated prior to that date, and which have been fabricated in accordance with the provisions of this part in effect at the time of package approval. Notwithstanding the provisions of paragraph (a) of this section, such packages shall be deemed to have been fabricated and assembled in accordance with a quality assurance program which satisfies the provisions of paragraph (a) of this section.

(d) A Commission-approved quality assurance program which satisfies the applicable criteria of Appendix B of Part 50, of this chapter and which is established, maintained, and executed with regard to transport packages shall be deemed to satisfy the requirements of paragraph (a) of this section.

§ 71.52 Assumptions as to unknown properties.

When the isotopic abundance, mass, concentration, degree of irradiation, degree of moderation, or other pertinent property of fissile material in any package is not known, the licensee shall package the fissile material as if the unknown properties have such credible values as will cause the maximum nuclear reactivity.

§ 71.53 Preliminary determinations.

(a) Prior to the first use of any packaging for the shipment of licensed materials, the licensee shall ascertain that there are no cracks, pinholes, uncontrolled voids or other defects which could signifi-

[1] The pertinent requirements of Appendix E should be applied in a graded approach, i.e., applied to an extent consistent with their importance to safety as described in section 2 of Appendix E.

*Amended 43 FR 27174.

cantly reduce the effectiveness of the packaging.

(b) Prior to the first use of any packaging for the shipment of licensed materials, where the maximum normal operating pressure will exceed 5 pounds per square inch gauge, the licensee shall test the containment vessel to assure that it will not leak at an internal pressure 50 percent higher than the maximum normal operating pressure.

(c) Packaging shall be conspicuously and durably marked with its model number. Prior to applying the model number, the licensee shall determine that the packaging has been fabricated in accordance with the design approved by the Commission.

§ 71.54 Routine determinations.

Prior to each use of a package for shipment of licensed material the licensee shall ascertain that the package with its contents satisfies the applicable requirements of Subpart C of this part and of the license, including determinations that:

(a) The packaging has not been significantly damaged;

(b) Any moderators and nonfissile neutron absorbers, if required, are present and are as authorized by the Commission;

(c) The closure of the package and any sealing gaskets are present and are free from defects;

(d) Any valve through which primary coolant can flow is protected against tampering;

(e) The internal gauge pressure of the package will not exceed, during the anticipated period of transport, the maximum normal operating pressure;

(f) Contamination of the primary coolant will not exceed, during the anticipated period of transport, the limits specified in §71.35(a)(4).

(g) Space provided for contained expansion of liquid coolant or a liquid shielding medium is adequate, and the systems for the liquid coolant and the liquid shielding medium are leaktight.

(h) The pressure relief valve or valves are operable, and set in accordance with written procedures.

(i) The package has been loaded and closed in accordance with written procedures.

The provisions of this section shall not be applicable for packages authorized in the general licenses granted by §71.6. In such cases the licensee shall ascertain that the contents of the package are as authorized in the general license.

§71.55 Opening instructions.

Prior to delivery of a package to a carrier for transport, the licensee shall assure that any special instruction needed to safely open the package are sent to or have been made available to the consignee.

§ 71.61 Reports.

The licensee shall report to the Director of Nuclear Material Safety and Safeguards, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, within 30 days any instance in which there is substantial reduction in the effectiveness of any authorized packaging during use.

§ 71.62 Records.

(a) The licensee shall maintain for a period of 2 years after its generation a record of each shipment of fissile material or of more than a type A quantity of radioactive material as defined in §71.4(q), in a single package, showing, where applicable:

(1) Identification of the packaging by model number;

(2) Details of any significant defects in the packaging, with the means employed to repair the defects and prevent their recurrence;

(3) Volume and identification of coolant;

(4) Type and quantity of licensed material in each package, and the total quantity in each shipment;

(5) For each item of irradiated fissile material;

(i) Identification by model number;

(ii) Irradiation and decay history to the extent appropriate to demonstrate that its nuclear and thermal characteristics comply with license conditions;

(iii) Any abnormal or unusual condition relevant to radiation safety.

(6) Date of the shipment;

(7) For Fissile Class III, any special controls exercised;

(8) Name and address of the transferee;

(9) Address to which the shipment was made; and

(10) Results of the determinations required by §71.54.

(b) The licensee shall make available to the Commission for inspection, upon reasonable notice, all records required by this part.

(c) The licensee shall maintain, during the life of the packaging to which they pertain, sufficient quality assurance records to furnish documentary evidence of the quality of packaging components which have safety significance, and of services affecting such quality, including records of the results of the determinations required by §71.53, and of monitoring, inspection and auditing of work performance during the design, fabrication, assembly, testing, modification, maintenance, and repair of the packaging.

§ 71.63 Inspection and tests.

(a) The licensee shall permit the Commission at all reasonable times to inspect the licensed material, packaging, and premises and facilities in which the licensed material or packaging are used, produced, tested, stored or shipped.

(b) The licensee shall perform and permit the Commission to perform, such tests as the Commission deems necessary or appropriate for the administration of the regulations in this chapter.

(c) The licensee shall notify the Director of Inspection and Enforcement, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, at least 45 days prior to fabrication of a package to be used for the shipment, in that single package, of radioactive material having a decay heat load in excess of 5 kW or with an operating pressure in excess of 15 psig.

§ 71.64 Violations.

An injunction or other court order may be obtained prohibiting any violation of any provision of the Atomic Energy Act of 1954, as amended, or Title II of the Energy Reorganization Act of 1974, or any regulation or order issued thereunder. A court order may be obtained for the payment of a civil penalty imposed pursuant to section 234 of the Act for violation of section 53, 57, 62, 63, 81, 82, 101, 103, 104, 107, or 109 of the Act, or section 206 of the Energy Reorganization Act of 1974, or any rule,

regulation, or order issued thereunder, or any term, condition, or limitation of any license issued thereunder, or for any violation for which a license may be revoked under section 186 of the Act. Any person who willfully violates any provision of the Act or any regulation or order issued thereunder may be guilty of a crime and, upon conviction may be punished by fine or imprisonment or both, as provided by law. [40 FR 8774]

APPENDICES

APPENDIX A—NORMAL CONDITIONS OF TRANSPORT

Each of the following normal conditions of transport is to be applied separately to determine its effect on a package.

