CHARLES STOKES/12-7-83

DUKOFF: Good morning. Today's date is December 7, 1983. The time is approximately 8:25 a.m. This will be the interview of Charles Stokes, being conducted at the Diablo Canyon Nuclear Power Plant. Mr. Stokes is represented by Mr. Thomas Devine as his counsel and I understand that you are his counsel. Is that correct, Mr. Devine?

DEVINE: That is correct, sir.

DUKOFF: Thank you. For the NRC Technical Staff, present are Mr. Thomas Bishop, Mr. Jess Kruze, Mr. Esa Yin, Mr. Samuel Reynolds, Jr., Mr. John Fair, Mr. Stuart Ebnedder, Mr. Dennis Kirsch, and Mr. Marvin Mindonka. Representing the Office of Investigations are Mr. Eugene Power and myself Phillip DUKOFF. At this point in time, I will turn this over to Mr. Bishop, who will start the interview.

I have asked each of our staff members before they make their statements to provide their last name which I just didn't do, for the purpose of if it's decided to transcribe these tapes, we would know who the speaker was. So, I'd just like to remind each of our members to do that. I think also that it's important that the principal speakers put up with the inconvenience of having to hold this microphone so that we can have a clearly auditable record. The stated purpose of our effort this morning is to gather additional information. We have received your affidavit dated November, '83. We have had an opportunity to go

through that and in the course of some of our follow-up work to this point, we do have some additional questions we'd like to ask your assistance on. We would also seek any additional information that you might have that might help us in this regard and we'd appreciate anything along that line. Mr. Ebnedder is the team leader of this effort on the site. Do you have a particular format that you would like to follow as far as individuals go?

EBNEDDER: This is Ebnedder. Not particularly. We each have gone through the affidavit and have identified areas where we would like clarification. Some of these areas we would like you to also point out to us in the field. We will take you on a tour of Unit 1 and have you specifically identify areas that we can look at. I think we can just, we might go through the affidavit page by page, and then ask each staff member as we go by the page, if he has any questions in that particular area. And I think that will be the easiest way to do it. Is that all right with you?

??: Fine.

EBNEDDER: Staff members, is that all right? Sam, Esa?

??: We don't all have copies of the ...

DEVINE: While we're getting seated here there was one point that came up last night that I was a little concerned about and just wanted to check with you. The Mothers for Peace told me that they had received a call from the News Media asking if there would be a press conference surrounding Mr. Stokes' plant tour. And we were a little bit concerned that the word of this plant

tour had been announced in advance for the simple reason that he'd just as soon not have people ready for him when he comes in. And I wanted to inquire about that as well as whether the affidavit has been shared with the applicant or Bechtel or any of the people that we'd be checking.

BISHOP: The answer is no to both of those. We have not provided any material to any parties outside the NRC nor have we, to my knowledge, informed anybody other than security people just recently that we would like to have Mr. Stokes and yourself come on site and go on a tour with us. We've had no press discussion, no discussions with the press to my knowledge. I did discuss this with Sandra Silver of the Mothers for Peace in trying to run you down over the last few days, but other than that, that's the only person outside the NRC in addition to the security people, which we had to line up for clearance to get on site.

DEVINE: This is Devine and you might want to check on that then because we didn't and Ms. Silver was horrified that the press was asking her about it. And she assured me that she didn't and asked the reporter. He said he'd learned about it from the NRC. So you might want to just check with how that occurred. And I would refer you back to Ms. Silver.

BISHOP: Thank you.

CRUZE: On this question of the affidavit, soon after we got here we did learn that the licensee had obtained a copy. I attempted to find out how that might have happened. I understand they obtained it from media sources.

DEVINE: I would think that they would have gotten it from the Department of Labor. That was my expectation. We only gave it to one media source and that was the day before the Commission received it and he told me that he wouldn't be sharing it. That was kind of a condition of getting it. So, I would guess that they could've gotten it from the Department of Labor and that's unavoidable. I wasn't sure how fast their system operated.

BISHOP: Okay, with that let's proceed into the technical session. Again, our general format we thought would be to go through the issues and ask our questions and seek any supplementary information you may have. Following the technical area the representatives from the Office of Investigation may have some additional questions from their area or they may ask their questions while we're going on, whichever is most appropriate. Let me turn it over then to Mr. Ebnedder, Mr. Yin, and Mr. Reynolds. They will be the principal questioners and I'll turn it over.

??: Thank you. Let's go page by page and discuss topics as we go. On page 1 is background on Mr. Stokes, his history and qualifications as an engineer and lawyer so forth. Does anyone have any questions on page 1? Page 2 is more data on Mr. Stokes, background and the issue starts to appear of control documents. That moves on into page 3 on control documents. Any questions on control documents?

??: Could I make a suggestion? If possible, you could sit in between Esa and me. It would be better. Then both of us could see that.

BISHOP: This is Bishop again. If at any time we're talking this morning and you feel you need a break or want to get a cup of coffee, we do have some in the back on the tray there. Just feel free to say let's take a break. I recognize it's stressful enough for you at this point without making things any worse.

??: Jess has instructed there will be no more interruptions. Any issues on control documents? Esa.

YIN: Esa Yin. On the affidavit, page 3, second paragraph. You stated the size of gaps between hardware controls the definition, such as whether an item qualifies as a restraint. I would like Mr. Stokes to clarify what he means about this sentence.

STOKES: This is Charles Stokes. By the size of gaps between hardware controlling definition, what I was intending to state was in every restraint, depending upon the amount of gap between the pipe and the restraint, it will be considered either a restraint or a non-restraint. In the case of a lateral restraint, or dead weight support, if it's not bearing on the pipe, or within a sixteenth of an inch which is allowed in the industry for thermal expansion, it's not considered a support. At Diablo Canyon if it was not within a sixteenth of an inch, it was considered a non-restraint. In the case of anchors, it's a direct contact and it had to be welded. No gap, and therefore, full restraint. That's what I meant by the size of the gaps controlling the design or support conditions.

YIN: Esa Yin. Mr. Stokes, do you are aware the present design of the seismic restraints allows a maximum of one-eighth inch gaps, and still qualify as a seismic restraint?

STOKES: That's true. This is Charles Stokes. Typically, that's supposed to justify one-sixteenth each side of the support. However, there are cases where the variance if plus or minus from zero on one side up to an eighth maximum on the opposite side. However, the overall gap on any one particular side supposedly under a seismic condition that could exist would be one-sixteenth on all sides and no more than an eighth overall.

YIN: Esa Yin, again. Based on the experience we see at the operation plants, during the initial thermal startup testings, not always the design movements matches the actual movements that we see. One point. The second point is during the normal plant maintenance, when we check the snubber hot and cold position settings, those settings vary from shakedown to shakedown. So as far as the design engineering is concerned, whether or not one side is altogether one-eighth or one-sixteenth inch on each side, doesn't really make any difference as far as in calculation of the thermal movement as far as the design basis earthquake and operation basis earthquake is concerned. Do you agree?

STOKES: Um, it's true that the actual location within a support of a pipe will vary based on operation. The supports are considered installed at a zero operational time frame and installed with the tolerances that construction are instructed to install them to. Which typically, that it's sixteenth each side. Having known that this plant was operating or had at least operated at hot testing, all the engineers here were aware that the actual gaps and the support would not be exactly one-

sixteenth or even close on any side. All the design that I worked on and anyone that I know of worked on here used an overall gap of an eighth. But if a gap already existed of an eighth according to the design manuals on this plant, that is not considered a restraint. In other words, we were considering our work at a zero base in time design. Not after operation. If we had designed this plant strictly as though it was operating, then we would have taken an eighth. But we had to assume for design that it had never operated and that the gaps weren't constructed according to the tolerances per the ESD 223. Which would have allowed at most a thirty second over that. But we did not allow for that in the installation per our checks. The critical thing was to us, and as far as stress was concerned, if the pipe had moved during warm testing, and already had a new set, that is a permanent position assumed from that, then the new location justified where the hangar should have been to start with. And if the gaps were not correct at that time, to offer the restraints per that condition, they weren't correct. L9 was the governing design document which said if the gap exceeded an eighth, or was an eighth, there was no restraint.

BISHOP: Just a point for our staff. I'd like to make sure our line of questioning does not take the frame of does Mr. Stokes agree or disagree with a particular technical point. Our line of questioning should be along 'do you have further information or clarification of what the statements mean?' We're not here to ask him what his technical opinion is or put him in that kind of pressure. It's primarily just to get additional information. So, ...

STOKES: This is Charles Stokes. I'd like to say something along those lines. When a I come on the plant site, the first controlling document I request in the design are control documents, design documents. Typically, any job I work on takes quality control two weeks to issue documents in a controlled manner to new personnel. Once I receive those documents I read through them, I determine what codes and standards that the plant is supposed to be designed to. I also look at any project supplied information to clarify. And any answer I give I will not give my personal feeling. I will give you what I know to be hard facts concerning the gaps, the design conditions, and other things to consider which management did not want to consider.

DEVINE: I'd just like to add I appreciate your concern, Mr. Bishop, but we don't feel any particular restraints on how intensively Mr. Stokes is questioned. The more that Mr. Yin puts him through the mill, the better chance we'll be that we didn't miss anything today, no stone was left unturned. Every NRC engineer or investigator whose really been serious about the assignment has just put my clients, pinned them up against the wall, and they've passed the test. So we welcome all pressure he can offer.

YIN: Esa Yin. If I understand correctly, what you are saying, Mr. Stokes, is the fact that what you have seen perhaps in some occasion that stress group was manipulating the stress level, trying not to take account of the thermal stress, thermal loadings rather. On some of the restraints, and also thermal stresses on some of the piping. Because, in fact, if you really

see the one-eighth inch now, you may change next time. So there's no way a conscientious design engineer will factor the one-eighth inch that you are going to create for the restraints or you have seen it exist at the restraint. Is that correct statement?

STOKES: Yes, I'll agree with that. The gaps are primarily concerned with thermal loading. Seismicly, it doesn't matter whether it's a sixteenth or an eighth. But the thermal loadings in many of the Class 1 supports far exceed the seismic. As a result of that I took several pictures of U-bolts, which, not only the U-bolt but the supporting structure was deformed based on the previous thermal loading. I tried to take pictures as close to vertical alignment as possible to make it very obvious that there was a large amount of distortion. A lot of these supports were Class 1 systems but they were in the Ox Building. I happen to have a very limited time frame to take pictures. I used my own camera and I had a pass that was good for two days. A friend of mine asked me to come down and take these pictures of the U-bolts and the supporting plate. But they do indicate that the thermal loading is very critical to these structures and that they are a zero gap on one side and already exist distortion to the support.

EBNEDDER: Mr. Stokes, this is Stu Ebnedder. Can you, on the plant tour, specifically identify where these supports are?

STOKES: Yes, it may take me a few moments of recollection. I may have to pull some copies of the plant organization or look at drawings, floor level drawings, but I do

know where, in the general area, all the pictures I submitted exist. And as far as I know, up to the date I was terminated, these problems had not been corrected.

??: Dennis, do you have any questions on these pictures? You were talking about those, weren't you?

KIRSCH: I was able to locate the accumulator 1-2 discharge line pictured on _____ pictures on the far right. The other three pictures, or four pictures, I could not locate and any help that Mr. Stokes can give me in that regard would be appreciated.

YIN: Esa Yin. I guess I don't have any further questions in this area. I would like to observe the actual condition while we were conducting the site tour.

EBNEDDER: Any other questions, this is Ebnedder. Any more questions on control documents? I think we will probably ...

YIN: Yes, I do have an additional question on page 3. In second paragraph, shown on page 3, it was stated, let me paraphrase it, _____ and _____ used by _____ were checked to being consistent with those on the control documents. And specifically, Mr. Stokes mentioned the assumption used in fact differ from those on control documents in thirty percent of the cases. In this particular area, I have two specific questions to ask. First, approximately how many calculations were checked by Mr. Stokes? And second, can Stokes provide some of the calculation numbers for us to check and verify?

STOKES: That's a big question. Typically, we were responsible as far as production here at the plant to produce in the neighborhood of one and a half supports a day. If production is checked, I believe I will be beared (sic) out that I was in the top production of anyone here at the site. Which, in effect, would say that over a period of year, I did hundreds of hangars. The exact number I can't say. Because of the speed required by management, I did not make additional copies for myself on many of the designs. It was hard enough to get copies that they needed for the checking and the work that was actually required. I do have copies of many supports where the design assumptions are incorrect. I do have a list of specifically, I had intended to request that these documents be located and made copies for the NRC immediately on my arrival. I was very much afraid that if anyone on the site knew that I was coming, they would completely review certain areas of the calculations which had indeed caused them many hours of work and modify those hangars, clear up records, and correct things which I have copies showing to be incorrect. I would like to turn over a list of approximately twenty or so supports, some of which I have the very first drafts of the calcs showing them performed by one set of engineers. I believe when they locate the final draft of these calcs, they will find that the final set of calcs was performed by another engineer. There was absolutely no mention or no record of the earlier engineer's work. The copies I have show that the calcs failed, the supports failed for one reason or another. In some cases, the gaps caused extreme load problems.

And in other cases, I am aware that strudel was used quite deliberately in up to like seven runs, making modifications to the design assumptions to try to get hangars to work. I also have a copy of the control log for these documents and in some cases they didn't completely update the log to show the final engineer's work and they still left the original engineer showing but the final calc shows someone else did it. I would like to turn this over to someone in the NRC, Mr. Bishop, and I would like, as quickly as possible, without disturbing our meeting, to have someone obtain those documents for them, because I am very much afraid they will be tampered with.

