ORIGINAL

UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

In the Matter of:

ACRS SUBCOMMITTEE MEETING ON DIABLO CANYON
NUCLEAR POWER PLANT, UNITS 1 & 2

Location: 1717 H Street, N.W., Room 1130 Pages: 1-219
Washington, D.C.

Date: July 11, 1984

FROM Delete B. White
0/1 Add: LPDR Ltr Encl
0 1

ORIGINAL

UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS SUBCOMMITTEE

MEETING ON DIABLO CANYON

NUCLEAR POWER PLANT, UNITS 1&2

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

Wednesday, July 11, 1984

The Subcommittee met, pursuant to notice, at 8:30 a.m.

SUBCOMMITTEE PRESENT:

C. P. SIESS - CHAIRMAN
C. MICHELSON
H. ETHERINGTON
J. C. EBERSOLE
H. W. LEWIS

SUBCOMMITTEE CONSULTANTS:

M. BENDER
D. MYSINGER

ACRS STAFF:

J. C. McKINLEY (DESIGNATED FEDERAL EMPLOYEE)
C. A. McCLAIN

ACRS FELLOWS:

R. A. CUSHMAN
J. H. ELAD
S. SETH

NRC STAFF AND PARTICIPANTS:

M. HARTZMAN
K. MANOLY
E. J. SULLIVAN
E. C. RODABAUGH
H. POLK
G. W. VOLLMER
J. P. KNIGHT
R. J. BOSNAK

P R O C E E D I N G S

MR. SEISS: The meeting will now come to order. This is a meeting of the ACRS Subcomittee on Diablo Canyon. I am Chester Seiss, chairman of the subcomittee. The other members of the ACRS present starting on my left, Mr. Michelson, Mr. Ebersole, we have two consultants with us, Mr. Bender and Mr. Mysinger.

The purpose of the meeting today is to discuss matters relating to the issue of an operating license amendment to permit operation at power level above 5% of the full power at Diablo Canyon Unit 1.

This meeting is being conducted in accordance with the provisions of the Federal Advisory Committee Act, and the Government and Sunshine Act.

Mr. John McKinley, seated on my right, is the designated federal employee for the meeting.

The rules of participation in the meeting have been announced as part of the notice of the meeting previously published in the register. We have received no written statements from the public, and no requests to make oral statements.

A transcript for the meeting is being kept, so I request that you please use the microphones. If you are at the table, get to a microphone. If you are

not at a table, please identify yourself when you first speak.

We have been provided, some of us with various documents. The basic ones are the several submittals by Pacific Gas and Electric in response to the licensing conditions on the pipe and piping support design, and then we had a draft of the staff's SER. I assume that that is a supplemental SER, right?

MR. VOLLMER: Yes. Ther will be a number of such supplemental SER's

MR. SEISS: Mr. McKinley says that it is not yet an SER, is that right?

MR. VOLLMER: That's right it's a draft.

MR. SEISS: It's a draft, but it's a draft of an SER. Okay. Did the members of the subcommittee get both of those? You didn't get a draft of the SER did you?

MR. MCKINLEY: The draft that Chet is reffering to is a draft report of a peer review group. I believe that it will be incorporated?

MR. SEISS: No. They didn't get it. Did you send it to us?

MR. MCKINLEY: Yes sir.

MR. MICHELSON: That should have gotten to you

BH
NRC-72
T-1

by express mail Saturday.

MR. MCKINLEY: Okay. I didn't read that as a draft of the SER.

MR. MICHELSON: That's right. It does not say that anyplace in the text. It will be incorporated in a supplement to the NCR, probably as an appendix.

MR. SEISS: How many of the members of the subcommittee got the notice from PG & E. They have come over a period of time, but I don't think everybody got them. I have got a stack of stuff, I couldn't itemize it. That is not as important as having the draft of SER. FIrst, it summarizes what was in the others. There is a lot more detail in the PG & E stuff, and if you feel the need to address that, John has a copy of it here.

Are there any questions or comments from the members of the subcommittee or their consultants before we hear from the staff? Mr. Lewis has just arrived. is a member of the subcommittee. Okay. I'm going to call on Dick Vollmer to summarize either the peer group report, or the draft SER.

MR. VOLLMER: Okay. Thank you Dr. Seiss. My remarks will be very brief. We had in the introduction and conclusion, a little bit of the historical background. As you know, the reveiw that was formed in

BH
NRC-72
T-1

to consider issues formed by Mr. Yin prior to the Commission's decision to seek a low power licence. The following review group report of the ACRS meeting and other activities, supplement to the licensee, our license was issued with certain license conditions which arose on recommendations of the review group. These recommendations were along the lines of the technical concerns raised by Mr. Yin. Since the low-power license, and now effectively were to include three things. First of all, be sure that the licensee has met the low power license conditions, and look at the documentation activities that he has performed to meet those conditions.

In addition to that, we have taken additional task or two dealing with concern raised by Mr. Yin on the inadequacy of the design verification program, and also programatic issues which he had with respect to activities of the on-site project engineering group. OPEG did a lot of the on-site piping work. So, we considered both of those issues and met with the licensee on several occassions. We met on the site, the ACRS and subcommittee at the site, looking over the concerns, physical concerns raised by Mr. Yin. We had an audit at the office of CULP (Phonetic) / Associates who were prime contributors to the IDP. The scope of the work of the group indicated

BH
NRC-72
T-1

that the group has indicated in the first light in a hand of their own. The people that were involved in the second slide,

MR. SEISS: Dick.

MR. VOLLMER: Yes.

MR. SEISS: Since the members of the review group, among other things reviewed and evaluated what I call engineering judgements, and I guess on the process of exercising their engineering judgement. I wonder if you would run down that list and give us at least an indication of the disciplines represented by the various people, where they are from, etc. Can you do that?

MR. VOLLMER: Okay. Let me do it this way. Mr. Allison, Mr. Heishman who are not here are dealing with QA issues. When I get item C I'll indicate what further activities they will have.

MR. SEISS: Was Allison dealing with QA issues only?

MR. VOLLMER: That's right.

MR. SEISS: And Also Heishman were dealing with QA issues. Bob Bosnak, as we know, is chief of engineering, mechanical engineering branch, a division of engineering. It is on the main committee of ASME. He will be talking about item number 6, license condition

six, and the independent design verification program. We will be covering those two topics. Tom Burr, who is from EG&G is senior engineering specialist out there at the Applied Mechanics branch. He and Mr. Keith Morton, who has the same title at EG&G work primarily on license conditions 2 & 3. They do the calculations for us.

MR. SEISS: They are at the Mechanics branch of EG&G?

MR. VOLLMER: That's right.

MR. SEISS: And they specialize in engineering stress analysis?

MR. SAFFEL: Primarily piping. This is Bernie Saffel. I am from Battelle Columbus Laboratories. Tom Burr and Keith Morton's expertise is in the area of Piping dynamic stress analysis.

MR. VOLLMER: While you are there, Bernie since you will be covering items two and three as the prime speaker here, why don't you give your title and background.

MR. SAFFELL: I am a program manager for Battelle Columbus Laboratories, and I have experience in piping support and stress analysis.

MR. VOLLMER: Okay. Then we have Mr. Chen and Mr. Fleck from Engineering Analyses Associates,

BH
NRC-72
T-1

which is a DOE facility which used to be the LMEC part of National back in the old days. I'm not sure what the company is right now. Part of North American Rockwell is a DOE facility. Mr. Chen and Fleck have been consultants for the staff in the beginning branch for a number of years.

Their specialties, Mr. Bosnak can tell what specifically they are. The title of Mr. Chen is the manager of Materials Unit and Mr. Fleck is a member of his staff.

MR. BOSNAK: I'm Bob Bosnak. Both of these gentlement mentioned by Dick Vollmer are engineering mechanic special dynamic specialist. They have had hands on experience in several plants for us over the last three or four years.

MR. VOLLMER: Why don't you continue on with your own ground. Art Hartzman is a senior mechanical engineer in the mechanical engineering branch. He work with Mr. Bosnak. Mr. Hartzman will be covering item number seven.

MR. BOSNAK: Dr. Hartzman. Dr. Hartzman is our special dynamic specialist, with particular emphasis on computer code applications.

MR. VOLLMER: Okay. Next on the list, I haven't covered yet Jim Knight, assistant director in

engineering, and it would be my guess it would be basically mechanical engineering. He is engineer with a very broad expertise in a number of areas, piping analysis, pipes and structures. Mr. Manoly will cover item 1, as a reactor engineering support program for region one and Mr. Manoly has been the NRC for less than a year. He came out of an architectural engineering. His specialty is in pipe and stress analysis.

Ed Rodabaugh, I think you all know him pretty well. He is also here with us today to help with the staff. Ed Sullivan is my technical assistant. His specialty is in the piping and stress analysis.

Jim Taylor is a deputy director. He has been involved primarily in QA and worked for me on the IBP issue. He is not here today.

Burr and Morton we covered with EG&G as Bernie Saffell indicated their speciality. And, Mr. Yin as I indicated here, has been involved in the group activities to the extent possible. We have invited him to these group activities. Some of them he was able to participate in, some of them he was not.

MR. SEISS: If I may interrupt you for just a minute. How many of the subcommittee members have any questions on makeup of the peer review group?

MR. VOLLMER: Okay. I would just like to finally say, that as you all know. The plant seismic criteria changed during the licensing process. It has been a different exercise than a number of plants that such criterias were somewhat stable and the peer review group had to recognize that getting the final design of the plant was not always particularly elegant. QA inefficiencies and deficiencies were the reason for the large IDP effort, staff effort in the last couple of years.

The peer review group looked as hard as it could at the final results and urderlined basis for get ting the results and looked particular at QA per se, because we found that from the start that QA deficiencies were there. When we look at the process of getting to the final product in the process of checking the final engineering drawings, the appropriate things for review, and generally check to see that sound engineering decisions were made in the process. So, I think the focus on our group has been, as you said, the one of using judgement reflected by a group of experts we had assembled here to come to the conclusions of the report we have indicated that these areas we felt the licensing criteria were met.

Without me going into any more detail in that

framework, I would like to call Ken Manoly who inspector of region one to brief you on the next topic.

MR. SEISS: You mention that the seismic criteria changed. I would just like to remind people that we are thinking of the criteria in terms of G-forces and we know that DE at 2/10's and DEE at 4/10's and the INAUDIBLE at something else. BUt, they have also changed in terms, I believe of damping factors, allowable stresses, etc. Not just the input of this.

MR. VOLLMER: That's right.

MR. SEISS: More complex changes are just piping then?

MR. VOLLMER: Yes. It's been a number of very complex changes. I might also add that the basis for the IDP and the basis for the computer group was to meet licensing critiera on that. The license criteria reflected in the documents for decision. We did not necessarily at the same licensing criteria that we used right now, that the plant was given its instruction permit in 1968 or something like that. So, it is a little different than the usual.

MR. EBERSOLE: Would a design criteria postulate a crack like the ASME kind of thing?

MR. VOLLMER: I'm sorry

MR. EBERSOLE: Would a design criteria postulate a crack like the ASME?

BH
NRC-72
T-1

MR. VOLLMER: In the piping?

MR. EBERSOLE: In the piping, yes.

MR. BOSNAK: Some of the piping, of course is designed to be fairly volatile. We have a mixture of codes that are explicable.

MR. EBERSOLE: The B31 wouldn't postulate a crack at all with stress.

MR. BOSNAK: That's correct. But others, speaking of the lay loop. We did have those kind of things applicable.

MR. EBERSOLE: That is applicable in your criteria then?

MR. BOSNAK: Yes. The appendix G was applicable, but not across the board certainly in all of the systems applied.

MR. EBERSOLE: Was it applicable to the big piping let's say?

MR. BOSNAK: I'd have to, you've got to mainstream the feedwater. By way of application, there was a plant, as every plant around here where the B31-1 was a design code and it was supplemented by additional Westinghouse requirements which were pretty much the fatigue analysis of this type of thing that were making its way at this time. Again, speaking of the main loop.

MR. KNIGHT: Mr. Vollmer, I have had a lot of difficulty with all of this detail on scale and contact. I am having trouble getting in position on space. A number of years ago, Monmont Point (Phonetic). almost broke attendance for mal-design for certain different INAUDIBLE It was fixed, and there was that much more to it than just that more extrapolation of the matters before the other deficiencies of that sort existed in that plant, much less than the basic. So, what I would like to hear is a view from the staff as to looking at the vast amount of detail here, we are addressing a matter of to you with performance of the applicant at Diablo Canyon. The peculiarity of the problem there. The degree of earthquake. And I guess, in the final analysis, whether we are looking at the potential that might exist there by having an earthquake, I think we all have to recognize that for a variety of reasons, which we can hardly list, we must expect pipe failures one way or another. I have seen nothing in these analyses that says the main thrust of the effort is to avoid multiple failures and thus invalidate / the design basis of the plant that we are covering. Although, I suspect there is a central theme like most of these analyses. There must be some thrust to common failure functions. In short, I'm having, I say that we turn

BH
NRC-72
T-1

around and look at the plant that has the most potential for public damage in the same context that we are looking here. What would we find in the same period of investigations that we are looking at here? I'm trying to get this into some perspective, and keep it from being distorted.

MR. SEISS: Jesse, if I may point out, it was not due to an earthquake, but it was due to an earthquake design.

MR. EBERSOLE: Whatever.

MR. SEISS: Seismic restraints then appeared, and due to thermal movements on the first break line.

MR. EBERSOLE: I'm trying to get a focus view, a focus view in the larger perspective, not just in the detail of Diablo Canyon. What can you say? What do you know about the Diablo? in terms of Indian Point?

MR. VOLLMER: I think in terms of Indian Point which includes seismic analysis at Indian Point. It is selective. Any review of this would be predicted in terms of the point. We have raised a couple of issues which were very, plant specific dealing with buildings bumping and ceilings falling in and localized deficiencies as / Gary pointed out, might happen if an earthquake much larger than it's design earthquake. But, certainly, I don't think any plan has been agreed with the rigor that this plan has with terms of the

analysis effort or in terms of having those who are familiar with Plan Type A and the plant problems come in and given an engineering judgement to see if this thing really looks alright. We would characterize this find as more of that than any other. At least, from the staff point of view as licensees of another plant. I guess what the overall questions that you asked, I would say that the staff relies on the assurance of the design and license conditions, feeling that there would not be comparable failures from the seismic event. Certainly, I don't think the analyzed in detail this would have a seismic analysis is a great vehicle behind the IDP work. The IDP for this is something like ten times as much effort as the staff did. The staff put in double effort in this plant. These efforts you might consider third party reviews of the overall design process.

I think it did focus on meeting license conditions.

MR. EBERSOLE: Well, my problem is I think that have spent a lot of time here, on about which we know virtually nothing. On something like this is my point. I find that material / statement there I have a little difficulty getting fixed on that.

MR. VOLLMER: I guess I couldn't disagree. We asked for a long time on / matters here that we have not looked at.

BH
NRC-72
T-1

MR. EBERSOLE: And then, if we are at a corner stone -- we must orient to the main focus which is supporting common load failure. I have seen the load effort to say that is what we are going to do.

MR. VOLLMER: I think we are going to the following way. The thrust of what the staff's review and ADPE looking to uncover the generic deficiencies in the design effort, I would have to turn to Jim, for example and ask the question, how much margin do we have of common load failure if you find if he follows our design criteria. I'd like to ask him about the second.

MR. SEISS: But, don't limit your common load failure to earthquakes.

MR. VOLLMER: I'm sorry.

MR. SEISS: Please don't limit your common load failure to seismic.

MR. VOLLMER: Well, the seismic effort has been a predominant one.

MR. SEISS: Yes, but also the seismic effort affects the ability of the plant to reduce thermal movements. I think a lot more certain an earthquake.

MR. VOLLMER: Yes. No question about that, and I think that the staff had not been involved particularly in looking into any loads issues, and certainly generic I think the recognition of the staff was you were looking

BH
NRC-72
T-1

at a well designed system from the point of view which was from the seismic point of view.

MR. SEISS: Suppose at Indian Point there had been half a dozen seismic pipe supports that had been incorrectly designed. They were designed that 80% of the load that somebody's calculations showed that they would get. Not 80% of the strength, but 80% of the load. Would the BRA have indicated that as a significant particular risk?

MR. VOLLMER: No. I think the BRA would have taken a look at a seismic hazard curve / and a fragility curve and assumed from a given seismic hazard that a certain futility, or a certain amount of these would break. I think that the assumption would be that the design would be at the appropriate level, but the futilities would extend below that level, so that there wouldn't be failure at some of these supports at some limited design levels.

MR. SEISS: But no more than one pipe.

MR. VOLLMER: I don't think that's true.

MR. SEISS:But it only takes two pipes to put the plant out. Because of the single failure factor.

MR. VOLLMER: If it is the right two pipes.

MR. SEISS: If it is the right two pipes. I think it would be a different case in different consult

BH
NRC-72
T-1

areas.

MR. SEISS: So you say that by five supports that have mistakes, that those probably would be represented within the range of the fragility curves. Would the converse be true that if I had five instances of interferences due to the seismic restraints that the interferences would be covered by some sort of a defect include somehow of the PRA. Not seismic PRA now. I'm talking about low-cycle.

MR. VOLLMER: As I recall on the non-PRA's it was not considered external events. It was not considered more than one pipe failure at a time, unless that pipe failure were to make an existing cause of failure. The seismic PRA's were the ones that would use fragility curves, and wouldn't discriminate whether or not it was a failure of a hangar or a thermal movement. It wouldn't indicate what the reason of the failure was.

MR. SEISS: In a non-seismic PRA you'd have a non-mechanistic assumption as to the probability of a pipe failure.

MR. VOLLMER: Right

MR. SEISS: That's strange to say the least.

MR. BENDER: I'd like to try a slightly different tactic to develop an understanding of these problems. My impression is that if there are

BH
NRC-72
T-1

failures that might occur as a result of thermal movement that the probability of those failures occuring in groups is somewhere near to zero. A failure due to thermal movement , will one at a time, so really if there's anything we want to know is whether failures of that sort are big enough to introduce a big change in the public risk. There is a second element to this thing which is a little fuzzy to me right now but I think it goes along the lines of saying, if the pipe restaints are not installed property there would be some detremental effects on critical equipment and there's enough of that

equipment involved, so that we might induce a very high probability of failure in the equipment itself, something other than the piping. That may not be a problem. I would like to know whether it is or not.

The third point is the one which seems to come up repeatedly in these discussions. Mainly, the question of whether the seismic event can result in multiple effects. I'm not clear that that has been addressed at all in the piece of paper I've seen/ But, it probably has not in the thinking somewhat. It would be helpful, I think that the staff would in some way convey to us, me at least, the viewpoint concerns the multiple failures arising from mistakes or installation errors, whatever they are called, in the piping systems. It seems to me if we get those three points out on the table, we might understand this a little better.

MR. SEISS: The trouble with this is Mike, that the staff has not approached this from a risk standpoint of view. They have approached it from the licensing criteria point of view. It is going to be very difficult to turn 90° or 180°.

MR. BENDER: I wouldn't argue with that point one bit, Mr. Chairman. I think that that is basic safety.

MR. SEISS: That's right. This is a generic

BH
NRC-72
T-1

problem that this committee is having once or more. We have been looking at risks, looking at severe accidents, we have been looking at PRA's and plants are still being licensed on the basis of the standard review plan general design criteria, reg. guides, etc., for the various criteria of part 100 and part 50.

And, our thinking, in terms of risks. Their terms in the licensing criteria. They have the same objective, but if they do, it is somewhere down the line.

MR. BENDER: From the public safety, it is certainly there. I could...

MR. SEISS: And, I do think that it is important that the ACRS will be looking at this issue, as it does at most issues in terms of the risks to the public. I don't think in our letters that we ever had made a finding that the license of the plant had been designed in accordance with the criteria. We make a finding that there is no undue risk to the health and safety of the public, which is a little bit different than the kind that you have to make as a preliminary map.

So, to the extent that you can address our criteria, it will help. We will try to understand your criteria and hope that they both lead to the same result.

MR. VOLLMER: The conclusions of what we do is certainly of risk to public safety. Based on meeting licensing criteria regulations regulatory guides, and so on and so forth. We have been trying to get better insights as to how good these criteria are to the risk process, and so on. As you know, that is a long process.

The only other comment that I would like to make, with respect to Mr. Bender's comments were, I think the ACRS has been briefed by the Squelter (ph.) group the seismic/utility qualifications group who used as a basis for helping the staff resolve safety issue 846 with experience data on a large number of facilities that had common design and hardware nuclear plants. That is primarily refineries and conventional park plants. And, looking over a broad spectrum of earthquakes and they did reach ACRS there are probably their views based on the data that they have captured in the piping systems and much of the equipment in Nuclear plants. The equipment, more particularly the piping is not very sensitive to seismic events. On that basis, 846 is directing toward using experience data selected components in lieu of a specific qualification testing for plants that are already operating, already licensed. Their findings on piping systems are similar to the very

BH
NRC-72
T-1

few instances in these instances in these plants of seismic events.

MR. BENDER: I don't take issue with that point. I think that the important question here is that this plant has had somewhat more severe seismic design requirements than is typical of the types of plants that were evaluated in that particular study. This may be within the spectrum. I think that it would be worthwhile to say whether it is or not. Because, if you can rely on that study to make the argument, then fine. I wouldn't, that wouldn't bother me any. I'm not sure right now whether that particular argument fits, and the staff hasn't indicated yet that it does or does not.

MR. VOLLMER: Your're right The staff has not made the judgment. You have indicated the concern about a lack of knowledge about the staff activity with knowledge of equipment piping and seismic event. I would hope though, that the design of this plant would eclipse the design of a plant investigated that particular studies, since they were UPC plants, they had no specific type of seismic design in assignment some cases particularly out of California plants and forgein plants. I am not trying to compare them.

BH
NRC-72
T-1

MR. BENDER: I really was, in a sense, trying to help address Mr. Ebersole's question which has to do with the question that, why can't we put Diablo Canyon in a context of Indian Point. Can you or can't you? If you can, it may be easier to address. If you can't then we have to look at it as an individual case.

MR. KNIGHT: I would like to approach I think in a reasonable way. To my view, I believe I speak for a large part of the professional staff. All of the things that are so-called deterministic approach go toward all of these questions. Whether or not we / we have adequately protected against common / INAUDIBLE failure. Whether, or not we are adequately sure that we have the balance between the restraint that we would like for seismic design and flexibility that we would like for federal motion. It is a trade off. It is a place where you have to walk the line between the two goals.

The great purpose, from my point of view, for a level of detail that we are getting into here. As we go through the presentations today, I would ask that you look at them from the standpoint of the amount of time and effort that started asking base-line questions that are necessary to get to the determination of that. We have a plant here in a high seismic area that is adequately designed. The very first analyses that are

BH
NRC-72
T-1

done in terms of normal stress analysis of piping, carry it all the way through to design of supports in making sure that all of the loadings are necessary and are in fact considered structures of the supports, characterization of the piping is sufficiently accurate to give you a good handle on this response. The, in this case of this stage of this plan, the marking of the plan under hard conditions, determined to me, at least as a first cut, that's got to be a very sufficient, and very significant point as far as concern of thermal restraint goes. We had the plant up to its operating, very close to its capacity . There are exceptions in some systems where we get very close to full operating temperature and pressure. And then, we have found, as one always does, that those have been fixed. Continuation of that program goes onto power. Particularly, when you look at Dr. Hartzman's speech on liscencing Condition 7. Gone to, I think, unusual levels here in seeing that problems, in my view may well be protruded at Diablo Canyon because of high seismic design. And, the number of changes that have taken place over the years, which gives you, I think significantly a more complicated support system in some areas to see that what one might be called the more usual loading conditions on various structural members.

BH
NRC-72
T-1

The other fact is that not considered rigorously. So, all of the, all of the things that an engineer can do that he has an accurate system, I believe have been done here.

MR. SEISS: Jim. I don't quite get your point as to why the item seven issues, which seem to be related to details of stress analysis are more important issues at Diablo than at another plant. If I am designing a support for 20,000 pounds at Diablo, and 5,000 pounds somewhere else, it seems to me that designing for the same allowable stresses is just, whether I neglect walking stresses, about the same effect as one in another.

MR. EBERSOLE:Yes. I want to endorse that. That happens all the time, Chet.

MR. KNIGHT: Yes. My other point was that the opportunity, the likelihood of somewhat having complicated loading cases is higher at the end.

MR. SEISS: Yes. But that doesn't mean the imporance of ordinary stresses?

MR. KNIGHT: No.

MR. SEISS: And then, I look at Indian Point where it takes something like the SSE to start getting things in a serious condition. I have difficulty visualizing three times the SSE at Diablo, you know,

BH
NRC-72
T-1

without floating California out in the ocean somewhere. And support, pipe supports, seismic supports are almost the only thing in the plant that is 100% seismic.

MR. KNIGHT: True.

MR. SEISS: The pipe stresses aren't 100% seismic. I just don't really think that Item No. 7 is of special concern at Diablo any more than it is at any other plant.

MR. KNIGHT: No. I was only trying to point out that, I think special attention.

MR. SEISS: Sometimes I think the more complex these supports are, the more redundance there is and

MR. KNIGHT: That's certainly true.

MR. KNIGHT: Along with redundancy, it just makes it difficult to analyze. But, it works a lot better.

MR. LEWIS: Chet, could I perhaps get a little clarification about why we are sitting here today. This whole conversation has been very interesting, and it has to do with the relationship between the ultimate safety of the plant and the criteria for licensing. I must say that in the period that I have been on ACRS, I have searched throughout this building and other buldings throughout that connection and assert like the holy grail. I know it must exist, but I take it

BH
NRC-72
T-1

but, to be specific in the call to this meeting, my understanding is that we are suppossed to review the review group, review the peer review group. I don't know if we appear as super peers or sub-peers to review the review group. Their report has nothing to do, if I read this call correctly, has nothing to do with the safety of the plant. I just simply says that the seven licence conditions have been satisfactorily addressed. Is that what we are suppossed to determine, or are we suppossed to decide whether there are reasonalbe license conditions.

MR. SEISS: That's a very good question, Hal. The meeting here today, which Mr. Denton asked us to review the review group report, and because that I believe Mr. Yin still has some reservations about it here. As far as what we are suppossed to decide, it is a little difficult. I have been trying to visualize it in my mind what kind of a letter we might write off of this, and whether that letter, if we do agree with thestaff we agree with the findings of the review group that Pacific Gas and Electric had satisfied the licensing conditions and whether that letter would go on to say that we find no risk to the health and safety of the public, or as we have said in about two or three letters we find no reason to change the conclusion of our letter

BH
NRC-72
T-1

of July 14, 1978 which said that. So, I'm not quite sure. I think the basic reason for our meeting is that Mr. Denton asked us, and Mr. Yin has some concerns and that they thing that we might help resolve them. I suspect that one reason Mr. Denton asked us is because when we wrote our last letter about these licensing conditions there were additional remarks about whether the ACRS ought to review it again.

MR. LEWIS: Thank you for the elusive clarification chairman.

MR. SEISS: I know slightly more than you do, but not much.

MR. EBERSOLE: Mr. Vollmer, if I were to eliminate the seismic question, and eliminate the lousy pipes and the boilers used with the cracking problem, and then arbitrarily eliminate piping. Look at the LER's. I wouldn't find as many cases of trouble with pipes or wells or hangars, or whatever had been hanging these plants in the water. Not nearlythis one. I ask you to look into perspective at that sort of thing. I don't know if we have had a record of that types of things that we are looking at here.

MR. VOLLMER: That's true. But, I don't think that we have had much in the way of earthquake testing.

BH
NRC-72'
T-1

MR. EBERSOLE: In the focus on common mode. I'm trying to get a point of view to look at.

MR. VOLLMER: Right. Yes.

MR. EBERSOLE: And so, I guess this is the thrust. Now,

MR. VOLLMER: We have had a number of plants where something had malfunctioned, they hung up in mechanical failures, operators, things like that. So, additional problems on things like that would deal with seismic .

MR. EBERSOLE: It was suppossed to be able to take a pipe back in and run it. But, maybe not two. In the peculiarity of our business in an earthquake that it would have that potential. If we can, more fortively look at whether we have a common failure, then we have a handle on safety rather than just licensing conditions.

MR. SEISS: We can take JESSE just as long as your probability isn't too high.

MR. EBERSOLE: Yeah.

MR. SEISS: After all, that's how we get to the core melts probability that we do by having multiple rate.