1. *Heat*—Direct sunlight at an ambient temperature of 130° F. in still air.

2. *Cold*—An ambient temperature of −40° F. in still air and shade.

3. *Pressure*—Atmospheric pressure of 0.5 times standard atmospheric pressure.

4. *Vibration*—Vibration normally incident to transport.

5. *Water Spray*—A water spray sufficiently heavy to keep the entire exposed surface of the package except the bottom continously wet during a period of 30 minutes.

6. *Free Drop*—Between 1-1/2 and 2-1/2 hours after the conclusion of the water spray test, a free drop through the distance specified below onto a flat essentially unyielding horizontal surface, striking the surface in a position for which maximum damage is expected. [33 FR 17621]

FREE FALL DISTANCE

Package weight (pounds)	*Distance (feet)*
Less than 10,000	4
10,000 to 20,000	3
20,000 to 30,000	2
More than 30,000	1

7. *Corner Drop*—A free drop onto each corner of the package in succession, or in the case of a cylindrical package onto each quarter of each rim, from a height of 1 foot onto a flat essentially unyielding horizontal surface. This test applies only to packages which are constructed primarily of wood or fiberboard, and do not exceed 110 pounds gross weight, and to all Fissile Class II packagings. [33 FR 17621]

8. *Penetration*—Impact of the hemispherical end of a vertical steel cylinder 1-1/4 inches in diameter and weighing 13 pounds, dropped from a height of 40 inches onto the exposed surface of the package which is expected to be most vulnerable to puncture. The long axis of the cylinder shall be perpendicular to the package surface.

9. *Compression*—For packages not exceeding 10,000 pounds in weight, a compressive load equal to either 5 times the weight of the package or 2 pounds per square inch multiplied by the maximum horizontal cross section of the package, whichever is greater. The load shall be applied during a period of 24 hours, uniformly against the top and bottom of the package in the position in which the package would normally be transported.

APPENDIX B—HYPOTHETICAL ACCIDENT CONDITIONS

The following hypothetical accident conditions are to be applied sequentially, in the order indicated, to determine their cumulative effect on a package or array of packages.

1. *Free Drop*—A free drop through a distance of 30 feet onto a flat essentially unyielding horizontal surface, striking the surface in a position for which maximum damage is expected.

2. *Puncture*—A free drop through a distance of 40 inches striking, in a position for which maximum damage is expected, the top end of a vertical cylindrical mild steel bar mounted on an essentially unyielding horizontal surface. The bar shall be 6 inches in diameter, with the top horizontal and its edge rounded to a radius of not more than one-quarter inch, and of such a length as to cause maximum damage to the package, but not less than 8 inches long. The long axis of the bar shall be perpendicular to the unyielding horizontal surface. [33 FR 17621]

3. *Thermal*—Exposure to a thermal test in which the heat input to the package is not less than that which would result from exposure of the whole package to a radiation environment of 1,475° F. for 30 minutes with an emissivity coefficient of 0.9, assuming the surfaces of the package have an absorption coefficient of 0.8. The package shall not be cooled artificially until 3 hours after the test period unless it can be shown that the temperature on the inside of the package has begun to fall in less than 3 hours.

4. *Water Immersion* (fissile material packages only)—Immersion in water to the extent that all portions of the package to be tested are under at least 3 feet of water for a period of not less than 8 hours.

NOTE.—The reporting and record keeping requirements contained in this part have been approved by the General Accounting Office under B-180225 (R0056).

APPENDIX C–TRANSPORT GROUPING OF RADIONUCLIDES

Element*	Radionuclide***	Group
Actinium (89)	Ac 227	I
	Ac 228	I
Americium (95)	Am 241	I
	Am 243	I
Antimony (51)	Sb 122	IV
	Sb 124	III
	Sb 125	III
Argon (18)	Ar 37	VI
	Ar 41	II
	Ar 41 (uncompressed)**	V
Arsenic (33)	As 73	IV
	As 74	IV
	As 76	IV
	As 77	IV
Astatine (85)	At 211	III
Barium (56)	Ba 131	IV
	Ba 133	II
	Ba 140	III
Berkelium (97)	Bk 249	I
Beryllium (4)	Be 7	IV
Bismuth (83)	Bi 206	IV
	Bi 207	III
	Bi 210	II
	Bi 212	III
Bromine (35)	Br 82	IV
Cadmium (48)	Cd 109	IV
	Cd 115 m	III
	Cd 115	IV
Calcium (20)	Ca 45	IV
	Ca 47	IV
Californium (98)	Cf 249	I
	Cf 250	I
	Cf 252	I
Carbon (6)	C 14	IV
Cerium (58)	Ce 141	IV
	Ce 143	IV
	Ce 144	III
Cesium (55)	Cs 131	IV
	Cs 134 m	III
	Cs 134	III
	Cs 135	IV
	Cs 136	IV
	Cs 137	III
Chlorine (17)	Cl 36	III
	Cl 38	IV
Chromium (24)	Cr 51	IV
Cobalt (27)	Co 56	III
	Co 57	IV
	Co 58m	IV
	Co 58	IV
	Co 60	III
Copper (29)	Cu 64	IV
Curium (96)	Cm 242	I
	Cm 243	I
	Cm 244	I
	Cm 245	I
	Cm 246	I
Dysprosium (66)	Dy 154	III
	Dy 165	IV
	Dy 166	IV
Erbium (68)	Er 169	IV
	Er 171	IV
Europium (63)	Eu 150	III
	Eu 152m	IV
	Eu 152	III
	Eu 154	II
	Eu 155	IV
Fluorine (9)	F 18	IV
Gadolinium (64)	Gd 153	IV
	Gd 159	IV
Gallium (31)	Ga 67	III
	Ga 72	IV
Germanium (32)	Ge 71	IV
Gold (79)	Au 193	III
	Au 194	III
	Au 195	III
	Au 196	IV
	Au 198	IV
	Au 199	IV
Hafnium (72)	Hf 181	IV
Holmium (67)	Ho 166	IV
Hydrogen (1)	H 3 (see tritium)	
Indium (49)	In 113 m	IV
	In 114 m	III
	In 115 m	IV
	In 115	IV
Iodine (53)	I 124	III
	I 125	III
	I 126	III
	I 129	III
	I 131	III
	I 132	IV
	I 133	III
	I 134	IV
	I 135	IV
Iridium (77)	Ir 190	IV
	Ir 192	III
	Ir 194	IV
Iron (26)	Fe 55	IV
	Fe 59	IV
Krypton (36)	Kr 85 m	III
	Kr 85 m (uncompressed)**	V
	Kr 85	III
	Kr 85 (uncompressed)**	VI
	Kr 87	II
	Kr 87 (uncompressed)**	V

