NUCLEAR REGULATORY COMMISSION

ORIGINAL

RETURN TO SECRETARIAT RECORDS

In the Matter of: BRIEFING FOR COMMISSIONER BRADFORD ON SEISMIC QUALIFICATIONS OF ELECTRIC EQUIPMENT

DATE: December 11, 1981 PAGES: 1 - 65

AT: Washington, D. C.

RETURN TO SECRETARIAT RECORDS

ALDERSON REPORTING

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

Telephone: (202) 554-2345

UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

BRIEFING FOR COMMISSIONER BRADFORD

ON

SEISMIC QUALIFICATIONS OF ELECTRIC EQUIPMENT

Nuclear Regulatory Commission
Room 1167
1717 H Street, N. W.
Washington, D. C.

Friday, December 11, 1981

The briefing convened, pursuant to notice, at 2:05 p.m.

BEFORE:

PETER A. BRADFORD, Commissioner
THOMAS R. GIBBON, OCM
L. B. (TAD) MARSH, OCM

STAFF PRESENT:

Z. ROSZTOCZY
S. AGGARWAL
G. BAGCHI
R. VOLLMER
B. LIAW
E. ABBOTT
A. BATES
G ZECH
G. KELLY
S. TRUBATCH
E. CASE

* * *

DISCLAIMER

This is an unofficial transcript of a meeting of the United States Nuclear Regulatory Commission held on December 11, 1981 in the Commission's offices at 1717 H Street, N. W., Washington, D. C. The meeting was open to public attendance and observation. This transcript has not been reviewed, corrected, or edited, and it may contain inaccuracies.

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

P R O C E E D I N G S

COMMISSIONER BRADFORD: So if we had an earthquake how much would work? Let me start right about in that vicinity. With regard to the operating plants, and I am just trying to get a rough sense of where we are now, even the ones coming into operation other than Diablo Canyon, what sorts of assurance do we have in the event of a safe shutdown earthquake that the electrical equipment would function?

MR. VOLLMER: I guess we would have to approach that by what are they currently being reviewed to. Why don't we pick it up there then. There is a handout and we can turn to the appropriate spot in that.

MR. GIBBON: Well, let's see, the question I don't think is what they are currently being reviewed to but what they were reviewed to.

COMMISSIONER BRADFORD: For the ones coming into operation what are they being reviewed to, and we can go from there to the ones in operation.

MR. ROSZTOCZY: The very first page of this gives the basic requirements but in purposely abbreviated form and rather summary form. Later on, if you want, we can go into more details.

The basic requirement is that the licensee has to demonstrate that their equipment is going to perform. This

demonstration typically is done by testing their equipment.

We also accept analysis in combination with testing, especially when the equipment is large sized or there is some other limitation.

Analysis alone is acceptable also, but only if by showing the structural integrity of the equipment is enough to show its functional ability.

If we are talking about only the new plants than that is basically what is applicable to this.

The test procedures typically include a preconditioning which means to bring the equipment into the state that it would be at the worst part of the life of the equipment. If the end of life is the worst, then it would be preconditioned to that. Preconditioning includes thermal aging, irradiation, cyclic loads operation based earthquakes.

Once it went through the preconditioning then it has to be mounted for test and it is important that the mounting is done the same way how it is done in the plant. Then it is tested for the SSE loads.

COMMISSIONER BRADFORD: When you say tested under representative conditions, I gather that means as it is in the plant. Is it also conditions representative of roughly the SSE or are the tests that rigorous?

MR. ROSZTOCZY: The preconditioning, which is just conditioning, that would be lower earthquake like, OBE.

Once that is done, then it goes under the SSE testing and those are the loads which are expected during the SSE.

MR. BAGCHI: Near the mounting of the equipment itself.

COMMISSIONER BRADFORD: What generation of plants does this level of requirement apply to?

MR. ROSZTOCZY: This level of requirement in general terms applies to all plants which are going through on licensing now. The differentiation comes in in the details that I didn't go into here. There are some differences in the details of how precise we are in the newer plants which indicates that sequential testing is required.

Let me digress back here since we are talking about others, too. If I go back to the fourth bullet under the very first item there that discusses the difference between the new test and the old test.

If somebody has already performed the test before these requirements were put out then we are willing to look at the available test results, whatever form the test was done and the analysis that they have performed in the test and possibly some new analysis that they have performed.

If the overall picture provides us sufficient information to judge that the equipment would perform then no new tests are required. That is the main differentiation

between old and new.

Now the second slide kind of shows the status of the review of what has been reviewed and what hasn't been reviewed.

On the left-hand side the plants are put into four groups, the SEP plants which are the oldest ones, then the rest of the operating plants in the next one and then near-term OL's which fall under the 344/71 version of the criteria, and most of the ones going through now are in that category, and then the NTOL's under 75. Comanche Peak and some of the newer ones fall in there.

Up on the top there are three entries: "Anchorage," this is supporting the anchorage of the equipment which is one area that we are reviewing. The second area is the "Seismic Input Load" at the equipment location that is going to be used. The third one is the actual "Equipment Operability" under these loads.

In the first group of plants, the SEP plants, the first two of these are under review. Up to now they have finished five plants of the 11 plants in the program. SEP has a schedule for it and I am not sure exactly what it is, but within the next year or two years they will finish the 11 plants.

However, they are not addressing the operability of the equipment. A request to provide test reports on this

type of thing was not requested. There was an agreement between them and us back a year ago that when we do the operating plants for equipment operability we will cover the SEP plants also.

The other operating plants back in the '73-'75 range, there was a team which reviewed 12 of the operating plants. They started out originally with the goal to do pretty much of all of them, but then this program was terminated and only 12 were reviewed. There are approximately 57 plus or minus 2 maybe in this part and 12 have been reviewed.

Furthermore, the review was limited to electrical equipment. Only electrical equipment was looked at under that program.

The review covered all three of these items. So they looked at everything there. The only possibly difference between what we are doing now and what was done back then is that there was a review of some of the ground motions for some of the plants and it is possible that for some of these plants today a higher ground motion is required than what was used in '73. Should that be the case, then some additional review might be appropriate.

The rest of the plants, the other 45, were never reviewed for seismic equipment qualification. However, based on the experience gained in the SEP plants in the

anchorage problems and I&E information notice was issued last year which was sent to all of them. It did not require action in terms of reporting back to NRC, but it brought to their attention that we have found shortcomings and it pointed out some of the typical shortcomings which were found and then it was left to them.

COMMISSIONER BRADFORD: How extensive were the shortcomings?

MR. ROSZTOCZY: There was a fair amount of equipment which was not properly anchored like the bolts used for anchorage maybe weren't strong enough. In some cases it wasn't even bolted down and it was just completely loose indicating that the case of an earthquake it could simply fall over. After that, of course, you don't know if it would perform its function or not. So there were a fair amount of problems found and this was brought to the attention of the others.

Again, the thinking at the time was that when the seismic review for operating plants would take place that would pick up the action part of this and this is just kind of a notice.

COMMISSIONER BRADFORD: So that with regard to that generation of plants, the first two horizontal lines, what was done was basically to check any given piece of equipment as to whether it would stand up or move around and

whether the input loads used I guess for all of the seismic analyses were adequate, but there was no further check as to whether or not it would actually be expected to work except for 12 of the 57.

MR. ROSZTOCZY: If you look at only the SEP plants, then these are the two that have been accomplished. Up to now it has been accomplished for five and the third one is not done.

COMMISSIONER BRADFORD: Let me narrow the focus. With regard to equipment operability, I take it that really is another way of saying does it work after you have shaken it.

MR. ROSZTOCZY: Yes. The operability is that you take the actual equipment, you put it on the shake table and you shake it and see if it works during or after as it is required.

COMMISSIONER BRADFORD: Right.

MR. BAGCHI: That is the main function of it. During the motion that is important. When the motion is occurring the thing is on the table and its functional parameters are checked, whether or not it is generating an invisible signal and that sort of thing. So it is operability during the motion that is being checked.

COMMISSIONER BRADFORD: What about afterwards?

MR. BAGCHI: Afterwards these electrical devices

can be put into other states and there is no reason to believe that they would not operate if it is manually intervened.

COMMISSIONER BRADFORD: If it is what?

MR. BAGCHI: Manually intervened. In other words, if someone comes back and does it.

MR. ROSZTOCZY: But it is part of the testing to test it during and afterwards. Once you have checked that afterwards it is operating correctly, then there is no real reason to believe that it wouldn't function.

COMMISSIONER BRADFORD: Right, but you do want to know both during and after.

MR. BAGCHI: That is correct.

MR. GIBBON: Zoltan, are you saying that in these 12 plants of the other operating plants that actual tests were done on the equipment?

MR. ROSZTOCZY: Yes, a review has been conducted and when they reviewed individual equipment they looked at both the test and the analysis that was performed for that equipment.

MR. GIBBON: They didn't do any testing themselves but they reviewed the documents that the licensees had?

MR. BAGCHI: The staff doesn't do any testing. The testing is done by the vendors and by the utility owners.

COMMISSIONER BRADFORD: But you didn't require any

additional testing, I take it, in the review?

MR. ROSZTOCZY: In some cases if the outcome was that it didn't meet the requirements, then they required that additional steps be taken, yes, which could be some type of analysis like you would show that based on the testing that was available plus some additional calculations to show that it would work, or it could be additional testing.

Now as a result of this how much equipment was retested, I wouldn't know that. I could go back and try to get some information if it is important, but I am not sure how important that is.

In general we talked to the people who were running this review at the time and the type of requirements that they used for this were pretty much the same requirements that we are using now for the plants which fall into the 344/71 category.

So we would feel that there would be no need to go back to these 12 plants and re-review it, except in the areas that haven't been covered. Like if there is a change in the input loads since they changed the ground motion for that plant, then one would have to go back and check that.

On the mechanical equipment one would have to go back because they did specifically only electrical.

MR. MARSH: Zoltan, how do you pick the sample

size or the equipment that you actually review the records on?

MR. ROSZTOCZY: Right now, or when we do our audits then we try to pick typically somewhere between I think 10 and 20 percent of their equipment and we put it kind of across the board. We have some areas where from previous experience there are kind of problem areas. So we pick some of those. We pick some areas because we haven't looked at that on previous plants. So we try to get around to look at different types of equipment. Some I think is pretty much just random that we pick some.

MR. BAGCHI: There is one other criterion, and that is what is the most severe load for that particular plant and we might pick equipment in the upper floors rather than near the basement and that sort of thing.

MR. MARSH: But you do try to cover all the types of equipment or all the manufacturers that are represented in the plant in your 10 to 20 percent sample?