DUKOFF: This is Dukoff. Mr. Stokes has presented Mr. Bishop with an eight and a half by eleven piece of yellow paper with a series of numbers on it. We'll be marking this as Exhibit 1.

BISHOP: I don't know, is it beneficial to have these numbers recorded into the transcript or would we just attach this document?

DUKOFF: If it's acceptable to Mr. Devine, we could just mark it as Exhibit 1. And then we can keep it as an Exhibit to the interview. Is that acceptable to you, Mr. Devine? I'll be marking with my signature on the back that we received it from you on this date.

BISHOP: Probably missed that. Bishop, turn it back over to Mr. Yin.

YIN: I have reviewed some of, this is Esa Yin again. I have reviewed some of the calculations in both support group and

the stress group. Many of the calculations that I reviewed show a number of revisions. In most cases, the first revision may be or may not be a rev number. Some cases have revs 0; some cases do not show a rev number. Those are the considerations that, those are the hangars restraints and may not have received sufficient calculation. And subsequently, does require further review in providing the backup calculations. And rev 1 or rev 0 usually indicates the hangars, have been calculated based on preliminary assumed data, or loading data. And subsequent revs, they change the preliminary calculation to final calculation and the last ref normally showing the as built evaluation. My question to Mr. Stokes here is that particular exhibit, Exhibit 1, that was presented just now, what time frame, and what condition are those calculations? Are they all in as built condition or in various stages of upgrading the system?

STOKES: I'm glad you asked that. I'd like to try to, maybe everyone here understands how this plant was designed in the first place. Let me point out that when I came to this plant, we were supplied no preliminary calcs from existing work. The drawings from the hangars in many cases were well up past rev 0, they were up to rev 4, 5, 7, the number varied. I think the largest I saw was seven. Many of the drawings had been stamped as built two or three times. They had supposedly been reviewed and reviewed. We, in effect, were instructed not to assume anything we received was any good. We also were told that if any calc existed it was at such a state of condition, that it could not be used to verify the support as it existed. We did perform

from November 8th through March what was considered a rev 0 calculation noting that there was some kind of calc somewhere on each of the supports possibly, in many cases none, but we did reference those calcs. We never saw those calcs. We did see, I saw or was shown at one time one of the calcs. It was a combination stress and a combinaton hangar calc. It wasn't what I consider a valid calc for either, but what I'm trying to tell everyone here is the rev 0 calcs we were instructed to perform were supposedly under a reverification program. We were supposed to determine whether the support, as existing, was correct, could stand the loads given to us by stress, the gaps, the configuration, everything met code standards. We, the group of engineers and myself, we reviewed these supports strictly from an as built drawing, and with the personal lockdown of each in many cases. I won't say that in all cases every hangar was physically looked at. To make a field trip, especially when we were never given security clearance, and we were required to come up with an escort, and to put out one and a half hangars a day documenting cover sheets, loads and everything else, made it impossible to look at some supports. Things that looked questionable, supports that looked beyond, I mean just the drawing looked questionable, we did look at. Very simple cantilevers that looked well over design, we didn't look at. We didn't check the gaps on the bolts, we didn't have time. We were not given time. If we had, we wouldn't have been here more than two weeks. The process here was they hired thirty-five guys, they filled the trailer, they gave them preliminary calc and then they gave them a set of calcs

to do. They didn't even have control documents. They were informed to start producing. If they didn't produce in two weeks, they were terminated. They were replaced with more people. Production had to increase. It was simply a very fast paced approach. But I was very shocked when I came to this plant and I found that there were no control documents concerning the design. I've worked on plants all over the United States and it's true that in many cases, they are not as good as they are now, people tend to be more critical of plants designed in the last four or five years, than they were fifteen years ago. But I came from an area, Atlanta, and I worked for a utility engineering firm there for five years after school. I did have associations with Bechtel. I found that Bechtel's document control from scratch on plants that they had started from day one to be exceptional. Their cross-reference system, their computer printouts, giving you an ability to research a hangar was just unbelievably accurate in my opinion. I did find problems on other plants where the as builting was what I considered up to par. I know why. Typically, Bechtel sends down designers, draftsmen, they don't send high level, high paid engineers to do as builting. They do not have instructional how to determine the weld. They look at a hangar and they say everything's a fill-in. In many cases, they're not. And even if they weren't, they don't have the experience of looking at a weld and determining whether or not it was prepped and how it was made. And many defects from that kind of thing come into the welding. However, most designers and draftsmen that have done work, that I've

worked with, including this plant, are capable of taking dimensions down, noting gaps. As far as gaps on U-bolts, they've never been given filler gauges, the QC here were given little pieces of wire which supposedly worked to compliance with the gaps and they were on a string for them to use and so typically gaps are just a visual thing. You estimate whether it's an eighth or more. In many cases, it's more than an eighth, but if you looked at, you give it the benefit of the doubt. What I'm saying is that things that were measured here that I've noted are beyond any doubt. I mean, they were gross. There's many things in this plant I don't like because they weren't adequate equipment to do a good job doing their job. But many of things that I tend to overlook in my personal engineering knowledge, I use my own judgment a little bit, everyone here does. Every engineer on this job site uses his knowledge, his engineering judgment, depending on his background, how he was born and raised, where he went to school, what kind of life he lived. Most of them, their engineering judgment probably isn't worth 10 cents. Some of the guys, I value their judgment very much. In any case, any of the work we did here, our primary objective was to validate within the procedures what existed as being acceptable. We were batting more than fifty percent failure on all areas of investigation. We only, and I'm not sure anyone here is knowledgeable of this, I've been told they did a hundred percent seismic by a reporter. To my knowledge, up to the time I left, there was only and never was any more than a ten percent sample done on this plant. The attitude of management was from

the beginning they would perform ten percent on a random basis supposedly, they would try to prove that ninety-five percent passed. There was a five percent failure which statistically they would be agreeable to buy off. From my statistics background, that's an acceptable figure. I also contacted a Cal Poly professor of statistics in regards to one of my noted areas that I didn't like, particularly the U-bolt load allowable switch they wanted us to use on Unit 1. He agreed with me that ninety-five percent and the method was an acceptable procedure for validating the large mass of data. However, in the case of my U-bolt program, or analysis in reviewing their program, they did not use a statistical mean, they used the average. It's very rough to say they complied with the Code Section which allowed them to do what they did. The Code says that they could have performed only one calc and reduced it ten percent and used that figure. They did use five load cases. Statistically, according to the professor, they would have had to do in the neighborhood of a hundred to come up with a reasonable accurate number and, based on the statistical average of the data I got in their analysis, when I did my calcs, the best they could have done was just slightly over what ITT Grinnell supplied at 650 degrees. They stated in their report it was only at a 120 degrees, which I, using the ability, or training I've had, I could see where they would get a slight load increase based on temperature not being as high as it should be because the allowables are reduced at higher temperatures. I may be veering, and I'll stop at this, but I hope I did explain the problem with the drawings, the

calculations, they were extended beyond the rev 0 stage. When they split the trailers, the calcs we had performed were, we were told would be nothing more than a review for control document assumptions. However, the people they put in that trailer. They never questioned anything we did. I had friends who were transferred to that trailer that kept me informed. They did not just give a cursory review for accuracy and assumptions. In many cases, they completely redid the calcs and I can prove that.

BISHOP: Thank you, Mr. Stokes. Before we proceed further, I want to introduce a new member who just joined our group. It's Mr. Mark Hartzman, oh excuse me, Paul. Mr. Bezler is with our Office of Nuclear Regulation in Bethesda. Paul, we are recording this session and we would ask that if you have a question that you'd like the mike, and we'll pass it to you. And you state your last name and then proceed with your question. Also, Mr. Cruze has a few words to mention in reference to the list you just provided us.

CRUZE: Ah, yes, this is Jeff Cruze. I just wanted you to understand from the very outset here of our undertaking to retrieve the documents from Exhibit 1. The arrangements that I've made, I have Mr. Marvin Mendonsa, who will accompany whoever within the organization here that will be necessary to make a prompt retrieval of those documents. And Marvin is there just so that we know the process by which these documents are retrieved from their files. Is that agreeable to you? I think that will expedite getting this matter taken care of while we continue with our session here.

BEZLER: At some point, this is Paul Bezler. At some point, I may like to see a number of drawings that are mentioned in this disclosure. And since you're going to be getting documents, ...

CRUZE: This is Jeff Cruze. I only want to give some priority attention to the documents that Mr. Stokes has asked that we retrieve. I think for our purposes we'll give that whatever priority it deserves. [question from someone - unclear] I'll deal with you separately on that. I just would like to confirm that the arrangements we've made are acceptable to Mr. Stokes and Mr. Devine.

STOKES: They're acceptable to me.

EBNEDDER: Stu Ebnedder. Mr. Stokes, let me pursue just very briefly, I don't want to spend a long time on it. On this statistical, could you describe for me your technique? Was it large sample size, small sample size?

STOKES: I don't have with me a copy of the program they used here at the plant. I used the data supplied to me in a report that concerned the U-bolt test program. It can be located down in the control office. The sample was five tests on each particular design condition. That was established by PG&E personnel. The method for testing was PG&E personnel methods. All I simply did was review their data, their report, I noted things I questioned and I noted the way they used the data was the way I said. It was not a statistical, it was strictly an average.

EBNEDDER: I was hoping for, you said you did some statistical calculations and checked them with a professor. I

was interested in the technique you used and whether there was a specific name, normally, there's about five different techniques you can use. Would you describe them?

STOKES: Well, statistically, there are many methods. At the moment, boy, I got pinned down. I tend to, when I get put under pressure, I tend to slip. Um, I do have copies that I can pull out of my formulas that I used. I didn't have any statistical books here with me at the plant. The closest thing I had covering statistics was a new, recent World Book encyclopedia and the reason I called the professor was to substantiate the method I used out of all the methods was the reasonable way to use the data. It was a critical, oh God, I, well, not majoring statistics, at the moment I can't remember the precise method. Like I said, I can supply that.

DEVINE: There is undoubtedly going to be a number of questions that Mr. Stokes can't answer from memory and he's going to have to go back to his notes. I'll make a star of each of those and you all can too and we'll check to see if we have the same follow up questions.

EBNEDDER: That's fine. You say you can provide us with a copy of the statistics that you developed. We would like to see those for clarification purposes. Any other questions, we're on page 4.

YIN: I think we got some side track. This is Esa Yin here. Let me readdress my specific question and I appreciate the general comments from Mr. Stokes but the specific question that I raised previously has not been addressed by him. The first

specific question let's assume they have a calculation Rev 0 shows no calculation, Rev 1 the calculation was performed on site. (end of side one, tape one)

BISHOP: We went off record to turn the tape over. We're now going back on record at 9:27 a.m. During the interim, a break was taken by all the participants in the interview. Bishop speaking. Before we proceed with the pages of the affidavit you supplied, we have one question from a statement that you gave a little earlier in the morning that has to do with taking the photographs out in the plant. You mentioned that a friend had asked you to take some photographs. A question that occurred to us was is this perhaps another individual who might have knowledge of the types of problems you're talking about and could help us get an additional data base? Could you identify that individual for us and tell him, give us an idea if he might have knowledge of this area.

STOKES: In answer to that question, this is Charles Stokes, try to limit my answers to being exactly what's asked. I shouldn't have pointed out that I was asked to go by a friend. He does have knowledge, he does still work here. And as far as giving you his name, I'm not at liberty to do that. At his wish, he wishes to remain anonymous. He has agreed, if he could stay anonymous, to providing those conditions are met in advance, give testimony. At least to me, and to my attorney. I would have to ask him personally if he's willing to give anything to the NRC. I'm not, my whole attitude on this whole thing was. I never at any time, wished to put anyone in jeopardy as far as what he does

as a living. I do know people who support me. They've, on a personal basis, they've been very supportive. They do, however, have more constraints upon them as far as earning a living than I do and I will not at any time, do anything that they're not acceptable to in advance.

DEVINE: We'll sure cooperate on trying to help you follow through on these issues within those limitations. And there's a lot of ways we can do it. For example, we could suggest to you that you all contact individuals who work in a certain area and just come in of your own volition. And, as a matter of course, you'll cover the right person and they won't be so much on the spot coming forward as an alleger but rather responding to your inquiries which they don't have any choice about. And we just thought we'd see how things went today and what you needed for followup. Trying to be as creative as possible to help you without threatening them.

BISHOP: Bishop, I appreciate your concerns for that. I do think it's very important if there is another individual who has knowledge of these or similar issues that we do have an opportunity to talk specifically with him. And I would seek your cooperation in making him available to us or identifying his name. I can tell you that we would do our utmost to protect his identity. We always have the possibility of it falling through but we would seek to the best of our ability to protect his identify. But I think it is very important that we have an opportunity to talk with him if he has knowledge of what you feel or what he feels are improper activities at the site.

EBNEDDER: Any further questions on these control documents and statistical techniques?

YIN: Mr. Stokes, I'd like to ask you two specific questions regarding those calculations that you have checked. As I indicated earlier that _____ calculation, let's say, assume you got three or maybe four stages, say, let's assume Rev. 0. That was with no calculation at all. And Rev. 1. You have performed calculation based on preliminary loading assumption. And Rev. 2, you design these hangars based on final loading condition. And Rev. 3, is the as-built evaluation. Now which of these Revs. do you personally involve and check there was 30% to be improper?