33 FR 17621

See footnotes at end of table.

APPENDIX C–TRANSPORT GROUPING OF RADIONUCLIDES–Continued

Element*	Radionuclide***	Group
Lanthanum (57)	La 140	IV
Lead (82)	Pb 203	IV
	Pb 210	II
	Pb 212	II
Lutecium (71)	Lu 172	III
	Lu 177	IV
Magnesium (12)	Mg 28	III
Manganese (25)	Mn 52	IV
	Mn 54	IV
	Mn 56	IV
Mercury (80)	Hg 197 m	IV
	Hg 197	IV
	Hg 203	IV
Mixed fission products MFP.		II
Molybdenum (42)	Mo 99	IV
Neodynium (60)	Nd 147	IV
	Nd 149	IV
Neptunium (93)	Np 237	I
	Np 239	I
Nickel (28)	Ni 56	III
	Ni 59	IV
	Ni 63	IV
	Ni 65	IV
Niobium (41)	Nb 93 m	IV
	Nb 95	IV
	Nb 97	IV
Osmium (76)	Os 185	IV
	Os 191 m	IV
	Os 191	IV
	Os 193	IV
Palladium (46)	Pd 103	IV
	Pd 109	IV
Phosphorus (15)	P 32	IV
Platinum (78)	Pt 191	IV
	Pt 193	IV
	Pt 193 m	IV
	Pt 197 m	IV
	Pt 197	IV
Plutonium (94)	Pu 238 (F)	I
	Pu 239 (F)	I
	Pu 240	I
	Pu 241 (F)	I
	Pu 242	I
Polonium (84)	Po 210	I
Potassium (19)	K 42	IV
	K 43	III
Praseodymium (59)	Pr 142	IV
	Pr 143	IV
Promethium (61)	Pm 147	IV
	Pm 149	IV
Protactinium (91)	Pa 230	I
	Pa 231	I
	Pa 233	II

APPENDIX C–TRANSPORT GROUPING OF RADIONUCLIDES–Continued

Element*	Radionuclide***	Group
Radium (88)	Ra 223	II
	Ra 224	II
	Ra 226	I
	Ra 228	I
Radon (86)	Rn 220	IV
	Rn 222	II
Rhenium (75)	Re 183	IV
	Re 186	IV
	Re 187	IV
	Re 188	IV
	Re Natural	IV
Rhodium (45)	Rh 103 m	IV
	Rh 105	IV
Rubidium (37)	Rb 86	IV
	Rb 87	IV
	Rb Natural	IV
Ruthenium (44)	Ru 97	IV
	Ru 103	IV
	Ru 105	IV
	Ru 106	III
Samarium (62)	Sm 145	III
	Sm 147	III
	Sm 151	IV
	Sm 153	IV
Scandium (21)	Sc 46	III
	Sc 47	IV
	Sc 48	IV
Selenium (34)	Se 75	IV
Silicon (14)	Si 31	IV
Silver (47)	Ag 105	IV
	Ag 110 m	III
	Ag 111	IV
Sodium (11)	Na 22	III
	Na 24	IV
Strontium (38)	Sr 85 m	IV
	Sr 85	IV
	Sr 89	III
	Sr 90	II
	Sr 91	III
	Sr 92	IV
Sulphur (16)	S 35	IV
Tantalum (73)	Ta 182	III
Technetium (43)	Tc 96 m	IV
	Tc 96	IV
	Tc 97 m	IV
	Tc 97	IV
	Tc 99 m	IV
	Tc 99	IV
Tellurium (52)	Te 125 m	IV
	Te 127 m	IV
	Te 127	IV
	Te 129 m	III
	Te 129	IV
	Te 131 m	III
	Te 132	IV

33 FR 17621
31 FR 9941
31 FR 9941

See footnotes at end of table.

APPENDIX C–TRANSPORT GROUPING OF RADIONUCLIDES–Continued

Element*	Radionuclide***	Group
Terbium (65)	Tb 160	III
Thallium (81)	Tl 200	IV
	Tl 201	IV
	Tl 202	IV
	Tl 204	III
Thorium (90)	Th 227	II
	Th 228	I
	Th 230	I
	Th 231	I
	Th 232	III
	Th 234	II
	Th Natural	III
Thulium (69)	Tm 168	III
	Tm 170	III
	Tm 171	IV
Tin (50)	Sn 113	IV
	Sn 117 m	III
	Sn 121	III
	Sn 125	IV
Tritium (1)	H 3	IV
	H 3 (as a gas, as luminous paint, or adsorbed on solid material)	VII
Tungsten (74)	W 181	IV
	W 185	IV
	W 187	IV
Uranium (92)	U 230	II
	U 232	I
	U 233 (F)	II
	U 234	II
	U 235 (F)	III
	U 236	II
	U 238	III
	U Natural	III
	U Enriched (F)	III
	U Depleted	III
Vanadium (23)	V 48	IV
	V 49	III
Xenon (54)	Xe 125	III
	Xe 131 m	III
	Xe 131 m (uncompressed)**	V
	Xe 133	III
	Xe 133 (uncompressed)**	VI
	Xe 135	II
	Xe 135 (uncompressed)**	V
Ytterbium (70)	Yb 175	IV
Yttrium (39)	Y 88	III
	Y 90	IV
	Y 91 m	III
	Y 91	III
	Y 92	IV
	Y 93	IV
Zinc (30)	Zn 65	IV
	Zn 69 m	IV
	Zn 69	IV
Zirconium (40)	Zr 93	IV
	Zr 95	III
	Zr 97	IV

*Atomic number shown in parentheses.