MR. ROSZTOCZY: Not necessarily on a given plant. If you would want to cover all of that on a given plant you would have to go to a larger sample. But if we didn't cover it on one, then part of the criteria for selection on the next plant is to try to pick up some of those that we didn't cover in previous audits.

So by the time you have finished as many as there

are, for example, now in the NTOL program I think pretty much each manufacturer and each type of equipment would be covered. But it is an audit. Please recognize that.

The purpose of the audit is to get an appreciation of whether the utility or the contractor in the utility's behalf has done a good job of reviewing and requiring the qualification of the equipment.

COMMISSIONER BRADFORD: Would I be misstating the chart then if I said that in 56 out of 68 plants at this point we don't know what the degree of equipment operability is?

MR. MARSH: 57.

COMMISSIONER BRADFORD: No, it is 56. I am adding the 11 SEP and the 57 other.

MR. ROSZTOCZY: Yes, it is fair to state that we have not done an evaluation and listing to know exactly where they stand which leaves open the possibility that a given plant could be in very good shape because maybe that organization paid quite a bit of attention to that and it leaves open also the possibility that some might not be in good shape because they paid less attention.

MR. MARSH: Did you find any operability problems in the 12 of 57 that you reviewed?

MR. ROSZTOCZY: Yes.

MR. MARSH: Were they significant deficiencies?

MR. ROSZTOCZY: Yes. Some of the deficiencies were, for example, there were no seismic input loads established for the individual what we call floor spectra for the equipment location. If you don't even know that, then how do you know that your equipment has been properly qualified. That was one of the problems and that has been established for these 12.

Now maybe I should add one thing there, too. In addition to reviewing these 12 plants, at the very same time, this very same team also initiated some generic reviews. They started some generic reviews with Westinghouse, with Combustion Engineering and with some of the architect/engineers. None of those were completed with the possible exception of the Westinghouse. The Westinghouse came to kind of a stage when it was close to completion or completion, but the others were left in a relatively early stage when the program kind of faded away.

So through those generic programs some attention has been brought to these problems in other plants also. We just don't know to what extent did they respond to it and to what extent did they follow up on those.

MR. GIBBON: Zoltan, was equipment typically tested that you found in the reviews of the 12 of the 57? That is, when the equipment was originally installed did they actually do tests? Was that the common finding or did

you find equipment where no tests had been done and no seismic review had been done at all?

MR. BAGCHI: Considerable testing was done even for the better SEP plants, the five SEP plants that the staff has completed review on, and in some cases they found evidence of testing being done.

MR. ROSZTOCZY: It depends I think more on the type of equipment. If you are talking about large pieces, then typically it is not tested. When you talk about smaller ones, then even in the old days that has been tested to a large extent.

MR. BAGCHI: And you are not necessarily simulating the seismic motion either, design test, resonant search, et cetera.

MR. GIBBON: Actually could you describe what a typical test would be that was performed on this vintage of plant?

MR. BAGCHI: Early tests would be to take the equipment and subject it to sine motion to search for resonant frequencies and add those resonant frequencies that would dwell for a certain period of time based on the experience and practice at the time.

COMMISSIONER BRADFORD: Sine motion is just ---

MR. BAGCHI: --- just one frequency. Now is the equipment has a significant natural frequency and if the

testing is done at its own natural frequency, then that is the most severe test one can think of.

In some cases they tested it by sine beat which would mean that there are two basic frequencies with the frequency of the equipment being between the two frequencies. So it is not as severe a test as the resonant frequency test. Sometimes these would be tested under blast loading, a typically Navy application, for example.

Those were the general types of test that were used in the early plants.

COMMISSIONER BRADFORD: I suppose a certain amount of testing of this sort is inevitable for anything that is going to be used in a submarine.

MR. ROSZTOCZY: One would expect, if anything, it is more extensive testing there because of other motions.

MR. ROE: There were also equipment tests done at sea on submarines.

MR. ABBOTT: How much equipment is common between a commercial reactor and a submarine?

COMMISSIONER BRADFORD: I wasn't assuming that that solved the problem.

(Laughter.)

MR. BAGCHI: I wouldn't want to guess.

MR. VOLLMER: In terms of equipment types, you know, that is a fair correlation. Many of these things have

similar design specifications, commercial grade and military grade. It is just that there is a different pedigree in the military grade and they are subjected to different loadings.

MR. ROSZTOCZY: That is one of the main concerns we have and that is one of the main things that is coming out from these reviews independently whether it is seismic or environmental qualifications. The old specifications sometimes didn't specify what it has to be tested for or what it has to be qualified for.

Therefore, the manufacturer did whatever he was normally doing and didn't necessarily extend it to certain spectra or certain frequencies that would be required today.

MR. BAGCHI: Another thing that might help is that plants have been subjected to earthquake motion, Humboldt Bay, for example, El Centro steam plant in the 1978 earthquake and the Fukusima plant in Japan. We don't see a major breakdown of electrical equipment during these motions.

COMMISSIONER BRADFORD: Do you see breakdowns at all?

MR. BAGCHI: Not at these facilities, not during these earthquakes.

MR. ROSZTOCZY: Well, with the exception of some of the most recent ones which have been looked at, it was really not an item that would have been carefully recorded following an earthquake. The utilities now are considering

to go back and try to collect together information that they can gather from these plants, not only nuclear plants but other power plants or similar types of plants which have similar equipment, and see how much detail is known, what equipment do we know that it functions in light of the earthquake and so on.

They are developing a program to gather this information and I think once we see the results of that it will give us a much better idea of how much was learned from these plants. I think it is rather obvious that with maybe some little extra effort one could get more out if there is an examination done right after the earthquake.

COMMISSIONER BRADFORD: There is still going to be a pretty serious shortage of data points, isn't there?

MR. ROSZTOCZY: Yes.

MR. BAGCHI: Yes.

MR. VOLLMER: The type of thing we have seen is a series of looks at plants or facilities. In the Near East I think we have some good examples where large earthquakes pretty much destroyed commercial buildings, apartment dwellings and things like that, but the power plant looks virtually undamaged and it is built, you know, to standard basis procedures.

As Zoltan was saying, of course, we don't really have a record of how it rode through the earthquake, that

short period of time when the vibratory ground motion was, but we know they were able to start up the facility shortly thereafter in many cases. So it would indicate that much of the equipment was able to sustain operation following that.

COMMISSIONER BRADFORD: Do they shut them down in a severe earthquake, or does the plant shut itself down automatically?

MR. VOLLMER: As far as nuclear plants go, there are a couple of plants with seismic scram.

COMMISSIONER BRADFORD: Right, but I am talking about the Near Eastern ones.

MR. VOLLMER: I don't know. I would expect that they would go out on a turbine trip. The turbines have sensitive vibratory motion equipment and I would imagine they would go out on that, but I don't think they would likely be scrammed for any other reason specifically.

COMMISSIONER BRADFORD: Whatever that is.

MR. LIAW: On that one, Fukusima did have a seismic scram and the seismic scram system was not triggered.

MR. VOLLMER: I was talking about the fossile plants. I wasn't thinking of Fukusima.

MR. BAGCHI: But for nuclear plants it is a very good assumption that if there is a very large earthquake like the SSE that the load distribution system will go first

because the in-selectors will break and things like that. So if you lost a load there has to be a reactor trip.

MR. VOLLMER: At Fukusima I belive it was an insulator problem that shorted out the incoming power or off-site power distribution. That was about the only damage that was reported in that one.

COMMISSIONER BRADFORD: If there a staff position or recommendation with regard to the rule of the Commission's now considering equipment qualifications generally? You all would like to see seismic qualification included at least as to new plants in the rule that the Commission might be putting out now? Have I followed the paper correctly?

MR. VOLLMER: I guess version three, I think it is, would include it; is that right, Satish?

MR. AGGARWAL: Let me answer that, if I may. The staff position is that we are asking that alternative one, which is only environmental qualification, be approved, which is SECY paper 603(b).

In the last meeting I mentioned that the staff was willing to concede to request the Commission to approve the alternative three which will cover the seismic and dynamic qualifications for the plants which are in the pipeline, namely, currently under review, and also future plants.

The problem which was brought out in that meeting

was the requirement of IEEE-32374 which requires sequence testing. Chairman Palladino raised the question are we sure whether or not sequence testing is being done in the country at this time or not and if such equipment is available or not. If the equipment is not available, we should not impose any such requirement.

The alternative three, which is before the Commission, really doesn't tell you that you have to do the testing in sequence. You have to go to regulatory guide 1.89.

My personal views will be that perhaps we can have a compromise since we don't know at this time that sequence testing has any technical significance. We propose to do some research. All we know is that it is logical to do it, and this is how this standard IEEE-32374 will do it.

Now my summation will be that if the Commission decides to approve alternative three we will go with the regulatory guide 1.89 asking for sequence testing and review the public comments. If we find that the equipment is not available in the country, then we can always change the regulatory guide 1.89 at that time.

MR. ROSZTOCZY: Satish, let's look at this a little bit carefully. Looking from our viewpoint in terms of trying to implement something, obviously what one would like to see is to have the regulations, the requirements

spread out ahead of time so when you go out to implement something everybody is familiar with it and knows what is available. So that is kind of a driving force to try to get all the requirements out as soon as possible.

At the same time there is a certain amount of urgency to get this rule out because in addition to being the rule it has with it the implementation schedule and that is really the change in the June '82 deadline. One ought to pass on that before June '82.

(Laughter.)

MR. ROSZTOCZY: If it doesn't go out for public comment right now, then it won't get through the process by June '82. So I think everybody's feeling is that what it takes to get it finished on time is to separate out the seismic from it and issue the seismic somewhat later. If that is the price we have to pay, then we have to pay that price for it.

As an end product there will be basically just one rule. For the seismic you will add a few sentences to this rule or modify a few sentences. When we add the mechanical equipment again it will change a few sentences in the rule, but it is basically there. It will be just one rule just being first issued in this form and then modified later on into other ones.

Now what is holding back the seismic one? The

requirements for all the plants which are in review now are clearly spelled out and have been on the books since 1975 and there is no significant change in them. So all of that is rather straightforward and that is going through the reviews and being implemented. Whether sequential testing is required beyond a certain date, that is what we are going with and that is really not at question.

What is at question are these plants, the operating plants which did not have a review at the time when they were licensed in the equipment qualification area. That was just too much detail in those days and we didn't go that for.

Mr. Denton feels rather strongly that before we would go out and issue something a 7901(b) type of bulletin to tell the operating plant that you just do something and you must do it on a certain schedule, before we do that we should look at very carefully what is the minimum that needs to be required to establish reasonable assurance whether this should be across the board or whether it should it be for some selected parts or some emphasis on certain selected parts. We should establish that and we should know how much is it going to cost. We should be able to inform him as well as the Commission of our judgment on what priority it gets relative to other competing NRC requirements.