MR. EBERSOLE: I have never heard yet whether I have got two critical types on the same hangars here.

MR. BENDER: Yes. You may have made the point

BH
NRC-72
T-1

clear is only whether two pipe benders performing the same type of function.

MR. EBERSOLE: But not necessarily a specific function. putting them one place in the service order, and another in

MR. BENDER: Well, they would have to be prepared. / Prepared in such a way that they lose their function. We could have a lot of pipe failures and it would not make a damn bit of difference.

MR. EBERSOLE: Youare quite right.

MR. MICHELSON: I need a clarification on the previous reply. It is my understanding that from time to time the staff has granted a certain amount of relief on type break, so that now you only break at certain locations, and they are rather minimal, in some cases particularly on the primary system, so that you didn't have so many jet infringements to worry about, and so forth. So, I don't think that the statement that Jesse made that you replied to is quite correct. You can't take a break anywhere. You can only take it at certain periods of the primary system.

I am wondering the relationship of those primary locations to the additional stress problems that we might be having at Diablo. So, clarify for me the fact that if you are taking breaks anywhere, and you are

BH
NRC-72
T-1

rather limiting / the break locations.

MR. BOSNAK: You may be thinking about the leak before break situation, and then again you may be thinking about there are finite breaks in the primary loop. In fact, there are eleven. The eleven breaks do cover a spectrum of positions along the loop. Not, necessarily ever point. But, you do get a recovery. Thinking of where the staff is heading, heading to leak before break, which would, in fact say that in these systems, and we have looked at it based on seis mechanic techniques, we are not going to get breaks. Here in Diablo Canyon, they haven't gone to the use of that kind of criteria. They have stayed with the eleven postulated breaks with the high foot restraints that are located to take care of the effects of those breaks.

So, those are included in the analysis of the system. In other words, that loca and SSE are combined.

MR. MICHELSON: Does that mean that you are technically intermediate point breaks, as well as the anchor point breaks?

MR. BOSNAK: That's correct.

MR. MICHELSON: Okay, for pipe break analysis program purposes, you always include the anchor point for at least one intermediate point on that stretch?

MR. BOSNAK: That's correct. They have at

BH
NRC-72
T-1

least one, in most cases there are two.

MR. MICHELSON: You brought up a INAUDIBLE. We need to clarify the question on leak before break, the idea being that you have got express rise that somewhere started to crack and started to leak. If you start adding to this through a seismic disturbance, are you going to see a leak before a break on the case of the seismic conditions.

MR. BOSNAK: Well, again, with the largest supplied bending moment we are talking about a seismic moment, we are not going to get a complete rupture. BUt, there is going tobe leakage, and if that occurred during a seismic event, you would of course have the plant shut down and you would be able to determine one way or another that you do have cracks in those lines and you do have a certain amount of leakage. I don't know if that answered your question. the fracture mechanics tell us

MR. MICHELSON: I'm quite sure that it does.

MR. SEISS: Do these criteria apply to Diablo at all.

MR. BOSNAK: No. They do not. Because Mr. Michaelson was getting towards....

MR. SEISS: They haven't applied to anybody so far, have they?

BH
NRC-72
T-1

MR. MICHELSON: The problem is that it is a kind of further extension of how leak before break theory is and now we are saying that it may still be good even though the break is being introduced by a seismic event rather than just by a normal corosion / phonomenum, or whatever.

MR. SEISS: Break is induced by stress, and the stues that were made included seismic.

MR. BOSNAK: That's correct. Those are the limiting betting moments that produce the cracks. Even those, with that amount of stress could not run. In other words, they do not become unstable. The first plant to ask for that extension, I believe, was Comanche Peak.

MR. SEISS: Okay. Dick. I gather that you are going to want to go through the seven, eight, nine items on that first viewgraph of yours.

MR. VOLLMER: Yes.

MR. SEISS: One by one in relation to licensing criteria, etc. and that nothing that we have said is likely to change the nature of those presentations.

MR. VOLLMER: It may have changed the duration we could speed them up a little bit.

MR.SEISS: I think it would be wise to speed them up and allow more time for questions. How long do

you expect that to take?

MR. VOLLMER: I think the presentations without questions would generally average about five minutes a piece.

MR. SEISS: Okay. I think we ought to go ahead on that basis for a while. But, first lets think about getting a break.

(Brief recess.)

MR. SEISS: Mr. Etherington has another question that he wanted to ask before we get started.

MR. ETHERINGTON: I thought that I understood the grade criteria, but I wanted to be quite sure. I understood the full break criteria remains at least the same not under normal loads that before it would break on the FSE loads. Is that correct?

MR. BOSNAK: Yes. That is correct.

MR. VOLLMER: Okay. I would like to call upon K. Manoly, inspector for Region one for a brief presentation of license condition one.

MR. MANOLY: My name is K. Manoly from Region one. Originally here, in the technical programs and with the peer group on presentations to get some kind of perspective kind of result, but on this review work. My central was the recent draft with production / the review of / respect to findings which would have resulted on allegations and

BH
NRC-72
T-1&2

inspection findings related to our QA problems, staff training, control problems, designing problems and NRC had / extended the a view which looked at some of the rod work that we have done offside and a hardened percentage of errors in the calculation process, more than you had expected. And, I had inspection on all sites when the slag steps went through the / struedel board supports for evaluation and that was the first charge. He started going through the process of the small board. At that time, we were going to do a small sample of the preview order. The findings are, it was in the calculation of the upper modeling and the technical problems and the seismic decisions were not as expected / to be and with that, the review group was / formed to to the meeting in San Francisco, and then with a site tour and we looked at the supports there and that was the, that led to the licensing conditions that we were about to address. I think everybody has seen the party of operating license. The first response we have is from PG&E under activities and summaries on the license conditions one, we have got on April 27 and followed up with a meeting with PG&E to notify their response and make it the same way that we meant it to be. And, the major issue is that for license condition one for the GOD (ph) /all the small board supports for license conditions stand. up to the major differences in understanding the license conditions. We have perceived that as only 50% and

BH
NRC-72

T-2

application was made and they decided that they are going to go with the rest of the percent.

Going back, we have two audits at PG&E office, Bechtel office in San Francisco. First audit was myself and Dr. Hartzman and following that had another audit with Dr. Hartzman and myself and BETAC consultants. We looked at a sample of the small-book agnations with a twenty one in both audits. Twenty one small calculations. That was a simple one hunderd and ninety one supports. that were reviewed at the Bechtel office. I would like to review I have a slide here that reviews the design critera for small and large bore supports. And it gives three instructions to give the specifics of this licensing condition, like structure I55 -- and I68 for addressing certain number of efficient properties in the store analysis which we felt there was the lack of by our standards. That is the instruction of my request, and we also include evaluation request of condition seven and we have instructions for that.

MR. BENDER: If you will excuse me a moment, I'd like to have some clarification. These instructions, if they had not been put out, would the things that are required in those instructions have been dropped.

MR. MANOLY: Well, the instructions made the designers do it in a more uniform way. A more system-

BH
NRC-72
T-2

matic way. A lot of times I don't have as many instructions as how we do a review of pipe support calculations. There is criteria, and that is really the binding document.

MR. BENDER: So now there is uniformity in the analysis of the methods. That uniformity has been universally applied to all the piping systems that are involved.

MR. MANOLY: They are the small bore supports. This is with the review process of the small bore supports.

MR. BENDER: Is it true that with the small bore supports. Now, they have been uniformly analyzed in this way.

MR. MANOLY: THat's correct. Well in the former review, what happened was the design checked out on the review at our own sites. The test at San Francisco was another round of doing the reviewing and checking and reviewing.

MR. BENDER: It is 100% review.

MR. MANOLY: Around 100% review from my understanding, yes. You have a 57 support.

MR. BENDER: THank you.

MR. EBERSOLE: Let me ask you a question about the Okinawa/steel beam supports. In the seismic event, do you examine lets say, take two critical factors. Did you

BH
NRC-72
T-2

examine the degree of failure that is acceptable. For instance, can one hanger out of X-hanger fail.

MR. MANOLY: No. We don't review it in that direction.

MR. EBERSOLE: Is that to say that if one hangers fails that both of those pipes will come down?

MR. MANOLY: First all of the materials with regard to supports, the fail criteria is not really not by piping. Suppose a design to lower levels piping concentration Piping is designed sometimes on a point to see (inaudible) So, of course, you limit yourself in the A/C allowable 1.63 exit v. So, that can sometimes only to yield stress.

MR. EBERSOLE: I'm with the idea of systematic context.

MR. MANOLY: Even single support failure for seismic is not very likely. Because, you limit your stress to a much lower limit than for (inaudible)

MR. EBERSOLE: SO, your thrust is to handle no failures?

MR. MANOLY: With supports, yes.

MR. EBERSOLE: And then, when you have margin for failure which are quite high.

MR. MANOLY: I think our margin for supports is much higher than the margins in piping.

BH
NRC-72
T-2

MR. EBERSOLE: This includes the anchors into the concrete.

MR. MANOLY: That's correct. They are all designed to the same criteria.

MR. EBERSOLE: But, you do permit concurrent or going to the hanging of critical pipes. Critical to a single function on a single hanger.

MR. KNIGHT: If I may. I think that it is a little unfair to ask that of Mr. Manoly. I think, I may be underestimating him as to his length of knowlege but all of the people here today, there expertise lies in design or explicit design requirements for piping and hang rs and questions like should we go for greater separation of redundant systems and this type of thing.

MR. EBERSOLE: We can't deal with expersuion of functions. We have got to...

MR. KNIGHT: Not to any great length.

MR. BENDER: You might try this line of thought for a minute. Can we say with reasonable confidence that pipe hangars have been looked at and designed in such a way that the likelihood of failure to the piping is a result of pipe hanger behavior is in / greater in this plant than in others where the seismic design/ MR. KNIGHT: Yes. I think that is our goal. requirements are lower.

MR. BENDER: I think that might be a better

BH
NRC-72
T-2

way of addressing the point.

MR. MICHELSON: You said that the hanger examination included the anchor bolting. How far back do you go? Do you go all the way back to the concrete and start with that, since that is obviously that's the thing that is anchoring the bolts.

MR. MANOLY: Well, the boundary of the supports is the base point in the bolts.

MR. MICHELSON: Who checks the concrete, and the concrete anchoring.

MR. MANOLY: Normally, the loads from pipe supports as building in the supports has given to the several instruction role. Part of your total audit, did you ever go back and look at the integrity of the quality dampering. Has anybody looked at the integrity of the concrete anchoring.

MR. KNIGHT: If I may. FIrst of all, its a part of nominal review. BUt, as it occurred, here at Diablo Canyon there are additional allegations that had to do with anchor bolts and concrete, and just last week as a matter of fact we had a following on an allegation We had yet another task group in the field looking at that very question, the criteria used for the anchor bolt and the installation procedures. There were some questions about since there are such a large number of

supports at a proximity of bolts on any given wall, one coming from one side, one coming from another, and we audited a manner of which was being sure that the loading was being fed back to the civil structure so we could look at it from that standpoint. / We are in the process of writing that up I can refer characterization now, that we are satisfied that is done through this process.

MR. KNIGHT: If I might add, if some questions about what we did during the course of this last weeks audit, we have Harold / (inaudible) from the structural engineering branch here who led that effort. / There were some specific questions about the content of that matter and the extent of it we can ask others.

MR. MICHELSON: Well, it might be a very general question, did you find anything unusual or of concern?

MR. KNIGHT: No. After looking at their installations procedures and their repair procedures / we found nothing that concerned us very much.

MR. MANOLY: I jump on the slide that deals with the twenty one supports that we have done and the two audits we have done in the PG&E office. We also looked at the / technical actions (ph) that we felt that were not really part of the licensing condtion seven. The sample of which is (inaudible)

BH
NRC-72
T-2

computation of the pipe most technical would be -- special/ analysis to show the frequency of the supports, and u-bolt analysis of high temperatures and the/ (inaudible) in struedle terms of the / analysis because it was not an understanding on how does it work/ in struedle and we got that part All that stuff was not part of lisence/ part 7 but we felt that we had to cover them here as you responded to our question. Our findings, are basically built on some sample of judgements sometimes are not well supplied. That issue is really very tricky because judgement is/ usually dependant on the experience of the/ person who did the calculation. People have done it many years/ usually still things are clear and that is where it starts. If someone is not constantly involved with a problem we must feel that everything should be specified so that it is a very gray area. What is judgement and what is not judgement. I believe that reference should be made to extracting numbers from other documents. Reference to textbooks and other documents used and

Some people want every step of the way explained in a sentence. I believe that when -- makes his judgement he should document that. So, it is but if anything that had impact on the calculation. A lot of things were made to some calculation errors and still that was all the error was . It was a big word depending on how you

BH
NRC-72
T-2

when you are doing pipe supports and you look at the motions and sometimes there is a lot of mixed changes two here is not going to make a difference. and dimensions because an inch or/ Now, we have to realize that some of these have done this for many years so they have a feel for it, what kind of answer are they going to get so. If a (inaudible) knows a fraction of an inch or two and then you look at the final results in a calculation package.

The one that we have seen in the central test audit that were this, the calculation errors were there didn't seem to make much difference in the numbers. Re /Doing this thing is (inaudible) There was, PG&E reported that they had done the last complex screens in the last two or three weeks, and they have found that three cases/ where the angle sections the supports have exceeded the criteria limits. The left L/T ratio exceeds the inertia limits and they were asked to, I tend to think but they were requested to / meet the criteria and the modify the / support to cut down trace glen/ (ph). That was done. Coefficient of angles and/ (inaudible) had to do with the papers --

MR. EBERSOLE: Let me ask this. Does this suggest that the degree of definition required by the typical code is just simply too sharp, that there are not enough listeners in it to prevent a good sense of

BH
NRC-72
T-2

reason. That the code will send out errors, print out errors when, in fact, they have no significance.

MR. MANOLY: Well. Which code are you referring to?

MR. EBERSOLE: The stress analysis code.

MR. MANOLY: Right.

MR. EBERSOLE: They don't prevent the degrees of difference which are entirely reasonable.

MR. MANOLY: Well when you are modeling something --

MR. EBERSOLE: I'm saying, is that one of the weaknesses in the modeling process?

MR. MALOLY: That's probably true. I mean things, you will find the people who look at supports they can look at the drawing and think it is going to make it.

MR. EBERSOLE: So then, they throw out the whole rules of errors? They are not errors?

MR. SEISS: If you are talking about AISC code as it is supplied to other steel structures that nuclear that are. It intends a great deal on the experience of judgement of the engineering.

The NRC doesn't interpret codes the same way that building officcials do.

MR. EBERSOLE: And this causes some confusion here. Are we talking about computational modeling / I think that's what I wanted. you have suggested that the

BH
NRC-72
T-2

models are too tight.

MR. MANOLY: The models are / mathematically not on the program.

MR. EBERSOLE: You can pick mathematical models and have it gear to listen. You know, ask him if we are dealing with paper problems or real problems.

MR. MANOLY: No. Well. It is still very much of an experience. Sometimes, you don't need to make a computer analysis to judge a support to be adequate. But, if you are not doing it every day, you want to see a document that shows that this support is something adequate. That is what we are looking for. We don't, without expecting that everyone reviewing this had one years experience with price supports, that someone can follow through it and make some sense out of it. So those three cases were the annual licensing, excuse me, criteria limit. -- modified the support, I think that even if this thing had gone on undiscovered would not have gone on undetected.

MR. EBERSOLE: Those three were three out of all the cases that I think you said that it was 100%. Only three were found.

MR. MANOLY: Yes that is correct. We did not audit that particular, because that was done in the labratory through the review process.

MR. BENDER: Can I interpret from what was

done here that aside from those, the numerical values of the report were all acceptable bounds based on a more uniform copy test procedure that would now be found. A number of overloaded.

MR. MANOLY: That's correct. That is a result of the -- deal with the San Francisco office.

MR. SEISS: One quick technical question, where an ankle member had a L/T ratio rating on the allowable, in the analysis was that member assumed to carry zero load once it buckled or was it greater than the allowable?

MR. MANOLY: No because if you look ... No, I, since they exceeded the L over T ratio. First of all when you exceed the L over T ratio...

MR. SEISS: I'm not talking about the... I'm talking about what happens. You just assume that if it exceeded the L over T ratio that it was wrong?

MR. MANOLY: No, I didn't say it was wrong. The paper which I looked at shows that your compressors, allowable compressive strength, quendenting (ph) would decrease. That doesn't mean the member is invalid.

MR. SEISS: Yes, the member would still carry a load.

MR. MANOLY: Would still carry a load. That's correct.

MR. SEISS: Did anybody analyze it with the..

MR. SEISS: Did anybody analyze it with the..

MR. MANOLY: I think that was PG & E argument but they went ahead of the change anyway because the proctillium is limited to a...

MR. SEISS: You are gonna change it to -- OK. That concludes your....

MR. MANOLY: One.. I guess we'll make a finding when we ask P&G to address was the constriction of the seizmic support -- citation on supports themselves. We are concerned with some supports and ignore the others. And we asked them to address that and it becomes significant when you have heavy supports expecially if the large frame supports when you have multiple pipes hanging from the same supports.

MR. SEISS: You sure they have become significant. Have analysis been made to show a significant or..

MR. MANOLY: I think that's judgment too. We felt that they should address it and they....

MR. SEISS: I understand that but that's not the same thing as saying it's significant.

MR. MANOLY: Well, if you have a large frame and the support is up to the limits then you have a large exertation load on the support itself then your going to overstress the support.

MR. SEISS: As I recall, I saw some plots of stresses verses frequency and there were very very few where the stresses were up to the limit.

MR. MANOLY: That's probably true.

MR. SEISS: OK, this requires both that it be a heavy support that could generate large inertia forces and that the stresses be close to the limit.

MR. MANOLY: Well, you have to realize that to appeal to the large supports usually you are talking about large frame type structures. If you have a hangar or a spring can that's not done by computer. As far as I know that is done by hand calculation.

MR. SEISS: I couldn't care less whether it is done by computer or by hand calculation and I don't think it is going to know the difference when the earthquake hits.

MR. MANOLY: That's true but there's not much of a structure there, not much of a mass.

MR. SEISS: OK

MR. MANOLY: And I guess in conclusion that the --samples reviewed the supports would be able to stand the undisputed loads as we see them in the pact stress analysis.

MR. SEISS: Thank you.

MR. BENDER: We are trying to show by --

Carl go ahead.

MR. SEISS: Yes, just a question. I am still puzzling over the question of the anchorage. What are the margins of safety for anchorage verses the margins that go with the steel portions?

MR. MANOLY: OK, I can answer the question. For which type anchorage, you have a number 64 for shell type you have a number 65. That's further load to the Diablo load.

MR. BENDER: Would you repeat that. I don't..

MR. MANOLY: Which type anchorage?

MR. SEISS: Which type anchorage? Wedge type anchorage. Wedge is about 4.

MR. MANOLY: Shell type is about 5.

MR. SEISS: 5. That's a nominal and they are very variable, that's one reason we prize them.

MR. BENDER: So someone hired them back in 70?

MR. MANOLY: That's correct.

MR. SEISS: We have a copy now of the two letters from Mr. Yin. One is a draft form, neither is dated so I don't know exactly the status. Addressing certain questions in the Diablo review group basically. I assume you have those.

MR. BENDER: We have the first of those

that included license conditions except for license conditions two and three. We got the second draft which include license condition two and three this morning.

MR. SEISS: The committee members have these now and I would suggest that we begin with any of the concerns, item by item as they come up, now some of these are addressed to the pay review group. Now are you prepared to respond to those that are addressed to you? At least...

UNIDENTIFIED SPEAKER: Yes, at least the ones we can.

MR. SEISS: Ok. Mr. Yin you want to come up? How do you want to do it?

MR. YIN: Mr. Chairman and members of the H.R.S.. My specific question is related to the -- condition, Item I. Following. First subsequent to the DCB, Diablo Canyon Board of Review of/or computer -- small piping supports. How many among the 358 total population will require hardware adjustment modification or rework? I think the question is important. This question as I recall, has been asked by the H.R.S. previously and has not been addressed by the Staff and this will give us a little bit perspective on whether or not we are talking about

hardware problems or talking about paper problems. A second question I have address is the conduction with concern about with hardware change. How many were unable to meet the code and especially our requirements after the first rerun of the computer or perhaps hand calculations. This supports require alternative or additional computation effort in order to meet the design criteria. The reason for me to address the question is I would like to know is the licensee's attitude trying to make themselves look good by sharping up the pencil rather than include the safety of supports. So this is basically my motive in asking the second question.

MR. MANOLY: Could I ask which one, before we run out of time, which one is dead weight.

UNIDENTIFIED SPEAKER: Surely.

UNIDENTIFIED SPEAKER: Let me interject here first of all, I've could Mr. Manoly just answer the question whether or not the design criteria were met. I don't think it's a point of trying to get into anything doing with licensee's motives or anything like that, please...

MR. MANOLY: Answering the first question, I believe there were three cases where the information was slight where the support structural needed

modification and those are the ones that we just talked about.

MR. SEISS: Those are the only three that required hardware.

MR. MANOLY: That's correct.

MR. SEISS: Thank you.

MR. MANOLY: Answering to the second question, it's unknown to me how many supports had to be rerun more than once to be qualified and the number of computer runs that were required to qualify supports in modular situations to the support meeting the criteria, the criteria limits and against the -- analysis ...

MR. SEISS: Mr. Bender.

MR. BENDER: Why would you want to rerun a computer analysis? What happens to make this necessary. I heard you say earlier that in the analysis when once you had a applied the uniform design criteria or whatever you want to call those things that all of the analysis came within the acceptable limits. Now, you could probably do that by finaglling the model somewhat, but I'm sort of interested in the finagling that goes on. What kind of adjustments are made in the model?

MR. MANOLY: I don't know the specifics in

this case. I really don't know what kind of...

MR. SEISS: I don't mean to interrupt. In previous discussions we were given examples, I believe whether they are completely applicable here, I don't know. I believe one example was that that was soon to be intended the first run through. Of course, that was a conservative assumption and if that did not meet the criteria then they made a more realistic assumptions regarding the degree of fixity at the end of a rerun.

MR. BENDER: Is that the procedure that is being used? It seems to me that you should be able to tell us whether these kinds of changes in the modeling approach, which are reasonable, I mean that's not a bad price to start with a rigid model and see what happens and then adjust it if that turns out to be too conservative and you know it's unrealistic, but I think from the standpoint of understanding what is being done it would be good to know what the modeling procedure is.

MR. MANOLY: My knowledge of the last group of supports reviewed by P&G is from the transmittal of NRC. When we audited the P&G office twice they had completed 191 supports out of the 370 of the total population. My guess is true that up to 191 there was no modification made to those supports. The modification was done in the last batch. Which one of those that

require a rerun, I don't know the total number. All I am saying is the rerun is sometimes... I give you example of case where...

MR. BENDER: Let me try this. The licensee has a number.

MR. SEISS: You may ask your question from the people from TT&E if you wish.

MR. BENDER: Well, that was what I was going to try to do. If the licensee has a number of people here that have been involved in the modeling approach. Could they clarify the question for me?

MR. SEISS: Yes, certainly. Larry Shipley

MR. SHIPLEY: I understand the question is that, why would we need to redo a computer analysis that had previously been done?

MR. SEISS: No it is not quite that. It is if you do it, well, alright it is. If you're doing it, why are you doing it, and what's the logic to it.

MR. SHIPLEY: If you were, in many cases as Mr. Manoly stated, Mr. Manoly stated that there were assumptions made by the designer that he felt were perfectly justified and therefore did not feel that documentation of that judgment was necessary. When it was reviewed in San Francisco, it was felt that complete justification for each and every modeling attribute was necessary for this final review and in many cases

where for example, we felt that we're being insignificant, we none-the-less went through the calcualtions to show that it was insignificant. Where we felt that memberexentricities had differences in shear sides of connected angles.

MR. SEISS: That's not the issue. The issue was that analysis that did not meet the criteria and had to be rerun in order to meet the criteria, meet the total allowables, not analysis of the rerun to take into account the additional factors. It is something where the analysis showed it did not meet the code allowables and is rerun. The first question is how many of the small bore piping analysees were unable to meet the code in FSAAR requirements and the first rerun in the computer and required some alternative or additional computation effort in order to meet the design criteria.

MR. SHIPLEY: I am afraid that we didn't deep any statistics and I guess I couldn't even hazard a guess on that number. We reran, recomputer analized the support to incorporate the licensing conditions where it was necessary we reran the screwal calculations where it was not necessary, we justified with previously existed. I am afraid I don't have the statistic on how many.

MR. BENDER: I think you are quite. We have two sets of questions here and I think that is the problem. The question was not numerical having to do with how many, it had to do with how you changed the modeling assumptions. If the initial analysis shows that the stresses were too high and sometimes that is done by the cost of... The cost is arbitrarily fixed and that is a very conservative condition but you know that it is maybe not as rigid as you originally assumed and you want to adjust the model to allow for more realistic condition, what is the procedure? Can you describe it in a way that we can understand?

MR. SHIPLEY: Yes, I believe so. We would when we got a computer output that indicated an over-stress or overloading condition we would look at the model to see if there was any excessive conservatism in the model. An example of that might be that, might be a case where we had taken the excentricities of connected angles at the centroids where in actuality it is really the / sheer center difference which were angles that are connected plant to plant is very small and we would use rigid links rather than in in order to get it to a sheer center difference such as the torregan that was put into an angle when it is in reality what exists not a conservative computer model. In some cases we

would use when we were evaluating the public capability of members we would use a very conservative K value and if it showed that the buckling load was exceeded we would go back and realistically look at the end connection to determine what a proper value would be. Many things were done along those lines in order to develope a more realistic model and a more realistic representation of the actual support.

MR. BENDER: I think that clarifies most of the question. Let me pursue one just one step further. The structure is described on paper and it also exists out in the field. The last time we discussed the subject there was some discussion as to whether the paper analysis, paper description and the physical being in the field matched. Can you tell us anything about how that issue was treated and analytical problem.

MR. SHIPLEY: Yes sir. The file has no drawing was obtained and used in the evaluation for correctness in the computer model and the file evaluation was a comparison of the computer analysis to the Astoral (ph) drawing.

MR. SEISS: The Astoral (ph) drawing?

MR. SHIPLEY: Yes sir.

MR. SEISS: Thank you.

MR. SEISS: Are there any other questions on this particular item?

MR. YIN: My first -- just mentioned, when he reviewed 191 supports and there was three modifications so in fact...

MR. MANOLY: No, there were three modifications after 191.

MR. YIN: Alright, so my question maybe I didn't make it clear here so 358 you only reviewed a certain stage, you have not really reviewed when the job is finished. So, you don't really know how many it is going to take.

MR. MANOLY: No, they... I am basing what P & G has told us that there is 357 supports that could be computerized and 3 or 4 modifications. That is they're letter up on the screen.

MR. YIN: But my question is do we want to know how many changes were required after the completion of the...

MR. SEISS: You were just told three. He answered your question. The answer to your question is three.

MR. YIN: OK that is assuming he is telling the truth.

MR. SEISS: Three out of 358.

MR. YIN: My question sir, is how many among the 358 of the population will require hardware

adjustment modification or rework.

MR. SEISS: As I understand it it is 3.

MR. YIN: Maybe I don't understand the question.

MR. SEISS: The answer is 3. Go on to the third question.

MR. YIN: OK, Thank you.

MR. YIN: The third question is the P.R. Review panel. PRP, identified open on-sight -- enterin design judgment presumably we are talking about design basis and criteria. It was not documented in some of the confirmations. What PRP action if any was initiated to determine that there were just a few isolated cases. If the situation was determined to be generic, was there any license program upgrade and dated by the PRP.

MR. MANOLY: The P. R. Review panel -- that this is our judgments were few were based on the following: (1) is that the percentage is low. And number 2 is that these, the judgments were made. Supports have had ample design margin so really it wasn't much of an issue. Number 3 which I mentioned earlier, the significance of the design judgment depends in many cases on the background of the independant reviewer. Some of the obvious conclusions to

experienced support engineers are not so obvious to someone outside or... You know that doesn't really get into the nitty gritty of doing them and thats where why sometimes depending upon the explosion of the -- supports and you will call it if it needs to be documented or not. But there are obvious things that need to be documented, things like where did the load come from, the references, some calculation is not made the design should state by judgment is not acceptable. Checker has to review that and the reviewer has to deal with that. There will always be a question really what is a design judgment and it is a gray area. It is a gray area and based on the sample that we looked at, the judgments were a problem...