STOKES: Okay, the Rev. 0 on this plant was not a no count. That was Rev. A, or a dash. That's all it was in the control block on the calculation -- a dash. Any reference previous _____ calculations, it was given no number. Rev. 0 was, like he says, preliminary loading. However, Bechtel's procedure on this plant was to maintain a preliminary status for this calculation's write-up until, to my knowledge, two weeks before I was terminated. When they finally decided to sign those off as being final. They were the same calcs. There was, by that time, several revisions to some of the calcs. To my knowledge there was no as-building of them. At the same time these calcs were being finalized, preliminary loadings and everything, they were at the same time in the field being constructed, modified, or, if there was any. I'm not sure there would be a 3 as-built. I'm sure it might happen sometime in the

future, but ... what we were told when we performed these calcs is ... it's true that the Rev. 0 were preliminary. They were, and may be, the final calc. Rev. 0 ... may also be as-built. The review that I stated was supposed to have been performed in March following our calculations on these reports was, as stressed, finalized their preliminary loadings. They were supposed to review the calc for loads to see what loads were used. Whether they were conservative, non-conservative, and at that time make them final. They were also supposed to review the changes that were required by M9. Because, by the time I left here, M9 had 12 revisions. Each revision changed certain things in the design that were affected in each of the calcs. To my knowledge, they've never finalized M9. Technically, there is no final calc, even at the moment, even though they've been finally issued as final. They're still subject to change, depending on any new reanalysis.

YIN: Based on my personal observation, this week and last week, they are final calculation provided following the preliminary calculation, and this also as-built evaluation that I personally reviewed. So based on the information that you have provided to me, I can only assume that during your employment at the site, you were performing and checking the preliminary calculation based on the preliminary load assumptions. Is that correct?

STOKES: I would have to say yes.

YIN: The second specific question related to the questions regarding _____ documents. Is that the fact, when you

talk about the assumption used in fact differ from those on _____ document. Are we talking about the assumption preliminary loads? Are we talking about the incorrect use of formulas? Are we talking about confusion maybe based on the fact the allowable loads differ from one, the design document, to another? Can you be more specific on what is the load assumption whether it is before calculation, or after the calculation, or in the process of doing the calculation? Can you be more specific than that?

STOKES: I'll try. Some of the problems I listed in my statement cover this. They are listed as separate items. One of the DRs that I issued just before I was terminated concerning the bolt spacing on the plates, I found out that we had never been supplied an M9 or any of our design manuals. The size of the shells for anchor bolts, concrete anchor bolts. The vendor catalogs did not show these dimensions; a few of the people may have had information from other design sites. The allowables for the spacing on the bolts was supposed to be based according to M9 Rev. 12, the diameter of the hole for the bolt ... or for the anchor. The reason I wrote that DR is, to my knowledge, I didn't have the shell size and unless someone brought it with them from another plant, he didn't have it either. Also, we were instructed in M9 as far as a design assumption that we could check the support movement in the support direction to a .025-inch movement. Rather than doing a stiffness calc, and if it was within that .025 inches it was acceptable for stiffness. The problem with that is in the U-bolt allowable loads, in their test

program they deflected the U-bolts to .025. If you add up all the displacements that they technically used in a U-port support, you'd have had .025 if the allowable load was pushed to the limit. A .025 maximum for the support, and if the gaps were not correct, an additional movement. M9 states that the total restraint movement was .025. Now I know for a fact on the U-bolt supports that was not even close to being correct in many cases. That statement is primarily concerned with things that changed in M9. The methods for doing the base plate calcs. We were instructed per a memo which stated our work here, that on small bore Bechtel assumed that small bore plates did not flex. There was no displacement from the base plate involved in a support. From my previous work on many stancheon supports that can lever off plates, there is sizeable movement affected with the plate displacement. The reason they wanted to make that assumption is they assumed the loads were very small, they were adequately braced, and that there would be very marginal displacement. They did however ultimately end up deciding to do finite element plate analysis on the supports. They only checked stresses to the plate in the finite element. They did not ever go back and include that displacement at the support point due to the plate movement to the supporting steel, which is added to these other movements that they would have allowed in the calculation. There were other cases and other points, but I'd rather not make a complete list of all of them. I don't think it'd be worth while at this point. It would take an awful lot of time.

DEVINE: Would you like that Mr. Yin? Would you like him to prepare a list of other examples on this?

YIN: Yes, I do appreciate you can give me more information in that. You mentioned allowable bolt spacing, and the U-bolt that may be defect more than .025 inches, and the M9 base plate calculations. Those are not assigned in my areas. Look's like I can go home now, but I do appreciate if you can provide me some additional information in regard to other areas that you have concerns, such as formulas, such as basic design allowables, and such as design of _____ that was incorrect, so in the area of actual calculation other than the other areas that you just mentioned, I would appreciate you provide me more information.

STOKES: Let me give you one. Concerning formulas. Not knowing exactly what each person's area ... if you'll ask me a question telling me what area you're in, I'll try to provide something. When you mentioned formulas, there's one formula concerning the U-bolt allowable loads which was dictated on Unit 1. The U-bolt loadings were too high, which were part of M9. They required that we used those loadings even though we disagreed with them. They also forced us ... or wanted us to use a formula concerning the interaction of the U-bolt loadings. That formula was based on a square of both terms ... in summation of those terms. ITT Rennell and they're ... let me stop for a second.

DUKOFF: Time is approximately 9:44 AM and Mr. Stokes has stopped for a minute to change the tape in his tape recorder.

We'll be going off the record at approximately 9:44 as Mr. Stokes works with his tape recorder a little bit.

DUKOFF: This Dukoff. The time is approximately 9:46 AM. Going back on record. Mr. Stokes has his tape recorder running again. Mr. Stokes....

STOKES: Concerning formulas. Typically that formula ... and past experience has not been square by square. It tends to make the calc unconservative. The closer you get to one with any factor, it tends to put it away from one. The loads for the U-bolts on Unit 1 that they wanted us to use, which were in my opinion too high, also included that formula. It wasn't something people brought with them. It was something that was in a controlled document at that time, meaning the people didn't have that ... it was supplied in a drawing; the number is 049243. It was supplied by PG&E. It wasn't part of M9 to my knowledge. I should note that I worked on both Unit 1 and Unit 2. I only worked on Unit 1 up through March. I did work in the quick-fix fill area on Unit 1 from June to near the end of the summer, almost up to my termination, and I was given the responsibility for modifications to snubbers in the field that had problems in installation. But as far as providing formulas that people brought with them, and design assumptions from all plants, all I can say is I don't have copies of those. I do know I was shown documents by other people from Susquehanna. I myself had documents from Farley, Davis Bessy, ... they also were old Bechtel methods of calculations. Anchor bolt calcs, and so forth. Due to the fact we were not supplied with M9s or guides

as to how they wanted us ... or methods they wanted us to perform the work, the people used what they had in their background. That's ... I'm sure many they still ... many of these documents are still in the trailer over there.

EBNEDDER: Mr. Stokes, again I'm just gonna ask you, and you can say yes or no. Could you provide us with names of people who use their own personal documents?

STOKES: Well I could, but like I said earlier, I'd rather not without their approval.

EBNEDDER: Thank you. In relation to the U-bolt on page 5, you mention that ratings for U-bolts that we purchased in some cases were one-third to one-fourth more stringent than those on drawing 049243. Could you give us some specific cases. You said "some cases." I would like to know if you have any specifics. If you don't have them now, could you supply them at some future date?

STOKES: Well, I've got copies of ITT Rennell catalogs. Many of the people in the design group also have copies of these catalogs. The catalog themselves supplied by the vendor gives a recommended load rating. It does state that there's a considered factor of safety of five. It gives them the operational maximum temperature which the U-bolt is supposedly allowed to be rated at, which is 650 degrees. I mentioned that earlier. The requirements for design were 120 in many of the areas, which is not very high. In the containment, there was a 300-degree operational temperature just from room conditions. Many of the pipe operational temperatures, however, exceeded 650 degrees. In

the U-bolt load test program and the allowable computation that they supplied us for the U-bolts, they did not account for these differences in temperature due to pipe line temperature. They did the test program at 120 degrees. They did not statistically justify their results. Based on the ITT data, I took the test program and I statistically took their same data to determine how valid their numbers were. The calculations I did I never turned over to anyone. I couldn't find anyone in the design group willing to check them. They've never been checked. I did, like I said, consult with the professor on my formulas and I redid the formulas and the calcs several times myself to make sure that what I was getting was valid. What I'm saying is the loads per 049243 when compared to the load ratings for ITT catalog ratings, the numbers are 4 times greater in many cases.

EBNEDDER: Those statistical calculations are one you agreed to supply to us previously ... these same ones. So let me move on on that. Would you be specific, on what lines you have ... you have identified in your statement that there are several lines out there that exceed 650 degrees, and in some cases 1,000 degrees. Could you be specific on what systems these lines are located on Mr. Stokes?

STOKES: Well, I've got a copy of the pipe vendor list. It gives supposedly operational temperatures, or standard design temperatures. I made that statement based on what was written in that list of popping ISOs systems. I do know that from experience doing the calculations, those numbers were low, and many times those actual operating temperatures of the line was in

far excess of those numbers. I personally worked on supports doing M40 calcs on a line that was in the neighborhood of 900 degrees ... 800 degrees. Oh boy. I may be able to go back in the room of that line. The number I can't give you without physically finding it in the plant again.

EBNEDDER: How about 650-degree lines. Can you identify any of those?

STOKES: Well, I can give you a copy of that line list. It shows right on the list itself those lines.

EBNEDDER: The licensee system?

STOKES: That's something they should be able to give you in Document Control.

EBNEDDER: _____. Or a number pulled out.

STOKES: Right. I can supply what numbers listed per that document. The document I have probably has been updated. It was constantly under revision. It's typically a line list.

YIN: Just to followup on the statement, you mentioned you have performed some M40 calc. From what I understand, there was only about 6 people given the assignment in performing that particular task. This M40 calc, if I understand correctly, is based on hand calculation to determine the hangar loads that will be imposed on the supports. Is that correct?

STOKES: Mr. Yin, that's correct. They were used to determine loads. The number of people were more than 6 in many cases. Concerning Unit 1, before March, there was a group that I was part of, which was assigned to high thermal and sam-tam systems which we were asked to do M40 calcs, trying to justify

the code break locations. The code hangar loads. I was the first person in that group to find a line which did not have adequate offset to be support under sam-tam conditions and thermally within acceptable procedures. My judgment and my ability was questioned. The system I was talking about earlier that was very high temperature, I performed that same analysis on that system. I required 7 snubbers to allow it to move thermally without overstressing it, and at the same time supported seismically. They ran that same system on an ME101 computer analysis. They only removed 1 snubber. I felt fairly confident that that justifies my ability to do a hand calc that is very close to pushing computer abilities. A person with good experience, making valid decisions to judgments, and using accepted procedures within the industry can do an M40 calc on very high temperature, high seismic load case lines and be fairly accurate. I can't say that you can't go and take another support out with a computer analysis, because it's much more accurate in the calculation, but a person can push computers and at the same time he can do it in a closer timeframe which makes it economical in many cases to put in that extra support, rather than try to stretch the impossible.

YIN: If I understand correctly, M40, the basic use of the M40 is to determine the 3-span peak loading on the cold break. The non-safety piping that is connected to the safety cross-piping. The use of M40 to calculate the entire piping system, especially the high temperature ones, I'm not too sure that that was applicable at the site. Can you be more specific whether or not that was the case?

STOKES: Initially, ... what you're saying is true ... not initially; now. When they first started doing the review on Unit 1, they didn't want running all the systems on computers. They felt it was too expensive. They felt if they could buy off a line using an M40 hand calc that was done very quickly and roughly, they'd do that. The thing was, on the code break systems which were high temperature in many cases and connected to large bore piping, ... the large pipe moved itself quite an amount, which required a lot of offset. They initially started us out doing M40 calcs, but when we started failing those systems requiring that additional pipe be installed for adequate offset, they decided they would not use any of those M40 calcs. They would rerun every one on an ME101 run. M40 calcs were used, not only for the 3-span load determination, which, you didn't need M40 for. The 3-span load determination was just a table length based on size and schedule of typical links between supports. Typically 7-9 or 10 feet, and the 3-span load rating was just 3 times that length times the weight with water in it, assuming that it's hydrate. It was a load placed at the end of a seismic system just to give a large, non-seismic load coming into it. That was an assumption based on management's decision as to how much load-down line on the non-seismic side could come to that support. If all the non-seismic supports fell down on that side or if it was a chain reaction, the end result would be you could have 100 feet on that support, not just a few ... 30 feet. However, that was their decision. In my paper I didn't question their 30 feet or the 3-span criteria. Whether or not I feel

that's a problem, I'm not going to say. But M40 was also used to determine preliminary loads when we couldn't get those from the ME101 group ... on gang hangers, when you get 5 and 6 lines on a support, and they're running one system, in many cases we held off on doing those calcs until we had more than one line. We tended to wait until we had pretty near all the loads and then assume pipes with the similar configuration have similar loads to the ones we already were supplied. We didn't just pull numbers out of the air. We also, at times, did an M40 calc on the lines where there were like 2 supports. And we had one, but one was quite different ... to determine the loads. Typically, those loads though did not vary very much from an M40 calc when it came back from the computer analysis. In many cases they came back even larger. And that was a problem with those last reviews we were doing. The loads were going up. Not only because of the fact ... our M40 calcs weren't very accurate, but the entire stress program here was dictated out of San Francisco. I had a problem early on when we started doing M40 concerning C28, C30, C17 ... the seismic data sheets coming from the City. We were not supplied control copies, and we didn't have the latest revisions. There was also some other guides which were supplied telling us about the local conditions, the thermal expansion of failure and containment, giving the displacements along certain points of the wall, which we were supposed to include from the anchor locations going through the wall. Initially the City zeroed all the building movements at ground level. Their assumption was there was zero movement at ground level from all

those buildings. Through a discussion with the person who wrote the paper in San Francisco, I was told that it was going to be released on a Friday. Two weeks later it had not been issued. That document ultimately came to us with movements all the way to their base level. There was building displacements even between the ... at rock level. Stress, on the other hand, when they used that data, their calculations were affected because they did not include those building movements correctly. Later on, when they got the corrected building movements which I had argued for, the loads went up based on that. Especially in between buildings. In many cases there was no way the line could be supported between buildings without rerouting. They did not want to do that.