COMMISSIONER BRADFORD: How much is it going to

cost NRC or how much is it going to cost everybody?

MR. ROSZTOCZY: The answer is that we would try to generate both, but I think the main part is how much is it going to cost for the industry. Our part is a lot easier to control. We don't have to review everything in detail. Our costs can be controlled and certainly can be handled within the type of budget that they put forward in the program, but how much is it going to cost the industry and how much would have to be replaced ---

COMMISSIONER BRADFORD: How can you tell that with as little data as you have now? You can tell with some accuracy how much it is going to cost to do the tests, but what do you assume about percentages of equipment that would have to be replaced?

MR. ROSZTOCZY: The approach that we are planning to follow for establishing this is to pick out some sample cases from the near-term OL reviews and see if as a result of the review what type of changes were introduced in a given plant and pick out also some of the SEP plants. So we would have some examples of some of the oldest plants and some of the most recent plants. We would look at in those two cases of what type of a change did this result in and what kind of an effort did this result in to be able to select out the equipment that needs to be changed.

By looking at those two and looking at the

improvement that you expect to come from this we would have the basis for the value impact statement. It would be a guess. It is always a guess. Even if you look at the environmental qualification today when we are maybe half way through, it is still guess. We still don't know how much is it going to cost before it is finished. So there will be always a relatively large uncertainty.

Nevertheless, one can pinpoint the order of magnitude of the effort. A major concern at least in some people's mind was that if they start to do this and if that was required in the license and they would go back and do a complete seismic reanalysis of the plant just to establish that input motion for the equipment qualification then that seismic reanalysis alone probably would run maybe in the $10 million range just to renalayze the entire plant.

Now we are convinced that nothing like that is needed. That is not necessary and it can be short-cut. Today equipment qualification is not even being based on individual spectrums because they try to qualify the equipment in such a way that it can go into a large number of plants within a certain seismic zone area and not necessarily individual plants. So we think appropriate spectrums can be generated and the equipment can be tested to that.

COMMISSIONER BRADFORD: The input motion doesn't

just involve taking a figure or a set of figures out of the overall seismic analysis but you have to go do a separate analysis for, what, each location in the plant?

MR. VOLLMER: It depends. The motion gets amplified throughout the plant depending on how the plant is structured and how the equipment is hung in the plant and so on. So you may have a basic vibratory ground motion on one level and it may be amplified ten times for something that is hung up at the top.

COMMISSIONER BRADFORD: And that doesn't have to have been taken into consideration in deciding the adequacy of the containment itself or the auxiliary building itself?

MR. VOLLMER: Yes, it would. In the structural analysis that would.

COMMISSIONER BRADFORD: So the number does already exist for any given location?

MR. VOLLMER: For those plants that have gone through a seismic analysis, yes.

MR. BAGCHI: The general finding is that structures and large equipment, they are fairly adequate.

COMMISSIONER BRADFORD: Right, but that isn't what I was after so much as whether ---

MR. ROSZTOCZY: Let's try it this way in a somewhat simplified manner. First you have a ground motion, which depending where the plant is it is a different ground

motion. California is different than some of the rest. Then the next step is that you look at the plant, the entire structure of the plant if you wish, and you establish seismic motions at different level locations in the plant, what we call the floor spectra.

Now in today's analysis somebody is going through on the normal day establishing this floor spectra and they establish it independent of equipment qualifications because they need it for other purposes also and then it is also used for equipment qualifications.

If you go back to the old plants then you find that this has been established in different degrees. Some plants might have done a relatively simplified analysis and not the type that we would expect today, or they did it somewhat differently. So with today's standards the old analysis probably wouldn't meet all the requirements.

Now our approach is that it would not be necessary to redo all of that just for equipment qualification purposes. If it is needed for something else, if there is some question about piping and it is needed to be done, then obviously we would use the other. But if it not needed for other purposes, then we think that the appropriate spectra could be constructed based on the location and the knowledge where it is and based on the available analysis or available information in such a way that it would be appropriate for

this purpose. That is the type of thing that is being done on the SEP plants.

MR. BAGCHI: Your bottom line would be that one would not have to go to detailed calculations and we think it is feasible.

COMMISSIONER BRADFORD: If you all have questions, don't hestitate to ask.

MR. ABBOTT: I don't understand what you are doing. If you have an old plant and it doesn't have a seismic analysis which meets the current standards I don't understand how you are coming up with this appropriate spectra for the equipment. I didn't follow what you said.

MR. BAGCHI: I would just like to give you the example of the five SEP plants that were currently reviewed and you have the NUREG reports published on that. They used very simple models. They developed all of the ground motion based on Reg. Guide 1.60, all of the current requirements, and then they developed the floor response spectra.

When one looks at it, it is broad and it can be generically established by using simple multiplication factors and simple scaling factors. We believe that looking at this and at the experience that we would develop some guidance on developing a generic spectra case.

COMMISSIONER BRADFORD: It just increases the uncertainty somewhat.

MR. ROSZTOCZY: You can cover that by being more generous and more conservative in the establishment of the spectrum.

MR. BAGCHI: That is right.

MR. ROSZTOCZY: You do a simplified analysis and you will put some bigger loads on the equipment.

MR. MARSH: These are conservative analyses? These are in all cases bounding analyses that are done?

MR. ROSZTOCZY: That is the approach, yes.

COMMISSIONER BRADFORD: Let's see, bounding after you have used the larger loads. It doesn't sound as though it is conservative as far as establishing the response is concerned.

MR. ROSZTOCZY: I am sorry, I didn't follow that. If anything, it will be broader and it might include some frequences that a detailed analysis would show that is not here.

MR. VOLLMER: There is one other element that I would like to mention. You asked about the cost or the potential costs of doing this. Another factor in the equation of course is the degree of seismic risk. Other than the fact that the event is not a high probability event, it is also not clear, I think as we have discussed here already, that a good deal of equipment in the plant would not ride out that type of event. So the seismic risk

is the other thing that we really have to evaluate in order to apply reasonable cost benefit to backfitting the old plants.

COMMISSIONER BRADFORD: Is this an area that is covered in the justifications for continued operation that are required in the context of equipment qualifications as a whole?

MR. VOLLMER: In response to the Commission's memo order those were for the environmental qualifications.

COMMISSIONER BRADFORD: It didn't cover seismic at all?

MR. VOLLER: It did not cover seismic.

MR. ABBOTT: That is correct.

MR. BAGCHI: 846 makes a statement as to why it is acceptable in general. I think the bottom line of that is that experience from actual earthquakes are not devastating.

MR. MARSH: But it hasn't been documented in any form, has it?

MR. VOLLMER: That is right.

MR. ROSZTOCZY: They have not been requested to provide such information. They haven't done it and we don't have that information.

MR. MARSH: What was the reason for not doing the operability checks in the SEP plants and picking those up for the rest of the operating plants?

MR. ROSZTOCZY: The approach taken there was something what you would call a walk-down type of approach. A team of experts inspected the plant and they walked through the plant and they looked at whatever they could through that type of an approach. That takes care of anything like how is the equipment supported. They looked at also what motions were predicted for that part of the plant, but they did not ask for the collection and submittal of qualification tests or seismic analysis and they didn't review anything of that sort.

When the Equipment Qualification Branch was formed we sat down with them to discuss these and we both felt that it was more appropriate to look at that part and we are going to look at the seismic qualification of all the operating plants.

It is a somewhat different discipline and it requires a fair amount of work on the licensee's part to collect all that information together and then you have to review it in some systematic manner.

MR. BAGCHI: I would just hazard one guess. If things stand up and they don't fall apart, then chances are very good that you could after the earthquake go back and make them operate.

MR. VOLLMER: That is basically the thrust of what was done. People who knew how plants should be hung

together walked through and looked at things and made observations and found in some cases some rather key things that weren't done like vital battery racks supplying vital DC power that were just mounted on the floor and obviously would tip over in an earthquake and likely wipe out your vital power. So they were made to go back in and fix those. That is the type of thing they looked for, but they didn't go into components and see that they actually had the tested capability of functional.

MR. KELLY: What reason do you have to believe that from just walking around that they could make an accurate determination that a piece of equipment was properly hung from the point of view of if it was sticking out it might have some torque or motion or there might be amplification there?

It seems to me that it would be something that would be very difficult to determine or eye-ball as you just walk along. The type of things that I think you could eye-ball, you know, do I notice that something is anchored at all, but it might be difficult to determine if it was anchored properly.

MR. ROSZTOCZY: It depends to a large extent on who is the one who is doing the walk-down. They also reviewed whenever there was a question, like if they felt that here is a piece of equipment where it is not obvious

what size of a bolt it should have or what kind of a valve it should have and what valve thickness. Then they asked for the calculation of how was it established and they took a look at that so that was available to them. This depends a lot on the experts. Those who are really expert on this business, when they walk through they will pick up most of the ones, if not all, that are outstanding.

MR. VOLLMER: It is a judgment based on experience.

MR. GIBBON: Dick, let me ask you. If the Commission put out version one, would that in any way change what the staff is going to do for NTOL seismic review?

MR. VOLLMER: No, we are continuing on.

MR. AGGARWAL: No, we are continuing on.

MR. VOLLMER: What I started out to say in answer to Commissioner's Bradford's question was that version three was an attempt to codify what the staff was currently doing for plants in the licensing process. We would intend on using the reg guides and the standard review plan methods and the same requirements with the team audits that we are doing right now. So it would not change.

MR. ROSZTOCZY: What it would change, and that is where some of our concern is, it changes the end date when this program of catching up with the operating plants is finished. If the requirements get out later, then the implementation of that gets that much later, too.

Originally when we were starting out and trying to plan this we were hoping that in something like three or four years the whole thing would be finished.

If it takes two more years just to get the requirements out, then the implementation will be either three or four on that.

MR. GIBBON: I see that, Zoltan, for operating plants.

MR. AGGARWAL: Option 4.

MR. ROSZTOCZY: For operating plants but the rest is not affected.

MR. VOLLMER: That is what he is saying. The answer to your question is it would not affect it.

MR. GIBBON: So as far as the staff is concerned, do you really care whether we put out version one or version three if it doesn't seem to affect you one way or the other?

MR. ROSZTOCZY: As far as the near-term OL's we are reviewing it doens't make any difference. As far as the operating plants is concerned, it will influence when are we going to finish those.

MR. CASE: Except that NTOL's would read into version one no longer any requirement for seismic and dynamic for their facilities.

COMMISSIONER BRADFORD: And therefore be less cooperative?