MR. YIN: Well, when you say -- is low, how many among the total number that you have determined there's a problem?

MR. MANOLY: I don't recall the exact number, all I am really saying that even among our group we had five individuals, myself and Dr. Huntsman and three others people from each section and someone thought that they should have been written up, someone thought that it has to be written up so... -- I don't think that it was anything of any significance that we felt that had to be redone. Naturally, the thrust of my

statement.

MR. SEISS: I don't think that the percentage is important and if you had found that these things are a large number of issues but in each case in your judgment the design judgment was adequate, like the more cases you found where you agreed with the designer judgment, the stronger your case would be with it.

MR. MANOLY: That's very true.

MR. SEISS: So I don't think though that three or three hundred really, in fact, I think if it had been three hundred instances and you agreed with all of them that would be an even stronger case that the designer is doing a pretty good job. So I don't know that the percentage is an issue. Mike.

MR. BENDER: I wanted to ask Isa a question. I gather you have done some of these analysees yourself in the past. What's your normal procedure? What would the normal procedure of a designer be in trying to make assumptions like this?

MR. YIN: If you read the specific question the design judgment presumably talking about the design basis and criteria, I am not talking, if my question is not quite right, please tell me so.

MR. SEISS: Your telling us what your talking

about.

MR. YIN: That's right. I I

MR. SEISS: You know me, everything is fine. Your are the one who wanted to ask the questions. You can ask the question but we have gotten an answer. The review group looked at it and they didn't find any cases where they disagreed and once they discussed it with the designer, is that right?

MR. MANOLY: We interviewed some designers as we were doing the audit and a quite number of them and we wanted to see how many of them understand what they are doing.

MR. BENDER: Well, the point I am trying to raise I would again, it is not really a point so much as a clarification. All of the discussion like suggested, maybe the review process is such that and I think it is, I think we need to know why and I am not sure right now that I have a feeling that it is suspect or that you necessarily think so, but the tone suggests and I would like to know whether that....

MR. YIN: Well, the statement in the PR Review Panel's conclusion is so weak and so general that how can any judgment will be concluded saying that the design judgment is acceptable where we don't have any specifics to view it.

MR. BENDER: You don't trust this review group. You would like to see the specifics of each of the instances.

MR. YIN: Yes. I don't trust it.

MR. SEISS: I think that's clear. Chet.

UNIDENTIFIED SPEAKER: I think that there is a missing link here. Certainly for the distant record and time is that the judgmental inputs are not on record and there will always be a void. You have to go back to somebody who is alive and breathing to get a decision.

UNIDENTIFIED SPEAKER: Why aren't these judgments, in fact, themselves a documented input as to what occurs after the judgment is made.

MR. SEISS: Maybe these are pin connected maybe they are not pin con.. whatever the hell they are.

MR. SEISS: Why are these not put on the record so we can all see them?

UNIDENTIFIED SPEAKER: They were in most cases, I think, but there were some instances where they were not. Remember, this was a very...

UNIDENTIFIED SPEAKER: Are they now?

MR. MANOLY: What is the question?

MR. SEISS: Are the undocumented judgments now documented?

MR. MANOLY: When we requested that I believe they are included, if we didn't request it based on our agreements that the judgment was correct. I don't imagine it...

MR. EBERSOLE: Well, I think if it is not on the record. We don't have in fact a record of this calculation.

MR. KNIGHT: I hear a great deal of mis-communication going on, I think. I would like to take a shot at it and then whoever correct me.

MR. SEISS: Give us a for instance Jim.

MR. KNIGHT: Well, maybe even before the for instance, my understanding from the reading of the review of the task force report and discussion with it's members that in the vast majority of instances and I do mean the vast a very big percentage. All of the necessary information to understand what was done in that amount in the package.

MR. MANOLY: That's correct.

MR. KNIGHT: The model shows whether it was assumed it was pinned or fixed or whatever. The relationships that were used were all there. We are down and please correct me if I misspeak. I believe we are down in the very, in the noise level of judgments that were made and questions as to whether each and

every explicit thing that went through the mind of the designer was shown there. Now clearly there are things that are germaine to the doing of problems. Some decisions are made that were germaine to doing the problem but I think it is improvident to characterize it as the kind of lack of information that would require you to go back to square one if you looked at this package 10 years from now. Now, correct me where I have mis-spoken.

MR. MANOLY: No, I think you presented it the way it is. Let me make an example here. The dimensional support is 6 foot and 13/16 and the model is 6 foot and 1/8 and the designer ignores the 3/16 and the stresses are low. He did say you know, I did ignore the 3/16 because it was insignificant, my judgment that he don't have to write that out and that is just one example you know. Many things are done and I don't expect that they are going to write all of this kind of stuff. It would just be wasteing time.

MR. YIN: Are they all in that same category?

MR. MANOLY: Well, that is just one example of what we saw. Let me give another example. That's -- you brought up the question. The beta annual is a big question.

MR. EBERSOLE: Well, is there some statement

of the fact that a nominal rounding of numbers will be accepted.

MR. MANOLY: I guess it is. I would buy that myself and some might not accept that. I think my bottom line is support can make it or not. Is it an adequate design or not and there is a degree of details I think is necessary as far as the criteria says and the documents say. It is easy to the documents and that is as far as I can ah...

MR. BFNDER: How much rounding off you do is approximately how sensitive the analysees is to the rounding off. So there is a lot of judgment that the analysist has to put into this, the work and it is hard to quible about that point. The issue is really whether the rounding off has been to -- or not.

MR. YIN: Are we concerned about those. My concern is design basis and criteria. We are worrying about the off a couple of inches here and there and rounding off decimal points. Are we trying to avoid the issue or are we trying to fix it.

MR. SEISS: BENDER I think what I would like to know from you, I asked earlier and I am going to try again. What are the things that you say need to be defined by the designers in order to do the analysis? Can you tell us what they are so we can have a basis for judging

the validity of your criticism. I think that this is a direct attack on what the review team has done.

MR. YIN: No sir, it is just a simple question. If you are so determined and you are so determined that the percentages are so low and so on, we would like to know what they are and how low is low.

MR. SEISS: I think what Mr. Yin is concerned about is that some of these judgments and they have been very important judgments are not documented, not minor judgments but let me ask the staff again. All of these analysees were reviewed by the licensee and whatever the judgments were made, documented or not, the bottom line was that they were adequate, is that correct?

MR. MANOLY: Based on the sample, I believe they are right.

MR. SEISS: Now, did you find any undocumented judgments that if they had been based differently, would have affected the bottom line?

MR. MANOLY: No. Based on the sample that we looked at.

MR. SEISS: And is there a choice of loads.

MR. MANOLY: The loads are, ok, let me give you another example. When you go through the calculation of central pipe supports you go through several revisions

of the same support and I think that is where the old load happen to be higher than the new stress loads and therefore, the designer did not change because they were higher. That's a judgment and if you look and compare the numbers are higher then you know that the support stress is really lower than what they are but they didn't want to make a rerun with the new....

MR. SEISS: Did you find any places where the source of magnitute of the load was not documented.

MR. MANOLY: No, it is always in the calculations brackett.

MR. SEISS: Were the criteria, the allowable stresses, the element of P (ph), etc. was not documented.

MR. MANOLY: They have a specific item for... They have a check list for the -- process consisting of I don't know, 30 some questions, 30 some categories and they have, and the review process has to go through this process one by one. That's instruction I can define.

MR. EBERSOLE: Is it fair to say that there are no important undocumented judgments?

MR. MANOLY: That is correct.

MR. EBERSOLE: I want to add on what you said you asked Mr. Manoly if the licensee had reviewed these and I would like to remind the subcommittee that there

has also been a -- of extensive review done by the due process sponsored by Teledyne plus additional staff activities over the last couple years in addition to what the peer review looked at. And all of these you could say were in audit form done by the competant capable angle of integrity and with the implication that there is only one individual here has those credentials and I think I look upon with favor. There have been a lot of people look at this and taking generically the whole problems, looking for problems, looking for generic problems and the peer review group only focused only on very specific conditions as you pointed out at the beginning of the meeting and were part of the -- license.

(End of tape)

MR. YIN: I have considered this issue. The reason for us to ask the licensee to review 100 percent of all the computer analyzed small bore calculation for the supports is the fact they are a large percentage of design judgment has not been prescribed in the design calculation and when we first reviewed those packages this comes as a surprise to me that this same situation still persists even after the program effort.

MR. MANOLY: Isa, let me answer this question. I think you had a fair statement that the check list in R-65 covers these kinds of important concerns that you are referring to because a lot of these things were not addressed before as in R-65 now and now the systematics of the engineer and the checker and the reviewer would go systematically through this list and hit all the significants, so anything that -- falls out of that we felt was insignificant.

And some of the stuff that you talked to me about was not there and I think that's covered and that's why we had a lot of discussions with the P and G to address all this concerns in the instruction sheet so it would cover all bases. An example, the self -- excitations might affect the supports, but we insisted in having done just to, to have the uniformity there.

So everything I see a judgment I think was addressed in that instruction of significance.

MR. YIN: Number 4, PRP identified calculation of efficiencies consisting of erroneous strudel input assumptions of structural member properties and geometry. Was there a license, was there a licensee procedure that included quantitative or qualitative acceptance criteria for accepting this kind of deficiencies? If not, what are the GRP's criteria in determining that no further action is required?

MR. MANOLY: I guess, I don't know of any such documents. First of all, we didn't I think use the word erroneous. We said there was errors and I prescribed what these kind of errors are. I don't know of any procedure that addresses erroneous runs.

I think when a run is found to be wrong, it should be rerun. That's the checker's responsibility to detect that and the reviewer to detect the error. And if there is a certain judgment made, the reviewer should agree or disagree with the judgment.

If he disagrees, it should be rerun. And that's the way I think the process works. I don't know criterias that just apply to erroneous or what's wrong and what's not wrong.

MR. KNIGHT: Jim Knight, again. I'm wondering if we're not about to get off on the same kind of discussion that we just had unless we clarify the -- as I think you did

earlier and I think it's worth discussing for a moment, calculate what is characterized here as calculation deficiencies.

My impression, again, from reading the report was that is was of the same order of magnitude if you will of the judgment. You found some things that you might class as a calculation deficiency but it was a very minor thing.

MR. MANOLY: That's correct.

MR. KNIGHT: I think for the sake of completeness you've put it in here.

MR. MANOLY: I think if those erroneous ones, mistakes that we have discovered, we never would have labeled this effort, based on our sampling, as adequate.

MR. SEISS: In how many instances did an error in the strudel input get by the checker and the reviewer and lead to a deficiency of the as-built support?

MR. MANOLY: How many instances?

MR. SIESS: Yeah.

MR. MANOLY: It's a tough question to answer. Sometimes -

MR. KNIGHT: No, I don't think you heard the question. In how many instances did an error in the strudel input that got by the checker and the reviewer lead to a deficiency in the as-built support?

MR. MANOLY: I don't believe -

MR. SIESS: I'm sorry, would you -

MR. MANOLY: I don't believe that, I mean, when you remember the package that was done by -

MR. KNIGHT: There was a specific question. And I think just for the sake of the record here, I want to make sure we're clear, if we build on your previous presentation, there were no instances in which the support is unacceptable?

MR. MANOLY: That's correct if that's what the question is. I thought he was talking more towards or more hypothetical.

MR. KNIGHT: Maybe I misconstrued the question.

MR. SIESS: I'm interested in how good those supports are out in that plant. I'm interested in what happens when the earthquake occurs and what effect it has on the health and safety of the public. Now, that's my interest.

MR. MANOLY: I think Jim answered that and -

MR. SIESS: And I've done enough analysis, enough design to know that mistakes are made and I've written codes that are written assuming that mistakes are going to be made and I mean not computer codes, building codes. I was just wondering how many of these errors an every analysis has been rechecked, right?

MR. MANOLY: Um hum.

MR. SIESS: This is not a sample, right?

MR. MANOLY: But our review's a sample.

MR. SIESS: No, you're review is a sample.

MR. MANOLY: PG&E's review is a complete review.

MR. SIESS: Okay. I have my answer. Thank you.

MR. YIN: The issue related to items 3 and 4 is the fact why the checker and the guys who approved the calculations still missing, still missed those items. I think the deficiency in monitoring strudel input was considered to be a significant problem at the beginning and we have meetings with PG&E numerous times and we have raised the issue and it just seemed to me the problem has not been resolved, the deficient is still being identified.

Now, the question that Dr. Siess raised, how many has been missed and still all right is a legitimate question. I also have a concerned how many that are missed with the wrong input will cause problems? I think that is also a legitimate question to ask, too.

MR. MANOLY: I want to give you, I guess I want you at least an example of some of the things we pulled. We pulled it because someone had raised a question of why put everything into the records. Maybe it's left to some individual opinion, I might have not included them, but I wanted to include everything that the peer review and our license division had come up with.

For example I give you how insignificant this thing is. The definition of beta annual structure on --, if

itignores altogether the -- is zero, the member orientation is, the press upon the axes coincide with the -- axes, zero is going to give you the same result as 90 as 180 or 270, sometimes the guys ignored it and that was a judgment, whether you put 180 or 270 it wouldn't make a difference because no matter how we turned the member it's going to give you the same answer now anyway.

So, theoretically, you should, based on the assumption I-57, the guys should give the exact orientation. And whether that's going to give you any different answer, that's what we're looking at, does it give you any different, any significant change. In that case it doesn't give you a different number.

I think we documented this think just for the sake of documentation and including every little concern that anybody had brought up.

MR. SIESS: Any questions, any other questions by the Committee or consultants? Okay. Let's go on to item 2.

MR. MANOLY: I just want to add one more thing. I think the discussion about the background of the people who did the work and I worked nuclear since 1971. I have a background in, for civil structure and my graduate work is in civil ctructure and post-graduate work in applied mechanics.

I worked with structure mechanics -- for six years and we managed the structural department as a consultant

before the -- Denver scene for four and a half years.

MR. SIESS: Can you -- (two people talking at once) both of these things without struding?

MR. MANOLY: Yes. I went to -- at school for ten years.

MR. SIESS: Thank you. Who's going to do item 2?

MR. KNIGHT: Bernie Saffell of Battelle Columbus Laboratories will do items 2 and 3.

MR. SAFFELL: I'm from Battelle Columbus Laboratories and I was responsible for addressing issues related to closely spaced pipe supports. The members of the team are identified here. In addition, Bob Bosnick and Mark Hartzman from the NRC staff participated in most of the meetings and audits of this team as did Mr. Yin.

The visiting relationship between these two, this license or two items were coupled into one and the items addressed, load sharing by closely spaced pipe supports, these are rigid restraints close to anchors or rigid restraints close to other rigid restraints as well as addressing snubbers located in close proximity to a rigid support or an anchor.

MR. EBERSOLE: May I ask a question. By and large, are these closely spaced supports, do they represent cases there the first support that was put in was not thought to be adequate and the second was added?

MR. SAFFELL: My understanding of this is that it's part of the evolutionary process. There were supports which were located based on the DE and rather than pulling out supports and beefing them up, as you went to the DEE and the hoscree -

MR. EBERSOLE: They added support?

MR. SAFFELL: They added support.

MR. EBERSOLE: Then your problem is to show us that they don't peel, right?

MR. SAFFELL: They don't what?

MR. EBERSOLE: Peel, P-double e -l, that is because of limited amplitude of movement in one which would destroy it before the second takes the load.

MR. SAFFELL: Oh, okay.

MR. EBERSOLE: That's peel, to me, anyway.

MR. SAFFELL: Okay. Yes, yes. The licensee program for addressing this issue consisted first of proposing and establishing and soliciting agreement stats on the proximity criteria. In other words, exactly what is close proximity?

This was followed then by identificature stream of those supports which fell within this proximity criteria. For those cases where we were looking at rigid restraints close to other rigid restraints or anchors, they were then inspected in the field to see if ah they required shimming to

bring the clearance on either side, we're talking bottom to pengos situation, down to a sixteenth of an inch.

I should point out that the tolerance for the installation of these supports calls for a sixteenth of an inch plus or minus a sixteenth and if you get that on either side, if it was all taken on one side you could get up to conceivably three sixteenths of an inch. In the case of snubbers, the licensee reviewed the analyses to determine the displacement without the snubber in there.

If that displacement was greater than a sixteenth of an inch, the snubber was assumed to lock, function as intended. In cases where it was less than a sixteenth, the licensee then made the determination as to whether the snubber was needed.

There were a number of cases where they weren't. And if the displacement was less than a sixteenth and also if , and the snubber was required, then we went to the, the licensee went to the snubber test data for that specific snubber or for that class of snubbers, I should say, to look at what the lock up distance was and provided that as the basis for qualification.

Even that procedure, the licensee made the statement that all of his snubbers were either qualified or determined not to be necessary.

MR. EBERSOLE: May I ask this? In the case of the

fixed supports without snubbers, I guess implicit in this is that you can take a 360 movement without any assistance from the adjacent support and you will not have accrued at that time excessive stresses in the member just taking load. Is that correct?

MR. SAFFELL: Okay. Let me, I evidently didn't say something quite correctly. I said the licensee's criteria was plus or minus a sixteenth or a sixteenth of an inch on each side with a sixteenth tolerance -

MR. EBERSOLE: But I want to go below that.

MR. SAFFELL: Okay. And that's what the licensee did. Part of the shimming effort was to tighten that down such that you would have no more than a sixteenth on either side.

MR. EBERSOLE: But that still leaves you with a potential three sixteenths clear movement before the second support takes a load?

MR. SAFFELL: No, a sixteenth.

MR. EBERSOLE: Just one sixteenth?

MR. SAFFELL: Just the one sixteenth, yeah.

MR. EBERSOLE: And at that one sixteenth clear movement before the second support takes the load, you are saying there are no excessive stresses in that support which are carrying the load up to that point?

MR. SAFFELL: Well, yes, that's what we're saying

that in fact between rotation and displacement that that's an adequate criteria for demonstrating load shift.

MR. EBERSOLE: And that would include the anchor bolts.

MR. SIESS: In the analysis, do you assume that -- moves a sixteenth of an inch before the support gets any load?

MR. SAFFELL: No, sir, no, sir. In the analysis, the supports are assumed to be active.

MR. SIESS: It's presumed to be zero in the -

MR. SAFFELL: In the analysis, that's correct. That is correct. And from that you get loads and then you look to see if -

MR. EBERSOLE: Yeah, I assume that. But then beyond that point, you assume that a sixteenth of an inch unassisted movement from the second support is not an overload.

MR. SAFFELL: That's right.

MR. EBERSOLE: And that includes the anchor bolts which are extremely tight because they have strength in excess of the hangers?

MR. SAFFELL: Yes, yes, sir. What we're saying is, what you're saying really is that the pipe if it deflects that amount, cannot put greater than design load on the single support which is carrying the load at that point in time.

MR. EBERSOLE: Right.

MR. SIESS: Let me get this straight. You've got two supports, both designed for a sixteenth of an inch.

MR. SAFFELL: Right.

MR. SIESS: And the first support has zero clearance I'm assuming.

MR. SAFFELL: Okay. In loaded case.

MR. SIESS: Yeah. For some reason this got zeroed.

MR. SAFFELL: Okay.

MR. SIESS: And the pipe then has to move a sixteenth of an inch of the second support?

MR. SAFFELL: Right.

MR. SIESS: And that won't overstress the first support? That either the pipe can move the additional sixteenth of an inch or the first support can. This is the nexus of the whole thing, isn't it? If the two supports are supposed to carry the load, if they're both ductile they will.

MR. SAFFELL: They will, that's right. That's right.

MR. SIESS: If the first one is brittle, I mean rigid and brittle -

MR. SAFFELL: Well, I think we're talking about ductile, ductile structures.

MR. SIESS: I hope so. They are fairly rigid,

though, aren't they?

MR. SAFFELL: Fairly.

MR. SIESS: If you put the full load on the first support, how much will it move?

MR. SAFFELL: I don't know the answer to that question.

MR. EBERSOLE: Did you finish that?

MR. SIESS: I think so.

MR. BENDER: You're not going to be able to generalize on something like this except to say that there's some limited stress associated with the deformation of the parts. You're not allowing in the analysis for inelastic movement of the support, are you?

MR. SAFFELL: No, sir. That is correct. The analyses are linear elastic analysis, no gaps,no material, non-linearity.

MR. BENDER: So what you're determining is that there's some deformation of the pipes.

MR. SIESS: Or the support.

MR. SAFFELL: Of the support.

MR. BENDER: Well, I don't think, well, maybe they do put the -

MR. SAFFELL: It's really, I think it's really the pipe. I mean, the pipe is going to move and close it up and the pipe is going to move by, by actually displacing which is

which predominantly is going to come from rotation.

MR. EBERSOLE: Wait a minute. I can't understand that. If you're talking about pipe movement, these are closely spaced supports.

MR. SAFFELL: Right.

MR. EBERSOLE: And you're not going to move the pipe and in a relevant sense between the supports primarily.

MR. BENDER: Why not? If you've got an earthquake, Jesse - These supports are virtually butted up against each other. You're not talking -

MR. SIESS: They might be twenty feet apart.

MR. EBERSOLE: Oh. I didn't know there was that degree of span.

MR. SAFFELL: 10D, yes.

MR. EBERSOLE: Oh, I didn't, then you are counting, you're talking about -

MR. SAFFELL: I'm not talking about two supports that are right next to each other like this.

MR. SIESS: How close were the closest supports you looked at?

MR. SAFFELL: We had not asked the licensee to provide that. The licensee may know. We did not ask for that.

MR. SIESS: There was some discussion about how far away they could be and be called close-

MR. SAFFELL: That's right.

MR. SIESS: But I'm not sure how close they will be.

MR. EBERSOLE: Well, implicit in your, in your basis of doing this then is the thesis that the pipe is bending -

MR. SAFFELL: Right.

MR. EBERSOLE: To get the load, not the support stretching.

MR. SAFFELL: That's exactly right, yes.

MR. EBERSOLE: And so there would be, it would be critical that you not get too close.

MR. SAFFELL: That's right.

MR. EBERSOLE: And so when you looked at the minimum separation, you did look at the finding stress amounts and confirm you could get an S bend in it or something.

MR. SAFFELL: We did not look at minimum separation. We looked -

MR. EBERSOLE: Well, how do I know you don't have any that are just two feet apart?

MR. SIESS: Can the licensee comment on that? Only a couple of dozen of these came within the the 10 D as I recall.

MR. SAFFELL: Came within the 5 D.

MR. SIESS: I thought you changed it to 10 D?

MR. SAFFELL: We did change it to 10 D and we're looking now at ones that are too close.

MR. SIESS: We're looking at close. What's the closest you have two supports, two rigid supports?

MR. SHIPLEY: I think in the large bore we're down in the, in the several feet, foot range, one to two feet, but I might point out that of course as you get these pipe supports closer and closer together, in the typing analysis, the linear analysis of the piping, you find that because of the couple effect that the two supports reduce, the loads on the supports are unrealistically high as opposed to when you factor in the gaps and only one support acts if you understand what I mean. The supports, being very close together, produce a -- couple which causes the loads on the two adjacent supports to be much higher than it would be if you had done a non-linear analysis and considered the gap of each support. So I think the closer they get it becomes somewhat self-compensating.

MR. SIESS: But you apparently needed the second support.

MR. SHIPLEY: Not in all cases. In fact, we've done several runs that indicated that we did not need the second support. However, the most expedient method of resolving this problem, you know, consistent with providing clearance for thermal expansion, was to shim to a sixteenth

rather than in many, many cases run interative pipe analyses to determine whether or not the support was really required.

MR. SIESS: Do you always cause the second support to take the load by pipe deformation only or do you let the first support stretch?

MR. SHIPLEY: The assumption in the analysis that generates the support load is that both of them are acting simultaneously.

MR. SIESS: Yes, but I'm assuming now that one has zero gap and the other has a sixteenth of an inch.

MR. SHIPLEY: Yes, sir.

MR. SIESS: And the first one acts first, carries all the load.

MR. SHIPLEY: Yes, sir.

MR. SIESS: Now, what happens to get the load to the second one? If they're far enough apart the pipe bending will do it.

MR. SHIPLEY: Rotation of the pipe.

MR. SIESS: And if they're a couple of feet apart over a two foot pipe -

MR. SHIPLEY: No, no, no. No, sir. I was speaking of some of the smaller pipes like the four inch size. If you get into a two foot pipe I wouldn't expect it to be closer than eight to ten feet, five feet perhaps.

MR. SIESS: So we haven't got anything closer than

a few D's?

MR. SHIPLEY: Yes, sir.

MR. EBERSOLE: In the subsequent shared load of the supports, does the one that takes the first fraction of the load continue to be assumed to be the highest stress level all through the entire load carrying regime? In other words, it has a load substantially greater than the secondary support, doesn't it? And you continue to load it.

MR. SHIPLEY: If you were to consider in a very machanistic sense, that's correct. I think, though, the method of the piping analysis for very closely spaced supports, the type that we tend to think about that really doesn't exist, but we talk about these very closely spaced supports, the piping analysis as I say, the closer they get the higher the loads go because of the -- couple that's produced and as a result each support is designed for those very high loads that do not exist.

Those loads do not exist when a gap is in an adjacent restraint. So, and I might add that the reason that we could not develope that as a criteria is that we couldn't develope a hypothesis that was true in 100 percent of the cases. It becomes very subjective as you get into three dimensional piping systems.

For simple spans it's easy to do. You can show that closely spaced supports you develope a higher load the

closer you get than if you were to consider one and assume the other's not acting.

MR. SIESS: Okay. Keep going.

MR. SAFFELL: Okay. Our review consisted of reviewing the licensee program, discussions among the group and Mr. Bosnak, Parson and Yin led for a revision of the initial screening criteria.

We then reviewed the licensee's initial submittal, subsequent submittal and also some of the analyses performed related to both the snubbers and the closely spaced supports and inspected installations with our conclusion being that adequate assurance was provided to insure load sharing of closely spaced supports and snubber operation.

MR. SIESS: Are you finished?

MR. SAFFELL: Yes, sir.

MR. SIESS: Mr. Yin has some questions on this. Would you like to pose them, please?

MR. YIN: Thank you. My first question related to the staff review of the license condition item 2 is this the 5 D and 10 D criteria was established by peer review panels PRP on June twentieth, 1984 at Cloud's office with my concurrence. Actually, it's based on my presentation of the -- criteria.

As a result the 5D and 10D was upgraded. Previously is was 3D and 5D. One week later the NRR staff

called me up stating that the licensee had requested some exemption on the 10D proximity criteria for the snubber anchor pier.

The couple transconnections designed by the Spannou were request to be excluded from the review because they would require excessive effort and that may delay licensing --.

MR. SIESS: Excluded completely or different than 10D?

MR. YIN: It's excluded completely.

MR. SIESS: Okay. Go ahead.

MR. YIN: Well, the 5D actually was not really applied in the first place. Only 10D applied to that particular consideration. The NRR staff honored the request based on the reason that the decoupling branch connections are less important to safety. I would like the NRR technical staff for the technical justification on exempting the PRP criteria.

One of the reasons, it's kind of interesting to point out is, we had various meetings and hearings where Dr. Cloud participated and during those hearings and meetings the only small, he mentioned that the only small bore piping that will be overstressed during seiemic -- would be those located at connections to a large bore piping.

MR. EBERSOLE: I've got a question on that. I can't find any valid reason in my own mind to say that these are thus unimportant pipe connections.

MR. YIN: That's the point. That's the reason I would like to have a technical justification on them.

MR. SIESS: Response, please?

MR. SAFFELL: Okay. Our basis for honoring the request was one, we're talking small piping, two inch and under. Two, we're talking -

MR. EBERSOLE: Well -

MR. SIESS: Let him finish, Jesse.

MR. EBERSOLE: All right.

MR. SAFFELL: Two, we're talking piping that is relatively low temperature, 200 degrees and under for stainless, 160 degress and under for carbon steel. We're talking piping that have small seismic anchor movements, small thermal anchor movements, very small. So we're talking cold piping.

We are concerned about branch connections, but we, our basis was that your, one, we didn't expect if any to see, we expected few if any snubbers or rigid restrants to be located within, we're talking now twenty inches or less or the branch connection and -

MR. SIESS: Excuse me. I hate to interrupt you, but I don't understand the term decoupling branch connections.

MR. SAFFELL: Okay. Decoupling branch connections. That's where our branch connection that goes into a pipe that is very large so that when you perform the analysis you could decouple the branch from the run.