**Uncompressed means at a pressure not exceeding one atmosphere.

***Atomic weight shown after the radionuclide symbol.

m–Metastable state.

(F) Fissile material.

[31 FR 9941]

APPENDIX D—TESTS FOR SPECIAL FORM LICENSED MATERIAL

1. *Free Drop*—A free drop through a distance of 30 feet onto a flat essentially unyielding horizontal surface, striking the surface in such a position as to suffer maximum damage.

2. *Percussion*—Impact of the flat circular end of a 1 inch diameter steel rod weighing 3 pounds, dropped through a distance of 40 inches. The capsule or material shall be placed on a sheet of lead, of hardness number 3.5 to 4.5 on the Vickers scale, and not more than 1 inch thick, supported by a smooth essentially unyielding surface.

3. *Heating*—Heating in air to a temperature of 1,475° F. and remaining at that temperature for a period of 10 minutes.

[33 FR 1762]

4. *Immersion*—Immersion for 24 hours in water at room temperature. The water shall be at pH 6-pH 8, with a maximum conductivity of 10 micromhos per centimeter.

APPENDIX E—QUALITY ASSURANCE CRITERIA FOR SHIPPING PACKAGES FOR RADIOACTIVE MATERIAL

Introduction.—In accordance with § 71.24, every applicant for an approval for use of a shipping package is required to describe his quality assurance program, and every licensee is required by § 71.51 to establish and maintain a quality assurance program for the design, fabrication, assembly, testing, use, and maintenance of each packaging, as defined in § 71.4(1).

This appendix establishes quality assurance requirements which apply to all activities affecting the components of the packaging which are significant to safety. These activities include designing, purchasing, fabricating, handling, shipping, storing, cleaning, assembling, inspecting, testing, operating, maintaining, repairing, and modifying.

As used in this appendix, "quality assurance" comprises all those planned and systematic actions necessary to provide adequate confidence that a system or component will perform satisfactorily in service. Quality assurance includes quality control, which comprises those quality assurance actions related to control of the physical characteristics and quality of the material or component to predetermined requirements.

[42 FR 39364]

1. ORGANIZATION

The licensee[1] shall be responsible for the establishment and execution of the quality assurance program. The licensee may delegate to others, such as contractors, agents, or consultants, the work of establishing and executing the quality assurance program, or any part thereof, but shall retain responsibility therefor. The authority and duties of persons and organizations performing activities affecting the safety-related functions of structures, systems, and components shall be clearly established and delineated in writing. These activities include both the performing functions of attaining quality objectives and the quality assurance functions. The quality assurance functions are those of (a) assuring that an appropriate quality assurance program is established and effectively executed and (b) verifying, such as by checking, auditing, and inspection, that activities affecting the safety-related functions have been correctly performed. The persons and organizations performing quality assurance functions shall have sufficient authority and organizational freedom to identify quality problems; to initiate, recommend or provide solutions; and to verify implementation of solutions. Such persons and organizations performing quality assurance functions shall report to a management level such that this required authority and organizational freedom, including sufficient independence from cost and schedule when opposed to safety considerations, are provided. Because of the many variables involved, such as the number of personnel, the type of activity being performed, and the location or locations where activities are performed, the organizational structure for executing the quality assurance program may take various forms provided that the persons and organizations assigned the quality assurance functions have this required authority and organizational freedom. Irrespective of the organizational structure, the individual(s) assigned the responsibility for assuring effective execution of any portion of the quality assurance program at any location where activities subject to this Appendix are being performed shall have direct access to such levels of management as may be necessary to perform this function.

[42 FR 39364]

2. QUALITY ASSURANCE PROGRAM

The licensee shall establish at the earliest practicable time, consistent with the schedule for accomplishing the activities, a quality assurance program which complies with the requirements of this appendix. The quality assurance program shall be documented by written procedures or instructions, and shall be carried out in accordance with those procedures throughout the period during which packaging is used. The licensee shall identify the material and components to be covered by the quality assurance program and the major organizations participating in the program, together with the designated function of these organizations. The quality assurance program shall provide control over activities affecting the quality of the identified materials and components to an extent consistent with their importance to safety, and as necessary to assure conformance to the approved design of each individual package used for the shipment of radioactive material. Activities affecting quality shall be accomplished under suitably controlled conditions. Controlled conditions include the use of appropriate equipment; suitable environmental conditions for accomplishing the activity, such as adequate cleanness; and assurance that all prerequisites for the given activity have been satisfied. The program shall take into account the need for special controls, processes, test equipment, tools and skills to attain the required quality, and the need for verification of quality by inspection and test.

The licensee shall base the requirements and procedures of his quality assurance program on the following considerations concerning the complexity and proposed use of the packaging and its components:

(1) The importance of malfunction or failure of the item to safety;

(2) The design and fabrication complexity or uniqueness of the item;

(3) The need for special controls and surveillance over processes and equipment;

(4) The degree to which functional compliance can be demonstrated by inspection or test; and

(5) The quality history and degree of standardization of the item.

The program shall provide for indoctrination and training of personnel performing activities affecting quality as necessary to assure that suitable proficiency is achieved and maintained. The licensee shall review the status and adequacy of the quality assurance program at established intervals.