BISHOP: I'm sorry to change the subject for a second. We're having a ... we're in the process of copying the calculations from Exhibit 1 that you had provided us, and Mr. Cruze tells me that there is a very large volume of documents associated with each of those numbers. Are there particular records within that package?

CRUZE: I just ... I want to make sure we're getting what you want, okay. And that we're doing that in an expeditious way. I understand we're not going to have these reproduced at this point in time. We want the originals in our possession. And ... is that basically what you want, number one, and you want the calculations and the calculation log sheets for each of those. And any other information in the files, you appreciate, some of these packages are rather voluminous. But as I look

things over there, it looks like the calculations are sort of in a separate folder, or at least, excuse me, at least the log sheets are. And so we're gonna have original documents and of course we want to make sure we return those complete to them, so we're not going to reproduce things at the moment, and would you see that that would be necessary for any reason. Other than for our purposes, we may, for our purposes. Okay, Alec, maybe you can answer the question ... quite along with a series of questions perhaps.

STOKES: I'll try to make it short. I didn't ask for documents which I didn't feel had some problem with them that would be relevant to what I had to say. Many of the supports at the end of that list, I feel that if you review those particular calculations, you'll find probably deficiencies in how the assumptions were made. Because those were the problem supports. And they do come from sam-tam sampling, thermal sampling, and from seismic sampling. They're varied. The first supports that I asked for, the reason I asked for those is I have the zero rail calcs. The point I was trying to make in zeroes and the ones, twos and threes, is I have copies of calcs that are Rev. 0 that are not included as Rev. 0 in the final pack. They completely discarded that preliminary calc. To my knowledge, in the industry, once a calc is performed on a support you don't support it. It's only added to, subsequently, when new information is provided. You do not destroy it. They completely wiped out Rev. 0 that we did showing it failed, and the final pack, which ISO end is looking at showing Rev. 0, 1, 2 and 3 and

as-built do not show those failure conditions, even if they were assumed incorrectly. And what I'm saying is they tampered with calcs that, according to industry criteria, should not have been done away with. They should have only added to that pack. I do know that the packs are very voluminous. They're computer runs in some cases ... I'm not ... you need those because the struddles ... a guy's assumptions on releases at a joint are very critical unless a guy's a struddle ... fairly knowledgeable in struddle. Knows how that you can model a release at a joint. It's very easy to change load conditions to a plate by assuming no moments. They did that. And I'm aware of that. One support in particular, I have Rev. 0, the guy that did that calc, the only reference to him in the final calc is the drawings showing the hangar. He went out and as-built it; his name's on the as-built sketches in this package. The Rev. 0's credited to some other guy at a future date. That particular calc they didn't get the catalog adjusted on it, I don't think. It still shows him doing it, but the final never shows him at any point in time as having worked with that calculation. That's what I was trying to point out to Mr. Yin that those documents are primarily addressed to him, and with what I know ... in other words, he could look at calcs for 4 days, but unless he knows what calc to look at, the odds are he will never see what I notice.

??: Why don't we get at least 3 of those things completely done and get over here so that Mr. Stokes can show Mr. Yin exactly what he's talking about. But there's so many of them there that it might take a long time, but let's get at least 3 here before Mr. Stokes leaves.

STOKES: First one on that sheet has a _____ one, zero being destroyed, and it is also a hangar that had an awful lot of difficulty in getting it to work, and I'm pretty sure that if I pull not only those drawings but the ISOs, the construction dates for all the supports on the ISOs, that particular support had a support located within 6 inches of it to suck up the load because it was failing. The final calc I don't believe shows it failing. And that's only one calc.

CRUZE: That was precisely the point I was getting around to, Stu. Perhaps we can get a couple ... get us started, make sure we've got the right information you're seeking, and then we'll continue with the effort to obtain them all.

STOKES: I do think you should get the regionals, because I don't think they should be left over there in that trailer for them to ... once we pull one drawing, they're gonna know what we're looking at. I mean ... see a friend of mine did the struddles for me on those supports that were problems. He did not agree with what they were doing, but all he did was the struddles. He helped program in and run it. He didn't have to sign off the calc or anything or he wouldn't have done it. He supplied me with the list of a lot of those drawings, and that's the reason I know the ones that are critical to what they did as far as making false assumptions. The first one on that sheet though, I monitored from the day it was first done, because the guy that I mentioned earlier that asked me to take these pictures is the one who did Rev. 0. He kept a copy of that. And I got a copy of it, so you will know his name once you see the calc.

BISHOP: We will pull all those calculations of all those packages. All the originals. And then we will assess what we need to do with them. Whether we should be making copies of them for our retention or not. One thing I wanted to make clear is that we will not be providing copies of those documents outside the NRC. Hope you appreciate that.

STOKES: Well I expect to be providing you with extensions of those calcs, rather than you providing me with anything.

BISHOP: Thank you. Mr. Bezzler has a comment.

BEZZLER: I just wanted to get one thing clear. The calculations that you say disappeared, the preliminary or earliest calculations, did these in fact disappear for all supports or just for those that had some problem, in your opinion?

STOKES: To my knowledge they only disappeared on the ones that failed. The ones that I have lists of failed, and they do not exist now. I know because I've already ... I managed to xerox some of those calculations myself before I left the site. It was very difficult because I was not allowed in that trailer without supervision, however, when I was placed in quick-fix on nights I was given pretty much free rein of the plant because I was the lead engineer, the only engineer responsible for design. There was one other guy assigned to help me a little later on. During that time when the maintenance people were in that trailer at night, I managed to get in there, without control, and xerox controlled documents. Without tampering with them, I want to say. I did not adjust anything. All I did was

xerox what they had finalized to see how it compared to what I already had copies of.

DEVINE: This question is to Mr. Cruze. I just wanted to clear up what the proper standards were. To see that we have a consensus. Is it improper for there to be two versions of Rev. 0 with the first version missing? Is that something that's not supposed to happen?

STOKES??: I don't think we can answer that.

CRUZE: My experience in this area is limited and I'm going to have to disqualify myself in making a specific judgment or stating our position on that. Perhaps Mr. Yin might be able to add to that. He has extensive experience where I do not in this particular area.

YIN: Now let me say something. We're not making much progress. I'd like to get through the affidavit, and this issue is a big issue, and we can discuss it at length. But let's try and identify other areas so that we can at least get through the affidavit. And then ... this area is a big one for Mr. Stokes and NISA's following up on it, and then we can do more limited discussion, particularly when we get the package and Mr. Stokes can show us exactly what he's talked about on the Revs. Is that all right Mr. Devine?

DEVINE: Mr. Yin, not to belabor the point, but is there a simple answer to that question?

YIN: Probably not.

BEZZLER: Mr. Stokes, you allude that they've destroyed some preliminary calculations and yet you say that at times they would

add new supports adjacent to old to accommodate the loads, or what have you. It seems to me they're making adjustments or corrections to the system by adding new supports. Why did they choose not to own up that if one support was bad and redesign it, rather than add a new support? In other words, they seem to be doing what they have to do in any case, but....

STOKES??: Can I go off record, Mr. Stokes, we're going to run out of tape.

DUKOFF: This is Dukoff. We're going off record at 10:15 to change the tape.

DUKOFF: The time is approximately 10:22 a.m. We have changed the tape and a break has been taken by the participants. Mr. Stokes will now respond to the last question asked.

STOKES: The last question was how could a new support be added without relevance to the redesign program? It seems that that would make the plant safer. That's correct. The problem is the management here submitted a list of supports to be reviewed under the sampling program to the NRC staff. Those supports existed at that date. When we started encountering failures, their first impulse was to code, to shorten the code break locations and cut out failing supports. They could not come up with a reasonable decision or answer on how to explain not doing the analysis on those supports which they had already given the list to the NRC. Their decision then was not to limit the calculations but they decided if they failed they would camouflage them in calculations and at a last resort, in certain

hangars they had problems they couldn't make them pass under any conditions with any amount of load other than a pound. They added supports within six inches, which, according to stress calcs, they, depending on how the gaps were modeled, they could assume that support to suck up all the load. That support had not existed previously, had no count number, no documentation, was not given to the NRC. They did not plan on giving the NRC adequate information for them to determine that hangar had been added as a coverup of a failing support. The ISOs which were modified to show the addition of that support, the basis for the engineering changes on that drawing that I was told by Pullman QC was quickly a note stating engineering judgment changes. There was no record that they added a support. The only way you could look at the ISO and determine the support is pull that ISO, take down a list of the supports, go to the support issued to field copies and find out when they were constructed, and you would find that one particular support was added. Otherwise, you'd never know it. It's a very intentional type act that they didn't expect anyone in the NRC to go through enough to ever determine.

BISHOP: Mr. Bishop. Mr. Stokes, you have made frequent reference to "they". Can you be more specific as to who was providing you this instruction and what form that instruction took?

STOKES: Well, I put it in my document. The person responsible for trying to make this all work and to my knowledge the one who was in all the meetings was a Mr. Marvin Lepke. From

the people that I was working with and all instructions came from Mr. Lepke on how we would do this. Most of the things that didn't work that they had to modify, the person who was in charge, Mr. Leo Mangoba, didn't ever stand up for any of this. When we first started working in November through March, he did support me when I was requesting control documents in that one of his group leaders, Mr. Kevin Wah, had a letter typed up by the secretary and had that list of all the people in our trailer submitted to management, which was Mr. Lepke and Mr. Bob Omen, who was the Project Manager here at that time. I was told that letter went to one of their desks and was put in a drawer. When we followed through on it, we found out that they decided, Mr. Lepke told me personally he didn't feel I deserved control documents. And, as far as cordiality between me and Mr. Lepke and Mr. Bob Omen, Bob was friendly to me, he acknowledged my presence. Mr. Lepke, on the other hand, never even admitted that I existed, even if I spoke to him first. His hatred for me pushed, in my opinion, the points which I was bringing up and he could not stand me to question his authority for a decision. And I'm sure he was predominantly in control of making those decisions. I have raised questions of who was in management and who was the actual control leader. Bob supposedly was the Project Engineer. Mr. Lepke made the decisions. I don't know if he ever consulted with him. I wasn't aware of it. He was very prone to just tell you what he felt right on the point. He didn't ask to delay it and talk to Bob. He was very instrumental in doing what he wanted to. In this case, I know for a fact that

he was the one who thought up all this rigamarole for covering up deficient supports.

BISHOP: Bishop. Thank you. I'm sure our investigative staff will have some more questions for you on that topic but at this point let me turn it over to Mr. Ebnedder to continue through the affidavit.

EBNEDDER: This is Ebnedder. Let me ask you something on page 10 and 11 very briefly. And I just need some answers to the fact that you can supply us with information to verify them. It has something to do with falsification. On page 10, you said the logs had been falsified and at the bottom of that and the top of page 11 you said you would share the falsification of these records with the NRC. Mr. Stokes, do you have actual documents that will verify falsification that you can provide to us?

STOKES: I have Rev 0 copies which were performed. I also have final copies which I made before I was terminated. Whether or not they've been modified, I'm not sure. I can provide the large sheet showing that one guy did it initially. The final drawing shows that he had nothing to do with it. I can also show certain calcs that failed. The log sheet has been modified to show final calc and final calc shows that it was done by someone else other than that.

EBNEDDER: Ebnedder. These are related then to the packages we were discussing with Mr. Yin so that problem could also be resolved with the ... The OI people should definitely be involved when they look at... Let me move on to Sam Reynolds area in the flare bevel and the weld conditions. Sam?

REYNOLDS: Reynolds. The first question I'd like to ask concerns a hangar attachment. Mr. Stokes, did you supply the hangar welded attachment we received?

STOKES: (unclear)

REYNOLDS: Did you supply the hangar welded attachment we received? And if you did, can you indicate where this was received from and under what conditions?

STOKES: Sir, can you describe the hangar welded attachment that you received?

EBNEDDER: This is Ebnedder. We have a hangar support, a large U-bolt that has some laminations. Tom Bishop has just brought it in. I guess what we're really interested in where did that particular support come from in the plant?

STOKES: The particular item you referenced as a U-bolt is a spring can supporting end bracket. It's a structural beam attachment. It's a U-shaped item. I can't say that I supplied it. I'll have to plead the Fourteenth on that. I will say I know where it came from. I can show you the support that that was to be installed on and I was hoping to lead into that without having to tell you that I would plead the Fourteenth. I probably could be pressed for theft if I admitted taking that and I won't.