MR. CASE: Yes.

MR. GIBBON: For the equipment that is being tested today as part of our program for environmental qualifications, are the operating plants doing any seismic testing?

MR. ROSZTOCZY: Yes, they are doing very extensive seismic testing. There is one area there where I was informed last week that they have stopped some of the testing recently because of the draft version of the Regulatory Guide 1.89 that has a sentence in it that for equipment in mild environments testing is not required.

Some of them are interpreting that to include seismic. That sentence was originally for environmental testing and some of them are interpreting that it also includes seismic and they actually stopped the seismic testing of some of the mild environment equipment because of that.

MR. BAGCHI: If the staff performs a seismic review they will say it is not qualified by any way and it will not be acceptable.

MR. AGGARWAL: That is right. Let me clarify one more issue. 1.89 only addresses the environmental qualification. It doesn't cover the seismic requirement. They are covered by Regulatory Guide 1.100.

MR. ROSZTOCZY: This is an illustration I think of

the comment that Mr. Case made a minute ago, that when we write something and we write it with the goal that this applies only to environmental qualification sometimes when somebody else reads it by not having an equivalent statement in the seismic area he uses it also at least until further notice.

MR. GIBBON: Let me ask you whether it is possible that the operating plants that are having testing programs ongoing would test to environmental conditions and not test to seismic and then in a couple of years the Commission comes back with seismic requirements for operating plants, would that equipment then have to be replaced again to meet the Commission's new seismic requirements?

MR. ROSZTOCZY: Which plants were these?

MR. GIBBON: I am talking about operating plants.

MR. ROSZTOCZY: The operating plants, if they send something out now for testing, it is likely that they will include the seismic. It is likely but not certain. It is questionable whether they will include it in such a manner that it is acceptable to us. If they include it in a cheaper or more simplified manner and then later on they will have problems with it when we review it.

MR. GIBBON: Why doesn't it make sense for at least replacement equipment that is going to go in and that is currently being tested to require that at least the

replacement equipment meet a certain minimum seismic requirement? That is, even if we aren't prepared now to put requirements on all the operating plants for the equipment in place, why doesn't it make sense that for at least equipment which is going to get plugged in which is going through a testing sequence to require that to be seismically qualified to a given level?

MR. ROSZTOCZY: It is required. It is just not a clear-cut black and white reading when you read the regulations. So if somebody elects to interpret it differently we would not know it until we review it and that might be four or five years from now.

MR. GIBBON: And maybe that would be an audit. I guess what I am saying is why doesn't it make sense to make it a clear requirement for replacement equipment?

MR. ROSZTOCZY: It would help.

MR. BAGCHI: It would be very difficult to put that floor, that this is the minimum seismic input, very difficult.

MR. VOLLMER: That is the problem. I think in general anybody who went through the expense of qualifying, as Zoltan has indicated, will give it seismic testing. Certainly if it is a manufacturer's sponsor testing he would like to have something that, you know, would meet the envelope of all plants. But whether or not that would be as

effective would depend on plant specific spectra and seismic requirements.

MR. GIBBON: If we don't do it, aren't we going to be put in a situation of possibly having these guys go through doing the testing and replacing the equipment. I mean, you guys quoted 15 to 40 percent of the equipment would be replaced. That equipment would be replaced and then four years down the line the Commission comes up with seismic requirements and that stuff has got to be replaced again because the seismic testing wasn't done.

MR. VOLLMER: I thought I answered that. I think most of the stuff that was being qualified with the category one requirements would be undergoing seismic testing along with all of the rest of the sequential testing. There may be certain cases where if the level of it is not adequate ---

MR. GIBBON: Would it be difficult to set that level? I guess not.

MR. ROSZTOCZY: No. The level is really there because the seismic requirements have been spelled out in 1975 by NRC both in a regulatory guide and in the standard review plan.

MR. VOLLMER: He is asking for plant specific application now, Diablo Canyon versus Midland, for example. If that your question?

MR. GIBBON: No. My question is, is there a down

side to putting in this rule that we are about to put out seismic requirements for equipment that is going to have to go through a test sequence so that we avoid two or three years down the road having to retest that equipment and having it possibly fail and then having to replace that equipment?

MR. CASE: I am afraid it begs the question of whether it is rational to do it from a cost benefit standpoint.

MR. MARSH: You mean in that part of the rule?

COMMISSIONER BRADFORD: The cost benefit on seismic qualifications at all?

MR. CASE: (Nodding affirmatively.)

MR. ROSZTOCZY: That really wouldn't affect it. He is just saying equipment which is sent back for other purpose and not because of seismic. Then when that one is requalified it must meet the existing seismic requirements.

MR. CASE: What is the correct "G" value and what is the correct spectrum.

MR. GIBBON: But Dick said they are doing some seismic testing anyway. I mean they are required by the general design criteria to have it qualified seismically, right?

MR. CASE: Yes.

MR. GIBBON: So the only question is whether we

are willing to set down the more detailed requirements so that in three or four years we don't have to replace that exact same piece of equipment.

MR. CASE: But the whole issue on whether you ought to do that is whether by just kind of doing it using good engineering judgment it comes close enough to meeting the seismic requirements without going through a bunch of detailed calculations. That is the whole cost benefit issue, isn' it?

MR. VOLLMER: To do it the way you suggest you would have to envelope everything that we expect to happen in a plant to do it right or else it wouldn't make too much sense.

MR. AGGARWAL: May I make an observation.

MR. ROSZTOCZY: The cost benefit issue is I think quite different. The cost benefit issue is that in addition to the environmental review which has been going on how much of a need exists to go back again to these operating plants and look at the seismic qualification to identify possibly additional items.

MR. CASE: Yes.

MR. ROSZTOCZY: Tom is suggesting that that will come later. He acknowledges that.

MR. CASE: It may or may not.

MR. ROSZTOCZY: It may or may not. So whatever

happens to that will be decided separately. But he is saying that since the ongoing review is sending back certain equipment for requalification maybe we should make clear what seismic requirements should the requalification meet.

MR. CASE: It still seems to me it begs the question of how the cost benefit is going to come out.

MR. ROSZTOCZY: As a matter of fact, if you really look at the Commission order it is already there because it says the equipment sent back now for replacement has to meet the current requirement.

MR. CASE: For environmental.

MR. ROSZTOCZY: But the two are not separable any more. That is all the same test. When you go to the environmental requirement it has in it the requirement to go through seismic before it goes into the LOCA atmosphere.

MR. CASE: That is just a bootstrap statement.

MR. LIAW: You were saying through the 323 test sequence, right? The Commission addressed that by asking for a sentence saying that seismic qualification was not included. That was the purpose of that sentence, right?

MR. ROSZTOCZY: Oh, no, no, no. Be very careful there. To the contrary, I think nobody ever in any form indicated that the new tests which are performed doesn't have to include seismic. They must include seismic. The purpose of that sentence in this rule is to say that a

seismic review of the plant is not required by this rule. The deadline is what we are establishing and it doesn't apply to seismic.

MR. LIAW: That isn't what was proposed by Commissioner Ahearn. That was not in there. I suggest that you and I go back and talk about it.

MR. ROSZTOCZY: My understanding is that what we are trying to make very clear in the new version of the rule is that the deadlines established in this rule do not apply to any seismic review.

MR. LIAW: I understand that.

MR. ROSZTOCZY: Any equipment tested now must include the seismic as part of the test.

MR. LIAW: That is 323. The Commission then wrote an order and I am telling you that that was not the case. I think to some extent there is some misleading statement or whatever. I spoke to Vince Newland and asked him what was the intention at that time and he said no, we never explicitly addressed that question. I think that prompted Commissioner Ahearne's question on that point.

MR. ABBOTT: So what are we saying?

MR. GIBBON: Wait a minute. It still has to be qualified under the general design criteria.

MR. ROSZTOCZY: That is right.

MR. GIBBON: The question is what is the

Commission going to be satisfied with?

MR. LIAW: That is right.

MR. GIBBON: What I am suggesting is what is the down side to having the minimum requirements, the minimum seismic requirements for replacement parts spelled out in this rule.

MR. LIAW: Yes.

MR. CASE: What do you mean by minimum seismic requirements?

MR. GIBBON: Well, somebody is going to have to bite the bullet and decide whether it is multi-axis or single axis or whatever it is, but at least have a minimum requirment that you have to do a test of some nature, and I think the test ought to be spelled out whether it is single axis or multi-axis and state that.

Otherwise, if you don't do that, and I will bet you I am not going to be here, but I will bet you you are going to be here ---

(Laughter.)

MR. GIBBON: --- in three years telling these guys to replace their equipment again.

COMMISSIONER BRADFORD: If you are not here nobody is going to be telling them ---

(Laughter.)

COMMISSIONER BRADFORD: Tom.

MR. LIAW: I think that to some extent the so-called minimum seismic requirement you probably can say that the 344/71 version is about what we are asking for the time being, because the 344/71 version was implemented since, what, 1971 or '72, Jim?

VOICES: That is right.

MR. GIBBON: If everybody is in agreement, you know, that that is the standard we ought to use, fine. I am just suggesting that I think that we really ought to sit down and decide what standard it is.

MR. LIAW: Let me say more because that has not been done. The 323/74 version did refer to the 344/71 version.

VOICES: Yes.

MR. LIAW: You ask people and they tell you that there is no equipment available in the market for the time being.

MR. ROSZTOCZY: 323/71 is a very vague statement.

MR. LIAW: No. The 323/74 version referred to 344/71 of seismic testing.

MR. AGGARWAL: That is correct.

MR. ABBOTT: Are you saying there is no equipment out there that will meet that?

MR. LIAW: The Commission asked the staff during, what, Sequoyah ---

VOICES: Yes.

MR. MARSH: There was no equipment, I remember that. There was none available that would meet the '74 standard.

MR. LIAW: The 323 standard. The seismic portion referred to 344/71 standard.

VOICES: Right.

MR. ROSZTOCZY: You have to be very careful when you are saying that the equipment is not available. There is some selected equipment out of a hundred different types.

MR. LIAW: I understand that.

MR. ROSZTOCZY: There is a few that today it is not available. They are testing it right now.

MR. LIAW: I understand that, a certain portion of it.

MR. ROSZTOCZY: It is being tested right now. If they don't do that testing correctly then it won't be available in the next round either.

MR. LIAW: I understand what you are saying.

MR. VOLLMER: I guess the only down side, Tom, would be if we made the statement and picked some floor requirement, would we then not be in a position to or not want to go back and upgrade that when we go through the process we are anticipating going through with the equipment qualification program?