[1] While the term "licensee" is used in this appendix, the quality assurance requirements are applicable to whatever design, fabrication, assembly and testing of the package is accomplished with respect to a package prior to the time a package approval is issued.

Management of other organizations participating in the quality assurance program shall regularly review the status and adequacy of that part of the quality assurance program which they are executing.

3. DESIGN CONTROL

Measures shall be established to assure that applicable regulatory requirements and the package design, as specified in the license, for those materials and components to which this appendix applies, are correctly translated into specifications, drawings, procedures and instructions. These measures shall include provisions to assure that appropriate quality standards are specified and included in design documents and that deviations from such standards are controlled. Measures shall be established for the selection and review for suitability of application of materials, parts, equipment, and processes that are essential to the safety-related functions of the materials, parts, and components of the packaging.

Measures shall be established for the identification and control of design interfaces and for coordination among participating design organizations. These measures shall include the establishment of written procedures among participating design organizations for the review, approval, release, distribution, and revision of documents involving design interfaces. The design control measures shall provide for verifying or checking the adequacy of design, such as by the performance of design reviews, by the use of alternate or simplified calculational methods, or by the performance of a suitable testing program. The verifying or checking process shall be performed by individuals or groups other than those who performed the original design, but who may be from the same organization. Where a test program is used to verify the adequacy of a specific design feature in lieu of other verifying or checking processes, it shall include suitable qualification testing of a prototype or sample unit under the most adverse design conditions. Design control measures shall be applied to items such as the following: criticality physics, radiation shielding, stress, thermal, hydraulic, and accident analyses; compatibility of materials; accessibility for inservice inspection, maintenance and repair; features to facilitate decontamination; and delineation of acceptance criteria for inspections and tests.

Design changes, including field changes, shall be subject to design control measures commensurate with those applied to the original design. Changes in the conditions specified in the package approval require Commission approval.

4. PROCUREMENT DOCUMENT CONTROL

Measures shall be established to assure that applicable requirements of this part which are necessary to assure adequate quality are suitably included or referenced in the documents for procurement of material, equipment, and services, whether purchased by the licensee or by his contractors or subcontractors. To the extent necessary, the licensee shall require contractors or subcontractors to provide a quality assurance program consistent with the pertinent provisions of this part.

5. INSTRUCTIONS, PROCEDURES AND DRAWINGS

Activities affecting quality shall be prescribed by documented instructions, procedures, or drawings of a type appropriate to the circumstances and shall be accomplished in accordance with these instructions, procedures, or drawings. These shall include appropriate quantitative or qualitative acceptance criteria for determining that important activities have been satisfactorily accomplished.

6. DOCUMENT CONTROL

Measures shall be established to control the issuance of documents, such as instructions, procedures, and drawings, including changes thereto, which prescribe all activities affecting quality. These measures shall assure that documents, including changes, are reviewed for adequacy and approved for release by authorized personnel and are distributed and used at the location where the prescribed activity is performed. Changes to documents shall be reviewed and approved by the same organizations that performed the original review and approval unless the applicant designates another organization.

7. CONTROL OF PURCHASED MATERIAL, EQUIPMENT, AND SERVICES

Measures shall be established to assure that purchased material, equipment, and services, whether purchased directly or through contractors and subcontractors, conform to the procurement documents. These measures shall include provisions, as appropriate, for source evaluation and selection, objective evidence of quality furnished by the contractor or subcontractor, inspection at the contractor or subcontractor source, and examination of products upon delivery. Documentary evidence that material and equipment conform to the procurement specifications shall be available prior to installation or use of such material and equipment. This documentary evidence shall be retained by or be available to the licensee and shall be sufficient to identify the specific requirements met by the purchased material and equipment. The effectiveness of the control of quality by contractors and subcontractors shall be assessed by the licensee or designee at intervals consistent with the importance, complexity and quantity of the product or services.

8. IDENTIFICATION AND CONTROL OF MATERIALS, PARTS AND COMPONENTS

Measures shall be established for the identification and control of materials, parts, and components. These measures shall assure that identification of the item is maintained by heat number, part number, or other appropriate means, either on the item or on records traceable to the item, as required throughout fabrication, installation, and use of the item. These identification and control measures shall be designed to prevent the use of incorrect or defective materials, parts and components.

9. CONTROL OF SPECIAL PROCESSES

Measures shall be established to assure that special processes, including welding, heat treating, and nondestructive testing, are controlled and accomplished by qualified personnel using qualified procedures in accordance with applicable codes, standards, specifications, criteria, and other special requirements.

10. INSPECTION

A program for inspection of activities affecting quality shall be established and executed by or for the organization performing the activity to verify conformance with the documented instructions, procedures, and drawings for accomplishing the activity. Such inspection shall be performed by individuals other than those who performed the activity being inspected. Examination, measurements, or tests of material or products processed shall be performed for each work operation where necessary to assure quality. If inspection of processed material or products is impossible or disadvantageous, indirect control by monitoring processing methods, equipment, and personnel shall be provided. Both inspection and process monitoring shall be provided when quality control is inadequate without both. If mandatory inspection hold points, which require witnessing or inspecting by the licensee's designated representative and beyond which work shall not proceed without the consent of its designated representative, are required, the specific hold points shall be indicated in appropriate documents.

11. TEST CONTROL

A test program shall be established to assure that all testing required to demonstrate that the packaging components will perform satisfactorily in service is identified and performed in accordance with written test procedures which incorporate the requirements of this part and the requirements and acceptance limits contained in the package approval. The procedures shall include provisions for assuring that all prerequisites for the given test have been met, that adequate test instrumentation is available and used, and that the test is performed under suitable environmental conditions. Test results shall be documented and evaluated to assure that test requirements have been satisfied.

12. CONTROL OF MEASURING AND TEST EQUIPMENT

Measures shall be established to assure that tools, gages, instruments, and other measuring and testing devices used in activities affecting quality are properly controlled, calibrated, and adjusted at specified times to maintain accuracy within necessary limits.