??: That's fine Mr. Stokes. We're interested in what system it came from, the location in the plant. So you can supply that, though? Sam?

REYNOLDS: Mr. Stokes, are you aware of the practice of meeting the qualification requirements stated in the last sentence of D 1.1 paragraph 5.2 by performing procedure qualifications in accordance with ASME Section 9?

??: What do you want to know?

REYNOLDS: I just want to know if he's aware of what it says in paragraph ...

STOKES: Could you quote what it is? I do not know the Code by heart. I have a copy of D 1.1. I have a copy of the Symbols section and the Code. I have read it multiple times, and I have redded out and yellowed in many of the sections. I am sure that I have looked at that particular section but right off the top of my head I can't tell you that I've ever seen it. I can't quote it. I do think I am familiar with what you're saying as concerns testing, destructive testing. I wouldn't say that for sure. I do know that you do not have to comply with AWS if you're willing to do your own test program and justify your own procedures. Those have been done adequately here on the plant. The procedures for the welds, Pullman's weld procedures, were written. I have a copy that I got from QC department. The first statements of all the procedures state they were written for piping, pipe supports, pipe attachments. They were used for pipe supports, not attachments to pipes. The pipe supports, on the other hand, per what we were instructed, were governed under AISC and they did not even want to admit AWS was included in AISC. They instructed us to use prequalified partials and full pan welds per AIC. Those same welds go right back to AWS. It's just a different way of expressing the call outs. In the AISC they give you a local diagram, explaining exactly what is required. AWS gives you a chart with multiple call outs and multiple weld procedures. Whether or not that answers your question, I can't

say. But I spent five years trying to become more knowledgeable on welding. And I'm still learning, but... I was used by the management group that I was in to write a weld paper on how to handle flare bevels and flare B welds and how to prep them, how to call them out so that we would get what we asked for as far as design. I'm familiar with what they asked for as far as design. I'm familiar with AWS limitations on penetration, as far as installation of weld material in the throats. I'm also aware of the angle requirements. The weld procedures that Pullman had here that they used on support steel did not meet the minimums per AISC, prequalified minimums per AISC, pre-qualified minimums or full pans. On top of that these various DRs which were written against the piping. The co-hydro systems were U.T. the weld joints, full pan. There is DR written against those joints, showing that they're deficient. They didn't get adequate throat penetration. That was on a pipe weld joint per a pipe procedure. They didn't get it on the pipe. They didn't get it on the supporting steel. They used the same thing on both.

EBNEDDER: This is Ebnedder. I'm somewhat curious, Mr. Stokes, which weld are you referring to that were U.T.'d, Phillip, flare bevels, or pipe welds. We were talking about flare bevels, and those are rather difficult to U.T. But I'm just curious if you could identify which ones failed by U.T.

STOKES: Well, when I mentioned the DR, I was talking in reference to the co-hydro pipe systems. They U.T.'d the full penetration call out welds on those systems to determine full penetration. A U.T. exam will show a deficiency in the throat

due to an echo. Those particular welds are flare V penetration welds, partial groove welds. [someone asks question, unclear]. No, that's on pi. Okay, the flare bevel welds, per Pullman weld procedures, were handled under fillets. They were shown because of the management's decision as full pens. Our group, however, the paper which I was requested to write, which was sent to San Francisco and never used, recommended that these welds be called out with an S and E per AWS considering the drawings to be working drawings. They were also shot drawings. The materials were fabricated. We used, in my group, an S call out based on 2T, based on a manual I was supplied by the American tubing manufacturers, telling me what the minimum radius was they would roll to. The E call out was based on AWS minimum requirements of 5/16ths or well, anyway, there's a table in there that tells you, for the radius there's a minimum required weld which is allowed. So we put down those effective weld sizes.

??: Let's clarify that. The T dimension was from American Tubing Manufacturers.

STOKES: That's in my group. That's all covered in the weld DR. I think it pretty well explains that. I do know where a support is, or did, I worked on it. It was a Westinghouse support which was crossing tube structures. All welds at that joint are flare bevels. The QC, all they had to do was look at the material. They did not check the radius of the material. The City in the design group was using 3T for that calculation. We used 2T. We found out here through Pullman requisition that steel had a minimum radius of 1.5T which meant that the calcs

coming up were defective per AWS for that radius, were not conservative because we all used too high a number. On top of that QC did not have to inspect the joint for adequacy in any way. They didn't have to measure. The biggest criteria was that it was filled out flush, which should be adequate for the Code. The problem comes in in the documentation. The design calc shows in the case of the trailer I worked in, a 2T E calculation in most cases, San Francisco at 3T. The other trailer over here, probably 3T. But then, there's no guarantee that the effective throat, as specified, per the minimum, is there. The AWS specifies even that effective, there's two quick ways that effective can be determined. It's the minimum per the throat size for design, but then the minimum installed is a minimum based on thickness. The required well for installation was not, there's no procedure for doing that. There's no QC inspection for it. The design was based on something different from what they got because the material is not the same. It's a very, in other words you can't insure the designer got installed an adequate well.

BISHOP: Bishop, I'm sorry to interrupt again, quick change in subjects. Mr. Cruze has come in with one of the documents. He wants to make a statement about that and then he'll leave.

CRUZE: This is Jess Cruze. Actually, what I have in my possession, which I've had in my personal possession for about fifteen or twenty minutes, are the complete packages, calculations and calculation logs for the first one which you seemed to have special interest in. I just went and assured that

we had that as a top priority. I have that in my possession. I have the second one which Marvin has pretty much assured that that was together. And then I have an additional one which is the eleventh one on Exhibit 1. And so, I just want the record to show we have those now. It's our intent to maintain these in our possession for the foreseeable future.

REYNOLDS: Reynolds. Mr. Stokes, would you be satisfied if the flare bevel welds are full welded with a slight reinforcement on the outside, that they would meet the 5/16th OI requirement?

STOKES: On that particular point, I would be satified if project management, there are several possibilities on how they can solve that particular weld problem. I've discussed that with Mr. Ken Palmer and also Jeff van Klomptenberg who was my superior when I wrote that weld DR. Both of those two people are mentioned in my DR as having talked with Mr. Curtis in San Francisco. They either need to review each of those welds in calculation based on 1 1/2T to determine whether the weld is valid or they need to add additional welds. They don't want to add additional weld, it means additional work for the field. They, more than likely, don't even want redo the calcs. I'm not sure which way management would decide to do that. I'd be satisfied with any procedure for assuring the adequacy of the joint, period.

REYNOLDS: I think the question is if they're full welded with a reinforcement, are you satified that that is in accordance with D1.1 rules and if not, how would you propose that they add more weld metal after it's full welded with reinforcement?

DEVINE: Mr. Reynolds, if we're going to be basing his answers on D.1.1, paragraph 5.2, could he have a copy of that to be looking at?

REYNOLDS: We got off that number.

DEVINE: Okay, okay. Thank you.

STOKES: I think I'm getting at what you're saying. If it's flush welded per the weld code, it's considered effective as a prequalified weld on flare bevels. That's not a problem as far as I'm concerned. The welds exist. The problem is in the linking between the design calcs showing that that weld joint is adequate for the loads that are imposed on that joint. There's a breakdown in that documentation on that particular weld. It doesn't exist. The joint is valid per AWS as installed because even if it was welded as a fillet, but you need to know what weld size to make sure that the penetration was effective, there should have been a procedure established. The procedure was for a fillet. Fillet, there is a big difference in how the joint angle is limited. The joint configuration, the procedure that exists for when it was done. I'm sure that the joint's flush. Most cases that's the way welders weld it anyway, they filled it up. But whether they started with a quarter inch rod, an eighth inch rod, a tig weld, depends on how much penetration they got. And they were required, or are required, to provide the minimum effective weld, per the code. Based on thickness. They have no procedure for establishing that minimum. It may be flush, it may be adequate. But how can you tell me it is? You don't even know how deep the weld goes. It may be full of slag. Maybe it's just

a superficial cover weld. I don't know that. I can't make that decision. I don't, I didn't QC the joint. I didn't have access to a procedure they installed it with. I didn't supervise the weld size, the rod size he used, the voltage he used. All these things affect how much penetration he got. I can't guarantee that the effective minimum that was required for that joint per the code was established. Because they didn't have the paperwork, the controlling factors controlled to make it right. I don't know if that's answering your question. This is a very ... It took me an awfully long time to get this in my head straight. Because it's not just an installation thing. It's an installation, it's a design, it's a QC, it's, in other words, I'm responsible as an engineer, or the project engineer is responsible for every design from the design point through the installation of what he asked for, to insure that he gets what he wanted. There is no documentation on that on these welds. There is no assurety that he got anything that he asked for. There's no simple valve on these joints. I personally think each needs to be U.T.'d to determine the minimum effective that exists. And then the calc needs to be rechecked to see what the loads require. I never will agree to put this simple code minimum on any joint out there without reference to loads. I'm not going to make a determination that the minimum is always going to buy off the joint. In many cases, that's true. But there are supports out there where the minimum wasn't even close to buying off the joint.

BISHOP: Bishop here. I just want to make a point and how do I put this diplomatically? You were asked the question of something to the effect of would this satisfy you? I don't think, ...

STOKES: I just said no to that. I just told you what would satisfy. On those particular joints, I know the procedures weren't there for getting the weld that was asked for. The design group didn't have adequate information on the joint material being used for the joint, to insure that a conservative joint was installed. And, to just put a flesh weld and put a little extra, no, I won't buy that.

??: I understand your position. What I wanted to say in that regard is that again, we are not here to, we're here primarily to get more information. We will not be asking you in this process to approve or disapprove the conclusions we draw. So I would ask our staff again, in asking our questions, let's not put you in that position. We're primarily interested in getting more technical information and when things wrap up, we may agree on issues, or we may agree to disagree from a professional standpoint. But, that won't be the topic of today's discussion.

EBNEDDER: This is Ebnedder and I totally agree with that. We're not here to satisfy you or the licensee. We're here to determine that the plant is safe. And that's our sole objective. And your information will clarify that for us but the staff should not be going over what we have seen or not seen or any other information at this point because everything is

preliminary. So, again, Mr. Reynolds, do not put Mr. Stokes on the spot and do not make any premature decisions on where we're at.

DEVINE: If I could, as we said, we don't mind being put on the spot at all but I agree that it raises a little question in my mind to have a check on what an acceptable solution would be before you all flushed out all of the additional information. I sort of thought that that would probably come up in follow up interviews to resolve Mr. Stokes' allegations after you all finished your homework which he is here to help you on.

EBNEDDER: This is Ebnedder. That's true, any follow up would be through Region V, Mr. Bishop. But right now, we're just looking for clarification. So who has the next question? We do have the package here. Do you have any more on this flare bevel, Sam, do we want to pursue anything on that?

REYNOLDS: No. Mine were general, many of mine have been answered. For example, names, and just for the record, you've indicated you do not want to supply names, for other reasons, at this point. I think the major issue, Paul indicates, do you want to discuss something different, Paul, or you want to get back on this design package with Esa?

PAUL: Back on the design package.

REYNOLDS: Okay, let's get back to this major issue, Mr. Stokes, and Esa Yin, and Paul Bessler. We do have the first package over here. Now, on the back table, it's on a separate three packages, it's on a separate table, we do not want those papers to leave that table. They're originals. All discussion

should be done around the table without moving papers back and forth. If you want the blackboard over there to sketch on, we will move it back there. If you want the tape recorder down there, we will move the tape recorder down there. If you feel you want to record every paper shuffle, that's fine. But is everybody agreed to start looking at these packages? Let me ask Tom, first, do you have any questions that you want to ... So, this seems to be the big issue, let's get on that...

YIN: I would rather ask all my general questions and then go into the specific calculations that were brought to our attention, if that's okay with everybody. Get back to what we have left over. I left a short while ago talking about the M-40 calculation. I wasn't too sure what the point Mr. Stokes was making. Is there any problem with the M-40 calculation or is this concern that MU101, the computer program, should not be run, to _____ the M-40 calculation is done? What is the specific point of the problem that he wants to bring to the attention of the NRC?

STOKES: Esa, what I was trying to point out, is that M-40 calcs had been done previous to computer calcs on these supports. And that the computer calcs even though they were done subsequent to that cannot be automatically assumed to be better than the M-40 calcs and any subsequent computer calc any better than the one run previous because the assumptions that were being fed to the M-40 group from San Francisco for the local conditions and other things, the seismic load data, they didn't input data, it came from a computer table. The computer saw it, they never

saw it. Do you, I mean, I don't even know that they saw anything. What I'm saying is you can't say just because Rev 0 is preliminary stamped on the drawing, Rev 1 is preliminary and Rev 2 is final, and Rev 3 is as built, that Rev 3 is really any better than Rev 0. You have to look at what they put into each one of those. And each one of those is an awful lot of ifs, because the stress group were constantly being updated with locas and the seismic load data. We also were being constantly updated. The problem was we weren't being supplied revisions. At one time, when I questioned that, I had it assigned to a Mr. Kevin Wah. He is now the one who's assigned in the trailer that I was in the control seismic updates. It took an awful lot of work to get him to agree to be signed up. But he was a Bechtel direct. But what I am trying to say with that, I think I just made it clear. Just because they put on a calc cover sheet that one is preliminary, two is final, hell, you don't know if that's invalid, you don't know if two is a valid calc justifying that hangar. The stress conditions, the modeling, if it's all incorrect, and then the loads given the hangars are incorrect, and then those guys are being forced to model things on strudel incorrectly. The whole end result is you've brought off a hangar that never looked good. It's never been good. But it looks good unless you can do a really deep analysis. That's what I was trying to point out. Sure, I know they've got four revision on some of these. I've seen them. I know they've been changed.