MR. CASE: I think you are in a worse position to specify exactly what you want to try to by some minimum that you may change later on. If they have got to meet the GDC, then it is their damn responsibility. If you say, well this is a good method to do it, then you are going to be loath to change it later on, more loath.

MR. LIAW: But, Ed, GDC is just a bunch of words there.

MR. CASE: I know.

(Laughter.)

MR. ROSZTOCZY: There are only two choices, either the '71 version or the '75 version. The '71 version, the NRC didn't fully buy even at that time so it made some exceptions to it. The NRC modified '71 version and the '75 version are really not that far apart.

MR. LIAW: But the NRC did not buy the '71 version, but the NRC did issue a branch technical position in 1972.

MR. ROSZTOCZY: That is correct, and that is what I am saying. The '72 branch position together with the '71, how it modified the '71, that set of requirements is one choice. Another choice is the '75 version. The difference between those choices is very small.

MR. LIAW: Nothing.

MR. ROSZTOCZY: So we are not including it because

we can't select between the two almost ---

MR. LIAW: Other than to spell out the number of OBE and SSE it has to go through. Other than that they are identical.

COMMISSIONER BRADFORD: I have to go, and believe me it is not prompted by ---

(Laughter.)

COMMISSIONER BRADFORD: --- the choosing between the '71 or '75, 323 or 344.

(Laughter.)

COMMISSIONER BRADFORD: I do have to break off now. It sounds to be as though this is an area that we either have to leave alone or clarify. Without being able to follow all the nuances, I wish people were clearer on what it was we had already done.

(Laughter.)

MR. AGGARWAL: Commissioner Bradford, I would just like to make one concluding remark here. In the proposed rule, in the first paragraph all we are saying is the requirement for seismic and dynamic qualification of electric equipment are not included in this rule, but in the statement of consideration. We have made it clear that do not forget those requirements are namely general design criteria. With regard to replacement parts, the staff believes that it is such a minor detail that we have not covered that by a rule.

We believe that in Regulatory Guide 1.89 we have made very clear that they should meet the latest criteria. The staff is also planning to revise Regulatory Guide 1.100 which is on seismic qualification and the staff plans to incorporate those requirements.

MR. GIBBON: Incorporate which requirements?

MR. AGGARWAL: Namely, that the replacement equipment shall be qualified to latest criteria.

COMMISSIONER BRADFORD: But what will the latest criterion be?

MR. AGGARWAL: IEEE-323/74 and IEEE-344/75.

MR. ROSZTOCZY: The same, but the newest plants ---

MR. AGGARWAL: But you really don't have a problem.

COMMISSIONER BRADFORD: If I were in charge of procuring equipment for a plant today that was just beginning to replace a lot of electrical equipment, what would I think that I had to do with regard to the seismic qualification of that replacement equipment? Leave out the question of what I would do if I was smart ---

(Laughter.)

MR. AGGARWAL: You would follow IEEE-344/75.

MR. ROE: The latest.

MR. LIAW: You would use IEEE-344/75 first and then the same piece of equipment I will test it according to 323/74; is that correct?

MR. AGGARWAL: No. I am saying you will take a single prototype and you will follow 323 in terms of sequence and then you will go to 344.

MR. LIAW: And then back to 323.

MR. AGGARWAL: That is right.

MR. LIAW: Fine.

COMMISSIONER BRADFORD: Will I find such a piece of equipment?

MR. ROSZTOCZY: They are testing it now. If it is set forth by the requirement code this way, then they will test it this way. If you don't track this down they might test it differently.

COMMISSIONER BRADFORD: But if the requirement is that which exists today and not whatever we are going to promulgate in a week or two, is a description of the requirement or is that what I would do if I were smart?

MR. ROSZTOCZY: That is our interpretation of the requirement, but it is not black and white when you read through on the existing wording which means that somebody might elect to challenge us on it

MR. GIBBON: Zoltan, where is that requirement?

MR. ROSZTOCZY: When you go to the Commission order the Commission order says in some words first indicating that the replacement should be used in operating the plant and then it says that it is also to meet current

criteria. Then you go to the current criteria, that is the new version of the environmental which includes the sequence in it and in the sequence is the seismic. Then when you go to the seismic the current requirement for the seismic is the one that Satish recommends.

MR. GIBBON: If that is a requirement for new equipment ---

MR. AGGARWAL: Replacement parts.

MR. GIBBON: --- replacement parts, then I guess I don't see any reason at all not to codify that in the rule. I mean, if everybody agrees that is the requirement -- you agree it is a requirement ---

MR. CASE: I didn't know it was a requirement.

(Laughter.)

MR. AGGARWAL: Tom, again you are codifying an IEEE standard which we don't intend to.

MR. GIBBON: Then write it out.

MR. AGGARWAL: That is the detail. They is why we are coming with the regulatory guide.

MR. LIAW: Tom, that is not exactly the current requirement either. The Commission memorandum order said you qualify replacement parts, qualify to 323/74 which refers to the 344/71 version.

MR. GIBBON: I understand.

MR. LIAW: So that is not exactly what we require

today either.

COMMISSIONER BRADFORD: You are saying that the requirement that would emerge from the order is not exactly what the Commission staff practice requires?

MR. LIAW: That is right.

MR. ROSZTOCZY: His point is that was an update to both standards, the one covering the environmental standards and the one which covers the seismic. It turns out that the environmental was updated in '74 and at that time the only thing that it would reference on seismic was the earlier.

COMMISSIONER BRADFORD: Zoltan, let me stop you for a second.

Ed, was your point that you weren't aware that either of these requirements applied? You would have said what in answer to my question about the plant procurement effort?

MR. CASE: You have to follow the general design criteria, whatever that means.

COMMISSIONER BRADFORD: And that is it.

MR. CASE: Now my understanding is obviously wrong.

(Laughter.)

MR. AGGARWAL: I personally feel there is no problem because 1.89 and 1.100 taken together very clearly specifies what is expected on replacement parts.

MR. CASE: What is Stello's understanding? Does

he understand this, because he is the one who thinks ---

MR. LIAW: Ed, I bet you he doesn't understand.

(Laughter.)

MR. CASE: He thinks he has got seismic and dynamic in his book ---

(Laughter.)

MR. VOLLMER: That is the legal status but wasn't that clarified under this one rule, the clarifications of 7901(b)? We discussed replacement parts there, as I recall.

MR. AGGARWAL: Seismic never came up.

MR. VOLLMER: But we said what we meant by ---

COMMISSIONER BRADFORD: It doesn't sound, from what I understand the joint consensus to be, as though it belongs in Vic's shop at all. It sounds as though this is an existing requirement.

MR. CASE: Except for a minor glitch that it isn't quite current.

COMMISSIONER BRADFORD: Right, but I am sure that is not the part that he is worried about.

MR. AGGARWAL: I will be obligated to go to him with Regulatory Guide 1.100 and he may raise hell at that time. I don't know.

COMMISSIONER BRADFORD: But will Regulatory Guide 1.100 change the existing situation very much?

MR. AGGARWAL: Well, it is silent at this time and

I have to make it explicit.

MR. ROSZTOCZY: No, just a minute. It is not silent. It was issued in 1975 and it says that the new version of the seismic criteria is required.

MR. AGGARWAL: Correct, but it doesn't explicitly tell you what you do for replacement parts.

MR. ROE: Zoltan, a question about the current staff practice for licenses under review. What testing does your staff require before they will give them a favorable SER?

MR. ROSZTOCZY: We follow the standard review plan that was issued after Regulatory Guide 1.100. It says it cuts into two categories. For one of them it applies the new upgraded version. Those are the more recent plants. For the ones before that dividing line, that date, it applies the '71 version of the criteria which the branch position and some modifications. The dividing line is Comanche Peak among the NTOL's.

MR. AGGARWAL: The dividing date being the October '72 CP's.

MR. ROE: The CP's, okay.

MR. KELLY: You had indicated earlier collectively that you were taking care of this because you had regulatory guides and in part because of the standard review plan. We have plants that were built before the standard review plan

came along and we had plants that were completed before the regulatory guides were issued. What is the status of these plants then? Since they don't have their replacement parts, wouldn't they therefore not be covered under any of these conditions?

MR. AGGARWAL: They are covered. The rule and the guide is very specific for those operating plants that the replacement part will be according to the latest criteria.

COMMISSIONER BRADFORD: I think the situation for replacement parts, whatever it is, is uniform and it doesn't vary with the generation of plants.

VOICES: That is correct.

MR. AGGARWAL: That is right.

MR. ROE: I think if you look at your draft regulatory guide it is fairly explicit what you want.

MR. AGGARWAL: That is right. I can only assure you that when I go with 1.100 I will make it explicit. I don't know whether it will fly, but I will try.

(Laughter.)

COMMISSIONER BRADFORD: But does making it explicit result in a new requirement?

MR. AGGARWAL: No, sir.

COMMISSIONER BRADFORD: It shouldn't, but there will be those that argue that it does?

MR. AGGARWAL: Commission Bradford, this is a

question of who is reading it. I can always argue against you.

(Laughter.)

MR. AGGARWAL: It is a legal argument and how can you ever win an argument with an attorney?

(Laughter.)

COMMISSIONER BRADFORD: I don't feel I have won an argument in four year and half years.

(Laughter.)

MR. AGGARWAL: Commissioner Bradford, to tell you the truth the point I am making here is that you read a statement and I am saying it will always require another person that can come back and say, no, it was not required. Show me that it was required and I don't have anything to show.

COMMISSIONER BRADFORD: I didn't mean to drive you out. You were about to make a point?

MR. LIAW: All I want to say is he can argue with you, but I simply want to say that I disagree with him.

(Laughter.)

MR. LIAW: The way I read Reg. Guide 1.100, it was clear enough to me that seismic qualification should meet the IEEE-344/1975 version.

COMMISSIONER BRADFORD: But if your view would that impose a new requirement above and beyond staff

practice?

MR. LIAW: No, because as far as I understand it, the staff practice has been that way since, what, 1972 with minor differences between the branch technical position and the '75/344 on the number of OBE and also SSE.

MR. AGGARWAL: I agree. I have no disagreement. All I am saying is the other person may disagree with me.

COMMISSIONER BRADFORD: Something has alluded me. Come back to Tom's original question.

MR. CASE: Say it all over again.

(Laughter.)

COMMISSIONER BRADFORD: No, don't do that.

(Laughter.)

COMMISSIONER BRADFORD: I want to come back to the question but fold over some of the answers. If that does not impose a new requirement above and beyond the existing staff practice, then what is the concern with putting it in the rule?

I understand Ed's comment at one point to be that if you put it in the rule you wind up giving the licensee a basis for arguing that you can't go any further and you have now said what the GDC means and that is the end of it.