13. HANDLING, STORAGE AND SHIPPING

Measures shall be established to control the handling, storage, shipping, cleaning and preservation of materials and equipment to be used in packaging in accordance with instructions to prevent damage or deterioration. When necessary for particular products, special protective environments, such as inert gas atmosphere, specific moisture content levels and temperature levels shall be specified and provided.

14. INSPECTION, TEST AND OPERATING STATUS

Measures shall be established to indicate, by the use of markings such as stamps, tags, labels, routing cards, or other suitable means, the

42 FR 39364

42 FR 39364

status of inspections and tests performed upon individual items of the packaging. These measures shall provide for the identification of items which have satisfactorily passed required inspections and tests, where necessary to preclude inadvertent by-passing of such inspections and tests.

Measures shall also be established for indicating the operating status of components of the packaging, such as tagging valves and switches, to prevent inadvertent operation.

15. NONCONFORMING MATERIALS, PARTS, OR COMPONENTS

Measures shall be established to control materials, parts, or components which do not conform to requirements in order to prevent their inadvertent use or installation. These measures shall include, as appropriate, procedures for identification, documentation, segregation, disposition, and notification to affected organizations. Nonconforming items shall be reviewed and accepted, rejected, repaired or reworked in accordance with documented procedures.

16. CORRECTIVE ACTION

Measures shall be established to assure that conditions adverse to quality, such as deficiencies, deviations, defective material and equipment, and nonconformances, are promptly identified and corrected. In the case of a significant condition adverse to quality, the measures shall assure that the cause of the condition is determined and corrective action taken to preclude repetition. The identification of the significant condition adverse to quality, the cause of the condition, and the corrective action taken shall be documented and reported to appropriate levels of management.

42 FR 39364

17. QUALITY ASSURANCE RECORDS

Sufficient written records shall be maintained to furnish evidence of activities affecting quality. The records shall include the following: design records, records of use and the results of reviews, inspections, tests, audits, monitoring of work performance, and materials analyses. The records shall also include closely-related data such as qualifications of personnel procedures, and equipment. Inspection and test records shall, as a minimum, identify the inspector or data recorder, the type of observation, the results, the acceptability, and the action taken in connection with any deficiencies noted. Records shall be identifiable and retrievable. Consistent with applicable regulatory requirements, the licensee shall establish requirements concerning record retention, such as duration, location, and assigned responsibility.

18. AUDITS

A comprehensive system of planned and periodic audits shall be carried out to verify compliance with all aspects of the quality assurance program and to determine the effectiveness of the program. The audits shall be performed in accordance with the written procedures or check lists by appropriately trained personnel not having direct responsibilities in the areas being audited. Audit results shall be documented and reviewed by management having responsibility in the area audited. Followup action, including reaudit of deficient areas, shall be taken where indicated.

DEPARTMENT OF TRANSPORTATION

Nuclear Regulatory Commission

Transportation of Radioactive Materials; Memorandum of Understanding

The roles of the Department of Transportation and the Nuclear Regulatory Commission in the regulation of the transportation of radioactive materials were described in a memorandum of understanding signed on June 8, 1979. The present memorandum supersedes a 1973 agreement between the Atomic Energy Commission and the Department of Transportation. A text of the memorandum is set forth below.

Radioactive Materials

Abstract. This agreement delineates the respective responsibilities of the Department of Transportation (DOT) and the Nuclear Regulatory Commission (NRC) for the regulation of safety in transportation of radioactive materials. It supersedes the existing agreement executed on March 22, 1973, between the DOT and the Atomic Energy Commission. Generally, the DOT is responsible for regulating safety in transportation of all hazardous materials, including radioactive materials, and the NRC is responsible for regulating safety in receipt, possession, use, and transfer of byproducts, source, and special nuclear materials. The NRC reviews and approves or denies approval of package designs for fissile materials and for other radioactive materials (other than low specific activity materials) in quantities exceeding Type A limits, as defined in 10 CFR Part 71.

Agreement between the DOT and the NRC. The Department of Transportation (DOT), under the Transportation of Explosives Act (18 U.S.C. 831–835), the Dangerous Cargo Act (R. S. 4472, as amended, 46 U.S.C. 170), Title VI and 902(h) of the Federal Aviation Act of 1958 (49 U.S.C. 1421–1430 and 1472(h)), the Department of Transportation Act (49 U.S.C. 1655), and the Hazardous Materials Transportation Act (49 U.S.C. 1801–1812), is required to regulate safety in the transportation of hazardous materials, including radioactive materials.

The Nuclear Regulatory Commission (NRC), under the Atomic Energy Act of 1954, as amended (42 U.S.C. Chapter 23), and Section 201 of the Energy Reorganization Act of 1974, as amended (42 U.S.C. 5841), is authorized to license and regulate the receipt, possession, use, and transfer of "by product material," "source material," and "special nuclear material" (as defined in 42 U.S.C. 2014). The NRC authority to license air shipment of plutonium is further governed by Pub. L. 94–79.

For the purpose of developing, establishing, and implementing consistent and comprehensive regulations and requirements for the safe transportation of radioactive materials, and avoiding duplication of effort, the DOT and the NRC agree, subject to their respective statutory authorities, as follows. Terms used in this agreement are defined in 49 CFR Parts 100–199 and 10 CFR part 71.

I. Development of Safety Standards

A. The DOT (in consultation with the NRC) will develop safety standards for the classification of radioactive materials; for the design specifications and performance requirements of packages for quantities of radioactive materials (other than fissile materials) not exceeding Type A limits and for low specific activity (LSA) radioactive materials; for the external radiation fields, labeling, and marking of all radioactive materials packages and vehicles; for the mechanical conditions, construction requirements, and tie-down requirements of carrier equipment; for the qualifications of carrier personnel; for the procedures for loading, unloading, handling, and storage in transit; for any special transport controls (excluding safeguards) necessary for radiation safety during carriage; and for all other safety requirements except those specified in the next paragraph.