MR. SIESS: Okay. Now, on both branch connections, the requirement to look at closely spaced snubbers and/or supports was waived?

MR. SAFFELL: For just the cold pipe, for just span rule piping, piping that had been qualified by span -

MR. SIESS: Span rule piping -

MR. SAFFELL: Only.

MR. SIESS: That's small, connected to a larger pipe-

MR. SAFFELL: Right.

MR. SIESS: And if there were any closely spaced snubbers or rigid connectors they did not have to be investigated?

MR. SAFFELL: That's right.

MR. SIESS: Now, does anybody know whether there were any closely spaced rigid or snubber connections on there?

MR. SAFFELL: I don't think, well -

MR. SIESS: This is piping that had been analysed seismically?

MR. SAFFELL: Yes, by span rule.

MR. SIESS: Both by span rules DE, DEE and in the hoscree?

MR. SAFFELL: Right.

MR. SIESS: And conceivably could have had supports added with the hoscree.

MR. SAFFELL: This piping is span rule qualified piping, qualified under regional standards.

MR. SIESS: Well, if it's span rule qualified it is not likely that it would need more supports under the hoscree?

MR. SAFFELL: That's right.

MR. SIESS: The forces could be greater.

MR. SAFFELL: The licensee has told us that they went back and, and updated the span criteria and determined as I understand it, that there is no need to go back and requalify this piping, that the original qualifications stood.

MR. SIESS: Yeah, but the question now is the closely spaced. Now, if there are no closely spaced supports, that would be twenty inches or less since this is small bore piping, twenty inches or under-

MR. SAFFELL: That's right.

MR. SIESS: Then the question is moot?

MR. SAFFELL: Yes, sir.

MR. SIESS: But the way the law is that they didn't

even have to look?

MR. SAFFELL: Yes, sir.

MR. SIESS: Now go ahead with the explanation of why.

MR. SAFFELL: Okay. And the basis was one, it was cold; two, they were small. The anchor movement of the run for the bridge tension, where the bridge tension was small so you weren't going to have a large force even if there were one, small siesmic anchor movement which is probably, well, I'm not going to speak for Dr. Cloud.

There were small siesmic anchor movements, small thermal anchor movements. It was cold piping and it's small piping which is relatively flexible, it was felt that even if it happened to be a few, the snubber and/or support, there was a high probability that the snubber or support would in fact function.

MR. YIN: I have a great objection to that. I'm more concerned about the cold pipe than the hot pipe because if you have a large anchor movement and you have a large thermal movements and you put a snubber right next to it, I think you're crazy and you have a locked in stress right there.

It's precisely the cold piping that when you have a siesmic movement and there is no anchor movement and with no big thermal movements that you have to worry about how to

snub those small pipes.

MR. EBERSOLE: Has anyone in the course of looking at this examined the real issue which is what is the consequence of the functional failure of a set of these small pipes?

MR. SAFFELL: I don't believe so.

MR. EBERSOLE: The reason I ask this is these have a capacity to coincidentally produce -- small locus and blind the mitigating equipment to respond to those.

MR. SIESS: Jesse, that was taken into account in the design.

MR. EBERSOLE: But here we're talking - it was presumptive in the design these would be singular failures.

MR. SIESS: Yeah, but the issue now is whether they're closely spaced supports. I guess from what Mr. Yin said there probably wouldn't be many snubbers on cold piping, would they, snubbers on piping that you want to be able to move -

MR. SAFFELL: That's right.

MR. SIESS: So we're really talking about are there likely that anybody add any closely spaced supports to this piping.

MR. EBERSOLE: Chet,we may be look into the focus of the common mode failure right here.

MR. SIESS: Well, but I don't think that's the

issue on Diablo Canyon.

MR. BENDER: It would help if we had a couple examples. From the talk it would seem to me we don't have much of a physical understanding of what's going on.

MR. SIESS: These are designed siesmic, they've got a siesmic design, Jesse. The question is just have they got two closely spaced supports that might not work.

MR. EBERSOLE: Right, I know. But I'm saying if there's a coincident possibility we lose some of these small pipes, then we're up the creek.

MR. SIESS: But your reasoning was that you don't know whether there are any.

MR. SAFFELL: Well, the other way. We feel it's highly unlikely there are any because the piping was qualified by span criteria and based on that you wouldn't expect the support to be close to an anchor.

MR. EBERSOLE: Are we thinking about sheer failures at the point of attachment of the small pipe?

MR. SAFFELL: I think you're talking about a combination of bending and sheer. Well, that's how it would fail. I think we're not expecting it.

MR. SIESS: That's how it would be designed. If you qualify it by span formula, you put supports span like to control the frequency, right?

MR. SAFFELL: Yes.

MR. SIESS: And when you change from DE, DDE to hoscree and did some other reanalysis, wouldn't it have been reasonable to change the frequency? Somebody said there were revised span formulas.

MR. SAFFELL: Only if the frequency of the siesmic events, of the postulated siesmic event changed or was not encompassed by the original set of span rules.

MR. SIESS: Now, a lot of people here have walked through that plant, including people from Pacific Gas and Electric Company. Has anybody seen a small bore piping with closely spaced supports?

MR. SHIPLEY: Dr. Siess, I think I might preface the remark by saying there was a statement before about the sheer failure may decouple branch connection and I think that would indicate that there are supports that are located two to three inches away from the header thereby inducing sheers as opposed to a bending type of a condition at the header. You will not find that case.

The supports are sufficiently far away to assure that you will not have a probable sheer. As to whether they are closely spaced, within the 10D criteria, I believe it is possible. I think further, though, that the span rules that typically require on the order of eight feet, depending on the size and location in the building, six to eight feet nominal spacing provides some assurance that you don't have

any significant number of these proximity restraints let's call them on decoupled branch connections.

MR. SIESS: Two things. One is I don't know what the significant number one might be or two might be following up Mr. Ebersole. You mentioned a change in the span rule. What was that change?

MR. SHIPLEY: My understanding is the span rule itself did not change.

MR. SIESS: I was thinking if the span rule fell from eight feet and a revised would call for seven feet, I could picture somebody putting another restraint a foot away or six inches away at each end. When you're dealing with small bore piping with rigid restraints, what kind of gaps do you consider?

MR. SHIPLEY: My understanding is the gaps are the same, they are sixteenth, plus or minus a sixteenth on either side.

MR. SIESS: Oh. Gosh, a sixteenth of an inch on a two inch pipe is, the flexibility of the pipe is very large compared with a sixteenth on a twenty.

MR. SHIPLEY: Yes, sir.

MR. SIESS: Jesse?

MR. EBERSOLE: Yes. This last statement that Isa has here about Dr. Cloud had stated during various hearings and meetings that the only small bore piping that will be

overstressed during a seismic event would be those located in connections small bore piping. Is that still a matter of record?

MR. SIESS: Dr. Cloud is right behind you. We can ask him.

MR. EBERSOLE: I just want to impress on the fact that small bore pipes are not all that insignificant no matter where they're attached.

DR. CLOUD: Thanks for the reminder. I'm very well aware of the importance of small bore piping. I don't believe that I ever said this statement, at least in this context. I didn't say that that small bore piping will be overstressed in the seismic event.

What I did say is that historically we've seen that the junctions of small bore and large bore piping can be important and I pointed out that that was one of the reasons that we focused upon those connections in our independent verification program.

MR. EBERSOLE: You're talking about the extra welded junctions?

DR. CLOUD: The junctions between small bore piping and large bore piping and the most vulnerable of these as I pointed out are the vents and drains on the large bore piping which is the place that in fact there have been failures in earthquakes and we specifically evaluated those

situations and we ended up with in a result that requested the Diablo Canyon project to review systematically all those situations which they did.

DR. EBERSOLE: You did say vents and drains?

DR. CLOUD: Yes.

DR. EBERSOLE: I'm more interested in impluse lines.

DR. CLOUD: Which kind of lines?

MR. EBERSOLE: Impulse lines, static lines. They convey, process information to critical mitigating equipment. They can also be the source of small breaks.

DR. CLOUD: You're talking about the instrumentation lines?

MR. EBERSOLE: Such as those. See, they have the capacity to induce a small break and also functionally fail the systems which mitigate the effects of small breaks. Do you follow me?

DR. CLOUD: Yes, I understand.

MR. EBERSOLE: So you didn't just -- you're looking at to vents and drains?

DR. CLOUD: No.

MR. SIESS: Those are just examples.

MR. MYSINGER: Gentlemen, when I reviewed the material on this, I felt that there were two things involved and neither of them has been mentioned here. One, I think we're talking about just how, what kind of tolerance do we

expect to work to in construction? Again, I think if we have two supports side by side here within the closest tolerance designed by this material, if we can construct those so that they are within one sixteenth of an inch of the pipe, that's all we can reasonably expect fo construction.

Second, I think that we have to, we have a linear elastic analysis. We don't consider plastic deformation in -- and I think that there again we are expecting this material either to deform elastically or plastically for the load to redistribute.

I have NRC documents here, reg guides that speaks of shake dash. If we are to the point in the material property, or if our materials will not deform that much without failing, we can't build nuclear plants. I just think, you know, that's the real issue.

MR. YIN: Item 2, we're talking about snubbers. We're not talking about rigid to rigid.

MR. MYSINGER: Okay.

MR. YIN: We're talking about the functionability of the snubbers.

MR. SIESS: On the small bore, on the cold small bore piping, do we have snubbers?

MR. YIN: There is one specific sample, you might recall, identified as snubber. It's close to the large bore connections will not function based on the reanalysis

performed by Vecto Corporation.

MR. SIESS: Would not function?

MR. YIN: Would not operate, would not lock up during the seismic event.

MR. MYSINGER: It does move a sixteenth of an inch.

MR. YIN: Yeah. You may not have the pipe but the licensee I assume knows the snubber that's in there is to be a function of that.

MR. SIESS: Is that all this issue?

MR. YIN: Item 2 is snubber and -

MR. SIESS: You have the same concern on item 3.

MR. YIN: Item 3, I haven't got to that yet.

MR. SIESS: But this comment is identical on the two items?

MR. YIN: That's right.

MR. EBERSOLE: I hope we can elminate this matter of whether we overstress or do not overstress small bore piping at these junctures. You're going to retract whatever you may have said?

DR. CLOUD: What I said is that I didn't say that.

MR. EBERSOLE: That's a retraction, isnt' it?

MR. BENDER: It's probably irrelevant. The fact fo the matter is that if there is a defamation there in the samll bore pipe it can tolerate it. There's plenty of plastic capability in that part of the structure.

MR. SIESS: Maybe the -

MR. BENDER: There's nothing to worry about.

MR. SIESS: Mr. Bosnak?

MR. BOSNAK: I wanted to add one thing for the correction of the record. I thirk the statement was made that the NRR staff did not believe small bore piping was important to safety. That's not correct. That wasnt' stated in the telephone conversation.

What we did say was that we felt that in this piping we did not expect to see a closely spaced rigid, in other words, a rigid close to these decoupled branch connections and we didn't expect to see snubbers in this area as well. If there were any, we would be surprised.

And the other thing we said was that with respect to a rigid next to this decoupled branch connection that we would prefer to see it not shimmed because we would believe that you would want to have some deformation here and the samll piping is going to deform and to shim it might be going in the wrong direction.

MR. YIN: That's not true. And the conversation didn't turn out that way. But anyway, it's not a forum to set up lie detectors. But why I say that is what I was informed and that's whatever you want to take.

MR. SIESS: Any other questions on this particular thing about the small bore?

MR. YIN: Well, if Mr. Bender does not believe it isreally a problem, prehaps license condition number 2 and 3 should not be there in the first place then.

MR. SIESS: Well, the Committee has some comments about the question of shimming I think in its letter on this.

MR. BENDER: I'm sure the problem has been exagerated. It's not nearly as serious as might be inferred by the points that have been made here. If the material does not have sufficient strain capacity to deal with these kinds of different deformations the wrong material has been selected and I'm sure that the material that's used is of the type that could take deformations of this sort without all of that concern.

MR. YIN: Are you speaking general or are you talking about specific cases or have you determined that's the case? I'm not trying to question your integrity -

MR. BENDER: You have to work in generalities because there's nothing specific to discuss. You're working in generalities -

MR. YIN: I'm not.

MR. BENDER: When you're raising -

MR. YIN: I'm not, sir. I'm telling you specifics.

MR. BENDER: So far we have yet to see the example that represents a specific.

MR. YIN: I have presented my draft report I

believe is in the record of HRS --. So we are talking about specifics, not generals.

MR. SIESS: By specifics I think Mr. Bender means actual installations in the plant that would fail under the -

MR. BENDER: That's exactly what I'm talking about. I have to see something physical that is representative of the condition so I know what I'm talking about.

MR. YIN: Well, we're talking about the function-ability of the snubber. That's all we're talking about.

MR. BENDER: I'm talking about the functionability of the pipes and so is Mr. Ebersole.

MR. EBERSOLE: Yeah. We know the snubbers aren't going to work, some of them. May I ask a question, Chet?

MR. SIESS: Yeah.

MR. EBERSOLE: There was a time in the era of the large -- being the only accident that there was wherein pipes below I believe it was about two inches were real low on QA or committed to -- all over the place and hung by ropes, I reckon. I take it that has changed substantially and Diablo Canyon certainly represents the new view, that these pipes are functionally important. Am I correct?

And if I go back to Indian Point for instance you might find some of that old view about QA on small pipes. Mr. Bender mentions the QA on the material specifications. Is in fact, are there severe requirements to insure

requirements to insure ductility in these small bore pipes?

MR. BOSNAK: I think the answer to your question is yes. Obviously, we're not talking about the main loop but we're talking about piping which is very important nonetheless and they all are ductile materials.

MR. SIESS: Jesse, when they hung on the ropes they probably didn't get nearly the seismic excitation they will in Diablo. Mr. Yin has some other questions under this heading and under item 3 since we're taking the two together, so please proceed.

MR. MICHELSON: Before we do that, can I just, I want a little clarification on the ability of materials to elastically, plastically deform. The loading, I can understand when a loading is a radial loading, in other words, a radial displacement of a small bore pipe to a large bore pipe, not radial but rather at right angles.

What happens in the case of where the large bore piping is moving such as it puts an axial load on the small bore pipe and it's already locked up by support further down so that now it's an axial deformation? Can that take much axial deformation without failure?

MR. SIESS: The small bore or the large bore?

MR. MICHELSON: Small bore. The large bore isn't bothered at all.

MR. BENDER: You mean the large bore is, along the

small bore axis?

MR. MICHELSON: Yes.

MR. SIESS: You're looking at the small bore pipe that has a rigid restraint and the forces imposed on it by the large bore pipe.

MR. MICHELSON: For instance, a drain line coming off the bottom of a large pipe, as the large pipe moves vertically upward, the drain line is now loaded axially and if it's anchored there isn't very much opportunity for deformation.

MR. BENDER: You know, obviously we can reach some limit. We're talking about sixteenths of an inch.

MR. SIESS: No, he's talking about the large bore pipe could be moving more than that.

MR. MICHELSON: They're moving inches in an earthquake.

(Several people talking at once.)

MR. BENDER: You're shifting the argument. Mr. Shipley -

MR. SIESS: We've got an expert who's going to contribute something.

MR. SHIPLEY: The movement of the large pipe, the header is considered from both a seismic and thermal point of view in the evaluation of the small bore pipe.

MR. MICHELSON: But the small bore pipe was not

anchored anywhere close to the large bore pipe.

MR. SHIPLEY: Yes, that is correct.

MR. MICHELSON: Because if it were it would not be able to take the displacement.

MR. SHIPLEY: By close, perhaps close but around a change in direction which provide the necessary flexibility to absorb the movement.

MR. MICHELSON: So it isn't all, the material characteritics alone are not the only factors, geometry becomes quite a -

MR. SHIPLEY: There's obviously a matter of movement involved, but if you're talking about a piece of pipe that's supported at two points and it has to move vertically and take the small pipe with it and it's restrained so that it cant' move more than a sixteenth of an inch, the action is only a sixteenth of an inch.

MR. MICHELSON: The connection may be ten feet, twenty feet away from the mainline supports. The main line could be moving much more than a sixteenth of an inch.

MR. MYSINGER: That's part of your analysis and I'm not saying it could not be something that we overlooked.

MR. MICHELSON: I'm sure it is, Doug. That's the whole purpose of the analysis to make sure that such flexibility exists. My concern was I thought that we were saying that certain portions of the small bore piping may

become locked up for one reason or another and then the other question is will the small bore pipe fail?

MR. BENDER: That might happen, but it doesn't have to do with the issue Mr. Yin is raising. I think that's what the issue is at the moment.

MR. MICHELSON: Well, only if the snubbers for instance lock up.

MR. SIESS: They can lock up and it still wouldn't happen. The snubbers are supposed to lock up in an earthquake. That's what they're there for.

MR. MICHELSON: I'll remove my question. I was only concerned about geometry as well as -

MR. SIESS: I think there's a lot of consideration given to geometry for thermal movements. I'm not sure there is that much given for seismic movements.

MR. SHIPLEY: Yes, there is.

MR. EBERSOLE: When these pipes are field run, that's another part of an organization, are these factors always taken into consideration?

MR. SHIPLEY: From an as-built consideration, yes. They're reviewed by engineering.

MR. EBERSOLE: So one looks at these after the field run effect takes place?

MR. SHIPLEY: That is correct.

MR. EBERSOLE: Sees whether or not the field run

engineer has neglected flexibility requirements, is that what you're saying?

MR. SHIPLEY: Yes, sir, that is correct and the placement of supports of course are important to the overall flexibility of the system.

MR. YIN: Well. isn't it true that 34 percent or so, maybe 15,000 feet of pipe has never been evaluated based on the span rule criteria?

MR. SHIPLEY: It has been evaluated based on the span rule criteria. It was not reevaluated during the last --. It was qualified instead by the sample program that demonstrated that the original work that had been done was acceptable.

MR. YIN: My problem was that there wasn't any procedure how to field run those pipes, that means the span rule cannot be uniformly applied in all cases.

MR. EBERSOLE: So you're saying the first check then is the in situ investigation and that will not permit a -- investigation?

MR. YIN: That's right. And that's really the reason that we requested them to go back and check this 5D, 10D and all of a sudden it was excluded. I guess the problem is it is very difficult and time consuming to dig out those records and maybe there's no records at all.

MR. EBERSOLE: So what we're saying is the field

run equipment has not been inspected in a certain percentage case?

(End of tape)

MR. EBERSOLE: There are installations of this pipe that have never been looked at. Is that right? Never been looked at by whom?

MR. SIESS: I don't think anybody has said that. You were just told that all field run pipe has been, the as-builts that were referred back to engineering for verification and calculation.

MR. EBERSOLE: All of it?

MR. SIESS: That's what we were told. Is that correct?

MR. TRESLER: That is true but not all of the piping, small bore piping was reviewed under the Corrective Action Program. But more specific to Isa's point as far as branch connections or really we're talking about seismic and thermal anchor movements, all small bore piping is reviewed for that consideration and all significant Sam 10 movements were considered in all small bore piping analyses.

MR. MICHELSON: Even the cold piping?

MR. TRESLER: Even the cold piping. Yes, sir.

MR. SIESS: Gentlemen -

MR. TRESLER: Excuse me. That includes buildings, equipment and decoupled branch connections.

MR. YIN: And what's the reason you want to exempt the 10D criteria we tried so hard to get and then give up so easily?

MR. TRESLER: We don't think it's a significant concern, Isa. We don't feel that it's worthy of that manpower expenditure.

MR. YIN: What are you talking about, manpower expenditures? It amounts to how many hours?

MR. TRESLER: It's delaying, Isa. We've been working, all our engineers trying to get the work done necessary to get these responses out. We've received a number of requests which have caused us to expand our review and this one we didn't feel was warranted.

MR. SIESS: Gentleman, when we talk about reviews of design and looked at, let's keep in mind that this plant was designed once, it was redesigned once. There was a sampling design verification program done by an independent engineer and the NRC staff to various degrees have sampled those and sampled others.

So when we talk about when somebody looks at it, let's get it in the right time scale. Because they didn't look at it yesterday doesn't mean it wasn't looked at and we can easily get ourselves too oriented to the present and forget that this plant was designed at one time, at least once.

MR. BENDER: Mr. Chairman, I'd like to reiterate a point I made a little while ago because it's relevant to the observation you just made. There've been a number of

people have been out into this plant to look at it. If the problem existed, it should have been observable somewhere. So far I have yet to see the physical example that says the problem exists and if it doesn't exist, why are we worrying about it?

It seems to me that with all of this extensive group of people who have looked at the plant they should have seen one example. I have yet to find one.

MR. YIN: Can I address that?

MR. SIESS: I'd rather not. If you've got a specific instance of something that you think will fail under the earthquake and could give us something that we could look at drawings, I think it will help, but just to talk about it isn't going to enlighten us, I'm afraid.

MR. YIN: My concern is not so much specifics because we spend a relatively short time. I'm pretty sure the HRS also spent a very short time at the site and many of the areas is a radiation area. We wouldn't be able to get in there.

So the accessibility during the walkdown is very limited, firstly. But I think the overwhelming concern on my part is it is not really up to us to prove whether or not you have a safety significance or safety problems. It's up to the licensee's quality assurance, quality control managers that indeed everything that is in the record has been taken

care of and so on.

Further more, we have seen the shimming of the large bore restraints which brought out, you know, so if you want me to identify that I would be more than happy to put it in writing and then submit it to ACRS for their review.

MR. SIESS: You may do that if you wish. It will not help Mr. Bender. Mr. Bender is not interested in quality assurance or quality control. I believe he's interested in the quality of the plant that is built and not how it got there. If you can try to understand that you may be able to supply us with some specifics. Let's go to item 2 on the second page.

MR. YIN: Okay. Thank you. Item 2, the SSER stated is unacceptable. The actual manufacturer's test reports on a large portion were reviewed for the -- snubber. Please explain why snubber displacements under load were not a concern to the PRP in exmaining snubber operations. Do you understand that?

MR. SAFFELL: I don't know. I think I do. I think what we looked at was the manufacturer's data used to qualify, used, test data, used to determine the distance required to lock the snubber up. In some manufacturer's, there's a variability.

MR. SIESS: What's the reason?

MR. SAFFELL: They may be mechanical or hydraulic.

MR. SAFFELL: My understanding of the question is, given that it locks up, what additional displacement may occur as the snubber goes from say 10 to 20 percent rated load up to 80. 90 percent rated load. Is that the kind of thing you're talking about?

MR. YIN: Well, have you participated in any snubber testing of loads in the past?

MR. SIESS: Please explain your question.

MR. YIN: Well, I'm trying to, but it seems to me -

MR. SIESS: Well, explain it to me then and I have not participated in any snubber testing.

MR. YIN: Well, I didn't point to you, sir. I'm pointing to -

MR. SIESS: You pointed to me, sir.

MR. YIN: Well, if I did, I apologize for that.

MR. SIESS: I don't understand the question. Are you talking about the elastic displacement of the snubber after it locks up?

MR. YIN: No, sir. Yes, sir. Let me rephrase this. I feel like I'm being kind of pressured into a situation. Can I maybe take a little time to explain how a snubber works?

MR. SIESS: I know how a snubber works. I think all of us know how a snubber works. We're just trying to understand the question. Snubber displacements under load

were not a concern in determining snubber operability.

MR. YIN: Yes, sir.

MR. SIESS: By snubber displacement under load, do you mean once the load is on it, the load displacement characteristics?

MR. YIN: That's right, sir.

MR. SIESS: And you mean that those displacements should be taken into account in the analysis?

MR. YIN: Yes, sir.

MR. SIESS: Is that normally done?

MR. SAFFELL: No, sir. I have performed -

MR. SIESS: Are they assumed to be rigid?

MR. SAFFELL: I have performed piping analyses and whenever I have performed an analysis I have assumed that if the snubber locked up it behaved as a rigid member.

MR. SIESS: And you think it should be assumed to behave as a non-rigid member?

MR. YIN: Well, wait a minute. I think we have mixed different issues here. We're not talking about it is modeled. I have no problem with your modeling it as rigid because the license condition is such that it has been modeled as rigid in the Diablo Canyon site.

I have no problem with that. My problem is how you assured the snubber was really locked up. It's two differenct, distinct issues. The first one, no problem. The

second one I have a great deal of problems because based on the operation and based on the reevaluation by PEPCO, it does show quite a number of snubbers will not perform their intended function because we are not giving them enough space to move to initiate a lockup and subsequently the lock up does not have enough room to reach the load that it is required to reach.

MR. SIESS: Okay. Now, as I understood, there were snubbers that would not function because they were too close to the rigid support. The piping system was reanalyzed Assuming those snubbers would not function?

MR. YIN: No, assuming the snubber is not there.

MR. SIESS: Assuming it's not there?

MR. YIN: Right.

MR. SAFFELL:Okay. You think that they would have got a different answer if they assumed it was there? They got a different answer but would it have been more or less. Does that put your concern away?

MR. YIN: Can you clairfy your question?

MR. SAFFELL: Well, they said if it's not alone we'll take it out.

MR. YIN: That's right. They can take it out but it's no effect to the stress.

MR. SAFFELL: And the stuff met criteria. Is that the case you're concerned about?

MR. YIN: It met criteria under what criteria? As far as the piping stress criteria, yes. As far as the criteria that the equipment should function, I don't think so.

MR. SIESS : What equipment?

MR. YIN: Well, don't you have a criteria saying that safety related equipment should operate during the event that you -

MR. SIESS : Oh, you mean because the snubber doesn't function it violates the criteria?

MR. YIN: That's correct.

MR. SIESS : Okay. I understand that. Anybody want to pursue that any further?

MR. MICHELSON: Well, if it doesn't make any difference I guess is what you said, then what are we worried about?

MR. YIN: Well, it's after the fact -

MR. SIESS: It doesn't meet the design criteria.

MR. YIN: It's after the fact we evaluated, it happens to be we are still all right. But originally the criterial is saying, assuming everything should work. If that's not the case we would like to know what others will not work.

MR. MICHELSON: What other snubbers will not work?

MR. YIN: What other equipment.

MR. MICHELSON: By equipment, which other snubbers?

I mean this is trying to find out what kind of equipment you're talking about that's dynamic besides the snubber.

MR. YIN: Well, the equipment in general. The snubber is part of it.

MR. MICHELSON: Well, that's a far larger question.

MR. YIN: Okay. Let's restrict ourselves to say what other snubber will not work.

MR. MICHELSON: That I can come to grips with. Now, did you find other snubbers that have the same problem?

MR. YIN: Do I have the means to do that?

MR. MICHELSON: I was really addressing -

MR. SAFFELL: The licensee as part of, in response to this provided a table which identified those snubbers which would function, those snubbers which would not function and were not necessary and those snubbers which would not function under this gross screening, this 16 -- and were required and basically all those were, those remainder were qualified based on the manufacturer's testing.

MR. MICHELSON: As I recall they just reanalyzed without the snubbers that wouldn't work anyhow and it was all right.

MR. SAFFELL: Yes. Other than, there were some where the reanalysis without the snubber indicated that the snubber was required, okay, and for those cases we then had to go to, they then had to go to the manufacturer's data as

a basis for showing that it would function.

MR. MICHELSON: Okay. So they verified it would function even in those cases?

MR. SAFFELL: Yes, sir.

MR. MICHELSON: Thank you.

MR. SIESS: Now, that's what this -- does is those cases where the snubber was needed and you had to look at the manufacturer's test reports on lost motion?

MR. SAFFELL: Yes, sir.

MR. SIESS: And I understood that. But I still don't understand the last question, last part of the question about the snubber displacements on the load.

MR. EBERSOLE: Chet, may I review my structural ignorance here? Are snubbers in any case used to reduce loads on hangers or just to reduce pipe stresses?

MR. YIN: It, it to reduce, well, not reduce. It's really, how are you going to say it. It's the original design saying that portion of the load should be assigned to the snubber and some other portions of the load are assigned to other -

MR. EBERSOLE: The essence of my question is this. If I take the snubbers out, will I have a problem with the hangers?

MR. YIN: You may or may not depending on the frequency change. In many cases, based on my review, the

actual loads and the pipe stress actually decrease because you're shifting the frequency in the range that you have less respondence. So it is very unpredictable. In some other cases you may have maybe 30, 40 percent jump on the stress and loads.

MR. EBERSOLE: The extension of my question was then if they don't lock up I may have overloaded hangers?