MR. CASE: That is no longer valid apparently because I don't think we have any idea of jacking that up in the future.

VOICES: Right.

MR. CASE: I am afraid what you are going to find out is that there are a bunch of people like me who didn't understand that somehow seismic had gotten in the side door this way and they are going to say, oh my God, stomp it out.

(Laughter.)

COMMISSIONER BRADFORD: I won't ask you who you mean.

(Laughter.)

MR. CASE: I probably wouldn't answer.

(Laughter.)

COMMISSIONER BRADFORD: It seems to me that at some point that revelation is going to dawn on the community as a whole anyway. The only way in which it wouldn't would be if the licensees are unaware of it and are in fact putting in replacement parts that don't meet it and we are not enforcing it in which case it is not doing as much good anyway.

MR. CASE: Are they putting in the good stuff?

MR. ROSZTOCZY: This is a half sentence that says unless there is sound reason to the contrary. If they have the sound reason for the contrary they have to document it and put it in their file. It doesn't come to us. We do not know how often they use that but we know they are using it.

MR. CASE: If all this is true I don't see what

the great big issue is on going ahead with seismic because with all replacement equipment they are already going to have to do and what the hell is left?

MR. LIAW: Ed, there is some bridge there. The difference is whether you test in sequence according to what 323 specifies. If you don't test to sequence theoretically speaking you don't meet the requirement.

I spoke to some member participating in the working group of 323/74 and asked him what was the technical basis of coupling seismic and environmental. The answer was none, other than it seems logical to do, because both of them are required.

MR. CASE: But what is wrong with logic?

MR. LIAW: I am just stating what I heard. So that potentially could be a problem.

MR. CASE: The whole purpose of this rule was to codify existing practices and it seems to me the rule ought to be specific on this.

COMMISSIONER BRADFORD: What is I&E inspecting against?

MR. CASE: That I don't know.

COMMISSIONER BRADFORD: Are they inspecting in this area at all?

MR. ROSZTOCZY: I&E is inspecting against the procedures.

MR. CASE: For the replacement parts what are they inspecting against? That is the question, isn't it?

COMMISSIONER BRADFORD: Yes.

MR. ROSZTOCZY: On replacement parts they will have, they haven't done it yet, but they will write a piece of paper for this purpose. What we expect will be in it is they are going to inspect, No. 1, whether it was replaced with one that meets the new standards. If there would be sound reason to the contrary then they would look at the reason. If it was against the other, they would simply check if that was spelled out.

COMMISSIONER BRADFORD: What is the piece of paper that I&E is writing, a piece of their manual chapter?

MR. ROSZTOCZY: Yes. In Region IV I think they have an inspection manual and there would be a separate section on equipment qualification generated within the next year or so. There are other things under inspection and this would be one of them.

COMMISSIONER BRADFORD: I am exhausted. Does anyone else have questions?

MR. TRUBATCH: Why is any part of industry gearing up for another battle royal if we are only codifying an existing set of practices or do we have a bunch of plants out there which were built when staff practices weren't in existence?

COMMISSIONER BRADFORD: Well, it is not were built I think. Your question may be different. You are moving off of replacement parts now and talking about the whole ---

MR. TRUBATCH: The general subject.

MR. ROE: Do you have some idea, Sheldon?

MR. TRUBATCH: No. All I know is I got a letter from them today.

MR. ROSZTOCZY: What was the question again?

MR. TRUBATCH: The question is why is any part of the industry gearing up to oppose this rule if all it is doing is codifying existing staff practices? Presumably the existing plants need it.

MR. ROE: Well, Sheldon, let me interject and ask you the question. What do you mean by "this rule"? That is an important point because my perception of what we are talking about in this rule may be different than other people's perception about this rule.

If you are talking about this general subject of rule-making of seismic/dynamic equipment qualification, mechanical/electrical, I think the answer is fairly obvious. If you are talking about this one piece before the Commission for vote now, it is a totally different subject, a subset. You are talking about the small subset.

MR. TRUBATCH: The one that is going to come up before the Commission to be voted on as a proposed rule.

MR. ROSZTOCZY: The answer to your question is that if current practice, the so-called current practice was enacted through a Commission order without public comment they didn't imply this. Now this rule makes it a permanent rule. So this is the time when they have legally the option to expect ---

COMMISSIONER BRADFORD: I think Sheldon's question though really is different. It is what in the real world are they being forced to do that is making their client pay for the recommended objectives.

MR. TRUBATCH: These utilities are not going to spend the kind of money they are going to have to spend to pursue a lawsuit that they are clearly getting ready to pursue unless they are going to save a lot more on not having to do something inside those plants.

As I say, it looks to me like we are just gearing up for fire protection all over again.

MR. LIAW: You missed some of the discussion. I don't think we are doing something just like codifying the current practice.

(At this point Commissioner Bradford left the meerting.)

MR. TRUBATCH: Well, that is what I just heard.

MR. LIAW: That was your presumption. I don't think so because I don't think the staff practice ever asked

for sequential testing.

MR. AGGARWAL: That is right.

MR. LIAW: That potentially can slow you up because all the equipment there was not done on paper as the Commission memorandum and order say.

MR. TRUBATCH: So we are doing more than just codifying ---

MR. AGGARWAL: No, we are not asking for those operating plants to do the sequential testing.

MR. LIAW: No, no, he is not talking about that. He is talking about 603(b).

MR. AGGARWAL: Yes, 603(b), we didn't ask that the operating plant do sequential testing.

MR. LIAW: I know that.

MR. TRUBATCH: Let's get back to the question. Why are they excited?

MR. AGGARWAL: They are not familiar with it.

MR. VOLLMER: Sheldon, they have been representing the group that we have sat with on a couple of occasions to try to see what their technical problems were. The main problem we had was with this group that were looking for hearings on this issue. The one main problem they had of course was a date. They had a number of technical issues and I thought we had pretty well gotten those resolved. So I am a little surprised that they are taking specific action

right at this point in time.

I can't answer your question. I have no idea why.

MR. TRUBATCH: Well, if one of you can answer like on fire protection where it was clear there couldn't be a 20-foot separation all the time.

MR. VOLLMER: I don't think there is anything that they "can't meet" by application of dollars and elbow grease. But I am quite surprised. Again, Zoltan was a part of the meetings that we had with them. There were a number of issues which required clarification and in some cases they were taking a more conservative view of what the requirements were than the staff and the Commission, that the staff interpreted anyway, thought were required.

I was surprised that they are gearing up for a battle as you put it.

MR. TRUBATCH: That is why I am asking.

(Laughter.)

MR. ROSZTOCZY: Is this some recent information that you have?

MR. TRUBATCH: The Chairman got a letter today.

MR. GIBBON: Before the meeting closes there is one question that I just don't know the answer to. What is the difference between single axis, single frequency testing versus multi-axis and multi-frequency testing?

MR. BAGCHI: When there is an earthquake motion

the motion is recorded along three axes. The earthquake has a motion along those three directions. If somebody tests a piece of equipment just shaking the equipment only in one axis he is not simulating the earthquake motion.

MR. MARASH: Does he have to excite it on one axis and then excite it on another axis at the same frequency, or is it only single axis at any point in time?

MR. BAGCHI: That was the practice in some cases. Some tests were done by shaking in only one direction and not in the other simultaneously.

MR. GIBBON: This is in the operating plants?

MR. AGGARWAL: Yes, sir.

MR. GIBBON: But that would not be acceptable today?

MR. AGGARWAL: Well, in 1971/344, that asked for only single axis testing. But the staff when they issued the advanced technical position they made it clear that that was not acceptable and they required justification why multi-axis testing should not be done. I don't think we have a problem in that area.

MR. GIBBON: But in those 12 plants that we went back and reviewed were the tests that were done single-axis or multi-axis?

MR. AGGARWAL: No, multi.

MR. ROSZTOCZY: Single axis could be acceptable

even today if you justify the way how something is mounted and how it is exposed only to one dimension. So it could be acceptable. But under the review that was conducted in '73-75 which was under the so-called branch technical position it brought attention to that, that in some cases multi-axis will be needed. One of the items that they looked at as part of the review was whether multi-axis has been applied when it is needed.

MR. GIBBON: Was the staff's position the same on multi-frequency?

MR. AGGARWAL: Right, and it had been audited it that way.

Tom, I would just like to point out a the schedule problem which I have with regard to the rule. We are hoping that the final rule should come by June next year. Between now and June I have only six months to see what we are up against. We have to go to one committee of the ACRS and then the full committee there.

The second problem I have is that I have to provide 60 days for public comments. Then we have to go through Mr. Dirck's committee with Mr. Stello on the final rule. Then I have to come to the Commission.

What I am stressing at this time to the Commission is that it is imperative that the rule be worded as soon as you can.

MR. GIBBON: Do you have a final date, Satish?

MR. AGGARWAL: You are already three weeks late from the scheduling point of view.

(Laughter.)

MR. GIBBON: I understand.

MR. AGGARWAL: It should have been out December 1. It was due on December 1.

MR. GIBBON: Is that it?

MR. AGGARWAL: Yes.

MR. GIBBON: Thank you very much.

(Whereupon, at 3:35 p.m., the briefing concluded.)

* * *

NUCLEAR REGULATORY COMMISSION

This is to certify that the attached proceedings before the

in the matter of: Briefing for Commissioner Bradford on Seismic Qualifications of Electric Equipment

Date of Proceeding: December 11, 1981

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)

BRIEFING FOR
COMMISSIONER BRADFORD

Z.R. ROSZTOCZY
G. BAGCHI
EQUIPMENT QUALIFICATION BRANCH
U.S. NUCLEAR REGULATORY COMMISSION
DECEMBER 11, 1981

Seismic Qualification

Requirements

- Equipment should be tested under representative conditions to demonstrate operability for OBE and subsequent SSE excitations.
- When testing is not practical, for example, because of size, a combination of scaled model testing and analysis is acceptable. Analysis can also be used to interpret or extrapolate test results.
- Analyses alone, without testing, are acceptable as a basis for qualification only if the necessary functional operability of the equipment is assured by its structural integrity alone.
- In case of old equipment, which has been tested in the past, qualification is judged based on the available test results and analysis. Requalification is required only if the available information is not sufficient to assure operability.