B. The NRC (in consultation with the DOT) will develop safety standards for design and performance of packages for fissile materials and for quantities of other radioactive materials (other than LSA materials) exceeding Type A limits in the following areas:

1. Structural materials of fabrication;
2. Closure devices;
3. Structural integrity;
4. Criticality control;
5. Containment of radioactive material;
6. Shielding;
7. Generation of internal pressure;
8. Internal contamination of packages;
9. Protection against internal overheating; and
10. Quality assurance of packaging design, fabrication, testing, maintenance, and use.

II. Adoption of Safety Standards and Regulations

A. The DOT will adopt regulations imposing on shippers and carriers subject to its jurisdiction those standards developed by the DOT and the NRC pursuant to Section I of this Memorandum of Understanding and any additional requirements necessary to protect the public health and safety. The DOT will require NRC approval of designs of packages for shipment of fissile materials and other radioactive materials in quantities exceeding Type A limits (except LSA materials) by all persons subject to the jurisdiction of the DOT. The DOT will issue complete and comprehensive Federal regulations for the packaging and transportation of all radioactive materials as a part of its overall body of Federal regulations (49 CFR Parts 100–199) for the packaging and transportation of all hazardous materials.

B. The NRC will adopt packaging standards for fissile materials and for quantities of other radioactive materials (other than LSA materials) exceeding Type A limits and will adopt regulations imposing on its licensees administrative, procedural, and technical requirements necessary to protect the public health and safety and to assure the common defense and security.

C. The NRC will adopt procedures, standards, and criteria for approval of package designs and for approval of special transport controls proposed by the applicant for a given package design. The NRC will require its licensees to comply with the DOT regulations when those persons are not otherwise subject to the DOT regulations.

III. Package Review

A. The DOT will submit to the NRC for review the following package designs:

1. Specification containers. Approval by the NRC of package designs for fissile materials and for radioactive materials (other than LSA materials) in quantities exceeding Type A limits will be obtained before publication of such designs in the DOT regulations.

2. Packages with foreign certification. Approval by the NRC will be obtained before revalidation of the foreign certificates required in the DOT regulations for packags shipped between origins and destinations within the United States, except for import and export shipments. Approval by the NRC is not required if a package is used solely for export or import or if a package is authorized by the DOT regulations solely for transportation through or over the United States between origins and destinations outside the United States. the DOT has the responsibility for exercising discretion as to whether it requests NRC review of such packages.

3. Any package for which NRC evaluation is warranted in DOT opinion.

B. The NRC will evaluate package designs for fissile materials and for other radioactive materials (other than LSA materials) in quantities exceeding Type A limits and will, if satisfactory, issue approvals therefor (viz., a license, Certificate of Comliance, or other package approval) directly to the person requesting the approval.

IV. Inspection and Enforcement

A. Each agency will conduct an inspection and enforcement program within its jurisdiction to assure compliance with its requirements. The

NRC will assist the DOT, as appropriate, in inspecting shippers of fi[illegible]aterials and of other radioactive m[illegible]s in quantities exceeding Type A limits.

B. The DOT and the NRC will consult each other on the results of their respective inspections in the areas where the results are related to the other agency's requirements, and each will take enforcement action as it deems [illegible]ropriate within the limits of its [illegible]ority.

V. Accidents and Incidents

A. The DOT will require of all carriers subject to its jurisdiction the notification and reporting to the DOT of accidents, incidents, and instances of actual or suspected leakage involving radioactive material packages if such an event occurs in transit and the DOT will promptly notify the NRC of such events.

B. The NRC will require of its licensees the notification and reporting to the NRC of accidents, incidents, and instances of actual or suspected leakage involving radioactive material packages if such an event occurs prior to delivery to a carrier for transport or after delivery to a receiver. The NRC will encourage the Agreement States [1] and the DOT will encourage the non-Agreement States to impose incident reporting requirements on shippers and receivers subject to the States' jurisdiction.

[redacted] In all accidents, incidents, and [illegible]nces of actual or suspected leakage involving packages of radioactive material regulated by the NRC, the NRC will normally be the lead agency for investigating the occurrence and preparing the report of the investigation. The DOT may either participate, as appropriate, in the investigation with the NRC as the lead agency or conduct a separate investigation. Subsequent to each investigation involving radioactive material regulated by the NRC, the NRC and the DOT will jointly define he scope of the enforcement actions to be taken by each agency to assure that shippers and carriers are subject to concurrent and equivalent enforcement actions but not unduly subject to duplicate enforcement actions.

D. This section V does not affect the authority of the National Transportation Safety Board, which is independent of the DOT and the NRC, to receive accident reports and to investigate transportation accidents.

[redacted] National Competent Authority

[redacted] The DOT will be the national competent authority with respect to the administrative requirements set forth in the regulations for the Safe Transport of Radioactive Materials of the International Atomic Energy Agency (IAEA). In issuing certificates of competent authority for the United States under those regulations, the DOT will require for certain packages other than DOT specification containers an NRC approval in accordance with Section III.A of this Memorandum of Understanding. The NRC will provide to the national competent authority (DOT) technical support and advice pertaining to the transportation of radioactive materials.

B. The DOT will act as the representative of the United States to the IAEA and other international groups on matters pertaining to the administrative and safety regulatory aspects of transportation of radioactive materials. The NRC will provide technical support and advice to the DOT in this capacity.

VII. Exchange of Information

A. Prior to issuance of any regulations by either the DOT or the NRC involving transportation of radioac[illegible]e materials, each agency will advise and consult with the other to avoid possible conflict in regulations and to assure that: (1) the regulations will afford adequate protection of the health and safety of the public; (2) the effect of these regulations will not be inimical to the common defense and security of the United States; and (3) the regulations are in the public interest.