??: Is your badge up on the hill, Esa, or down on the bottom?

YIN: What's that?

??: Your badge, the one for the plant.

YIN: Down.

??: I want to make sure so that when we go out on the tour, everybody's together...

STOKES: I probably won't be allowed on the tour.

??: Yes you will. That's why I wanted to make sure...

YIN: This is Esa Yin again. Let me see if I can summarize here your specific concerns. For the M-40 series calculation, for the three span peak cobric calculation, you have specific span to work with, and you have a specific dynamic load factors that you can input in all three directions of seismic calculation. For the system line itself, you have the C series joints to work with. And subsequently, they summarize that, and pick the maximum, yeah, pick the OBESSE and _____ G values so you can use them. So you feel comfortable with what you were doing in regard to the M-40 calculations. As far as the present program, the ME101 calculation, the combination of various response back from input, is specifically assigned to be done in San Francisco office. And the whole package is performed and is not available for you to check review at the site. And you are questioning whether or not the response back, the sets of response back _____, for various calculations was indeed adequate to perform the calculations. Is that correct summary of what you have stated?

STOKES: Let me break here before I answer that and change the tape in my tape player.

DUKOFF: This is Dukoff. The time is approximately 10:57 a.m. and we'll be going off record so Mr. Stokes can change his tape.

DUKOFF: This is Dukoff. The time is 11:30 a.m. We're now returning from the break. We're going to go to the other side of teh tape so we can have an uninterrupted recording.

DUKOFF: This is Dukoff and we will be continuing with the interview after a break. Mr. Stokes will be answering the next question.

STOKES: I'll try to answer Era's (sic) question which was a summary which was quite lengthy. Um, he asked me if I was comfortable in my doing of the M-40 calcs. And the answer to that is yes. But I don't think that that is the question that should be asked. What I think he was trying to get at, and I tried to make some notes, as far as the seismic data from San Francisco, which they had control of, that was supposedly done by Blum, the seismic company responsible for the data. All that San Francisco supposedly did was to route copies of that in a controlled circumstance to certain people. As far as their control of input, the only input where they were completely unsupervised that I know of was in the tables which they generated for the stress people to use in the stress calcs. Those tables were already placed in the computer. No one here at site saw what those tables were. We, I don't question those, I never saw them. But he also stated that we didn't, I don't think, saw those seismic tables. We did in pipe stress receive C-17, C-28 and C-30 and we did use those tables daily,

initially. In Unit 1, the stress group was required to do a stiffness calc or use or stiffness deflection in the line analysis of 15 hurts. Pipe supports were required to do their justification of 20 hurts. Based on this, when we were doing M-40 calcs, I and Mr. Victor Chang worked up a design table for all the areas in the plant within a reasonable affected category. And we based that table on a 15 hurts stiffness, because stress, under M-40 calcs, was not peak in all cases. It was based on 20 hurts, or 15 hurts. It was just like a computer analysis. We didn't use people. We used 15 because, for the hangar calc, because it was conservative slightly. We did not, and management did not want us to sit down and generate two tables. It tookme and Mr. Chang roughly four days. He generated some, I checked, I generated some, he checked. We ended up with tables which the support people could go to and reference in their calc to select the seismic accelerations to be used in their calcs without having them to go to C-17, 28 and 30 because those tables required an awful lot of time to go into every time that you did the same thing over. It was redundant for one person to look at one table, determine peak and then determine the fifteen-twenty hurts readings. And so, we did it all at one time to increase the production of all the people in the group. San Francisco did not supply anything other than the curve data. They did not but we had problems locating the latest revisions to that. We did not want to do it to an earlier revision and then turn around and find out we had to go through all our calcs. We wanted to do our work on as late an edition of

information as possible. The peaks of the seismic curve data were only used in the three-span, code break calculation. They were specifically specified. They were specifically, the loadings were specified. We were dictated to a certain span of length, of pipe, which was governed by the schedule of the pipe when it filled with water, that can be determined from almost any pipe data anywhere by any company. So for the three span loads, that was spelled out, no question. I have no comment on whether I agree or disagree. But, for the support steel and for the M-40 calcs, we were at liberty to decide what the accelerations were to be used in our calcs. On Unit 1 I had an instrumental, I was instrumental in insuring that conservative numbers were used, and not overly conservative. Management agreed with that. Ultimately, those numbers could be reduced slightly and probably were. I think that pretty much covers what I thought he was asking me and I hope it does but if not...

YIN: Esa Yin again. So, in summary, I don't leave the neighborhood to extract any of your specific concerns. So, unless you provide us more information on your specific concerns, then there is no way we can follow up on this particular area.

STOKES: I didn't have any specific concerns with this, other than the fact that I used this as an example along with the loca data that was supplied to us by the city, which they ultimately changed their decision on, as far as zeroing the movements at ground level. I was attempting to state that since we had no control over the review of this stuff, or the seismic data in the tables for stress, that I would at least like to

review the determination of that, but I'm not going to question it, that it was signed off and done by someone that I suppose, which did it correct. I do know that stress used data supplied to them by the City that was incorrect. Based on the city's assumptions, it came from upper management, and not only I, but Mr. Kim, who was, at the initiation of our M-40 group, he was our lead. He also agreed with my decision that the locas, or the building movements should not have been zeroed at ground level. He also supported me in pushing to make sure that they didn't have that crummy information. I wasn't trying to make a specific point to bring up. The points I'm bringing up I pretty well specified in my paper and I can provide information.

YIN: Esa Yin again. On your affidavit, page 4, the first paragraph, you stated that you have alerted your group leader, Leo Mangova, regarding of lack of control procedure for performing the calculations. And in December, I presume it's 1982, you sent a memo, uh, he sent a memo to Lepke and Omen. I talked to Mr. Mangova on December 6. That was yesterday and he denied that he had ever written that memo. Do you in fact know the memo was there and you actually seen the memo and you have a copy of that particular memo?

STOKES: The section in question in my statement doesn't actually say Leo wrote the memo. It says he sent it. I mentioned earlier in an earlier answer that the memo, as far as I know, was written by Mr. Kevin Wah, who was Mr. Mangova's assistant at that time. He, with Leo's blessing, could not send that memo above Leo's head without his approval. Whether or not

he sent it, I mean I didn't say that he initiated it, I just say that he let it go above his head. Intercompany policy is that you go through channels. You cannot go above your supervisor's head normally. But there are occasions when you can. In this case, he did support it. I didn't say he wrote it. The memo, I don't know if Kevin has a copy or not, Mr. Wah. But the memo was sent. And it was sent to Mr. Marvin Lepke and Mr. Omen. Mr. Mandova's entire, let me explain his relevance to this entire position. Leo's intent in every asset of his existence to this plant has been to do whatever was necessary on his part to make himself look good. He would do whatever upper management wished as far as trying to make himself look good. He would comply with their any whim. He was not a no person. He was strictly a yes man. He tended to be close-lipped, he very seldom made any announcements in the trailer. If someone brought up something, he'd have them do it. He didn't do it himself. He wrote very few memos where he signed his name, pinning himself down. Not only he but the group leaders, Mr. Alex Schusterman, they were very deliberate and they would not put anything in writing that I questioned. I was specifically told by Mr. Schusterman that he wouldn't ask me to do anything and put it in writing. He would only ask me, and if I was willing to do it, then it was up to me. But he more than once informed me he was aware of the $10,000 fine and 10 years in jail penalties for altering and affecting calcs. And the possibility of him being punished. Like I said, they just picked people who did not question it. They didn't have to push me. They didn't have to give me a memo

to get me to do it. And I was not the only one who told them they'd have to put it in writing.

YIN: However, this is Esa Yin, however, there was a memo, according to your affidavit, that was sent to Lapke and Omen. Whether it was written from Kevin Wah or it was written from Mr. Mangova doesn't really concern me one way or the other. Have you actually seen that particular memo? If you do, do you have a copy of it?

STOKES: I saw it when it was written. It was a cover letter and attachment sheet listing all the employees in the group. I did not get a copy of it. There should be a copy in the ... there's a file of interoffice memos. The secretary maintains it. Having questioned him on that, it could very easily have been removed. As I said, what I was pointing out, if you ask Leo, there's no way you can prove that he would admit that existed because he didn't sign it. Even if you can find a copy, you can't prove he ever knew about it. Because he didn't sign it or initial it. He could very easily say it was done without his knowledge. Questioning him on it, you're not going to make him say he did. That's what I am saying.

YIN: I'm going to jump to the next question. On the same page, page 4 of your affidavit, quote "Within two days, however, before I went to the NRC, I received the necessary control document. In this case, the M-9 design guide for engineering." I have two specific questions, would appreciate you answer it. The question number one, you didn't mention the time you receive the M-9. Is that in January, 1983, you receive that M-9

document? The second question is, is it true only M-9 was received by you as the sole document for support design?

STOKES: I can't say for absolute that I got the documents in January. It should be possible to verify that through the QC department. However, they may only keep the latest revision dates and not when they first issued that to the person. It was either the end of the December or the first of January, I will say that. Initially, I didn't really get documents that were worth a crap. The M-9 I got was three to four revisions each of the sections out of date. What I did get was that copy assigned to me and issued to me in my name and a cover sheet listing the latest revisions that I should record in my possession for update. And once I filled out that cover sheet which everything on it was out of date, it was mailed to San Francisco. Within a few days, I started receiving up to date sections of M-9. Other than Mr. Wah, Mr. Alex Schusterman, Mr. Leo Mangova, and maybe one or two other guys, Bechtel people, that I can't remember their names at the moment, I can't say that anyone else other than the Bechtel people and myself up till well past March, had M-9 control documents. What they had done when we first were employed in November was to xerox only M-9 and a few specific sections out of the appendices for M-9 and give these to the employees. The control numbers and the peoples name that they had been assigned to that they xeroxed they blacked out before they xeroxed it because they didn't want to get them in trouble. Technically, those documents are never supposed to be xeroxed by anyone other than the controlling department. They're

only supposed to be issued as a control document and that xeroxing and control goes through QAQC program. I do know that in July there were several people who still had not received control documents. Those documents came to them while I was in the quick fix group assigned to Unit 2. And I know that when I returned to the trailer two weeks subsequent to my being terminated, the QC guy on site came around and he had a problem he was trying to determine who had not gotten revision 12 to their latest documents. They still were having problems making sure people had them. But by that time, they were trying to make sure everyone had it. This was nearly one year following our original work started.

DEVINE: Excuse me, this is Tom Devine. Charles, you mean two weeks before you were terminated?

STOKES: Yes, two weeks before I was terminated, the QC guy came to the trailer and he had a problem that he had three people who, according to his records, had not received revision 12. And he was getting all over my supervisor of the trailer, Mr. Roland Mannapiatt, at that time. And they issued an ultimatum, just told everyone in the trailer to stop whatever they were doing and see what revision they had. It was that important to make sure that they had it. But subsequent to that, for nearly, for well over half a year, I was the only person other than the direct with Bechtel, in my trailer, there were no PG&E directs in that trailer. I'm sure Mr. Lepke probably has a copy because he was assistant project engineer and PG&E direct. But what I'm saying is that people who were assigned to do the calculations, who

needed to look in these documents all during the calculation process, did not have control documents. They did not come ask me.

YIN: I think you addressed the first question. The second question I want to know is whether or not the M-9 document is the sole document for the support design. The reason for me to ask the question is I have reviewed M-9 and it doesn't tell you how to design a lot of things. It doesn't tell you how to check and verify the calculations. It doesn't tell you how to control the interfacing. Now, ...

??: Excuse me, Esa...

YIN: So it is important for me to know, have they provided additional documentation in the area of like procedures, and control design criterias, and acceptance criteria and that kind of thing to perform the work.

STOKES: I didn't get that question when I took down what you were asking. This is Charles. Initially, when we went into the plant, we were given a xerox copy of M-9. I said also appendices. Occasionally, we were also supplied design guides that Bechtel had issued in their office. Those were also xerox copies. We did not have control copies of those. I did. When I was given that update sheet, I was given an update sheet for all the C items, P items, some M documents, I can't remember any other areas that were concerned. But these were Bechtel inner design guides, which management had decided were applicable to Diablo Canyon. Initially, the only ones we were shown and given to use were some concerning a seismic stiffness calculations and

a table simplifying how to come up with an equation for the stiffness. It's just inverted deflection. But it had certain cases shown which were applicable, made it very cut and dried, easy to do. That was xeroxed. When I finally started getting my control documents on all these areas, other than the Bechtel directs, I was the only one who had all the guides. Not only that, I was the only one that was sure to have the latest edition. Even the Bechtel supervisors in some cases didn't have the latest. The other thing is the people we had been working for here, the group engineers, Bechtel supervisors, had been supplying us these documents from their catalog of what they had. Once I got the cover sheet, indicating what was valid for this plant, in many cases some of these documents had been voided by upper management. They were still being pumped into the group to be used. That upset me too.

YIN: Esa Yin. Does this Ps and M documentation, are those control documents? What I'm saying is I know M-9 has a control number assigned to you so that they can keep track whether you have received the new, the latest revision and so on. Are those Cs, Ps and Ms, are they having the same control number assigned to you?

STOKES: Yes, they did.