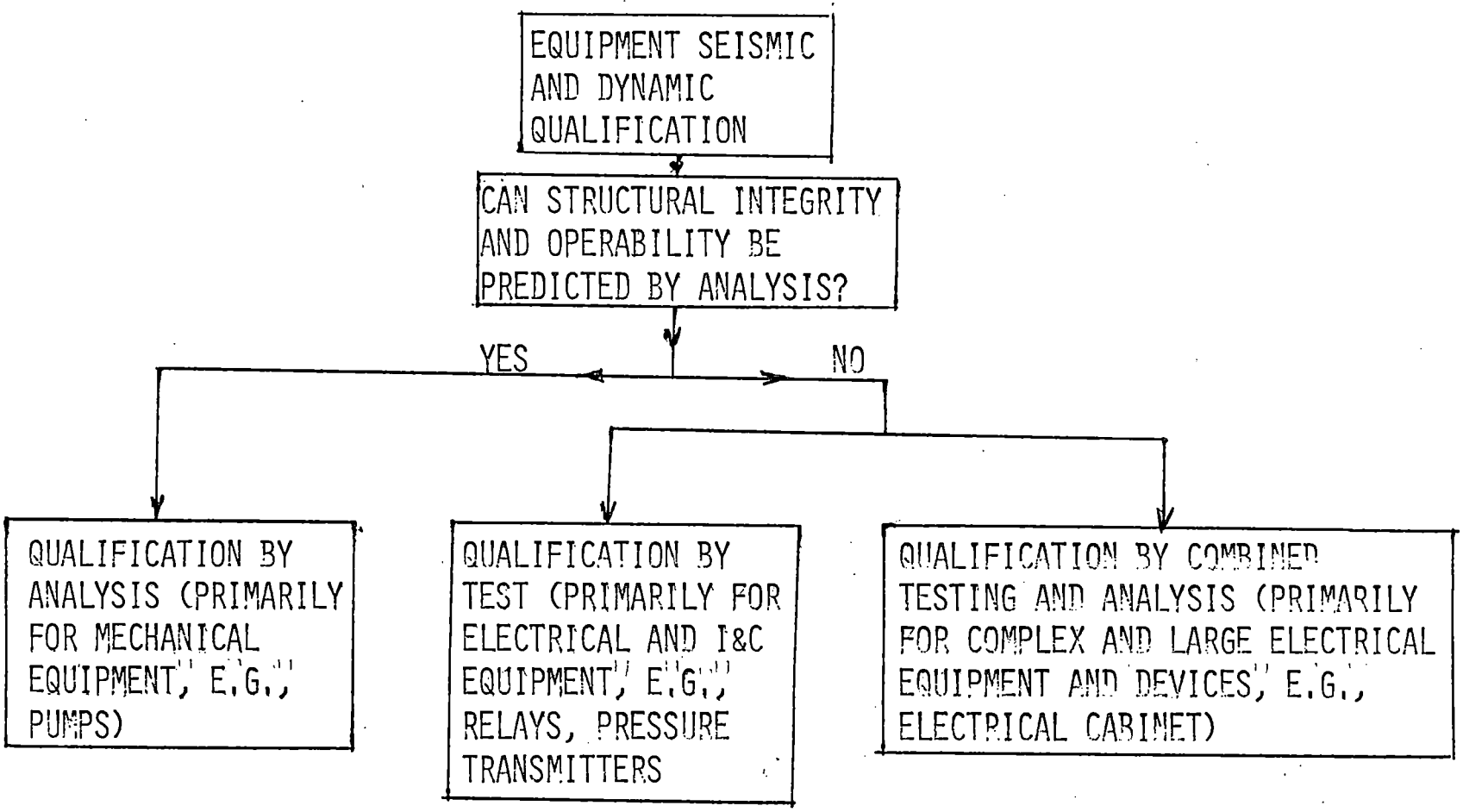
Test Procedures

- Equipment has to be preconditioned in a manner representative of the least favorable period during equipment life.
- Preconditioning includes thermal aging, irradiation, cyclic loads, and OBE-s.
- Equipment must be mounted on the test table in a manner representative of the actual mounting in the plant.
- SSE loads must be applied in an appropriate manner.

STATUS OF NRC'S SEISMIC QUALIFICATION REVIEW

	ANCHORAGE	SEISMIC INPUT LOAD	EQUIPMENT OPERABILITY
SEP PLANTS	UNDER REVIEW 5 OF 11 PLANTS ARE COMPLETE	UNDER REVIEW 5 OF 11 PLANTS ARE COMPLETE	NOT REVIEWED
OTHER OPERATING PLANTS	ELECTRICAL EQUIPMENT IN 12 OUT OF 57 PLANTS WERE REVIEWED. IE INFORMATION NOTICE IDENTIFIED POTENTIAL DEFICIENCY	ELECTRICAL EQUIPMENT IN 12 OUT OF 57 WERE REVIEWED IN 1973-75 THERE WOULD BE SOME CHANGE IN THE INPUT LOADS	ELECTRICAL EQUIPMENT IN 12 OUT OF 57 PLANTS WERE REVIEWED
NTOL'S UNDER 344/71	UNDER REVIEW UNTIL RECENTLY AUDIT WAS LIMITED TO ELECTRICAL EQUIPMENT	UNDER REVIEW	UNDER REVIEW, UNTIL RECENTLY AUDIT WAS LIMITED TO ELECTRICAL EQUIPMENT
NTOL'S UNDER 344/75	UNDER REVIEW	UNDER REVIEW	UNDER REVIEW

SELECTION OF QUALIFICATION METHOD



STANDARDS FOR SEISMIC QUALIFICATION

ELECTRIC EQUIPMENT:

. IEEE 323-1971
"IEEE TRIAL-USE STANDARD:
GENERAL GUIDE FOR
QUALIFYING CLASS I ELECTRIC EQUIPMENT
FOR NUCLEAR POWER GENERATING STATIONS"

. IEEE 344-1971
"IEEE GUIDE FOR
SEISMIC QUALIFICATION OF CLASS I ELECTRIC EQUIPMENT
FOR NUCLEAR POWER GENERATING STATIONS"

. IEEE 323-1974
"IEEE STANDARD FOR QUALIFYING CLASS IE EQUIPMENT FOR
NUCLEAR POWER GENERATING STATIONS"

. IEEE 344-1975
"IEEE RECOMMENDED PRACTICES FOR SEISMIC QUALIFICATION OF CLASS
IE EQUIPMENT FOR NUCLEAR POWER GENERATING STATIONS"

MECHANICAL EQUIPMENT:

THERE ARE NO SPECIFIC INDUSTRY STANDARDS. NRC ADOPTED IEEE 344 STANDARD FOR MECHANICAL EQUIPMENT.

STANDARDS FOR SEISMIC QUALIFICATION
DIFFERENCES

IEEE 323-1971

- BROAD GUIDANCE ON PREPARATION FOR QUALIFICATION
- STANDARD FOR SEISMIC QUALIFICATION NOT DEVELOPED
- NO MENTION OF MARGINS

IEEE 323-1974

- DETAILED GUIDANCE ON QUALIFICATION PROCEDURES AND METHODS
- SEISMIC QUALIFICATION PER IEEE 323-1971 REQUIRED IN SEQUENCE
- REQUIREMENT FOR MARGINS INTRODUCED

IEEE 344-1971

- CONCEPT OF SEISIMIC MOTION ALONG THREE ORTHOGONAL AXES IS ABSENT
- BROAD RANGE OF SEISMIC MOTION FREQUENCY IS NOT ACCOUNTED FOR
- NOTION OF DAMPING VALUES IS ABSENT
- NUMBER OF PEAK RESPONSE CYCLES NOT CONSIDERED

IEEE 344-1975

- CONCEPT OF SEISMIC MOTION ALONG THREE ORTHOGONAL DIRECTIONS IS INTRODUCED
- BROAD BAND RANDOM MOTION INPUT IS CONSIDERED
- GUIDANCE IS PROVIDED ON DAMPING VALUES
- NUMBER OF PEAK RESPONSE CYCLES CONSIDERED

STANDARDS FOR SEISMIC QUALIFICATION APPLICATION

IEEE 344-1971- PLANTS WITH CP DATES PRIOR TO OCTOBER 27, 1972.

IEEE 344-1975-PLANTS WITH CP DATES AFTER OCTOBER 27, 1972.

IEEE 323-1974-PLANTS FOR WHICH THE ISSUE DATE OF THE SER IS JULY 1, 1974 OR AFTER.

CAPABILITY OF EQUIPMENT IN OPERATING PLANTS

SEP PLANT FINDINGS:

GR I: SOME SEISMIC ANALYSIS AVAILABLE.
DRESDEN 2, GINNA, MILLSTONE 1, OYSTER CREEK, PALLISADES.

- MOST MECHANICAL COMPONENTS ADEQUATELY SUPPORTED - PUMPS, VALVES, HEAT EXCHANGERS

GR II: LITTLE SEISMIC ANALYSIS DONE.
YANKEE ROWE, HADDAM NECK, DRESDEN 1, LACROSSE, BIG ROCK POINT, SAN ONOFRE 1.

- SUBSTANTIAL MODIFICATION TO MECHANICAL EQUIPMENT MAY BE REQUIRED.

GENERAL:

- UPTO 80% OF ANCHORAGES AND STRUCTURAL SUPPORTS NEEDED UPGRADING.
  MOTOR CONTROL CENTERS, CABLE TRAYS, CONTROL ROOM ELECTRIC PANELS, BATTERY RACKS ETC.

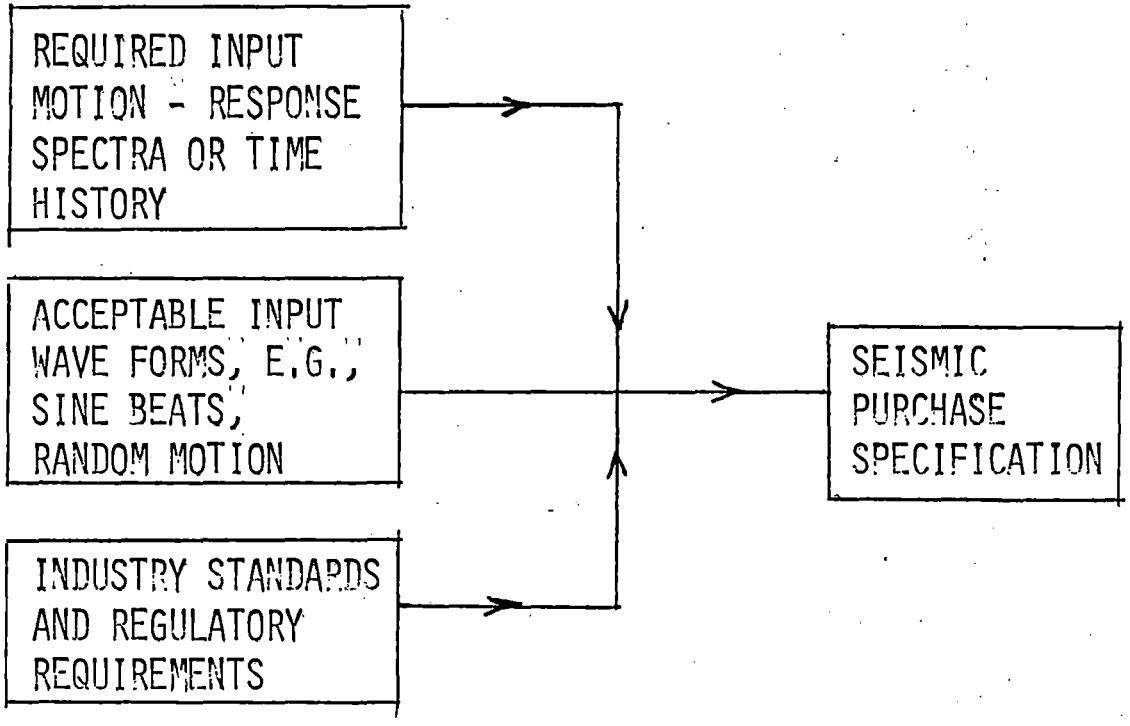
- REVIEW OF EQUIPMENT FUNCATIONAL QUALIFICATION WAS NOT PART OF THE PROGRAM. IN APPEARS THAT THERE IS A NEED FOR REQUALIFICATION OR ADEQUATE DOCUMENTATION.