MR. YIN: You may or you may not. You may help the situation as a matter of fact. But again, it's a kind of a thing, if you don't do it, you won't know.

MR. SHIPLEY: Mr. Ebersole, if I may comment on that. We looked at those cases where it was determined that teh snubber would not lock. We then looked at the loading distribution on the adjacent hangers and showed that those hangers could be qualified.

MR. EBERSOLE: Thank you.

MR. SIESS: Okay. Let's try the next one.

MR. YIN: Number 3, the SSER stated that -- inspection by NRC staff had opportunity to inspect the affected components on a first hand basis and that -- installed in proximity to equipment nozzle and rigid restraints were viewed by the peer review panel. Please discuss the purpose and scope of the viewing and what hardware attributes have been checked and verified by PRP?

MR. SIESS: Now, this is a question addressed to

the PRP. I think I'll just ask the Committee, would you like to hear their response to it? There are some of these that you might expect them to respond, but you don't want to hear it. Anybody want to explore this? Are you hesitating saying no or hesitating saying yes? First, let's ask if the PRP can respond to it? We don't know what's involved.

MR. SAFFELL: Well, I guess rather than the PRP it was the task group plus some portion of the PRP but it was not the entire PRP. We ah and I'll respond to it because I think I can explain what we viewed it for.

We were interested in one, seeing an example. Two, examining if the as installed snubber was in fact tight for example in and around where the clevis arrangement where the snubbers hooked in, to be frankly be able to try and shake the pipe. We did not ask for specific clearances to be taken.

We did view the clamp arrangement. We did view some of the shimming, examples of the shimming that had taken place with respect to the rigid restraints.

MR. EBERSOEL: Did you find cases where you could have used a struct which was adjustable and then fixed and just leave it on automatic clearance?

MR. SAFFELL: Instead of a snubber for example?

MR. EBERSOLE: Right.

MR. SAFFELL: I think you can't really determine

that from the field. You have to know the design conditions of the pipe and what thermal movements may occur before you canreally make that kind of a decision. In general, I would say yes, there were. But without knowing, you know, without benefit of further information -

MR. EBERSOLE: Without the fine structure.

MR. SAFFELL: So, you know, it was indeed what one would call a general viewing to get a feeling for what was in the field.

MR. YIN: I don't think that Region 3 instruction can get away with that general viewing. You should have a specific problems and scope on what we're doing at the site.

MR. SIESS: Are you speaking to a lack of a quality assurance program in the NRC but I don't think this is the best place to address it. Let's go on to the fourth question which has to do with statistics.

MR. YIN: Number 4. Among the 95 proximity snubbers, please provide the following category information: A, installation of the snubber is justified because of excessive, let's say one sixteenth of an inch or more, thermal movement at the location, how many belong in this category? B, how many snubbers, subsequent to the evaluation were determined to be inoperable in either DE, DDE or hoscree seismic conditions based on the 406 inch deflection criteria?

MR. SAFFELL: I believe that information is

available in the licensee's submittal, but I would have to sit down and get the submittal out and count those up. I don't have those numbers handy.

MR. SIESS: Will you supply that?

MR. SAFFELL: Yes.

MR. SIESS: Okay,on item 3 your first comment was basically the same as the other one, right?

MR. YIN: Right. So we'll skip to the second.

MR. SIESS: Okay.

MR. YIN: The second question or concern I have or comment to be more appropriate, among the 443 rigid restraints, how many required shimming?

MR. SAFFELL: That number has not been provided to us as far as I know because the licensee was not scheduled to complete the shimming program until the thirteenth. That was his schedule date for completion of that. But I will provide it.

MR. BENDER: Could I ask why that's important to know?

MR. YIN: Because as you mentioned it's a change, a hardware change and we want to know how many hardware changes you make.

MR. SIESS: Why?

MR. BENDER: I'd really like to know. Suppose it were 50 percent of them. What judgment could I make? I'm

trying to understand the significance of the information so if it's given to us we'll know what to do with it?

MR. YIN: I get to that in question 3 and 4.

MR. BENDER: All right. Sure, I'll wait.

MR. YIN: In shimming an --, will the condition cause overstress on the support of piping system. Also, if excessive potential for stress condition did exist without the shimming having been performed, would it be a -- report items that have never been reported?

MR. BENDER: Does that address -

MR. SIESS: I think I get the point. It's interesting. How many cases required shimming and if they had not been shimmed, if it had not been discovered and this condition imposed on the license, would the result have been an overstress? Now, the last one has to do with whether it's reportable.

It's none of my business. I guess that's enforcement. But I think it interesting because I've often thought it would be nice to do a PRA on Diablo Canyon before and after all these stritures were made and it was a suggestion here that if shimming was required and it had not been done, the plant would less safe than it is after shimming has been done and if I, you know, understand the requirements, the licensing requirements, I think that is true, but I think if we did a PRA we probably couldn't tell the difference. I'm

not sure anybody knows how to put shimming into a PRA.

MR. EBERSOLE: It's put in at Indian Point.

MR. BENDER: Dr. Siess, you know how much I admire the use of PRA's. I won't comment on that part of it. But the question that has been asked is how many. I would be interested in what effects might result from the shimming -

MR. SIESS: Well, that's the third point.

MR. BENDER: The next question's on overstress. It may be a matter of whether we're putting more limitations of the ability of the pipe to slide that may be in question. Those kinds of things need to be understood. But how many of them I don't think is a question that will answer that.

MR. MYSINGER: You're asking for judgments or opinions. I would like to say that we're talking here of the decision was made to go ahead and shim, but we are finding that during the normal thermal operation and we're overstressing pipe.

The other side of the coin here is one that's been discussed this morning by putting the shims in we have less movement of the piping before it binds up and I think it could be argued that before we made any of these corrections we were probably as safe as we are after we have made them. We know we're going to have the thermal, we're not sure of seismic and we're putting the shims in and getting it more rigid for thermal.

And again, I feel that the materials that we're using in these plants, we can expect them to perform elastically and plastically the 403 sixteenths of an inch that we had there originally without doing any damage. I think I support the position that we go ahead an shim, but I think it was a judgment call as to whether even that was required.

MR. SIESS: I might note that within the ACRS letter of April 9 this year with regard to hot shimming for close displacement strengths, the Committee said we believe that this requirement deserves further technical review and discussion between the staff and the licensee. Was there such technical discussion considering something besides earthquakes?

MR. KNIGHT: I think it's fair to say that there was discussion. I guess it's also fair to say, I know it's also fair to say that absent some, one might characterize as almost brutal effort and analysis in looking at inelastic actions and everything else, the only way that we could come toa quick meeting of minds as to what acceptable procedure the staff would accept was to go ahead with the shimming.

There was not and I really I think I get the essence of your question, there was not a detailed, lengthy period of discussion on what alternatives might there be and how might we approach these uncertainties in part because

we've had that experience in the past and know that we could spend an awful lot of time in arguing and going into great detail and analyses and burn up a lot of resources without reaching any decision so we took a pragmatic approach.

MR. SEISS: The sixteenth of an inch I gather is a traditional value. I think I saw it referred somewhere as an industry standard which means we've been doing it that way for a long time and haven't had any problems. Is that a reasonable characterization of the sixteenth of an inch as far as thermal movement is concerned? The industry obviously doesn't have a standard on seismic movements.

MR. SHIPLEY: It's a construction fact to construct the supports with a sixteenth of an inch on each side of the rigid --.

MR. YIN: It's three sixteenths of an inch maximum.

MR. SHIPLEY: I might add it's a sixteenth of an inch on each side of the pipe plus a sixteenth total diametral plus or minus, so if the piping were touching one side of the support the maximum you could have on the other side is three sixteenths.

MR. SIESS: Well, that's beside the point. I'm not interested inthat right now. But this is something that I assume has been done for years in power plants. Is that right?

MR. SHIPLEY: Yes, sir. In my experience with Battelle that was always used.

MR. SIESS: And it's based at least in one direction on construction tolerances?

MR. SHIPLEY: Yes, sir.

MR. SIESS: Now, I would assume that experience has shown that that's enough that you don't get into trouble with interferences and thermal movements?

MR. SHIPLEY: That is correct. I think you've just said a key phrase, the thermal movements. The reasons forthe sixteenth of an inch is to provide some capability to insure thermal expansion will be allowed axially through the support and that's the reason for the sixteenth, trying to shim any closer than that has an adverse effect on construction and the ability of the supports to do that.

MR. SIESS: And this is a criterion that was developed on other than seismic design products?

MR. SHIPLEY: Yes, sir, that's correct.

MR. EBERSOLE: Let me ask, you're talking about supports now which become functional in the presense of an earthquake. To support the -- and other aspects you use deadweight hangers and string hangers, right?

MR. SHIPLEY: That's essentially correct. Sometimes the supports are built -

MR. EBERSOLE: I've always been interested and

as you'll find out now, how do you coordinate the function of deadweight hangers and snubbers in a seismic event considering the throw of the counterweights?

MR. SIESS: You analyze them.

MR. EBERSOLE: Is that done weight by weight?

MR. SHIPLEY: I think counterweights perhaps is a misnomer. What we typically use are spring type supports.

MR. EBERSOLE: You only use deadweight hangers at Diablo?

MR. SHIPLEY: Well, springs and ridges.

MR. EBERSOLE: Well, you do or you don't use deadweight hangers?

MR. SHIPLEY: I think the term is the problem.

MR. EBERSOLE: Well, the kind I'm talking about is of course is the kind that has a arm and a fulcrum and a heavy weight.

MR. SHIPLEY: No, sir. We do not use those. You don't use those.

MR. EBERSOLE: You use strings then?

MR. SHIPLEY: Yes, sir.

MR. SIESS: Any other questions? Okay. You want to go to lunch early, gentlemen? Everyone who wants to go to lunch stand up and we'll reconvene at five minutes after one.

(Whereupon, the meeting recessed at 12:05 p. m. to reconvene at 1:05 p.m.)

DR. SIESS: The meeting will reconvene. We'll proceed with the presentation of staff. The next item is number four.

Items number four and five will be presented by Ted Sullivan.

MR. SULLIVAN: License position, item 4, sometimes called thermal gaps requires that PG&E identify places where thermal gaps have been specifically included in the piping thermal analyses. It then went on to require that for these cases the licensee develop a program to periodically inspect these gaps to insure that they are maintained throughout the plant life. PG&E identified that there were 37 gaps. That's a current figure. This number has been changing a little bit, but currently 37 gaps modeled in thermal analyses and these gaps are modeled in specifically account for normal to construction of tolerance gaps and they're modeled in to reduce the pipe stresses and the support loads.

MR. KNIGHT: If I might, I think just a little bit further explanation of what a thermal gap is and what it means might --

MR. SULLIVAN: Ok.

MR. KNIGHT: Give some assistance.

MR. SULLIVAN: Ok, in the cases we're talking about rigid restraints where you might have this maximum 3/16" gap that we were talking about this morning, in the analysis what

you do is, you provide for the clearance that's actually in the as-built support, so that as the pipe grows it either does one of two things in the analysis which is intended to represent what would happen in the field. And one case would be that the gap would never close because the pipe thermal growth is not very much or the gap would close at some time during the heat up, before the pipe reaches the normal operating temperature. So those are the two cases.

Also, of the 37 gaps, we're only talking about small bore piping. PG&E in --

MR. BENDER: Excuse me, in this case small bore really means less than 2"? 2" or less?

MR. SULLIVAN: In this case I mean 2" or less. I think that's the current -- definition of small boring. In a submittal that we received in April, PG&E proposed to monitor the gaps in their cold condition at refueling outages. And after reviewing this and discussing it among the task group, the four of us that were responsible for this particular item, we weren't completely satisfied with this proposal. We had further discussions with PG&E along the lines that we would be interested in having them do some monitoring, at least once, of the gaps in the hot condition. And, PG&E declined to do that. I think for a couple of reasons. One of them was LARA considerations. They came back with a subsequent proposal and that proposal was essentially,

to eliminate this kind of condition from the plant. They are planning now to reanalyze the piping without the gaps, which is the way they would have been analyzed -- No, let me put it another way, which is the way all the rest of the supports that are of the rigid type are analyzed and then, as support loads change, if necessary, they will requalify piping, supports and nozzles for --, as the case may be.

And the proposal is to complete the program by the end of the first refueling outage which we have found acceptable for a few reasons. One of them we mentioned is that these pipes have already been through some sort of hot functional testing and no adverse situation has come up and, furthermore, they are analyzed so they do meet licensee's criteria. I would characterize them as the principal reasons why we find this acceptable to go through one more refueling outage before all of these conditions have --. That really completes what I wanted to say about License Commission Item 4 on Thermal Gaps.

MR. BENDER: Could I ask a couple of questions. Thank you, Mr. Chairman. Is there any of the piping you can't see after the initial cycle, that's not exposed for inspection purposes, that's involved in this issue?

MR. SULLIVAN: That you can't see for what reason?

MR. BENDER: Because of the radiation level or because it's thermally too warm or it's covered up in such a

way that the insulation prevents you from seeing how it's behaving?

MR. SULLIVAN: Ok, from the point of view of the insulation, the insulation, from my experience, -- down the flight, does not cover the supports up. It doesn't cover the pipe runs. You can still - you can clearly see the supports, right. From the point of view of ALARA, I think I would have to defer to PG&E, although I do have a list of what systems they're from, with me over at my place there.

MR. BENDER: Is the answer some, none or a lot?

MR. SULLIVAN: I see shaking heads over there. I'm inferring that means that they don't anticipate that if they didn't get to this by the end of the first refueling outage they still wouldn't have problems. I might make one more point though. I don't think they're anticipating too many structural modifications from this.

MR. BENDER: I'm not expecting any. I just want to know whether they can see it after they've run through the operation one time and that's why I'm asking the question.

MR. TRESLER: This is Mike Tresler. I'm certain that we would be able to gain access to perform the inspections. There is a potential that some of these may be located inside containment, but I don't believe that there are any areas where the exposure would be so high as to preclude inspection.

MR. BENDER: Thank you.

MR. EBERSOLE: Why is the topic of thermal gaps reduced to just 2" or smaller?

MR. SULLIVAN: Well, when we first got involved in this license condition and I think it was in our April submittal, the only other piping that was larger than 2" that involved this kind of condition had, I think, consisted of 4 gaps total on 2 different lines and they had already been analyzed and shown to be acceptable, without the gaps.

Now, I don't know exactly why it turned out that this particular technique was used in small bore almost exclusively and not large bore. We didn't ask that question.

DR. SIESS: Another question? I don't think Mr. Yin had any problems on this side -- on item 5.

MR. SULLIVAN: Item 5 deals with piping system walkdowns and what the License condition provided was for an NRC participation in some hot walkdowns of main steam piping. And, as you can see from glancing down the slide, it turned out that we also added one more system which was an RHR walkdown. Certain portions of RHR.

The way we went about this was to review the procedures that PG&E has used for the hot functional walkdowns and to also review the procedures that they will be using for the power ascension walkdowns. And the team had a few questions about the procedures and approaches in general. We spent some time at a meeting in May and also during our site visit

5.

exploring the answers to those questions. We later went out then when the timing was feasible to do these walkdowns in late May. We reviewed results of previous walkdowns of these two systems as well as other systems. In the actual walkdowns we perfomed those walkdowns in - on four different days that we were out there.

We started out doing an RHR walkdown in a cold condition because the plant was under some level of low power. RHR was not high. We followed that by doing walkdown of main steam hot, then the following day we did RHR hot and then later when the main steam piping was cold, we did main steam cold. We approached these walkdowns from a couple of points of view. One was that we wanted to take measurements at discreet locations, as these locations were designed in the walkdown by PG&E. We did some measurement taking as well as watching the way the PG&E engineers did the measurements.

We also, I would say, spent most of our time walking down that piping to look for actual potential interferences and on the next slide I've summarized what the results of those walkdowns were.

And I'll talk about how we resolved those different items that came up. On the main steam line there are four legs. We walked down all four legs. We took measurements of two of the four. It turns out the way the piping is configured that lines 1 and 2 run a fairly similar pattern to

each other, so we took measurements on line 1. 3 and 4 are similar to each other. We took measurements on 3.

We observed all 4 of them. Of the two that we took measurements on, on each line there was one point that was outside some criteria that PG&E has for maximum deviation from calculated thermal displacement. The way those problems were disposed of was the following: a fair amount of time trying to physically figure out why the piping was outside the criteria. When PG&E determined that there was no significant finding anywhere, no single point reason for the discrepancy, that could be resolved they resorted to analysis where they used the measurements that were taken as new boundary conditions and reanlyzed the piping, reanalyzed any support loads that increased, -- head loads that increased and so forth.

But they were all determined to be within code. There was one unintended restraint on the main steam line and that turned out to be a case where there was a so-called abandoned stanchon that on full heat-up was butting up against a very large structural column. That was also analyzed and determined not be a problem, but PG&E has decided to cut that stanchon off and observe it during the - observe the way the pipe moves in that area as well as the rest of the piping during the power ascension tests. And there were several cases where the construction people had erected scaffolding

for our purposes, not being fully aware of how much the pipe was going to grow and since the maximum displacements on these lines are on the order of about 7", there were some places where the insulation was pushing up against the scaffolding.

The -- chart system turned out to be much cleaner. All of the measured displacements were within criteria. In fact, they almost turned out to be close enough to be an ideal engineering laboratory experiment. And there weren't any unattended restraints. So that's basically what we did on that walkdown.

DR. SIESS: That concludes your comments?

MR. SULLIVAN: Yes, it does. Mr. Yin, do you want to --

MR. YIN: Yes, sir. Thank you, Mr. Chairman. The questions I have - comments, rather, number one, the objective of this particular follow-up appears to be - fail to describe inspection of spacing -- for piping component sizing. That is, design based earthquake, double design earthquake and auswic movements that operate in procedures. The program did not provide measures to inspect, for one, piping components that may damage potentially -- such as electrical -- and cable choice; two, components that may be damaged by -- spaced structures and, three, interference that could change the piping natural frequencies thus cause the redistribution

of support loads or shifting of higher loads to the more critical equipment nozzle connections.

DR. SIESS: Would you like to address that?

MR. SULLIVAN: Yeah, I have some remarks on that. First of all, our - as I was talking before, our main objective was to review these systems from the point of view of thermal expansion-mechanical behavior. That's what we had in mind for this license condition, so-called hot walkdowns. The procedures that are used by the utility for these walkdowns did not specifically address Isa's first comment. And the procedures that do address it I believe are titled "Stress Walkdowns" and they were done separately by the company. However, we did, as I noted, spend quite a bit of time - I would say the majority of our time - at some personal risk in climbing heights that I'm not particularly used to, looking on all sides of these pipes, along their entire lengths and we did not observe for these systems any cases where we found electrical panels or cable -- up at these elevations anywhere nearby and did not observe cases where piping was running so close to the piping we were looking at that there would be potential for impact.

I guess I might also add through that if there were cases where the piping was impacting some nearby vacant structure, I don't see how that would cause a problem. In the piping you intentionally put restraints all along the

length and I think if there are a couple more, although I don't expect them, but if there were a couple more I think that it would tend to help damp out the motion rather than cause any load increases that would be a problem.

MR. YIN: Are you saying that more interference is better?

DR. SIESS: No, I hope not. Those first two items really relate to things that might be damaged by pipe movements, I assume, in the case of earthquakes. Is that right?

MR. SULLIVAN: That's correct. Yes, sir.

DR. SIESS: The licensee has done a seismic interaction study and I wonder if he can tell me whether those two things were looked at as a part of the seismic interaction - things that might be damaged by a pipe undergoing the kind of movements it would be expected to undergo during an earthquake?

MR. TRESLER: Mike Tresler, PG&E, I believe you're speaking to the seismic interaction program which was addressing primarily Class II or non-safety related installations.

DR. SIESS: I remember it having a narrow scope.

MR. TRESLER: Interacting with Class I installations and, yes, that's been done and has been completed. To be more specific to Mr. Yin's concern, is the stress walkdowns that were performed prior to heat-up of the plant and we did this program with the stress engineers under a great risk

procedure where they went out and walked down the piping with the movements, both seismic and thermal, from the analysis and the purpose of that walkdown was twofold. Number one, to identify that the piping and supports, indeed, were constructed as designed and, secondly, to identify any potential interferences to perform analyses or modifications to eliminate those potential interferences.

And that was done prior to heat-up.

DR. SIESS: --, I've often wondered what kind of movements would you expect to see, let's say, for a designer -- what kind of calculated type movements do you get?

MR. TRESLER: Well, let's --

DR. SIESS: At the upper end of the scale.

MR. TRESLER: I think I prefer Mr. Shipley to address that.

MR. SHIPLEY: The - in one particular case, in fact, the one that the NRC accompanied us in the walkdown, the RHR system, the average movements are in the 1/16 of an inch range, with the maximum at about 3/4". Now, some systems that are less restrained than that are somewhat greater, but I think that's a pretty good representation.

DR. SIESS: I mean, can you get 6" anywhere?

MR. SHIPLEY: It's very unlikely.

DR. SIESS: 3"?

MR. SHIPLEY: I think 3" is possible.

DR. SIESS: What about if you make a distinction it was large bore, small bore?

MR. SHIPLEY: Large bore.

DR. SIESS: What kind of thermal movements do you get in large bore pipe?

MR. SHIPLEY: Oh, you can have up to 6", 7".

DR. SIESS: Yeah, I guess so, and in the same direction.

MR. MOCH: Excuse me, John Moch. Let me amplify something as far as seismic interaction and clarify it a little bit. The particular issue that Mike talked about, while that wasn't a specific criteria for seismic interaction program, if the program Mike was talking about had not been carried out, the seismic system interaction program would have had to consider that very thing. As a matter of fact, it did in other areas. Let me just give you an example. One of the areas that was identified as a potential problem was looking at the top of the steam generator, there was some instrument tubing coming off the steam generator which clearances have been figured out between the tubing and the grading for seismic movement and for thermal movement, but not for the combination of the two things. And that was something that was identified out of the program.

DR. SIESS: In the stress program or --

MR. MOCH: No, that was just interaction program.

DR. SIESS: In the interaction program?

MR. MOCH: Yes. Another example just amplified something Larry said is, in a lot of cases or in a number of cases, non Class I piping, and I think I've pointed out perhaps in the plant to several of you, non Class I piping was found as part of the system interaction program to not have a lateral restraint. And, in the case of seismic movements of that piping, it was possible the piping strain lines, for instance, could swing significantly. And those kind of movements could be, you know, many inches. And so that's the kind of thing the program did is to provide some lateral strain.

DR. SIESS: Nobody addressed the third item, interferences that could change the natural frequencies.

MR. YIN: Could I comment on that personal before we --

DR. SIESS: Ok.

MR. YIN: The reason for the license condition item 5 is the fact I don't believe the stress walkdown that they have was adequate. There's two problems. First of all, the stress walkdown procedure requires the personnel to look based on the stress calculation. Yet the stress calculation shows the pipe moved in each direction 2" and then possibly the 1" seismic movement. The personnel would look at just that. Now, this is on the basis assumption the pipe will

move exactly to that location. There is no intention to include whether or not - or question whether or not the pipe will move sideways or in different directions. If that's the case, how are we going to deal with the seismic movements? That's the program merit procedure problem I have.

The second problem is the procedure implementation problem. I have also walked down a large number of piping systems. By the way, we were trying to show the SRAS, the ACRS members those locations where there are large interference. But due to the radiation problem, there was nothing able to guide the members - some of the members to those locations. They are touching the wall. They are touching the floor. So long as interference could have - should have been identified and not been identified by the personnel who is supposed to carry on the program.

So, basically, the program itself is not adequate. Secondly, the implementation of the program is not considered satisfactory.

DR. SIESS: Let's see. The second item you said, you have walked down some of that. You've found things that the peer review group did not find?

MR. YIN: Yeah, it's all documented in my draft report. You people should have a copy.

DR. SIESS: This is your report. I'm not sure --

MR. YIN: The draft report. The draft revision.

DR. SIESS: What's the date of it?

MR. YIN: I don't have it with me.

DR. SIESS: I mean, was this recently or is this --

MR. YIN: No, it was submitted during the first ACRS meeting. I mean involving this issue.

MR. MICHELSON: Was that Revision Three we got at that time?

MR. YIN: That's correct.

MR. MICHELSON: Ok, thank you.

MR. SHIPLEY: Dr. Siess, could I --

DR. SIESS: Yes, please.

MR. SHIPLEY: During the ACRS walkdown at the site it's true that there were some areas that we could not get into. However, there were also some areas where - that we reviewed that were cases where Mr. Yin has identified interferences, in those cases we explained one by one as to exactly why, in the stress walkdown, it was considered an interference. And an example might be - this is an example, the - in a particular case the thermal movement was clearly away from the interference and there was no way that that - that the thermal movement of the pipe could take place in any other direction than the one in which it was predicted. And, from that point of view, it was not noted as interference because the analyst realized that was the case.

MR. YIN: But when you mention the pipe is moving

away from the interference. This is based on design, you know, it is based on observation. The pipe indeed moves away from the pipe. This was in the reverse category of my statement is the fact everything you do, everything you inspect is based on design. It is not based on observation. And normally you would allow 5" or 6" or 3" of clearance all around. So you won't get involved into that kind of situation. But that was not done in this site.

MR. SHIPLEY: We had cases that were specific ones that we looked at where there was an anchor in the piping system that pulled the three directional fixative of the piping system whereupon the pipe grew axially from that anchor and thereby moved the piping away from the interference. There was no question that that was the direction that the pipe had to move.

MR. YIN: We're not talking about in general. We're talking about - we're talking all cases what you have designed is what you're going to get in reality. I doubt very much - I can show you tons of evidence that's indeed not the case.

MR. SHIPLEY: That's the specific reason for why we have the hot walkdowns is to be sure that the piping is moving -- or that we have reason to believe that it's acceptable as it is moving.

MR. YIN: Right, and your hot walkdown does not tie back to the stress walkdown, that's my big problem there.

There's no connection between the stress walkdown and the hot walkdown. So you identify that the pipe is not moving in the direction you designed, you have not provided additional effort to check back to the stress walkdown to insure that particular location will not cause kind of an interference, seismic.

DR. SIESS: I guess I don't understand now because I saw table after table comparing completed and measured movements. Now, what's the difference between that and what you're talking about?

MR. YIN: Well, two things. First of all, you perform the stress walkdown and you make sure, based on the - you carry out the stress diagrams, you carry out the stress results and, based on that, you predict, say this pipe and this particular movement - location, it's got to move towards the wall. But the wall is sufficient distance away from the pipe that the predicted location, that you say, this is pass, no problem. Now, you come on to the second program, it's called the hot walkdown. And hot walkdown finds out that the pipe is not moving towards that wall. It is moving outward, where outwards is not the wall, it's going to the ceiling. For instance, --

DR. SIESS: But isn't that what they did? They did a hot walkdown.

MR. YIN: Yes, but the hot walkdown measurements does

not correspond to the seismic movements. That is - what I'm saying is, in reality, when the pipe moves to that particular location, there was no program to make sure the seismic movement would not damage other equipment or be damaged by some structure.

DR. SIESS: Let me see if I could put it a different way. You're saying that the hot walkdown did not determine whether the thermal movements had reduced the margin available for seismic movements?

MR. YIN: Yes. The hot movement is - if the hot movements corresponding exactly to the design, I have no problem with that. I think the program is adequate.

DR. SIESS: They have actual measured movements from the hot walkdown that I saw.

MR. YIN: That's correct.

DR. SIESS: And your question is that those movements could have -- the amount of space that they assumed was available for seismic movement?

MR. YIN: That's correct. If you expect to find movement towards the wall, say 2", now you measure 3", so the amount of space left for the seismic movement may be reduced by 1". Would that cause a problem? That is the issue here.

DR. SIESS: And how would you go about doing that?

MR. YIN: Well, normally, in the industry they will estimate the total amount of movements and then they go out

when they have the construction going on to insure that sufficient clearance, say 5", 6", the maximum that you can possibly predict in all directions, make sure that all around you don't have that interference.

DR. SIESS: Is that the only way to do it?

MR. YIN: Another way to do it is like, for instance, like Diablo Canyon. They should use the hot walkdown data, combined with the seismic movement to check whether or not you have interference problems.

DR. SIESS: Myer?

MR. BENDER: I'm -- too. I'm trying to understand what's been said. One approach to doing this is to not assign a side to the movement in which case you would add all the thermal movement and all the seismic movement in the same direction. Is that what you're suggesting they do?