YIN: Next question, on page 10. Let me repeat again, I forgot to turn on the mike. This is Esa Yin. On page 10, of your affidavit, you stated most of the affected engineers object to modifications of prior engineering calculations by a new staffer. I have two questions. First question, can you name

some of the affected engineers? Second, who are those new staffers, assuming there are many staffers? How long have they been working at the site?

STOKES: Okay, yes I can name some of the people who objected and I don't mind doing that because I don't think that's, I'm not going to pin them down. One of the guys was Eddie Rasinella, another was Gary, God, I...

??: I have a list, maybe you can...

STOKES: Yes, that may be easier.

DUKOFF: Mr. Esa Chin (?) has just given me a document dated November 29, 1983, PG&E construction on loan. I'll be giving this to Mr. Stokes so he can identify the names for us.

STOKES: Okay, this list is current. To be accurate, Ira (?) needs to get copies of the people who were here that have been laid off or have subsequently left since March. Many of the people left here have never objected to doing anything. Many didn't work on Unit 1 during that first initial review from November to March. There are one or two, however, who are here, and wer affected by the last statement, concerning to objecting to modifications of their calculations with them still being present. Mr. Gary Katcher, K-a-t-c-h-e-r. Boy, there's not too many left on this list. I'm not on the list. Mr. Gary Katcher is the only one. I believe, well, Mr. Howard Bernstrum, was not there during the initial phase. I believe if anyone questioned him concerning my alteration of calcs he performed, he would say he would object. Even though I don't think he was there to have objected at that time. Boy, wish you had the first names on

these guys. Ed Rasinilla (?) was another. There are some people here that are listed in the stress group which had nothing to do with this. I knew most of these people by first names. With initial and last name it makes it very impossible, almost impossible unless I knew them very well, which I didn't. But I do have three here. The ones that aren't listed on this sheet was Victor Chang, ...

YIN: I'm going to give you another list, with all the names.

DUKOFF: This is Dukoff. Mr. Yin has given me another list we'll be showing to Mr. Stokes and it's a four-page document. At the top is written OPEG Personnel Roster dated 11/23/83. Mr. Stokes.

STOKES: Well, based on the date of this, if this is the latest listing of who works here, there's still a very large gap. It's dated 11/23. Many people left way back in January, not January, but June. Mr. Victor Chang left in the middle of the summer. He's not on the list. I'm not on the list. I don't believe. I'd be surprised. Let's see. No, I've been excluded already. Should have been by 11/23. Caesar Orbeda is not on the list. He left roughly in June.

??: Excuse me, is he someone who objected?

STOKES: Yes, O-r-b-e-d-a. I've been in contact with him. He told me personally he would be willing to sign an affidavit. Yes, you want it on tape. He's located in the Richland, Washington state area. He does not want a lot of publicity. But he said he would be willing to sign a statement as to anything

that was true. Many of the people that objected did not object too strenuously but these people were more vocal.

DUKOFF: Mr. Devine, the reading of these names into the record, is that sufficient with you, that we don't need to mark these as exhibits?

DEVINE: That's fine with you, okay, great.

YIN: Well, this is Esa Yin. The second question indicates that the second question was, are those new employees, seems to be implied that they may know what they were doing. They may know what they were supposed to do, or maybe not, probably trained, indoctrinated and so on and so forth. So can you give me more information on them?

STOKES: Yes, I'm sorry I didn't answer that part of it. When I said new staffers in my paper, I also stated that in March, the trailer was split. Initially, there had been one trailer, one twelve wide by seventy feet. There was thirty-five engineers in it plus group leaders and Mr. Leo Mangova. Following the date, there's a trailer established roughly right off the front road. Mr. Mangova was going to transfer himself to that trailer. The original staff of thirty-five was being split into two groups. Basically, the people that were being transferred to his trailer had not objected which, with anything they had asked them to do. Those people were going to be assigned, continually assigned to Unit 1. To finish out that trailer, which he moved to, they hired new staffers, people that had no past experience with the plant. The people that had initially worked on Unit 1 had already gone through the Minnesota

Multiphasic Test for security clearance to Unit 1. They had gone through the applicable security screening as far as what they've done for the last five years. I myself had been badged for Unit 1. I had completely free access to go anywhere I wanted without having to request someone to accompany me. This was a very critical thing to engineers working in Unit 1 because they would be asking them to review hangars and it takes an awful lot of time to do your work when you don't have that freedom. The people they were hiring to replace us, to my knowledge, never were tested. And even if they were, it was additional cost which was not necessarily necessary when they had people who had already been tested and security screened. However, they didn't object to what they were being told to do. And the people that had objected were not asked to go to that other trailer. This was relevant, sort of, later on, when I was put in quick fix. Because I was given Unit 1 snubber substitution on nights. There was also a Unit 1 quick fix group. You would think they would have someone in their group doing it to keep me away from Unit 1 but I did have security clearance and was allowed to go back into Unit 1. During this time is when I wrote those DRs. Because, when I wrote the angle DR, which this is getting away from the point, but I'd like to put it in, when I wrote that DR on a preliminary basis and it went over to Omen and Lepke's office it came back to me because I had not included a support which was governed by that DR. They asked me to supply them one hangar. I was afraid that when they wrote up the DR they would only issue it against that one hangar. I went out during my quick fix

abilities to go into Unit 1 under my original security screening alone, and wrote down two pages of supports that were affected by that and attached it to the DR. Once that went over it was ultimately signed off as a generic. No one has asked me about those three papers and the fact that management accepted them as valid design problems, I'm not sure anyone is concerned with that. But it shows that having management giving them control documents, control numbers, that management finally accepted that I had brought up points that were very critical. The problem is they didn't want to go through with doing anything about it.

YIN: Thank you. I'd like to ask the next question. On page 11 of your affidavit. You stated another technique was to assume joint releases for rigid connections, which means the welds which were in place were assumed to be non-existent. The question: do you imply that the local yielding of restraints of _____ was utilized in the basic elastic analysis?

STOKES: What was used and I have a specific example of this. There was a support which had completely welded joints. There was wide flange sections. And typically, industry requires that that joint be considered fixed. It's definitely not pinned in any direction. However, for this particular joint the plate was cantilevered off of concrete. The bolts were way back away from the edge. The plate was failing due to the moments because of the cantilevered section. To make that plate work, they simply released the joint assuming that it was pinned. Because they assumed the plate failed. Which it did, but if it failed then that was a failure. They assumed the failure but they

assumed it before they did the calc. By assuming it failed and that it was yielded, it allowed them to release that moment. Which the loading bin to that joint would never show that moment and the plate then would look like it was okay. But you'd have to look at the design assumptions to decide that they decided it failed before they run the calc. It was a very tricky, in other words, they're not going to put a statement in their calculation that I'm going to assume this joint pinned here because the plate failed in the previous calc. They just did it. You have to look at that to know whether or not. In other words, if you add the old calc in the loads, you could run a calc on the plate and know that it failed. They ran that as a preliminary. They looked at it. They didn't like it. They ran it again, using a pin connection. That came out very favorable. They put that in the calc. They didn't put the assumption.

BEZLER: What you're saying then is they assumed the joint release for a beam after first seeing that when it was a moment connection it exhibited failure. You said you had a specific example. Do you have a number or it's in this package over here?

STOKES: Yes, it's the primary calculation ... I think it's 180-12. I'm not sure that's exactly the number.

BEZLER: It's the first one on the list. Thank you.

YIN: On page 12 of the affidavit, you mention new supports were added within six inch (sic) of the first support. And you stated the failing support could handle the small load that was left and assuming the gaps accurate. Question. What is the implication? Does it mean different gaps in these restraints

could cause some of the larger gap restraints, not seeing the design loading conditions?

STOKES: That same hangar that has the moment release has this. What I was trying to point out, let's see, um, what happened is there may not have been adequate gaps at the existing support to justify assuming a non-restraint direction. But because the support was failing from load coming to it from that direction, because it was already failing, if it failed then it displaced enough that it didn't take the load. If the load failed, therefore it couldn't take it. Therefore, it had to go somewhere else. By placing a support six inches away, it allowed them to make it stiff enough that if they assumed the other support deflected, even if they run an ME101 line analysis and if it justified the displacement of the support, in otherwords they in placed the stiffness, then that hangar that was not adequate before, would only see a very marginal amount of the total load based on its stiffness compared to the support right next to it if it was very stiff. The other thing that I was trying to say is there may not have been an input similar to that in the stretch run. They may not have used the stiffnesses to do what I just said. They may have just on the other hand assumed the gaps of that existing support to be more than enough to justify a non-restraint and designed the new support with correct gaps so that it would be a restraint. Which, what I'm saying is the as built won't be correct because it doesn't look exactly the way it's interpreted in the calculation. Just looking at the old hangar drawing, it looked like a valid hangar with correct gaps. Look

at the new hangar drawing right next to it. It looked just the same. Unless you see the ISO showing them six inches apart, you don't know they're six inches apart. You don't know one's taking all the load and the other one's not. All you know is this looks like a good drawing. But when you take the whole thing into consideration, the whole plan system to make the hangar look bad. And you looked at all the calcs, all the assumptions, you can see that it was an intentional series of planned, forethoughted (sic) events, which were done to make that hangar look good, in the eyes of the NRC, which as far as I know, had only been supplied those hangars that already existed, not the new one.

BEZLER: I just want to be clear with the use of gaps in the supports. You're saying that at times, depending on gap, you would assume a support did not exist in a calculation. I would think if all the supports have proper gaps, they should always be modeled in all analyses. Is that an incorrect statement?

YIN: The specific question just raised already taking, you know, into the review area. We have some problems and issues identified. So we don't to elaborate in that area. This is Esa Yin. Page 12 of your affidavit again, this issue has been asked little bit earlier, but since I'm new here, I don't know the full story about independent design modification program, and the requirement of sending those allocations and support location to NRC and that kind of a requirements, so let me ask the same question again. Perhaps I already asked to you before. The new supports did not have control numbers or document number. What

is the specific implication. What is the actual requirement. Did the NRC ask the licensee to provide all the support numbers? Was the independent verification program required that all of the new support numbers be provided for their evaluation? Can you give me some background story on that?

STOKES: Well I can't guarantee that I'm completely aware of what was done to the NRC or given to the NRC. I can only give what I was told through my relations with management here at the site, as to what they were giving the NRC and why they were doing. That's how I know why they did what they did. They told me they had only supplied the NRC with a sample of ten percent of the supports. This list was strictly a list of supports. They did not list what, they may have listed the ISOs but it did not (end of tape 2)

DUKOFF: This is Dukoff. We went off the last tape and ran out of tape at approximately 12:21 hours. We're now going to take a short break.

DUKOFF: This is Dukoff. The time is approximately 12:24. We'll be going back on record. Mr. Stokes will be answering the last question.

STOKES: Okay, I'll try to cover it. I hope I can cover it. Um, we were in... I was informed that the NRC had only been given a list of the sample as I started to say. They were not given a complete list of all the supports. Many of the supports in the plant didn't even have adequate numbers. If they had been given a complete list and the ISOs they went with, and then later given the same list with all the current hangars on those ISOs.

It would be very easy for the NRC to check one list against the other and determine a new support. The reason for adding a support on that was the fact I was told they never gave the NRC that hangar number. It had not previously existed. It had no previous record. It wasn't that it wasn't a control document and issued a number. It just wasn't issued it until it was built. They could not have given it to the NRC before they decided to put it in. And I'm sure there was no requirement that they do supply that but I think ...

BISHOP: Bishop, we're taking a few second break while the fella brings in a pot of coffee.

YIN: Esa Yin. On your affidavit, page 17-18, you stated that walk through Unit 1 for an hour, you found 100 out of approximately, approximately 100 out of approximately 300 frames, checked to be in noncompliance with AISC bending and buckling design requirements. I guess you will show us where those locations are. Correct?

STOKES: That's concerning the DR I wrote up on angle concerning the bending allowable section of AISC. That section was overlooked. The reason it was overlooked was M-9 did not specify as a design guide that we should be checking that. They specified Calavar (?). They also said check to 200/T, the length versus 200 over T. They didn't include that specific section on bending allowable length requirement that should have been covered. I did see an awful large number of supports. I was looking forward to being able to walk through Unit 1 containment and point out the fallacies of the system. People who supported

me and agreed that that section should be complied with after I brought it to their attention. There's one support in particular, the guy took out the existing support and put in tube steel, it's a very monstrous support because the pipe is like eight to ten feet off the floor and it's kind of funny because he carried me out and showed me through the plant and that same support is right next to another support which was failing the same way and they only did a very minor change to it but it still doesn't comply to that particular section. But I do look forward to showing you as many as possible. Whether or not I can show you all of them within this afternoon, as large a group as we have, I'm not sure.

YIN: In the same question, is your determination based on the assumption that this angle frames will see the maximum AISC capacity loadings?