OTHER OPERATING PLANTS:

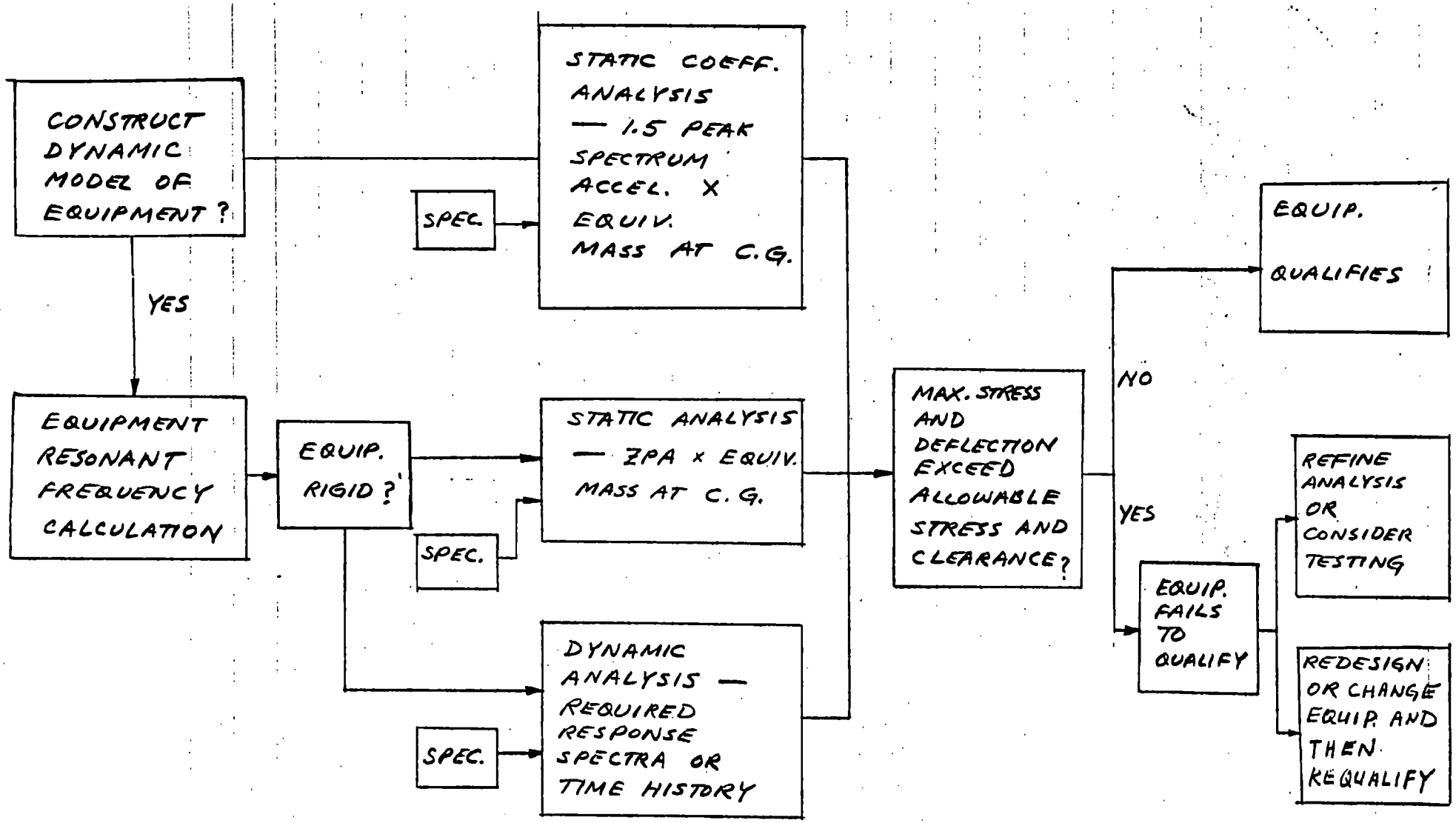
- NEED TO PAY ATTENTION TO ANCHORAGE PROBLEM

- EARTHQUAKE EXPERIENCE IN INDUSTRIAL FACILITIES INDICATE NO MAJOR OPERABILITY PROBLEMS IF THE EQUIPMENT REMAINS IN TACT.

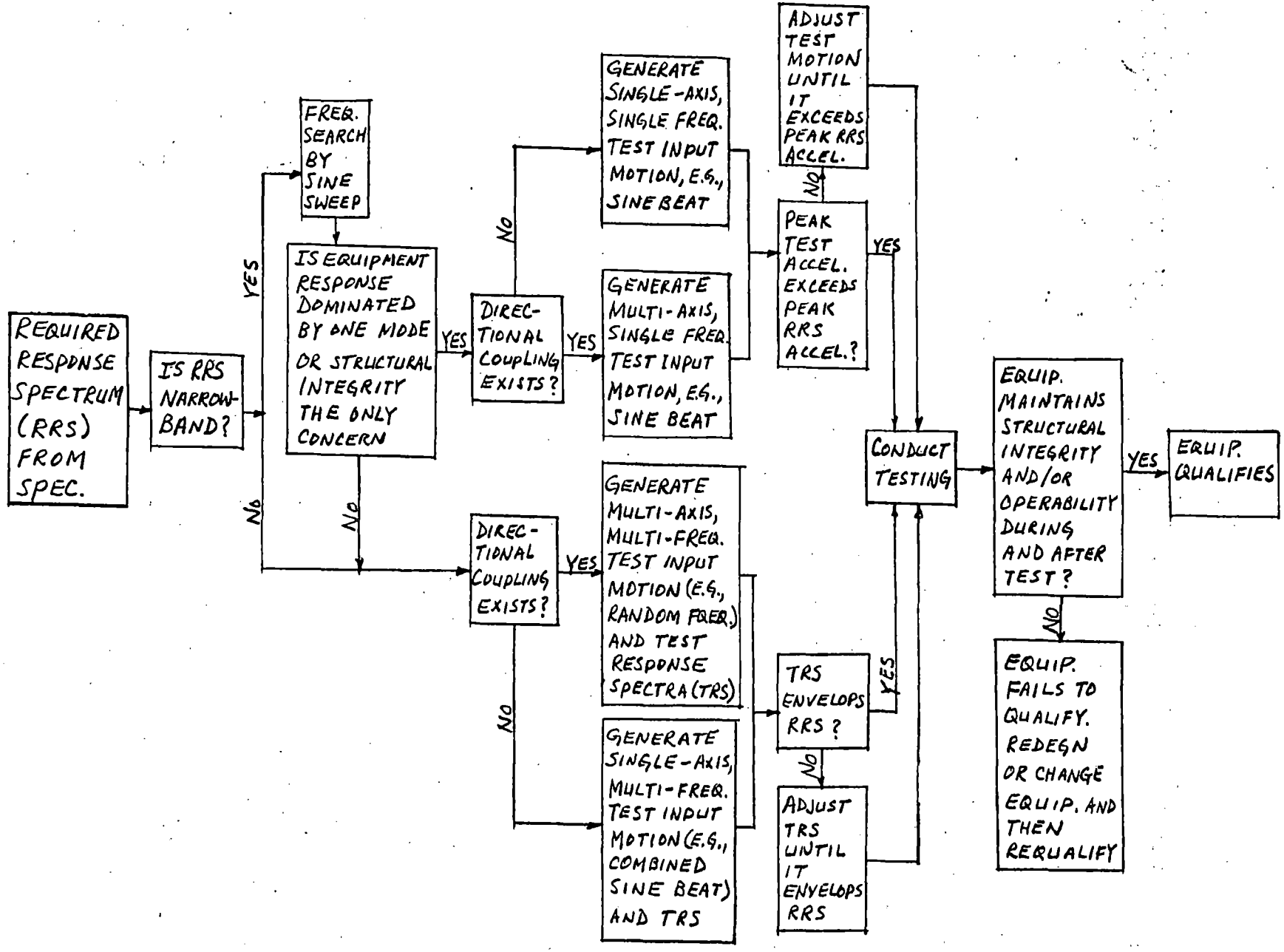
PREPARATION OF SEISMIC PURCHASE SPECIFICATION



QUALIFICATION BY ANALYSIS



QUALIFICATION BY TESTING



QUALIFICATION BY COMBINED TESTING AND ANALYSIS

THIS QUALIFICATION METHOD MAY TAKE ONE OF THE FOLLOWING SEVERAL FORMS

1. FOR COMPLEX EQUIPMENT LIKE MAIN CONTROL BOARD, USE MODAL TESTING TO DETERMINE NATURAL FREQUENCIES, MODE SHAPES AND DAMPING ASSOCIATED WITH THE EQUIPMENT, TO CONFIRM THE ADEQUACY OF THE ANALYTICAL MODEL OF THE EQUIPMENT.

2. FOR DEVICES HOUSED IN A CABINET, USE A TIME HISTORY ANALYSIS METHOD TO GENERATE REQUIRED INPUT MOTION AT THE DEVICE MOUNTING LOCATION FOR A SUBSEQUENT DEVICE QUALIFICATION.

3. IN A LESS FREQUENT INSTANCES, THE MEASURED MODE SHAPES CAN BE DIRECTLY USED IN A RESPONSE SPECTRUM CALCULATION FOR EQUIPMENT DYNAMIC RESPONSES.

DERIVATION OF REQUIRED INPUT LOADING FOR QUALIFICATION