B. The DOT and the NRC will exchange information, consult and assist each other within the areas of their special competence in the development and enforcement of regulations and procedures. Each agency will make available to the other, subject to security requirements and statutory provisions affecting the release of information, summaries of inspection records, investigations of serious accidents, and other matters relating to safety in the transportation of radioactive materials.

VIII. Working Arrangements

The NRC and the DOT will designate appropriate staff representatives and will establish joint working arrangements from time to time for the purpose of administering this Memorandum of Understanding.

IX. Effect

A. Nothing herein is intended to affect the statutory exemption of shipments of radioactive materials made by or under the direction or supervision of the Department of Energy or the Department of Defense in accordance with the provisions of 18 U.S.C. 832(c).

B. This agreement shall take effect upon the signing by authorized representatives of the respective agencies, and shall supersede in its entirety the March 22, 1973, Memorandum of Understanding between the DOT and the Atomic Energy Commission.

C. Nothing in this Memdorandum of Understanding is intended to restrict the statutory authority of either the DOT or the NRC.

Done at Washington, D.C., in triplicate, this 8th day of June 1979.

For the United States Department of Transportation.

James D. Palmer,

Administrator, Research and Special Programs Administration, Department of Transportation.

For the United States Nuclear Regulatory Commission.

Joseph M. Hendrie,

Chairman, Nuclear Regulatory Commission.

[FR Doc. 79-20398 Filed 6-29-79; 8:45 am]
BILLING CODE 4910-62-M

[1] States which have entered into an Agreement with the Atomic Energy Commission or the NRC pursuant to Section 274 of the Atomic Energy Act of 1954, as amended, under which the NRC has relinquished to such States the majority of its regulatory authority over source, byproduct and special nuclear material in quantities not sufficient to form a critical mass.

TRANSPORTATION OF NUCLEAR FUEL AND WASTE

The transportation of nuclear fuel and waste is regulated principally by the Department of Transportation (DOT) and by the Nuclear Regulatory Commission (NRC). The regulations of the NRC are found in Title 10 of the Code of Federal Regulations, primarily in 10 CFR Part 71, "Packaging of Radioactive Material for Transport and Transportation of Radioactive Material Under Certain Conditions." The regulations of the DOT are found in the Code of Federal Regulations, primarily in 49 CFR Parts 170-189, "Hazardous Materials Regulations" (for shippers and road, rail, water and air carriers). These regulations are applicable both to persons who ship radioactive materials as they package and offer such materials for transportation, and to carriers of radioactive material as they load and transport such materials in their vehicles. The regulations provide protection to transport workers and the general public from the hazards of radiation, and to undeveloped film from damage.

Primary reliance for safety in transportation of radioactive material is placed on the packaging. The DOT regulations prescribe general standards and requirements for all packages of radioactive material, and for handling and storage of those packages by carriers. For packages which contain no significant fissile radioactive material and only small quantities of other radioactive materials, the DOT standards and requirements provide adequate assurance of containment and shielding of the radioactive material. While these small quantity packages, termed Type A packages, may fail in an accident situation, the radiological consequences would be limited because of the limited package contents.

When the radioactive content of a package exceeds the small Type A quantity limit, it may only be transported in a Type B package, one which will survive transportation accidents. A Type B package must be designed to withstand a series of specified impact, puncture and fire environments, providing reasonable assurance that the package will withstand most severe transportation accidents and its design must be independently reviewed by the NRC engineering staff to verify its accident resistance. Finally a certificate must be issued by the NRC before a Type B package fabricated from that design can be used to transport radioactive material.

The standards which have been established in the DOT and NRC regulations provide that the packaging shall prevent the loss or dispersion of the radioactive contents, provide adequate shielding and heat dissipation, prevent nuclear criticality under both normal and accident conditions of transportation. The normal conditions of transportation which must be considered are specified in the regulations in terms of hot and cold environments, pressure differential, vibration, water spray, impact, puncture and compression tests. Accident conditions which must be considered are specified in terms of impact, puncture and fire conditions.

Procedures applicable to the shipment of packages of radioactive material require that a package be labeled with a unique radioactive materials label. In transportation, the carrier is required to exercise control over radioactive material packages, including loading and storage in areas separated from persons, and to limit the aggregation of packages to limit the exposure of persons. The procedures the carrier must follow in case of an accident include notification of the shipper and the DOT, isolating any spilled radioactive material from personnel contact, pending disposal instructions from qualified persons, and holding vehicles, buildings, areas, or equipment from service or routine occupancy until they are cleaned to specified values. Radiological assistance teams are available through a Federal interagency program to provide equipment and trained advisory personnel, if necessary, to help manage accidents involving radioactive materials.

Recent studies indicate that approximately 2.5 million packages of radioactive materials are currently being shipped in the United States each year. Within the limitations of the regulatory standards, radioactive materials may be safely transported in routine commerce using conventional transportation equipment.[1] No special restrictions on the speed of vehicle or routing are needed to assure safety.[2] In its recent reexamination of its regulations on packaging and transportation of radioactive materials, the NRC staff concluded that the environmental impacts of normal transportation and the risk attendant to accidents involving radioactive material shipments are sufficiently small to allow continued shipments by all modes and that no changes to the regulations are needed at this time. Two documents, "Environmental Survey of Transportation of Radioactive Materials To and From Nuclear Power Plants," WASH-1238, and "Final Environmental Statement on the Transportation of Radioactive Materials by Air and Other Modes," NUREG-0170, provide additional information on this topic.

---

[1]Section 201 of the Energy Reorganization Act as amended by Public Law 94-79 imposes special restrictions on the air transport of plutonium.

[2]According to the DOT, of the more than 32,000 hazardous material incident reports submitted to the DOT during the five year period 1971-1975, only 144 were noted to involve radioactive materials. Of these 144 incidents, only 36 showed any release of contents or excess radiation levels. In most cases, releases involved minor contamination from packages of low specific activity materials, exempt materials, or Type A quantities of radioactive materials.