MR. YIN: Can I draw on the board? Maybe --

DR. SIESS: Sure. As I understand it, let me ask you one - suppose I do a hot walkdown and I find that all of my movements are within a fraction of an inch of my predicted movements.

MR. YIN: It's all depending on the original walk-down. The original --

DR. SIESS: Let's say, suppose I find they're all exactly the same as my predicted movements.

MR. YIN: I can answer that better on a drawing, if

I could.

DR. SIESS: Ok, try it.

MR. YIN: By analysis --

DR. SIESS: You'd better stick to white, that other color is not showing, unless there is a yellow there.

MR. YIN: Alright now, by design we have a pipe moving towards the wall. This is a vertical wall. This is a section of a room. This is a hard condition. This is a cold procedure. And this is a hot procedure. And seismically, it's got a wide range this way on the sideways. And you will not touch the wall, based on design, ok?

Now, if the pipe is not moving exactly to this particular location, instead it's going to move to here. Then you are really, if the seismic condition exists, this pipe will bounce against the wall repeatedly. There is not way to know it. This is condition one. There is also a possibility that the pipe is going to move to here and you also have a vertical seismic condition. You don't have to worry about a vertical condition -- I'm pointing out the program --

DR. SIESS: And your point is that they ignored that?

MR. YIN: Yes.

DR. SIESS: It's a little hard to believe, but --

MR. SHIPLEY: Well, we ought to be able to find out whether they did or didn't. If I could add a couple things that were done during the stress walkdown. The - we looked

at interferences in both the small and the attached - I'm sorry, in the larger of the attached small bore piping. We looked for interferences and where it looked very close and where we could not accurately determine that - which direction the thermal movement was going to be in, it was noted and those conditions were resolved. We were not playing with 1/16ths of inches, which is approximately the movement of most of the pipe in the plant. We're not dealing with piping systems, entire systems, that are moving inches.

DR. SIESS: You're saying then that you did not ignore the combination of seismic and thermal movements.

MR. SHIPLEY: I'm saying that the program inherently considered that because we were not measuring things down in the 1/16 of an inch range.

DR. SIESS: Now, has the peer review group looked at this aspect of it at all?

MR. SULLIVAN: Well, we looked at it from the point of view that when we did these two systems we went through similar steps of looking at the kinds of clearances that existed in cold and hot conditions and we could verify that the types of clearances that we saw were large compared to the motions, seismic plus thermal, that are predicted for these pipes in any direction.

DR. SIESS: 5 or 6" that Mr. Yin referred to or --

MR. SULLIVAN: For the main steam, yes. We did not

see locations in the main steam piping where there were only very small, and I would say on the order of an inch, left or much larger clearances than that.

MR. YIN: Well, how much - what is the largest seismic movement on the main steam line? Have you kept the maximum displacement on the main steam line?

MR. SULLIVAN: I imagine the main steam line seismic motions are on the order of about 2 to 3", but I think we certainly mignt be able to confirm that.

MR. SHIPLEY: I'm sorry, I don't have that information right now. I can have it in a few minutes.

MR. YIN: The 2 or 3", are you guessing or you can really check it?

MR. SULLIVAN: That was not a check, that's an estimate.

MR. YIN: So, indeed, we have not seen actually how much the pipe will move under seismic conditions and --

MR. SULLIVAN: The numbers I was quoting was the RHR system which was another system that the peer group walked down. -- numbers from the RHR system.

MR. MICHELSON: That was 1/16 of an inch did you say?

MR. SHIPLEY: It was, at the worst case, it was slightly over 3/4 of an inch, in the worst location. The - by far and away the average movement in the system was 1/16 of an inch.

MR. MICHELSON: Thank you.

MR. BENDER: Since May, if we're going to talk about the summing movements, they're going to have to be - it doesn't make sense to look at the worst one. I think you have to look at the movement at some place where the two conditions are being combined. I don't have any reason to believe that, you know, the maximum seismic movement won't be at the places where the restrictions are the greatest, but it's a valid point. I think we just have to know --

MR. YIN: Not only that, you also have to look in the modes of operation and different modes of combination. It all varies. What we're talking about is -- there are other conditions and for the construction inspection purpose it would be just the one separate number to use, all of them to consider individual cases.

MR. BENDER: The nominal value that all pipes should conform to, isn't that what you're suggesting?

MR. YIN: Well, today's construction mythology that's true, but --

MR. BENDER: It makes sense to have some nominal value.

MR. YIN: Right, but we recognize we don't have this program and that's why we, at least I personally, believe they should combine the hot walkdown and the stress walkdown as one program and do not separate them because once you

separate them, you could not get the perspective of the need to insure the interference.

DR. SIESS: I don't understand how you'd combine them. You can't shake the plant at the same time you heat it up.

MR. BENDER: You can look at the allowances though, Chet. I think that's what's being said.

DR. BENDER: That's what they said we did.

MR. YIN: No, sir. What the stress work done is a cold condition. Unless it's verified during the hot situation, the design in the cold condition, from cold to hot movement is verified and the previous stress work done is, in a way, invalid as far as --

DR. SIESS: You hot walkdown doesn't show deviations from the calculated values more than the tolerance you've built into the plant, I don't see where the problem comes.

MR. YIN: No, that's no problem. You are correct, sir.

DR. SIESS: The largest deviation they handled was about an inch. Is that correct?

MR. SHIPLEY: I don't understand.

DR. SIESS: The deviation from calculated on the hot walkdown.

MR. TRESLER: I don't think we know what the maximum deviation was.

DR. SIESS: I just read your report and I think it was 1.1 inch dump instead of point something down, so that means it's an inch.

MR. RODABAUGH: Mr. Chairman, I can - since I have the specs here, the largest deviation is plus or minus 1 inch.

DR. SIESS: That is observed.

MR. RODABAUGH: That's a specification --

DR. SIESS: No, I'm not talking about that. I'm not talking about the specification. I'm talking about what was actually observed in the hot walkdown.

MR. RODABAUGH: That's the criteria that Ted is talking about and everything is within that criteria. That means that the deviations are not greater than plus or minus an inch from the calculated.

MR. YIN: Well, is plus or minus one inch to the expected direction or all directions because that's important too?

MR. SHIPLEY: To the expected direction.

MR. YIN: So there could be a situation in moving upwards which is no measurement at all?

MR. SHIPLEY: That would not be true, you see, because in the case you've drawn, the anticipated motion is only horizontal. Therefore, there would be a zero tolerance on movement upward.

MR. YIN: Is that true? I'm not too sure. Based on my experience it would also measure vertical too.

MR. SHIPLEY: What I'm saying is, it would need to be specifically considered.

DR. SIESS: If you compute zero, he says, you'd expect to get zero and if it's not zero it's a deviation.

MR. YIN: Yeah, but that's true too, but you don't really know as far as an interference is concerned whether or not the vertical movement, which you have not measured, you didn't look at it, will not cause any problems because unless you show a set line on the pipe and draw a radius you have no way to tell where it moves to and you do have a concern. Plus or minus --

DR. SIESS: Sorry, you've lost me again. You said the vertical is not measured and not looked at, why?

MR. YIN: Well, for this example, I'm referring to the example that I gave.

MR. TRESLER: Excuse me, that's not true. We've got to remember the purpose of the hot walkdown. The purpose of the hot walkdown was primarily to take the number of measurements necessary in all those directions, the three ways, to assure that that piping was responding as predicted by the analysis and there was a tolerance set on these movements. We just discussed that and any conditions found to be outside that tolerance were further evaluated for impact

on the plant and its safety. So we did measure vertical, horizontal, axial --

MR. YIN: At every location?

MR. TRESLER: Not at every location, no. We took the number of movements necessary to assure that the piping was responding as predicted.

MR. YIN: Then that is really still the issue here because you take any point, but if you don't look where it is close to the structure and whether or not there is a maximum movement at that location, how can you determine - you don't have any interference column?

MR. TRESLER: I'm sorry, we've got to go back again to the fact that we performed a stress walkdown. Granted, that walkdown was performed with both the theoretical and seismic movements coupled together, to determine whether or not there was a potential for an interference. And if we found the potential - I'm not talking about interference, I'm talking about potential interferences - in another installation within such close proximity that we had to look at it to determine whether or not there was a problem. We looked at those cases too. We're not talking, as Larry said, about 1/16 of an inch. Then we came back with a hot walkdown to verify that the piping, indeed, was responding as predicted thermally, alright? And since we got, generally, a good match on that we have confidence that the results

obtained from our stress walkdowns are still valid.

MR. YIN: Well, there is no 1/16 you're talking about. I know you have a different more space to consider. You have 3/16 inch. If you have a 3/16 inch clearance and you consider is enough gap in here, is that correct?

MR. TRESLER: I don't follow what you're saying.

MR. YIN: For instance, you are moving --

DR. SIESS: Excuse me, -- we were told it was a plus or minus one inch in all those -- thermal. And I would assume that was included when you looked at the stress walkdown. If you don't think you can compute it within an inch, you certainly should allow for that inch when you're doing the check.

MR. SHIPLEY: The stress walkdown - let me go back to the one inch and something I said earlier which was slightly incorrect. If we go - the one inch is a maximum tolerance on the movement in the hot - from cold to hot. That is for the larger anticipated movements. For the smaller anticipated movements such as zero, there is a very small allowance in there. What I said was, if it's a zero movement vertical in that case, there would be a zero tolerance. There is a small tolerance allowed vertically. Ok, so with that clarified, the stress walkdown was done first and should not be combined with the thermal expansion walkdown or test for a very simple reason. And that is that we want to catch interferences

before they occur. We do not want to have piping systems overstressed, supports overloaded. When we heat-up we want to be sure that we get those interferences remedied, out of the way, before we start to heat up. Then we go in and make sure that the piping is, indeed, free to expand thermally.

DR. SIESS: That's not the question. Let me try to be specific to understand this. You're doing your stress walkdown and you're looking at a pipe that has a potential for hitting something if it vibrates in an earthquake. And you've estimated the earthquake's movement at the design earthquake level as plus or minus 3" in small - wiggle back and forth. And you've also calculated one inch of thermal movement in that direction. Now, you measure your clearance and it's 4". Is that good enough?

Do you compare that 4 with your 3" seismic movement? Do you compare it with the 4" thermal movement total or do you put that plus or minus one inch on the thermal and compare it to the 5 inches?

MR. SHIPLEY: I think cases where that would occur would be very small. The number of times that would occur would be very small. I think that it would be up to the analyst that was walking down the piping system. You see, the variation is a thermal issue, ok? The variation occurs because of thermal - the case we're discussing right now - and if a person is very sure, such as the first straight run

run away from an anchor. If he's very sure he knows where that piping is going to move and it can only go in that direction and it can only move that amount, then, yes, sir, that would be acceptable.

If, on the other hand, he's out in the middle of the system somewhere where it's very flexible, there's different supporting arrangements such that the piping system might not move exactly as predicted, the tolerance he would use on acceptance of a potential interference would be larger. We would expect the walkdown person who is familiar with the stress analysis of that system to be able to make those value judgments.

DR. SIESS: I guess you don't put any uncertainty on the seismic movements, do you?

MR. SHIPLEY: Yes, sir, I do. That's why I prefaced by saying the discussion we're having, but I think it's also - it may be instructive to point out that in general the thermal movements are less than predicted, not greater.

DR. SIESS: When you start doing that PRA on the seismic, what are you going to do - will it actually look at things like how much greater those seismic movements would be for greater than design earthquakes? What they will be when an earthquake is large enough to make the pipe go inelastic? Do PRA's get that specific or that good?

MR. SHIPLEY: I'm going to have to ask one of my

colleagues about that.

DR. SIESS: That was a rhetorical question you can file away for the future. I'd like to get to Mr. Yin's third question on interferences that could change pipe natural frequencies. Is this something that is considered or are you just satisfied that there are not going to be any interferences now? Or have you ever looked at what changing the frequency can do?

MR. SHIPLEY: I think from an intuitive point of view, we have. In fact, we discussed this during the IDBP with Cloudin Associates and we believe that as you come into these interferences, number one, the insulation on the piping system which is primarily of a calcium silicate nature. There are some rigid type insulations, but mostly calcium silicate, is going to act as a cushioning device. It's questionable as to whether that is going to increase local damping in the system, perhaps it will. It certainly is not going to decrease it. Any amplification that has occurred that caused this movement to take place such that it interfered with an adjacent structural member will be dampened and de-coupled from the response of the rest of the system and amplification would have to build up again for that to occur.

As far as the load transfer goes, as far as load transfer goes to other supports and equipment and so forth,

we would - we see it as interference as being as a transient nature rather than the calculations that we make that predict the system is in full residence. We this doing the opposite.

We see it de-coupling from the full residence condition and, therefore. potentially, at least, helping the situation, not hurting it. We don't want interferences. We try not to have them, but we don't necessarily believe they're bad, from a seismic point of view. From a thermal point of view, there is a totally different story.

DR. SIESS: Let's go on to the next question, Mr. Yin.

MR. YIN: Ok. Number two, question of sliding type support was observed by the licensee to be a problem in meeting the code and it was replaced by this waste drum. It can reasonably be assumed that certain types of sliding support installed at the -- could cause excessive frictional forces. The PRB inquiry into the licensee measure to review the issue on a generic basis --

MR. SULLIVAN: I believe what Mr. Yin is referring to in his comment is something that is written up in the draft SSER and in that section of the SSER what we were discussing were the 8, total of 8, cases in the entire pot functional testing where the pipe measured motion was outside of criterions. In one of these cases, the engineers -

and I don't remember whether it involved Westinghouse or not - the engineers decided, after studying the system and the way it was behaving, that the problem was a particular support that was hanging up, excessive friction and the decision was made that that support should be modified to be a slight strut.

In another case, in that same SSER, we discussed another example where the - it was decided that friction was the reason why a data point was outside of criterion. And the way they handled it was to do a boundary condition analysis for the measured displacements and came to the conclusion that --

(End of tape)

MR. SULLIVAN: Came to the conclusion that all the code allowables were met. (Inaudible) I think in the approach and our review of this was such that we felt that a very systematic across-the-board approach was being used in that the, the hot walkdowns identified piping motion that was not as predicted.

From those motions, studies were made to determine what the causes were and if, if they felt that the piping was being overstressed, the support was modified. If they analyzed that the piping was not being overstressed and within criteria, they did not modify.

MR. SEISS: If, are frictional supports designed in such a way that their friction coefficient will remain constant during the life of the plant?

MR. SULLIVAN: I'm not sure.

MR. SEISS: In other words, what's the probability that a frictional support that lets things slide now might..

UNIDENTIFIED SPEAKER: Bind up later.

MR. SEISS: Bind up there at some later point in time? And are there walkdowns, hot walkdowns made at subsequent intervals?

MR. TRESLER: I guess your question is what's the likelihood of a support that hasn't been identified

as binding because of friction, being identified at a later point in time as a big problem.

Our program has been to..

MR. SEISS: This is an old problem for bridge designers.

MR. TRESLER: Our approach to hot walkdowns was to perform walkdowns at the various temperature plateaus and assess the system's performance and if it was performing properly to go to the next temperature. If it wasn't, we did whatever necessary investigation was in order and either made a modification or determined if it was acceptable.

I think that if we are going to have a problem with friction that has already been identified because now we're simply looking and experiencing higher temperatures which just increases the likelihood that the support will allow the pipe to slide on it.

MR. SEISS: Suppose the friction gets higher, suppose the joint..I don't know how they're made. I asked if they were designed in such a way that they wouldn't change in time.

If it's (inaudible) it probably won't. If it's something that rusts..

MR. TRESLER: I think, I think what you're

talking about is binding, not a friction force.

MR. SEISS: I assume a friction support is something that slides on something else.

MR. TRESLER: Right.

MR. SEISS: And is a force. So, there's a coefficient of friction in there?

MR. TRESLER: That's right.

MR. SEISS: Assuming the force doesn't change, is there anything that can change the coefficient of frictional time to make it hotter.

MR. TRESLER: Nothing other than binding it. We are going to perform additional walkdowns during power ascension on those systems that we have not observed at full temperature yet.

MR. BENDER: Binding may be the same as gauling (Phonetic) or it may not be in your, your definition, but it seems to me that rubbing surfaces can, as a characteristic, to get rougher with time. And if there's no lubricant on it, I guess I'd have to say, well, you may be a little optimistic in saying that the friction factor won't get higher unless you're assuming it's warm.

MR. SEISS: Of course, it may be they built enough power plants and they lasted long enough that they know, too. And we, we still have bridges fall down

every once in awhile for that reason.

MR. SHIPLEY: I think there's, there's several things that, that tend to mitigate the concern about friction becoming greater.

One is, typically, in the start-up of these, these systems you have a little bit of vibration in the line that's caused by a flow through the lines and so forth. And, in general, that causes the, the friction forces to break loose, if you will as the, as the system begins to operate and heat up.

We would not expect a significant amount of rusting of these surfaces and..

MR. SEISS: Since the subject is earthquakes, I might add that during the earthquake, there could be a lot of vibrations. I don't know whether that's good or bad.

DR. CLOUD: An astitute observation. If I could add a couple of things. As part of the IDVP, we, of course, did not evaluate this question, but I could make a couple of observations.

There are a number of friction type supports on the piping systems. In general, these friction type supports have a substantial clearance. So, I wouldn't expect a gauling or finding in that respect.

Secondly, the increase in the friction in

these supports during the lifetime of the plant, I would expect would be very small because, in general, the, the ones that, the design of which is most likely to increase are mainly inside. These are so-called P shoe (Phonetic) times.

So, we have a fair amount of clearance and they're mostly inside. The ones that are outside are generally just open bearing surfaces, and I wouldn't anticipate that the expected corrosion would have a significant effect.

MR. SEISS: Are these, these the types of supports, things that have been used in other plants?

DR. CLOUD: Yes, I believe they have.

MR. SEISS: Well, somebody must know from experience whether they are likely to bind up. And you guys have been in the business for quite awhile.

MR. SHIPLEY: Yes, sir. These are, the supports at, at Diablo, the, the friction type supports are no different than have been used for the last 15 years in the industry, 16 to 18 years.

And there has been no..

MR. SEISS: Maybe you need another walkdown every 18 years, but..

MR. BENDER: Excuse me, Mr. Chairman. We may be over emphasizing the tail here, and I suspect

we are, but in a realistic way, I think we don't, we don't have the kind of measurements that would tell us whether the friction factor is increasing or not.

If they're not contacting each other, I don't worry about it. If they're lightly contacting each other, I don't worry about it. But if there's a strong rubbing force, I think there's a very good chance that you'll have gauling, and then the friction factor will go up.

And it's worthwhile to think about how the struc, how the support is designed to that degree. And that's all it's worth thinking about.

MR. SEISS: Or what the pipe stresses are likely to be.

MR. BENDER: Well, I'll agree. That's part of it.

MR. SEISS: Okay. The, the last question you have about (inaudible) is really related to getting more information from the review group. That's going, I don't really think it's the kind of question that would help us very much right now.

MR. YIN: Okay. We can skip this one.

MR. SEISS: Does everybody agree, disagree? Okay. Then that I think concludes Item 5. We're ready for Item 6.

MR. YIN: Mr. Chairman, could I, can I supplement the information that you haven't received, the draft investigation inspection report was (inaudible) date March 29, 1984.

UNIDENTIFIED SPEAKER: 29th?

MR. YIN: Yes, March 29th. Thank you.

MR. BOSNAK: The license condition 6 involves two programs. One is called the TC Program, and the other is DP. And there is a, a difference between the two.

The first, the TC, is pipe support design tolerance clarification which became known by the acronym in a quick fix or TC Program.

The other, the Diablo Problem Program, was one that was in existence for a longer period of time than the, than the TC Program. The TC Program came into being in the '83 time frame.

MR. SEISS: What, what's TC again?

MR. BOSNAK: TC stands for tolerance clarification, pipe support design tolerance clarification. As I say, as, as it's better known, it's known as the Quick Fix Program.

The DP Program is very much the same as you would find at, at any power plant in order to take care of problems which exist at the site. Basically,

they're interference problems, clearance problems. You need to move something because you do have an interference and the site relates what the problem is and sends it back to the engineering office for approval of what they've done or sometimes disapproval.

MR. SEISS: Did that exist from the very beginning or is that just part of the (inaudible)?

MR. BOSNAK: The, the DP Program and PG&E can correct me if I don't have the, the proper dates, I believe it goes back to '73/'74 time frame. The other came as a, as a result of the mirror image problem when all the work was going on and the reason that the, the staff has gotten involved in these programs is because during the work that was going on, there were many allegations received that in particular with respect to the TC Program, that this permitted people at the site to do things that they shouldn't have done. It was, in effect, as it was characterized a, a license to do things that weren't, weren't appropriate, weren't correct.

And that later when the need came for engineering to approve or act on these things, the pressure was such that they couldn't act correctly. Those, those were the kinds of charges that, that we got.

PCU (Phonetic) I think visited the site early in the '83/'84 time frame and found there were problems with respect to the programmatic implementation, things that were going on with respect to these two programs.

So, the license conditions that were drawn up with respect to, to this dealt with the, the first thing that you can see there is the, is a program scope. And we asked PG&E to conduct a review of the, both the TC and the DP Program activities and to identify to the Commission the support changes which deviated from the TC Program scope. And there was that scope. Perhaps, as we, as you'll see later, was not as clear as it could have been, but there was, nonetheless, a scope.

Second was any TC or DP activities that led to significant deviations between the as-built and what was the approved design configuration, not the initial one but the final approved design configurations. Were there any differences?

Again, this group that went out were not QC/QA oriented. We were looking at, at whether or not the implementation of the programs made a difference as far as the hardware was concerned.

And, third, were there any unresolved DPs

that had not gone through the engineering process of reverifications. Those were the three things that License Condition 6 asked us to look into.

To give you some idea of what we're talking about, there were approximately, and these are round numbers, I've rounded them off, 15,000 of the quick fix or TC situations.

Now, the licensee, as a result of License Condition 6, went back and rereviewed 2,000 of the 15, 2,000 of the 15,000. Now, he found, and these numbers are roughly again approximately, 320 large bore and about 35 small bore TCs that did involve some design changes, changes that went beyond the scope of their program guidance.

First of all, there was only a, a memorandum which, which provided the people doing the work guidance. Later on there was an engineering instruction that was a little more, more specific. But of that total number, they zeroed in on 40, 40 of the most significant.

And in our write-up, I think we have a, we have a summary of, of the kinds of changes, the kinds of design changes that were found. Some of them were more significant than others. That's one way to, to state it. Some of them changed the configuration

of the particular support.

So, of the 40 which contained design review or design changes, the licensee went through those to confirm or not confirm whether or not the supports, the as-built supports and the final design calculations agree. And they found that, that they did.

Now, the staff, and this is the task group and we were there, we had selected 50 TCs. Some were from the group that the licensee had done. Some we selected at random. So, we, we felt we had a good cross section of what, what was done. We found things in those that we considered were, were design changes.

Had PG&E looked at those, we felt that they would have been in, in this group. Now, whether they would have qualified to be the, the 40 most significant, I think was inconsequential.

We did look through those. We visited the site, and we also included because we were there during the week of, I believe it was May the 18th, we had a session on one of the evenings that was recorded. It was a confidential session, and we looked at one of the hangers that was mentioned during that session.

I think what the allegers were trying to say was that they did identify at a point in time a

hanger which had not agreed with the, with the design, the appropriate design at that point in time. We looked at that particular one and we looked at others, and we found for that one that was identified, at least, that it, it was evaluated for the changes that were made. In other words, later on the process caught up with itself and the, the as-built support, the calculations were all in agreement.

So, we tried to include that during our, during our site visit and during the design office audit. Now, our conclusions were that, at least as far as the TC Program here, we initially did use a guide, not an approved procedure. And that, perhaps, I think led to some of the problems that Isa initially identified.

Again from my, I would say from a QA sense, our task group found that it was the conclusion of the group, and I think later the company somewhat agreed with our conclusion, that they did not comply with the intent of a TC programmatic procedure relative to what could be done and what couldn't be done.

By the way, before, before I mention, before I forget to mention it, the TC Program was terminated June 8th. And the other and really the bottom line here was there was no significant deviation between

the as-built and the current approved design configurations and calculations.

So, that was the, was the task group's bottom line as far as the TC is concerned. The program now that the company has in being for, at least for Unit 2, is a field change request which again is what you would expect to find and what you normally see in most plants.

Now, with respect to the other half of this thing, the Diablo problem..and by the way, we do have flow charts that are in your..and I have a copy of those if you want to discuss them, but I don't think it's necessary.

A TC or a quick fix many times became a DP. In other words, if, if they felt that it could not be handled as a quick fix, it became a Diablo problem. In this case, there were about 3,000 of them. About 1,000 were related to piping supports. And, again, in round numbers, about 200 transmitted design information.

As far as the process is concerned, the licensee went through and checked all of the DPs and did, in fact, find that they were included in the as-builts and related design calculations, very much the same as the TCs.

And when the staff was there, the task group during that same week, we looked at 25 DPs, approximately 25 DPS. And we found the same results as the licensee. So, again, here are conclusions as far as the DP Program was concerned, was that we did allow design information to be transmitted.

But the, the design info was included in quality assurance control as-builts, and they were accepted by design calculations. And, finally, which is the third part of License Condition 6, there are no unresolved DPs at the present time.

So, our conclusion is that the license condition, Item 6, is satisfying. One other thing that I probably should, should mention is that I think there was a perceived, at least from some of our interviews that we had, confidential interviews, there was a conceived notion that writing a, a quick fix was a ticket to, to completely get around all QA/QC functions.

Now, we, obviously, didn't get into that, but from the flow charts and from the information that the licensee furnished us, that was not correct. I stated that not to be correct.

MR. SEISS: That concludes Item 6?

MR. BOSNAK: That concludes Item 6.

MR. SEISS: Mr. Yin has some comments on

that I'd like to hear.

MR. YIN: As far as a DP, I don't have any comments. The licensee (inaudible) PRP review and evaluation effort. I concede it to be acceptable.

I have two concerns or comments relative to the PRP handling of the, of the TC issue. First, approximately 1,500 TCs were written since the inception of the program. This means that about 70% of all the large bore and small bore support design recording calculations (Inaudible) or more appropriately deviated by field site engineers.

It was inconceivable that the licensee management was unaware of a QA program (inaudible) of this magnitude. The PRP investigated whether or not there have been any DCP managements predetermined decision to by-pass QA program commitments relative to the design change control.

FSAR committed to 10 CFR 50, Appendix B, QA criteria.

MR. BOSNAK: I think Isa is asking something that the Office of Investigation could better answer. he's asking did the, did the company have a pre-meditated purpose when they had this program to violate 10 CFR Appendix B?

And we can't answer that other than to say

that that was not their stated intent, certainly.

MR. SEISS: Now, how did this violate QA criteria?

MR. YIN: The..

MR. SEISS: I understand the objective of QA is to get a good design, to get quality. And I guess I'm not quite sure how I see a procedure that tries to get things done right and the field violates that.

MR. YIN: Is this question addressed to me, sir?

MR. SEISS: I guess so, yes.

MR. YIN: On the face of it, everything will be eventually be reviewed and accepted by the engineering office. Then, really, there should be no problem because everything you have constructed will be checked.

The (inaudible) is not as simple as what we see because the QA program is kind of a interconnected to each other. Many other programs (inaudible) are really related to each other.

If you, if you have the design that has spent maybe a long period of time in the design office, you come out a result has quickly changed and deviated at a site. And you are not meeting the (inaudible) the Appendix 3, Appendix B, Criterion 3 requirement that

it called for any change of design control, any change of design should receive the same consideration commensurate to the compensity of the original design, and that was not fulfilled.

And, secondly, ..

MR. SEISS: You said that was not done?

MR. YIN: That was not done. And, secondly, ..

MR. SEISS: Just a minute. That's the important point.

MR. YIN: All right.

MR. SEISS: That there were changes made in the field that were not reviewed and approved by engineers?

MR. YIN: By the engineers that, who, who has the responsibility of the original design.

MR. SEISS: Is this something the PRP looked at, too, or..

MR. BOSNAK: Well, we, we looked at the changes, and we did look to see whether those changes were finally approved, whether they were done by the original design organization or some later organization, but it was done by the responsible people that, that had the responsibility at the time to approve the design.

A lot of these things, again, I think needs

to characterize them as, as, as important as the original design. I don't think we could characterize some of these things with that, with that amount of I guess design responsibility or, in other words, they were simple movements of the base plates small distances.

There were some that, that did, in fact, change the support configuration. And those, as we, as we tried to state here, should not have been part of the program.

MR. SEISS: But if there was something, say a simple movement of a base plate a couple of inches, did somebody decide that that did not need to be reviewed by a design (inaudible)?

MR. BOSNAK: That..

MR. SEISS: Was that reviewed..

MR. BOSNAK: That could be a judgment call that was made, and we saw some changes in, in weldments (Phonetic), that we agreed with, again, looking at some of the packages while we were there.

MR. SEISS: Well, I'm not talking about the changes. I said was it possible for somebody in the field to decide that this change did not need to be reviewed by design. And I think you've got a disagree-ment over here. Let's ..

MR. TRESLER: Excuse me. This is Mike Tresler. No, every change that was accomplished under the TC Program was reviewed, checked and approved in accordance with the original design process.

MR. YIN: But your particular look at the time frame because..

MR. SEISS: I couldn't care less about the time frame. If the things were designed and reviewed by design and built correctly, that's the bottom line. Now, if that violated the QA criteria, that's something that licensing can worry about, but I'm not going to worry about whether the thing worked in spite of the QA criteria or not.

But there's a difference. You're saying they did not review it, and they're saying they did.

MR. YIN: I, I said everything has been reviewed, and I understand that but, nonetheless, there's still a QA breakup.

MR. SEISS: Okay. I'll buy that, but for the record, we don't worry. Okay. Your second item?

MR. YIN: The second item. the SSER stated upon completion of construction of the support, the complete as, the complete as-built package, including any PSBTC forms associated with the support (inaudible) by construction to engineering for final acceptance

in accordance with project engineering procedures. The PRP conclusion was contrary to the evidence provided by an anonomyous alleger, getting the staff (inaudible) conducted on May 22, 1984.

The documentation of evidence show that some of the TCs were not included in the as-built packages. Those TC items include a vented concrete expansion anchor bolt, drilling, drill holes and added on (inaudible) to the original base plates.

MR. SEISS: Well, how is that different from the previous one?

MR. YIN: It's two completely different issues.

MR. SEISS: Yes, I gather that, but I don't quite see how they're completely different.

MR. YIN: Well, the, the first one, assuming everything that is still.. you have the as-built drawing reflect the actual condition and it's been reviewed by the design office.

But the second issue points out everything the design people have received may not reflect the actual condition of the site.

MR. BOSNAK: Well, there were some reviews and I can't speak for the company, but we did look at certain of the supports in the field. We compare

those with the so-called as-built drawings and the final calculations. And they all agreed. Admittedly, our sample was smaller but I would expect..

MR. SEISS: Does your sample include the specific allegations that..

MR. BOSNAK: It included one of the hangers that, that was talked about. And I might comment here that with respect to abandoned anchor bolts, the person who was here this morning, that was Harold Polk, is preparing a, a safety evaluation of these kinds of things and whether or not they belong on an as-built drawing or not is something I think that's open to question.

MR. SEISS: And you said you invested..looked at one instance that had been alleged. What did you find there?

MR. BOSNAK: We found on that particular one that when the, when the hanger was first designed, it was not designed with a thru-bolt. When it was installed, it was installed because of I guess problems that had occurred during the installation. It was installed with a thru-bolt.

There was also some allegations with respect to the material of the, of the bolt and the bolt size. We, we found that the proper as-built conditions were

represented on the final as-built drawings. So, all I can, all I can say is that perhaps the information that we got was at an earlier point in time, that what we saw represented the, you know, tne final conditions.

But that was only, we only looked, were only able to look at one of those.

MR. SEISS: Why were you only able to look at one? Time or addressibility or?

MR. BOSNAK: Just the amount of time that was involved and some of the..we didn't have, in all cases, all of the details as far as the allegation packages were concerned.

MR. TRESLER: Dr. Seiss, this is Mike Tresler. I believe I'm familiar with the cases (inaudible) began speaking to, and if I recall correctly, we did find in some cases that the TC document was not included as a part of the as-built package; however, a change to the configuration that was caused by that TC was clearly shown on the as-built and included in the as-built drawing and associated calculations.

MR. KNIGHT: And, Dr. Seiss (Inaudible) Jim Knight. I think as has been mentioned earlier this morning, we have..all the discussion with the allers came up during the period of time that we were discussing some of these other issues, license condition issues.

We felt a separate item insofar as the substance of the allegation and the significance of the allegation and Chris had yet another special group, including Professor Burdett from the University of Tennessee as a consultant to go out, to look at the practices that were used in terms of their anchor bolting and in terms of the way loadings from one of the other concerns from the alleger was that a possibility of enumerous anchoranges into the, into a given wall or given structure and whether that, in fact, (inaudible) it.

Those are the matters/that Mr. Polk spoke briefly about this morning.

MR. SEISS: I just saw a submittal from somebody. I don't know whether it was Diablo or not on abandoned anchor bolt holes. Did that come from Diablo?

MR. TRESLER: I believe it did, yes.

MR. SEISS: Yes, okay. Let's go to the next item, then, another allegation, I believe. Now, this is procedural. And why the staff didn't have a follow-up meeting, you can read it, Isa. Read it to us in the record.

MR. YIN: Yes, okay. Number 3, many rather significant engineering concerns were brought forward

during the May 22, 1984 meeting with the anonmyous alleger. The (inaudible) was still in confidential status. The staff stated in the transcript that due to the (inaudible) the follow-up on the meeting would probably be scheduled in two weeks. The SSER should address specific reasons for which the follow-up meeting was not scheduled.

Can I go into the next area?

MR. SEISS: I think so.

MR. YIN: Four of the support installations were examined by the PRP team. The team consists of one NRR branch chief, one consultant from Batelle, and two consultants from EG&G Idaho (Phonetic). My concerns are, one, considering the size of the group, the sample size selected for observation appears to be unusually small judging by the NRC regional inspection standard.

Second, have any or all of the team members have any prior (inaudible) inspection experience. Third, (inaudible) sufficient detail descriptions on how the supports were inspected and what attributes have been checked and verified.

I think this is very important because the conclusions (inaudible) us that the as-built that was evaluated by the, by the San Francisco engineering

office does match. If the inspection concluded that, there should be some evidence to show us.

MR. BOSNAK: When we visited the site we layed out the, our, our program for the day. We selected supports, and we looked at a lot of other supports that were included in the report.

We also wanted to talk with some of the area engineers, the, the TC people that were there, to make decisions. And we felt that was important to do. So, I'm not trying to, to defend or deny the size of our support. We felt that it was perfectly adequate for what we had to do.

As far as hands-on experience, yes, there's probably about 100 years of experience if you add up the hands-on experience between the four members of the group, including crawling into boiler mud drums, boiler steam drums, looking at piping, L&G, LPG, all kinds of, all kinds of hardware that would be associated with any kind of a, a plant much less a power plant.

So, definitely the people that made the, made the visit had certainly as good as or better than any of the regional inspectors would have.

With respect to description on how the supports were inspected, I tried to, to give you, at least with the one, the things that we checked and the things that

we looked at with respect to dimensional size of bolting. We looked at wing plates. We looked at the configurations of the base plates, the changes that were caused by, the changes in configuration, the addition of wing plates, their measurements.

We compared those with the as-built drawings. We looked at weld sizes, as Bernie mentioned earlier. In some cases, we looked at the support contact with the pipe. We're also interested in the fact that there was adequate interface between the support group and the structural group and, of course, the pipe stress group.

So, we wanted to be sure all of these things were covered and we looked at, again, given the fact that we were all mechanical engineers rather than, than concrete, we particularly emphasized the interface with the pipe and, again, the interface up to the concrete.

MR. SEISS: Any questions from the members of the Subcommittee or the consultants? Any questions on the Diablo problems? (Inaudible) have no concern there. Does anybody have any?

MR. MICHELSON: How near the end are we?

MR. SEISS: Oh, we've got..

MR. MICHELSON: I have one question that can

interject anytime.

MR. SEISS: We've got one more item, I believe, on the staff's presentation..

MR. BOSNAK: There's really, really two more, Dr. Seiss. There's No. 7 and then there's the IDVP.

MR. SEISS: I'm sorry, I didn't, I forgot about No. 7, yes.

MR. BOSNAK: Mr. Yin has no comments on that.

MR. SEISS: No. 7 really related mostly to No. 1.

MR. YIN: Let me comment on that, too, and then I can get out of here. As well as the review of IDVP, I consider them two separate issues.

The first one is the technical review that was performed by Krauss & Associates. And then the second part is the QA review by Roger Redy (Phonetic) Company.

I have spent about a day and a half at Bob Cloud's office, and I do not believe that I have sufficient time to complete my effort. And my request to continue that review was denied.

Secondly, my request for a QA review by Roger Redy was denied also. As far as the, the program, the change by management at the, at the OPEG,

On-Site Project Engineering Group, to abolish the design activities based on my inspection findings, I also request the management to give the opportunity to see how the program, the new program was working and what kind of improvement was made on those programs. Again, my request was denied by the management.

And with that remark, I think I have completed my, my, my work here today.

MR. SEISS: The last three comments you made are not in what we have here. Have you got those in writing anywhere?

MR. YIN: Well, since I return, my return to the office from the Cloud Associates, I have talked to my management in Region 3, and I request that the, I request my resignation from my involvement in the Diablo Canyon project.

And Mr. Castle, our regional administration, administrator, had discussed with Mr. Denton. And it was agreed, Mr. Denton request me to do three things. First, to finish up the report, to make it in a final report form.

Second, he asked me to attend the management, attend the licensee meetings on, on Friday, on Friday, June 29th. And the meeting was subsequently changed to July 2.

And, third, Mr. Denton asked me to comment on the seven license condition items. And based on my discussion with our management and we agreed to do two things, that is I will complete my inspection report, and I will comment on the seven license issue. And that will be the whole commitment and involvement that I will be with the Diablo Canyon project.

And my request not to attend the meeting was agreed by the NRR as well as the Region 3 management.

MR. SEISS: Regarding the IDVP, I believe you had raised a number of questions regarding the scope of the program and the sampling procedure, some of which I believe were addressed in the peer review panel's report.

Have you read those or you just choose, chose not to comment on those now?

MR. YIN: I have received, I measured it, three and one quarter inch thick of documentation, I guess is on July 6 or maybe on July 9th, just recently. And I have not had the opportunity to, to read any of it.

As a matter of fact, I have no intention to read any of this.

MR. SEISS: I was thinking of just the material, a very few pages that were included in the

draft SER.

MR. YIN: Yes. I just got hold of that a couple of minutes ago, and I have no intention to read it.

MR. SEISS: Okay. Thank you.

MR. YIN: Thank you.

MR. SEISS: Well, Bob, who's going to discuss Item 7, then?

MR. BOSNAK: Dr. Hartzman was, and I have the IDVP, if the Committee is interested.

MR. SEISS: No. Why don't you sit down and we'll take a ten minute break.

(BRIEF RECESS).

MR. SEISS: Number 7.

MR. HARTZMAN: Many of the items under Licensing Condition 7 have been addressed previously by Mr. Manoly in discussing License Condition Item 1. So, I will go through thi fairly rapidly.

The Item 7 stated that the PG&E shall conduct a program to demonstrate that the following technical topics have been adequately addressed in the design of both small and large bore piping supports.

And, basically, these items are, these technical topics are, inclusion of warping normal and shear stresses due to torsion in those open sections

where warping effects are significant.

B is resolution of differences between the AISC Code and Bechtel criteria with regard to allowable lengths of unbraced angle sections in bending.

C is consideration of lateral/torsional buckling under axial loading of angle members.

D is inclusion of axial and torsional loads due to load eccentricity where appropriate.

E is correct calculation of pipe support fundamental frequency by Rayleigh's method.

And F is consideration of flare bevel effective throat thickness used on structured steel tubing with an outside radius of less than two t.

PG&E has taken the following steps to address topics A, C, D and E. A, being the inclusion of the warping normal and shear stresses. C, the consideration of lateral torsional buckling. E the pipe support fundamental frequency, pipe support fundamental frequencies. And D is the inclusion of axial and torsional loads due to load eccentricity.

I have revised the design, the basic design criteria memorandum M-9, which applies to design of Class 1 supports, to specify to, to specify that the designers include the specific, specifically, these,

these topics in their, in their reviews or any future designs.

For, for the small bore pipe supports, I have issued an instruction I-59, which, which contains these items in great detail, including checklists and, and specific forms. This also applies to Instruction No. I-55.

And for the large bore pipe supports, a checklist was also issued which addresses, which, or which constructs reviewers who addressed, specifically, these, these topics.

And these effects, as pointed out by Mr. Manoly were addressed for all computer analyzed small bore pipe supports and, in addition, were evaluated also for a sample of 200 large bore, large bore pipe supports.

PG&E also provided additional information on, on items B and F. B being the resolution of the differences between the AISC Code and Bechtel criteria regarding allowable lengths of the unbraced angle sections. And F being the consideration of flare bevel weld effective throat thickness as used on structural steel tubing.

And we, we carried, we carried out, you know. very detailed discussions with, with PG&E's design

personnel and with personnel who were specifically responsible for implementing these, these topics.

The discussions were detailed and considerable. And we found them, and we found that their work is acceptable.

In addition to these topics which are called primary topics, we showed a series of related topics which we also had a considerable and detailed discussion with the PG&E.

And these additional topics were correct specification of angle of inclination of angle members in Strudl input, baseplate and anchor bolt assembly design calulation, calculation sheets, tributary masses for pipe supports, buckling criteria for B31.1 components, generic qualification of lugs and lug indiced local pipe stresses, Strudl calculation of displacement and load responses of angle section beams and qualification of U-bolts by load rating.

And PG&E has addressed as, addressed all of these topics in writing and through considerable discussion with, with myself and, and, and Mr., Mr. Manoly. And we find that their responses, in general, have been quite, quite satisfactory.

The results are as follows: We, PG&E has submitted all the results in, in the final report which

is spread out over three letters.

For the small bore pipe supports, they found that the warping stress, the normal warping stress was significant to felatively few members. All small bore pipe supports remain qualified, except for three, and those are the three in which the angle members exceeded the length criterion which they had initially adopted.

I have a firm, a statement here which says verification results, not completed. This is because we, we, we would liike to look into certain aspects a little bit deeper; however, in general, the results do, do appear to be quite satisfactory.

For the sample of, of large bore supports, the, again, the.. the warping normal stress was found to be less than equal to 40% of bending allowable, in general. Warping shear stress less than or are equal to 50% of shear allowable. The effect of warping is relatively small in the majority of supports but not negligible.

One support found unqualified, due to the site issue, due to an incorrect load condition, and this problem was resolved by modification. An additional sample of 30 large bore supports were checked for this incorrect load condition and none were

found or so, so PG&E stated. However, this is an issue that is not related to license condition No. 7.

And also all supports checked remain qualified and the same statement for, the same logic for, applies to verification of results. In other words, we'd like to take a look in, in somewhat more detail in certain aspects of the, of the analysis.

That completes my presentation.

MR. BENDER: Can I ask one question? I noticed in the draft SER or whatever it is. You're comparing that the U-bolt criteria for future application was being changed.

DR. HARTZMAN: That's correct.

MR. BENDER: The applicant was going to the recommended strength allowable for the (inaudible) bolts.

How does that compare with what is currently being used or what was used previously and what conclusions did you draw about bolt practice?

DR. HARTZMAN: PG&E qualified their U-bolts based on test data and procedures which are acceptable (inaudible) ASCE/NF requirements. On the other hand, we also requested from them that they perform a study on the samp, on the rental sample for over 100 small bore supports to determine what were the loads, what

were the actual loads that they had seen in the U-bolts during the design.

And they determined that the loads were considerably smaller than they were, then the, than the load tables that they had designed, the load ratings that they had designed to based on the NF, ASCE/NF requirements.

On that basis, they, they decided to change the, the load rating to the manufacture allowables.

MR. BENDER: That basis, those two statements don't follow to me. If the manufacturer's allowables are smaller or higher than the NF?

DR. HARTZMAN: They're higher. They're lower, excuse me.

MR. BENDER: They're lower than (inaudible).

DR. HARTZMAN: Yes, considerably lower.

MR. BENDER: By what?

DR. HARTZMAN: Two.

MR. BENDER: Say a factor of two. So, the conclusion to go to the manufactured rating had to do with the fact that the actual loads turned out to be a lot less than they had expected. So, they could live with those ratings.

DR. HARTZMAN: That is correct.

MR. BENDER: Is that right? Thank you.

MR. SEISS: Anything else.

MR. BOSNAK: Gentlemen, the handouts that we're going to use for this is attached to the earlier one that you already have.

I think, first of all, you've got to recall that back in the supplements 18, 19 and 20, the staff had already, has, had already concluded that the IDVP it's design verification, at least, with respect to the things that we're talking about, the large bore, small bore piping, and the supports were adequate.

So, the question comes up, why are we doing what we're doing? And I think the answer to that is that as a result of the allegations that we received, a lot of different people, new people were brought in to the picture, so to speak, and, and asked questions about IDVP, whether the thing was carried out properly, whether some of the, the errors or calculational things that were discovered were included or were, were incorporated in the IDVP.

We received a report from Mr. Yin and, unfortunately, he's not here to, to discuss, to discuss it, but we felt that we needed to go through and have another look, to be sure that we weren't covering up anything, that everything that was originally stated was still, still correct.

So, what I'm trying to, to describe is the process that we went through to do this. We put together a group. We went out to the offices of R.L. Cloud & Associates. We spent the half of one day with Mr. Yin himself. This was the group.

By the way, we might mention that the group went out from the staff included consultants, included staff members. And there was only one person, I think Dr. Hartzman, who had been originally fairly deeply involved with the IDVP approval.

So, this was not a group that you could say, well, since we've approved it before, we were trying to defend the work that we did. This, this group had not essentially been involved deeply with the IDVP before.

So, we spoke with Isa for five or six hours the first day by ourselves, without anybody else being present. And we tried to boil down his concerns. And we think we did into, and called them three main areas.

First of all, it was the span rule analyzed pipe. There was 15,000 feet of the span rule analyzed pipe. That was not gone through, again, in the corrective action program. It, Isa felt it was not documented and it was not rereviewed. And, so, the

question came up, well, why did IDVP feel that it was, was, was all right? So, that is the first major area, and I'll get to that.

The second major area was the distribution of the IDVP audits. There were several contractors that were involved as well as the Diablo Canyon project. There was IMPEL, EDS, Cygna and also Westinghouse was involved.

So, the question of, first of all, we, we had covered Westinghouse in our report, and we did mention that this was a decision that was made earlier, that the IDVP was not going to get into a review of, of Westinghouse, a decision made by the Commission. And that was the scope of the IDVP Program.

So, that was not reopened to include Westinghouse. The staff had no reason to, to look into Westinghouse. Our evidence of problems from other plants was, well, it was nill.

And the last were the listing of the ITR or the interim technical report, so-called deviations. There were a large number of those that were included in the reports and Isa characterized those into tables and then asked the question, with all these deviations, and I use the word in, in quotations, if I may, why wasn't there more looks made?

So, that's what we're trying to, we were trying to answer during the period that we were there. As I say, the task group wanted to look into the whole IDVP process, the methodology. We looked at, of course, at the ITRs. And in order to answer some of the questions that we had about the comments that were made in the ITR reports, we had to go back into (inaudible) call back-up packages which had to be retrieved from remote storage. And we did that. And that was the only way we felt we could understand the comments that were made.

You'll see later on one of the criticisms that we had of the ITRs were that they were very terse. The comments did not include explanations. So, for people that were looking at them for the first time, you could have been led, led astray. You could have been taken down the wrong path if you did not have the back-up information.

I can see how somebody would make a list of these things and say, well, they're all, they're all errors.

So, this is essentially what happened during the week.

Now, to cover the, the first area. First of all, there are, there are, there are approximately

43,000 feet of small bore pipe. The, the title up at the top doesn't refer to everything. It's the span rule analyzed pipe issue that we're talking about here.

Of the 43,000 feet, there was 5,000 feet that was computer analyzed. And there was no, no problem with the computer analyzed pipe as far as anyone was concerned.

3,000 used, what we call a current span rule, it, the current span rule piping included an Hos Rie (Phonetic) evaluation, and Mr. Yin had no problems with that area.

It was then the use of the, both the 5,000 and the 3,000 feet, the extrapolation to say that the 15,000 feet was not qualified. And, again, the 15,000 feet of the so-called bio-44 span rule, was initially looked at. The issue was that it wasn't rereviewed. There was no documentation made.

While we were there, the group decided that we needed to get some further information with respect to the characteristics for the record of the 15,000 feet. And it was appropriate to get that from PG&E, not from the IDVP.

I would, and I can't, I can't speak for Bob Cloud and his people, but I would expect that they would have gone through this kind of thing when they

decided in their own minds that the 15,000 feet was appropriately qualified, but the characteristics were, of course, that, that we're talking about pipe size that's less than 2 inches. It's all cold. I think you heard that earlier from (Phonetic) with respect to this, this piping. By cold, meaning it's under 200 degrees for (phonetic) and 160 for paretic.

No concentrated masses, a small seismic anchor motion and thermal anchor motion and..

MR. MICHELSON: Excuse me. A small bore here under two inches or does it include the two inch?

MR. BOSNAK: Two inches and under.

MR. MICHELSON: Well, that, okay, because that's the way you defined it before. It just wasn't on the slide that way.

MR. BOSNAK: Actually, I believe it's less than two inches but it would include the two inches.

MR. MICHELSON: Two and under.

MR. BOSNAK: Two and under.

MR. MICHELSON: Thank you.

MR. BOSNAK: Overspans, and we did look at some of the work for the other piping, that we believe overspans were, were unlikely in this piping.

MR. SEISS: What's an overspan?

MR. BOSNAK: An overspan is where you exceeded

the criteria for the span rule. In other words, if you went beyond it for some reason, that was an over span..

MR. SEISS: Permissible reason you mean or by mistake?

MR. BOSNAK: It could be by mistake. It could be for some particular reason, that you couldn't, you couldn't locate the support.

MR. SEISS: Let's see. That span length is ..

MR. BOSNAK: About ten feet.

MR. SEISS: To keep the frequency at some level.

MR. BOSNAK: Well, that's one, one of the other criteria that we wanted to keep or that was the licensing criteria that, that we have a frequency of above 20(inaudible).

So, that, in effect, was perhaps one of the driving conditions with respect to this, for this pipe, the pipe supports. We concluded, going through all this information, that the acceptance of the 15,000 feet of span rule small bore piping and the supports, the associated supports that went with this, these were, I'd characterize these essentially as simple supports.

They were analyzed probably, principally by hand, that all of the work that was done previously, there's no, no real reason to question it. And to go back if we do this work again.

So, we felt, again, that the IDVP decision on doing this after we went through the same thing was appropriate.

MR. SEISS: You say Mr. Yin went through that with you or, no?

MR. BOSNAK: He was there when all of this was discussed, and I don't know if he, if he agreed with the, with the characterization of the, he hadn't seen the characterization of the small bore pipe.

That came in in a letter that we got dated July 3rd. So, he was not here. He heard, I think, most of the discussions, though.

MR. SEISS: You mean you were that far along before you found out what you were looking at?

MR. BOSNAK: No. We, we knew what we were looking at, but we felt we wanted to get it documented for the record.

So, this is the, the issue with respect to why if, for instance, IMPEL analyzed quite a bit of piping, why didn't they do more, more audits or more samples from the, from the group than was actually

done.

Well, we, we posed that question to Bob Cloud and his people while we were there, and we felt that the answer that they gave us was, was well thought out. It had some engineering judgment behind it.

They were looking for when they went through the IDVP audits, (inaudible) would characterize this interesting problems. They were, they were not looking for the run of the mill pipe.

And one of the things that I do remember with respect to one of the contractors was that they did, most of the work was done in the fire protection system. I think that was, was IMPEL. And for that reason, I think 50% of IMPEL's work was fire protection.

Again, not to say that it's not important, but it's not one of the systems that are safety significant from the point of view of, of shutting down the plant, mitigating the, certain accidents.

So, that was one reason. They were looking for, again, piping configuration that went to flexible equipment. They were looking for systems that had inline components.

Again, the ones that were particularly of interest because they presented interesting design problems, things that the contractors, if they were not

paying attention to what they were doing, would come up conceivably with, with some errors.

So, based on those kinds of things, we believe that the sample distribution selected by the IDVP was appropriate.

MR. BENDER: Bob, could you clarify a term for me? What is meant by flexible equipment?

MR. BOSNAK: I would say they were talking about pieces of equipment that there might be the need to look at, at the nozzle loads. There might be some related motion that, that the piping and supports..

MR. SEISS: Where did the term come from, Myer?

MR. BENDER: I don't know. Well, it was in the draft SER, whatever this thing is, and it wasn't exactly clear what, what kind of equipment was being referred to..

MR. SEISS: Who drafter that SER? Did you use the word, Bob?

MR. BOSNAK: Yes, it was..I think the word flexible equipment..Ted?

MR. SULLIVAN: My name is Ted Sullivan. I wrote that section, and I basically borrowed that term from IDVP.

MR. BOSNAK: Okay. Then what term they

used.

MR. SULLIVAN: They were referring to..

UNIDENTIFIED: What did you mean?

MR. BOSNAK: We'll get to the author in a minute.

(CHATTER)

DR. CLOUD: (inaudible) heat exchangers use equipment like that, that has flexibility in it that could affect the response of the piping and it might have a frequency less than 20 (inaudible).

MR. SEISS: I see. You mean where the nozzle can shake?

MR. BOSNAK: Yes. The last (inaudible) is the one included in this, the ITR comments, but this is a compilation that you'll find in the draft SER of the findings by the task group.

Well, the action by the IDVP, the first two I think we've already covered, small bore piping not in the corrective action program was acceptable and the sample size distribution.

The next point..well, first of all, the perceived unexplained ITR deficiencies, we felt that was a valid criticism, and we weren't trying to necessarily look for more problems but, again, if, if one reads these, these reports, there are things that were not

too well explained.

For instance, looking at, at the packages while we were there, we found things such as a Schedule 80 pipe was called for, but a Schedule 160 was used. There were welds that were not analyzed because they were in some cases thicker than, than the weld that was called for in the, in the original design which was taken care of.

It did look at at stress concentrations. So, these kinds of things that didn't get into the reasons for listing these comments in the IPR were, we found, the packages that we looked at, covered in the basic back-up, back-up information.

And what we're trying to say is that the identified deficiencies were in all cases that we looked at not significant, and they really didn't disturb the IDVP final conclusion.

Now, we also asked the question and we asked it again in the transcript of the meeting that was, that was held on, I believe July 2nd, whether or not the IDVP detected the random imput errors of the kind which prompted the, in particular, License Condition No. 1.

I characterize these as input errors, geometry errors. Did the IDVP detect these kinds of

things and how were they able to rationalize them? And we feel that from what we saw that they, they did. Obviously, we didn't, we didn't look at all the packages that they had there, but they, they did find these kinds of errors in their reviews. They did find input errors and they did find geometry errors, but they also found that they did not affect the answer. And the answer was, did the plant item, when we're talking about a support of the piping system, did it deviate from that licensing criteria?

In most cases, and maybe this is (inaudible) was because there was plenty of margin there, but they found no generic, no generic problems other than the ones they identified.

MR. SEISS: Why do you say it's gratuitous? That's why we have margins.

MR. BOSNAK: Well, that's, that's correct, but some people would say..

(CHATTER)

MR. BOSNAK: ..there shouldn't be errors at all. We should have 100% perfection.

MR. SEISS: On this earth?

MR. BOSNAK: No, not on this earth. But the statements have been made. So, I think that's, that's quite important that, that they did see that

there were errors and they recognized that these kinds of things do exist in systems that are designed by, by ordinary human beings.

One other point that we, we want to mention that we felt, again, this is an omission but that we found no mention of the kinds of things that were included in License Condition 7, the things that you just heard about.

And that does, does not mention it, does not indicate that they did not think about these kinds of kinds. There was no documentation made. So, we feel that that is a, is a minor criticism other (inaudible) no impact, again, on satisfying the license condition.

So, our overall conclusion is that the original goal, hence the original IDVP goal, is design verification which meets the licensing criteria is still valid and nothing has changed as far as, as far as the original findings back in the earlier SER supplements.

MR. SEISS: Bob, I, I did notice you had a comment in the draft SSER that the IPRs were not as detailed as they might have been. I'm not sure whether it said might/or should have been or could have been, which I think is a very legitimate comment.

But if I wanted to be unkind to think I could make the same comment about the draft SSER..

MR. BOSNAK: I'm sure you're correct.

MR. SEISS: I appreciate brevity of the things I have to read but the things that I have to understand sometimes I'm willing to take a little extra time.

MR. BOSNAK: We were trying to, I think, in defense of what we were saying that we were trying to explain why a person going through the ITRs would find that that many comments..

MR. SEISS: They were a lot shorter than the monthly, than the bi-weekly statements reports. You can say that.

MR. BOSNAK: That's for sure.

MR. KNIGHT: I think having, having been involved at the onset of the program, I think in all fairness to the parties, I recall in establishing the procedures, we often discussed that the ITRs ought to be sufficient to tell the reader what was done. And an interpretation of that (inaudible) that they would not contain a great deal of volume or back-up or technical, there weren't technical reports to be reviewed like say (inaudible) but rather were a summary of activities.

MR. BOSNAK: Perhaps in some cases they told too much, and that was..

MR. SEISS: Jim, but the bottom line was about a quarter, about a quarter of a page. All the rest was..I read them all. I appreciated that brevity.

Okay. Any, any questions for Bob about the IDVP. Thank you.

There's one final item was addressed in the staff SSER that had a heading of programmatic issues. This all had to do with various kinds of documentation and (inaudible) programmatic is the right word for it, I guess, issues on QA for the site engineers which has now been abolished and their review on the reorganization is presumably continuing.

I don't really see any reason, I don't know what you could tell us. So, I would declare a review or presentation that the staff completed. Does that end up with you guys?

MR. MICHELSON: I have one small question.

MR. SEISS: Yes, (inaudible) any question.

MR. MICHELSON: This morning we discussed just briefly the question of the location of type breaks, and I'd like to follow-up on that question, one additional clarification.

In those cases wherein a reanalysis of a

piping system found that the, the point of high stress had moved from one location in the system to another. Was this incorporated, then, in the pipe break analysis studies that determine the effects of such pipe breaks?

MR. BOSNAK: The, the staff checked into that and it was done where those cases in which the threshhold criteria were exceeded. In other words, if the threshhold criteria were exceeded, the location moved to another spot, that other spot was checked into.

MR. MICHELSON: Did the licensee agree that he did this?

MR. SHIPLEY: Yes, sir, that's correct.

MR. MICHELSON: Now, was, in those cases wherein the, a new break location did indeed appear, did you submit any, an amendment to your break, pipe break study?

MR. TRESLER: I believe the answer to that is that the, the results of our pipe break review were transmitted to the NRC, included those new break locations that were..

MR. MICHELSON: Well, that report came out before all this current plant flow, didn't it?

MR. TRESLER: No, we made another..

MR. MICHELSON: Was this very recent?

MR. TRESLER: We made another report into the corrective action program.

MR. MICHELSON: Okay. And, so, the, the final report that now resides in the NRC does include any movement of these pipe break locations?

MR. TRESLER: Yes, sir.

MR. MICHELSON: Okay. Thank you.

MR. SEISS: We called on the licensee a number of times to answer questions. Do you have any last words?

(CHATTER)

MR. MOCH: Dr. Seiss, I don't think any last words. We are wondering about procedurally about the relationship between today's subcommittee meeting and your meeting on Friday and (inaudible) of course, to how many of the people we brought here with us today we should count on for Friday, whether we need anybody else, that the logistical problems of that.

MR. SEISS: Well, as of the moment, I can't tell you too much. I intend to caucus the subcommittee as soon as we finish the business and discuss a little bit how we might go about things on Friday.

I can assure you it will be shorter than today. I feel quite sure you won't need anymore people than you have here today. And I suspect that the people

that spoke today might be the ones you'd want to have.

MR. MOCH: But let me see if maybe I could just do it by, we can do it by categories. You've heard a lot today from Mr. Shipley and Mr. Tresler, and I think it would probably be prudent for us to have them back on Friday.

MR. SEISS: Think so.

MR. MOCH: We've had two people here with us today, both from PG&E's quality assurance program, the manager of that program and from the project's, the quality assurance representative from the project.

We didn't hear from them today nor did you ask us any questions. Is it prudent for us to assume that that same thing will happen on Friday? What I'm asking is if we can send them home.

MR. SEISS: I'd say send them home. I can't tell you what the full committee is going to ask questions on. I've been around too long to try to predict that, but I would be glad to explain to them why you can't answer them. And I will discourage them from asking questions on quality assurance.

MR. MOCH: And, finally, I guess the representatives from the IDVP were here today, Dr. Cloud and Dr. Cooper. I guess since they're independent, I guess we have to let them make up their mind whether

to come on Friday or not.

MR. SEISS: I think that's the way to do it. Dr. Cloud did most of the talking and Dr. Cooper lent his imposing presence.

DR. COOPER: I think the way things went, there's not much need for Bob Cloud to be here. It's up to him but he might like to go home. And tomorrow I might say differently, but..

MR. MOCH: I think we, except for those items, I think we have nothing else.

MR. SEISS: I think that's reasonable. I'd like to declare the major portion of the meeting closed and the Reporter can go home. And I'd like to caucus the subcommittee for a few minutes about how we might present this to the full committee.

(Whereupon, the meeting was closed at 3:50 p.m.)

CERTIFICATE OF PROCEEDINGS

This is to certify that the attached proceedings before the NRC COMMISSION

In the matter of:

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
SUBCOMMITTEE
MEETING ON DIABLO CONYON
NUCLEAR POWER PLANT, UNITS 1&2

Date of Proceeding: July 11, 1984

Place of Proceeding: Washington, D. C.

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

KIM SCHROEDER
Official Reporter - Typed

Kim Schroeder/NSB
Official Reporter - Signature
KIM SCHROEDER

UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
WASHINGTON, D. C. 20555

July 10, 1984

MEMORANDUM FOR: C. P. Siess, Chairman
Diablo Canyon Nuclear Power Plant

FROM: J. C. McKinley, Chief
Project Review Branch #1

SUBJECT: DIABLO CANYON SUBCOMMITTEE MEETING,
JULY 11, 1984 STATUS REPORT

The ACRS has been requested by the NRC Staff to review the draft "Report of the Diablo Canyon Peer Review Group"* and to prepare a report to the Commissioners. The report is limited to small and large bore piping, its supports and its quality assurance. As you may recall, Mr. Isa Yin has been concerned regarding the design quality which has resulted in additional supports being installed and the existing supports not being modified or removed as appropriate. The NRC established a Peer Review Group to consider Mr. Yin's concerns; the conclusion of this Group is that the seven license conditions imposed on the low power license have been satisfactorily addressed, the past staff conclusions on the IDVP remain valid, and the programmatic issues raised concerning onsite engineering have been resolved.

I anticipate this meeting will primarily be a discussion between the Subcommittee and the NRC Staff. Representatives of the Licensee will be present to respond to questions.

Attendance by the following is anticipated:

Dr. Siess	Mr. Michelson
Mr. Ebersole	Mr. Bender, Consultant
Mr. Etherington	Mr. Mysinger, Consultant
Dr. Lewis	

The tentative schedule is:

8:30 a.m	Opening Statement (Dr. Siess)
8:45 a.m.	NRC Staff Summary of "Diablo Canyon Peer Review Group" report (R. Vollmer, NRR)
9:30a.m.	Concurrence/nonconcurrence of Mr. Isa Yin (I. Yin I&E)
10:00 a.m.	General Discussion
12:30 p.m.	Lunch
1:30 p.m.	Resume Discussion
5:00 p.m.	Adjourn

* Copies sent by special mail on July 6, 1984 to all Subcommittee members and consultants

J.C. MCKINLEY

SUBCOMMITTEE MEETING: DIABLO CANYON July 11, 1984

LOCATION: Room 1046, 1717 H St. NW. Washington, D.C.

ATTENDANCE LIST

PLEASE PRINT

NAME	AFFILIATION
1. C.P. SIESS	ACRS SUBCOMMITTEE CHAIRMAN
2. C MICHELSON	ACRS SUBCOMMITTEE MEMBER
3. H. ETHERINGTON	" " "
4. J. C. EBERSOLE	" " "
5. H.W LEWIS	" " "
6. M. BENDER	" " CONSULTANT
7. D MYSINGER	" " "
8. J.C. McKINLEY	ACRS STAFF
9. M McCLAIN	" "
10. R A Cushman	ACRS Fellow
11. J H Sisk	ACRS Fellow
12. S. Seth	ACRS Senior Fellow
13. M. HARTZMAN	NRC/DL/MEB
14. B.F SAFFELL	BATTELLE COLUMBUS LABORATORIES
15. KAMAL MANOLY	NRC-REG I (DETP)
16. E.J. SULLIVAN	NRC/DE
17. E.C. Rodabaugh	NRC consultant
18. HAROLD POLK	NRC/DE/SGEB
19. G.W. Knighton	NRC/DL/LIC BR#3
20. R. H. Vollmer	NRC/DE
21. J P KNIGHT	NRC/DE
22. R J BOSNAK	NRC/DE
23. W E COOPER	TES/IDVP
24. R L CLOUD	RLCA/IDVP

SUBCOMMITTEE MEETING: DIABLO CANYON July 11, 1984

LOCATION: Room 1046, 1717 H St. NW. Washington, D.C.

ATTENDANCE LIST

PLEASE PRINT

NAME	AFFILIATION
1. RICHARD F. LOCKE	PACIFIC GAS AND Electric Co.
2. Bruce Norton	Norton Burke Berry & French, P.C.
3. Barbara Lew	Diablo Canyon Project
4. HOWARD FRIEND	Diablo Canyon Project
5. STEVEN A SKIDMORE	PG&E - QA
6. Michael Jacobson	Diablo Canyon Project
7. L E SHIPLEY	DIABLO CANYON PROJECT.
8. MR Tessler	PG&E - Diablo Canyon Project
9. Ronda Wirtz	TELEDYNE ENG. SERVICES
10. Jane Berglet	Pacific Gas + Electric
11. [illegible]	Epic
12. PATRICK MOCHERTY	WESTINGHOUSE
13. CHARLES G. STOKES	P.S. Associates
14. Deb Price	States News Service
15. Richard P. DAVIN JR.	PACIFIC GAS and Electric Co.
16. Shirley Cerilli	Fitz State Reporting
17. [illegible]	FITZ STATE REPORTING
18.	
19.	
20.	
21.	
22.	
23.	
24.	

T.1 & T.2

ISSUES CONSIDERED BY REVIEW GROUP

A. LICENSE CONDITIONS

1. REVIEW OF SMALL BORE COMPUTER CALCULATIONS
2. RIGID-RIGID SUPPORTS
3. INACTIVE SNUBBERS
4. THERMAL GAPS
5. PIPING SYSTEM WALKDOWNS
6. "QUICK-FIX" PROGRAM
7. SMALL BORE AND LARGE BORE TECHNICAL ISSUES

B. INDEPENDENT DESIGN VERIFICATION PROGRAM

C. PROGRAMMATIC ISSUES

Bore

T.2

LICENSE CONDITION 2.C.(11) ITEM #1

- I. YIN'S DRAFT INSPECTION FINDINGS RESULTING FROM
  - ALLEGATIONS
  - SITE INSPECTION
- NRC INDEPENDENT AUDIT
- MAJOR FINDINGS IN S/B COMPUTER ANALYZED SUPPORTS
  - IMPROPER MODELING
  - GEOMETRICAL ERRORS
  - POOR DOCUMENTATION OF DESIGN ASSUMPTIONS, DATA, AND JUDGMENTS
  - TECHNICAL DEFICIENCIES
- HIGH PERCENTAGE OF IDENTIFIED DEFICIENCIES
- NRC's REVIEW GROUP ON DIABLO CANYON PIPING ISSUES

LICENSE CONDITION 2.C.(11) ITEM #1 (CONTINUED)

- ORDER TO MODIFY FACILITY O.L.

- SUMMARY OF PG&E ACTIONS AND RESPONSE TO L.C. ISSUES (PG&E LETTER DCL-84-164 OF APRIL 27, 1984)

- PG&E/NRR MEETING IN BETHESDA ON MAY 9TH.

- MAJOR ISSUE RESOLVED: REVIEW OF ALL S/B COMPUTER ANALYZED SUPPORTS FOR L.C. ITEM 7 CONCERNS

- PEER REVIEW AUDITS AT PG&E OFFICE ON MAY 15 - 17, 1984 AND MAY 29 - JUNE 1, 1984.

- PG&E DOCUMENTS ADDRESING L.C. CONCERNS:
  - REVISED DESIGN CRITERIA MEMORANDUM (DCM) M-9
  - PG&E INSTRUCTION NO. I-55: INSTRUCTION FOR REVIEW OF S/B PIPE SUPPORT CALCULATIONS
  - PG&E INSTRUCTION NO. I-58: INSTRUCTION FOR DETERMINING MEMBER ORIENTATION (BETA) ANGLE IN STRUDL COMPUTER ANALYSIS
  - PG&E INSTRUCTION NO. I-59: INSTRUCTION FOR EVALUATION OF L.C. ITEM #7 CONCERNS

LICENSE CONDITION 2.C (11) ITEM #1 (CONTINUED)

° REVIEW OF (21) S/B PIPE SUPPORT DESIGN PACKAGES

° TECHNICAL ISSUES OTHER THAN THOSE CONTAINED IN ITEM #7 OF L.C. 2. C. (11)

- CLARIFICATION RELATED TO REVIEW OF COMPUTER ANALYZED BASE PLATES (INSTRUCTION I-55)
- COMPUTATION OF TRIBUTARY PIPE MASS IN THE NATURAL FREQUENCY CALCULATIONS
- GENERIC QUALIFICATION OF LUG INDUCED LOCAL PIPE STRESSES
- U-BOLT ALLOWABLES AT HIGH TEMPERATURES
- CONSIDERATION OF SHEAR CENTER LOCATION DEFINITION IN STRUDL ANALYSIS

° FINDINGS

- DEFICIENCIES DUE TO LACK OF PROPER DOCUMENTATION OF DESIGN JUDGMENTS

  CONCLUSION: NO IMPACT ON SUPPORT ADEQUACY

- DEFICIENCIES RELATED TO SOME CALACUATIONAL ERRORS

  CONCLUSION: INSIGNIFICANT EFFECT ON SUPPORT ADEQUACY

- THREE CASES WHERE THE LENGTH/THICKNESS RATIO FOR ANGLE SECTIONS EXCEEDED DESIGN LIMIT

  RESULT: MODIFICATION OF SUPPORTS
  IMPACT: INSIGNIFICANT

LICENSE CONDITION 2.C.(11) ITEM #1 (CONTINUED)

° FINDINGS - (CONTINUED)

- CONSIDERATIONS OF SEISMIC LOADS ON SUPPORTS STRUCTURES IN ALL S/B PIPE SUPPORTS TO BE COMPLETED BY OCTOBER 1, 1984

° CONCLUSION

SUPPORTS ARE ADEQUATELY DESIGNED FOR ANTICIPATED LOADS AS REQUIRED FOR ASCENSION TO FULL POWER.

T.3

CLOSELY SPACED PIPE SUPPORTS

B. F. Saffell, Battelle's Columbus Laboratories
T. K. Burr, EG&G Idaho
D. K. Morton, EG&G Idaho

Battelle
Columbus Laboratories

LICENSE CONDITION 2.C.(11)
ITEMS 2 AND 3

ITEM 2 LOAD SHARING BY CLOSELY SPACED SUPPORTS

ITEM 3 SNUBBERS LOCATED IN CLOSE PROXIMITY TO RIGID SUPPORTS AND ANCHORS

Battelle
Columbus Laboratories

LICENSEE PROGRAM

PROXIMITY CRITERIA

IDENTIFICATION

- INSPECTION
  - SHIMMING
- VERIFY LOCK-UP

Battelle
Columbus Laboratories

STAFF REVIEW

REVIEWED LICENSEE PROGRAM

REVISED INITIAL SCREENING CRITERIA

REVIEWED LICENSEE ANALYSES

INSPECTED INSTALLATIONS

Battelle
Columbus Laboratories

CONCLUSION

LICENSEE PROGRAM ENSURES LOAD SHARING AND SNUBBER OPERATION

Battelle
Columbus Laboratories

T.5

LICENSE CONDITION, ITEM 4

THERMAL GAPS

- L.C. REQUIRES PROGRAM TO MONITOR THERMAL GAPS IN PIPE SUPPORTS

- 37 GAPS MODELED IN THERMAL ANALYSES TO REDUCE STRESSES AND SUPPORT LOADS
  - ALL CASES $\leq$ 2" PIPING
  - GAPS FROM NORMAL SUPPORT CONSTRUCTION TOLERANCES
  - SOME GAPS PREDICTED TO FULLY CLOSE ON THERMAL EXPANSION

- INITIAL PG&E PROPOSAL TO MONITOR GAPS AT REFUELING OUTAGES IN COLD CONDITION
  - NOT ACCEPTABLE TO STAFF

- SUBSEQUENT PG&E PROPOSAL
  - REANALYZE PIPING WITHOUT GAPS
  - REQUALIFY PIPING, SUPPORTS, NOZZLES AS NECESSARY
  - PROGRAM TO BE COMPLETED BY END OF FIRST REFUELING OUTAGE

- PROGRAM ACCEPTABLE TO STAFF

LICENSE CONDITION, ITEM 5

PIPING SYSTEM WALKDOWNS

- L.C. PROVIDES FOR NRC PARTICIPATION IN HOT WALKDOWNS OF MAIN STEAM PIPING
- STAFF REVIEWED PG&E HOT WALKDOWN PROCEDURES
- SITE VISIT BY STAFF AND CONSULTANTS MAY 21-25, 1984
- STAFF REVIEWED RECORDS OF PREVIOUS WALKDOWNS
- MAIN STEAM AND RHR WALKDOWNS
  - BOTH SYSTEMS FOR HOT AND COLD CONDITIONS
  - MEASUREMENTS TAKEN AT DISCRETE LOCATIONS
  - PIPING WALKED DOWN TO OBSERVE ACTUAL OR POTENTIAL INTERFERENCES

RESULTS OF WALKDOWNS

- MAIN STEAM
  - TWO MEASURED DEFLECTIONS OUTSIDE CRITERIA
  - ONE UNINTENDED RESTRAINT
  - INTERFERENCE WITH TEMPORARY SCAFFOLDING

- RHR
  - ALL MEASURED DEFLECTIONS WITHIN CRITERIA
  - NO UNINTENDED INTERFERENCES

LICENSE CONDITION, ITEM 6

T.6

PSDTC AND DP

ISSUES

- TC PROGRAM SCOPE

- DID TC AND DP ACTIVITIES LEAD TO SIGNIFICANT DEVIATIONS BETWEEN AS-BUILT AND DESIGN CONFIGURATION

- UNRESOLVED DP

TC PROGRAM

APPROXIMATE NUMBER TC'S - 15,000

LICENSEE REREVIEW - 2,000

FURTHER REVIEW - OF THE 40 WHICH CONTAINED DESIGN CHANGES

RESULTS - AS-BUILTS AND CALCULATIONS AGREE

TASK GROUP REVIEW - 50 TC'S - DESIGN OFFICE AND SITE

CONCLUSIONS -

- o TC INITIALLY USED GUIDE, NOT APPROVED PROCEDURE
- o DID NOT COMPLY WITH INTENT OF TC PROGRAMMATIC PROCEDURE RELATIVE TO SCOPE OF TC CHANGES
- o NO SIGNIFICANT DEVIATIONS EXIST BETWEEN AS-BUILTS AND CURRENT APPROVED DESIGN CONFIGURATIONS

TC PROGRAM TERMINATED JUNE 8, 1984

DIABLO PROBLEM (DP) PROGRAM

DP PROCESS - 3,000 DP'S; ABOUT 1,000 RELATED TO PIPING AND SUPPORTS

ABOUT 200 TRANSMITTED DESIGN INFO

ALL DP'S WERE INCLUDED IN AS-BUILTS AND RELATED DESIGN CALCULATIONS

STAFF REVIEW

25 DP'S REVIEWED WITH SAME RESULTS AS LICENSEE

CONCLUSIONS

- o DP PROGRAM ALLOWED DESIGN INFO TO BE TRANSMITTED
- o DESIGN INFO WAS INCLUDED IN QA CONTROLLED AS-BUILTS AND ACCEPTED BY DESIGN CALCULATIONS
- o NO UNRESOLVED DP'S

LICENSE CONDITION ITEM 6 SATISFIED

IDVP

- SERS 18, 19, 20 - DESIGN VERIFICATION OF L/B, S/B PIPE & SUPPORTS
- ALLEGATIONS ON PIPE AND SUPPORTS
- PRINCIPAL QUESTIONS RAISED BY INSPECTOR
  - SPAN RULE ANALYZED S/B PIPE
  - DISTRIBUTION OF IDVP AUDITS
  - ITR DEVIATIONS
- TASK GROUP REVIEW
  - OVERALL IDVP PROCESS
  - IDVP METHODOLOGY
  - SAMPLE IDVP BACKUP PACKAGES
  - ITR COMMENTS

SPAN RULE ANALYZED PIPE

43,000 FEET S/B PIPE
5,000 FEET COMPUTER ANALYZED
3,000 FEET CURRENT SPAN-RULE
15,000 FEET FILE 44 SPAN RULE (OLD) AND 1,500 ASSOCIATED SUPPORTS

CHARACTERISTICS 15,000 FEET S/B PIPE

- PIPE SIZE < 2"
- COLD PIPING
- NO CONCENTRATED MASSES
- SMALL SAM/TAM
- OVERSPANS UNLIKELY
- 20 HZ MINIMUM FREQUENCY

CONCLUSION
15,000 FEET SPAN RULE S/B PIPING AND SUPPORTS AS ACCEPTED BY IDVP WAS APPROPRIATE

DISTRIBUTION OF IDVP AUDITS

CONSIDERED :

- o PIPING CONFIGURATION
- o BUILDING LOCATION
- o PIPING CHARACTERISTICS
- o GROUPS DOING ANALYSIS
- o DESIGN ANALYSIS RESULTS

CONCLUSION

SAMPLE DISTRIBUTION BY IDVP WAS APPROPRIATE.

IDVP FINDINGS BY T/G

- o ACTION BY IDVP ON S/B PIPING NOT IN CAP; ACCEPTABLE

- o SAMPLE SIZE DISTRIBUTION AMONG L/B PIPE AND SUPPORT ANALYSES ACCEPTABLE; BASED ON WELL FOUNDED JUDGMENTAL FACTORS

- o 1) PERCEIVED UNEXPLAINED ITR DEFICIENCIES-VALID CRITICISM

  2) IDENTIFIED DEFICIENCIES NOT SIGNIFICANT AND DID NOT DISTURB IDVP FINAL CONCLUSION

- o IDVP DETECTED RANDOM INPUT ERRORS OF THE KIND WHICH PROMPTED LICENSE CONDITION, ITEM #1

- o OMISSION OF MENTION OF LICENSE CONDITION #7 ISSUES CONSIDERED IDVP DEFICIENCY; HOWEVER, NO IMPACT ON SATISFYING LICENSING CRITERIA

OVERALL CONCLUSION

THE IDVP GOAL OF DESIGN VERIFICATION WHICH MEETS THE LICENSING CRITERIA STILL VALID

T.7

1-10-84

LICENSE CONDITION 2.C (II), ITEM 7

"PG&E SHALL CONDUCT A PROGRAM TO DEMONSTRATE THAT THE FOLLOWING TECHNICAL TOPICS HAVE BEEN ADEQUATELY ADDRESSED IN THE DESIGN OF SMALL AND LARGE BORE PIPING SUPPORTS:

(A) INCLUSION OF WARPING NORMAL AND SHEAR STRESSES DUE TO TORSION IN THOSE OPEN SECTIONS WHERE WARPING EFFECTS ARE SIGNIFICANT.

(B) RESOLUTION OF DIFFERENCES BETWEEN THE AISC CODE AND BECHTEL CRITERIA WITH REGARD TO ALLOWABLE LENGTHS OF UNBRACED ANGLE SECTIONS IN BENDING.

(C) CONSIDERATION OF LATERAL/TORSIONAL BUCKLING UNDER AXIAL LOADING OF ANGLE MEMBERS.

(D) INCLUSION OF AXIAL AND TORSIONAL LOADS DUE TO LOAD ECCENTRICITY WHERE APPROPRIATE.

(E) CORRECT CALCULATION OF PIPE SUPPORT FUNDAMENTAL FREQUENCY BY RAYLEIGH'S METHOD.

(F) CONSIDERATION OF FLARE BEVEL WELD EFFECTIVE THROAT THICKNESS AS USED ON STRUCTURAL STEEL TUBING WITH AN OUTSIDE RADIUS OF LESS THAN 2t.

PG&E SHALL SUBMIT A REPORT TO THE NRC STAFF DOCUMENTING THE RESULTS OF THE PROGRAM."

PG&E HAS TAKEN THE FOLLOWING STEPS TO ADDRESS TOPICS (A), (C), (D), (E) FOR S/B AND L/B SUPPORTS:

- o REVISED PG&E DESIGN CRITERIA MEMORANDUM M-9, REV. 10, "GUIDELINES FOR DESIGN OF CLASS 1 SUPPORTS"

- o ISSUED PG&E INSTRUCTION NO. I- 59, REV. 0, "INSTRUCTION FOR THE EVALUATION OF LICENSING CONDITION NO. 7 CONCERNS - DIABLO CANYON UNITS 1 & 2."

- o ISSUED PG&E INSTRUCTION NO. I-55, REV. 2, "INSTRUCTION FOR THE REVIEW OF S/B PIPE SUPPORT CALCULATION, DIABLO CANYON UNIT # 1."

- o ISSUED PG&E "DIABLO CANYON PLANT LARGE BORE PIPE SUPPORT REVIEW CHECKLIST"

- o EVALUATED THESE EFFECTS FOR COMPUTER ANALYZED S/B PIPE SUPPORTS

- o EVALUATED THESE EFFECTS FOR SAMPLE OF 200 L/B PIPE SUPPORTS

- o PG&E PROVIDED ADDITIONAL INFORMATION ON TECHNICAL TOPICS (B) AND (F) ISSUES IN THESE TOPICS RESOLVED.

RELATED TOPICS:

- CORRECT SPECIFICATION OF ANGLE OF INCLINATION OF ANGLE MEMBERS IN STRUDL INPUT
- BASEPLATE AND ANCHOR BOLT ASSEMBLY DESIGN CALCULATION
- PIPING TRIBUTARY MASSES FOR PIPE SUPPORTS
- BUCKLING CRITERIA FOR B31.1 COMPONENTS
- GENERIC QUALIFICATION OF LUGS AND LUG INDUCED LOCAL PIPE STRESSES
- STRUDL CALCULATION OF DISPLACEMENT AND LOAD RESPONSES OF ANGLE SECTION BEAMS
- QUALIFICATION OF U-BOLTS BY LOAD RATING

RESULTS:

- PG&E HAS SUBMITTED RESULTS IN THE REPORTS:
  - LETTER NO. DCL-84-219, JUNE 8, 1984
  - LETTER NO. DCL-84-223, JUNE 11, 1984
  - LETTER NO. DCL-84-253, JULY 3, 1984
- RESULTS FOR S/B PIPE SUPPORTS:
  - WARPING STRESS SIGNIFICANT IN RELATIVELY FEW MEMBERS
  - ALL S/B SUPPORTS REMAIN QUALIFIED, EXCEPT FOR THREE
  - THREE ANGLE MEMBERS EXCEEDED LENGTH CRITERION
  - VERIFICATION OF RESULTS NOT COMPLETED
- RESULTS FOR SAMPLE OF L/B PIPE SUPPORTS:
  - WARPING NORMAL STRESS LESS THAN OR EQUAL TO 40% OF BENDING ALLOWABLE

- o WARPING SHEAR STRESS LESS THAN OR EQUAL TO 50% OF SHEAR ALLOWABLE.
- o EFFECT OF WARPING RELATIVELY SMALL IN MAJORITY OF SUPPORTS.
- o ONE SUPPORT FOUND UNQUALIFIED, DUE TO INCORRECT LOAD CONDITION. PROBLEM RESOLVED BY MODIFICATION.
- o ADDITIONAL SAMPLE OF 30 L/B SUPPORTS CHECKED FOR INCORRECT LOAD CONDITIONS. NONE FOUND.
- o ALL SUPPORTS CHECKED REMAIN QUALIFIED.
- o VERIFICATION OF RESULTS NOT COMPLETED.