STOKES: It's not an assumption that they will assume the maximum capacity loading. AISC gives a criteria for using FB allowable of .6FY in the analysis. And that is that the angle be no longer than a certain length and be placed in bending irregardless of the stress being placed on it. What this DR revolves around is that the calc may fail interaction equations because the correct FB allowable that is used in that section of the calc is not valid because the angle exceeds the maximum length that it should be installed at. I'm not saying that if they ran a calc showing what the correct FB was and compared it to the actual stress, then the hangar is going to fill without looking at each one individually, I can't say that. If you look

at the angle DR I wrote and the including statements which are xerox copies of the '78 edition of AISC, '79 edition, the copies from the commentary state, by the people who wrote AISC manual that it is not impossible to calculate those FB allowables for angles beyond those critical lengths. They do state, however, it's beyond the average design office's ability. Bechtel's not average design office. They could assign someone to doing an extensive computer analysis at many, many variances of lengths for each of these angles, and determine those FBs in a table. That would be much more efficient use, or calculation procedure than having each person assign a support and the formulas and allow it to do. One of the guys in my trailer had done such calculations on a previous job. He informed me that it was a very extensive process and that just to do that one FB allowable calc would take in the neighborhood of three or four days. For Bechtel to want us to do a calc and a half a day, there was no way they were going to let us do it the other way. But to make the calcs correct, in other words in this particular area, for the calc to be correct, that FB is not correct. It would have to be determined when it exceeds those lengths per that specific section. Either that, or per that specific section, the change, the angle be changed to a shape which does not have that limitation. In most jobs that I've worked on and other people in the group, the simplest procedure is when the angles are in excess of those lengths. Per the code, they just simply replace them with tube steel irregardless of whatever the stress is on the structure because most places assume or agree with the fact

that it's too much trouble to try to calc that FB out and prove that the hangar is okay. It's easier just to cut it out and put in something that they know is okay. I do have a copy of NPS data which a friend of mine gave to me who worked for NPS, a design organization out of LA. It's a listing of sheets concerning every available and obvious type of structural member. It includes the pertinent structural steel sections and code sections per B31 and whatever. That section could be checked under for allowable stresses per any use on a support. B31 could apply, AISC could apply under various conditions, ASME could apply, depending on which job you're on, what the FSAR says. This plan I was told, the AWS doesn't apply really. That's not exactly true but that's what I was told by management. But, in any case, I do have a copy of the NPS sheets which they give to their personnel as to what they should check in doing each one of these members. It shows the same equation out of AISC which shows that they were obvious to the section that they expected their personnel to do that calculation, to comply with that calcuation, and what I'm saying by that, it's not something out of the ordinary for a design office to do. We did it when I worked for Southern Company Services five years ago. It took us a few weeks to decide that we should do it because we hadn't been doing pipe supports at that time. Grinnell, I worked with them, they were informed that they should comply with that. The only obvious way to solve angle frames that are nine feet long with two inch angle per this section is to brace it every 25.3 inches which in effect makes it a box

structure, or replace it with tube steel, which does not have that limitation on the compression zone. There were many debates at that time in our group concerning this section and whether and how we should comply with it. We ended up on the plants we were working on taking out the angles and replacing them with tube steel when they didn't comply with these lengths, when it was very excessive. When it was only a minor problem, we simply added braces. I hope that clears up.

YIN: Esa Yin. Would you disagree or agree that if sufficient engineering calculation is performed, that 25 inch and 50 inch and so on, can be exceeded?

STOKES: Yes, I think I just said that. I do agree that if you do sufficient calcs, you can exceed 25.3 inches for a 2 inch angle.

??: Mr. Yin, maybe we can turn Mr. Stokes tape over before ...

DUKOFF: This is Phil Dukoff and the time is 12:44. We'll be going off record so Mr. Stokes can change the tape in his machine.

DUKOFF: This is Dukoff. The time is approximately 12:46 and we're going back on the record. Mr. Chin will be asking a question.

YIN: Mr. Yin. (laughter) Esa Yin, again. Just to clear, at least clear my own mind that you will not disagree to any larger link that can be used on unbraced angle frames, as long as those angle frames, no matter how many of them and what different sizes, has been previously either qualified or subsequently

calculated, they are suitable for that particular loading. That is, if you load increase, then obviously your link of the angle beam will be decreasing. If the load is so small, then perhaps the longer frame will be able to handle the job.

STOKES: The answer to that is yes, they can exceed those links. The thing that's critical, that I would like to point out is beyond 25.3 inches for a 2 inch angle, the FB allowable decreases, regardless of whether the loading is decreasing, depending on how long the support is the load, well from previous calcs, I know it can get down to an FB allowable of around 7. There is a theoretical low point which it don't go any lower, but that's not, it's around 4 KSI, I think. But there is a possibility of using the angles longer than these accepted lengths, or the lengths that AISC requires you to check them to, in bending. But you have to check what the FB is to be able to do an interaction equation checking that with the sheer to know if the section is valid. Those calculations were not performed.

YIN: Is that true that M-9 requires you to design the support to 20 hurts in terms of the fraction is 25 mils. So if you satisfy that, the fraction criteria, will you also satisfy the unbraced angle beam?

STOKES: Yes, M-9 does require the 20 hurts and 25 mils. You would think that if it meant that, that it would be acceptable. But when you run a strudel program, there is one thing strudel is deficient in. Actually, there are several. But in this particular case, there is one. Strudel does not account for the warping effect caused to an angle concerned in the area

where bending is critical. It does not account for the fact that the angle, instead of remaining 90 degrees as it started out, for the fact that the angle opens up. It becomes a flat plate. It does not account for that. Because strudel does not account for that, there is no way to adequately justify that support. Even if the strudel says that it met the deflection and the stiffness criteria. The angle still could fail if you did the FB allowable calculations and did an interaction with the correct sheer values because the FB decreases, the allowable number decreases. It's theorectically possible to do strudel because of the deficiency in this area, on say, 120 inch 2 inch angle, and the things still meet all the displacements, because you're only checking the ends, they're probably braced, you don't check the middle. That's where the bending is going to be critical. Strudel doesn't adjust for the warping effect to the angle. That's why that section is NAISC. They don't want you putting an angle and bending. They come straight out and tell you that in commentary. But, it's possible for the calc to look good. It's just not good.

YIN: This is Esa Yin. I don't have any further questions.

DUKOFF: This is Dukoff. The time is 12:51 p.m. We'll be going off the record for the site tour.

BISHOP: This is Tom Bishop at 2:05 p.m. on the seventh. During the tour, we're at the 65 foot elevation waste gas compressor, 1-1. Mr. Stokes just identified a quarter inch U-bolt that he feels has been spread to be able to fit under the support. The U-bolt support is part of a support immediately downstream of Valve RV-228.

The second reported situation is in the waste gas compressor room 0-1. It's the equivalent U-bolt described in Room 1-1. In addition to that, Mr. Stokes has identified a second photograph that he has taken was of ... Mr. Stokes identified where each of the photographs were taken which were contained in Room 0-1 in the waste gas compressor. The tour has moved to the Unit 1 steam driven speedwater pump area, elevation 105. Mr. Stokes identified his, one of his high temperature lines as ASW EP 11 STM SUP trap drain L443. Mr. Stokes also identified the angle bracing in this area supporting the line which I described the number of as exceeding the code allowable on length of the angle member. Correction on that last elevation reading, it was at the 100 foot elevation. 85 foot elevation of the pipe penetration area just outside containment, Mr. Stokes described this line as similar to the one which he was involved with where the movement of the auxiliary building compared to that of the containment during a seismic event would create a problem for the piping which penetrates both those buildings due to the location and type of supports. The line was identified as CBCS1-8100 RCP 11-14, seal No. 1 outlet isolation valve line. Mr. Stokes identified the area where the bracket had been removed from and other brackets had been found defective outside the main steam isolation area, identified by support No. 1029 5CS.

BISHOP: This is Bishop. The inspection tour was concluded at 3:23.

DUKOFF: This will be a continuation of the interview of Charles Stokes. Today's date is December 7, 1983. The time is

approximately 3:46 p.m. Present for the continuation of the interview are Mr. Charles Stokes and his counsel, Mr. Thomas Devine. For the NRC technical staff, Mr. Thomas Bishop and Mr. Esa Yin. Also present is Mr. Paul Bezler, Brookhaven National Laboratories, and for the NRC Office of Investigation Eugene J. Power and myself, Philip Dukoff. Mr. Bezler will start with the questioning.

BEZLER: Charles, I'm just going to go through the document. The first is with the U-bolts you claim on this drawing to have an allowable of 2000 pounds, whereas Grinnell would state that the allowable for those same U-bolts would only be 485 pounds. Is that a correct statement?

STOKES: Yes, uh...

BEZLER: How did they then substantiate these 2000 pounds?

STOKES: I have a copy of the U-bolt test program which was done here in I think '78, '79. Another copy, which I may, I obtained my copy from is down in the office of, right outside Mr. Lepke's office now, it used to be Mr. Lepke and Mr. Omen's. The large loads, they ran a load case test program here, based under the ASME section which allows them to do so, to give a piece a load rating, do their own testing. They ran five load cases and side loading, forty-five degree angle and tension. And they took the average of their failures and they pushed the U-bolts to .025 deflection before they considered failure. That is where earlier I mentioned the .025 is also involved in the hanger itself, was allowed to deflect that much. I agree .025 is not too much. But when you add up those displacements you're

pushing your criteria that you establish for yourself. You're omitting things, overlooking things. Um, like I said, they came up with these load ratings based at a, or according to the report, it says normal room conditions. The report itself gives certain deficiencies which they listed. They tried to, however, in a summary point out that these things make the results more conservative. They tended to do that in a lot of cases. They also, well, I think that answers the question as to where I got it.

BEZLER: So essentially they had test results presumably substantiating the use of 2000 pounds. This interaction formula, you said that they said you should take the square of one component, add it to the square of the second component and use that as a resultant load. Or that quantity had to be below one.

STOKES: Below one. That's an interaction equation, side load plus tension.

BEZLER: You didn't take the square root of that sum?

STOKES: No, I didn't.

BEZLER: And that is stated right on the drawing reference?

STOKES: That's on 049243, on that particular station.

BEZLER: Again, for U-bolt, no modification of the allowed load was taken for temperature effects. Would that have been done with a Grinnell U-bolt? No, I can answer my own question, you don't have to bother. Grinnell qualifies it at 650.

STOKES: Well, even at 650, there should be consideration when you use a U-bolt on a high temperature line, above that. There would definitely have been more consideration except they

used normal room temperature and it should have been considered on every inspection.

BEZLER: Hartzman asked me to ask in the U-bolt testing you mention the fact that they use heavy wall pipe and then you refer to a failure of the pipe itself. I assume you refer to crushing failure of the pipe?

STOKES: Local failure. They specify in their test program they use the 160 schedule pipe. I notice now in the field just now there are now many cases where it's used on a _____. And they try to shim that, typically, to protect the local area? But even with the shim, it's not getting anywhere close to what 160 schedule pipe can take? And they didn't derate the loads for the pipe. They didn't do that on 40 schedule. In other words, if the load came across on the computer analysis that it's that much, they assumed the pipe locally could take that much on the U-bolt. I, when I worked there on a previous job, we did a calculation of local bearing failure from a U-bolt considering point contact because of the circular shape. And it doesn't take very much load to fill the pipe locally because of that point line contact and we ended up removing the U-bolt and putting on a U-shaped strap where the load was spread out over an inch wide, because of that bearing failure. Here it wasn't considered at all. And even though we made, I made statements that we had replaced the U-bolts on other jobs, they ...

BEZLER: The limit of .25 inches, I think you said before that that was used in a way to determine stiffness of the

support, that one could determine the stiffness by calculating deflection?

STOKES: Yes, you take that .25 deflection, you can use that same replacement as a relative magnitude that's given one's sort of topical to the other.

BEZLER: Is the 025 provides a support with a stiffness that has higher than 20 hurts.

STOKES: Actually the number comes out for 20 hurts, I think, .02497. It's under .25. 25 is just a little over.

BEZLER: But then the number comes about because it sort of defines the stiffness of the support. It doesn't really relate to a strength characteristic of the U-bolt. On page 8, I guess it's page 8, you start to talk about the Code break calculations and you talk about not having enough offset. Could you describe what you mean there to me? I was unclear.

STOKES: Um, maybe I should draw _____. The Code break locations were all containment _____, in many cases, both sides of the penetration. On the inside, at times, about located out here on this. Typically, that distance was far enough from the wall, in the neighborhood of 6, 7, 8 feet, that this support on the line out in here, would come off the auxiliary steel, and the inside of the angle of steel. That steel connected to the inner concrete wall on the inside. The displacements to that steel were based on that concrete movement because it was attached to that concrete. This wall, on the other hand, was allowed to move out under loca. It also had its own seismic movement. To do that particular calc for that

section of pipe, that pipe had to be supported in a condition which would allow this wall to move out its max and all this field to move in its max without overstressing the pipe. It also had to be able to move in the opposite direction. What happened is these valves were mass loads on the pipe. They required that you put in a rigid support to support them, in most cases. Now, the pipe usually came straight out and turned. If they had them putting these valves right next to the penetration, then they could have built the support out past the valve off the penetration and protected the valve. And they could have let that line break if they had wanted and still protected the valve. However, the line still had to be able to move because it was inside on the seismic side. So they couldn't let the inside fail. The inside had to be at the last splay. In many cases, when these came through the wall, there was not adequate offset sideways for that movement to be taken out without overstressing the line. On the opposite side of the line, a similar thing happened between the auxiliary building which has a big boot around it, and the line coming through on the opposite. That was what I was looking for and I couldn't find it, the section of pipe that I was looking for, that I worked on. The first M-40 calc I did on one of those outside systems that could not work period. But it came through the wall and the valve was located about eight feet off the all. The acceleration vertically for the support to protect that valve because it was non-seismic off that end. What made it impossible to design a hangar off the wall. The other thing is we had been instructed, we couldn't attach to that wall.

BEZLER: But then what is your contention as to what they did or didn't do regarding these lines? I accept that they had a problem with these lines.

STOKES: Okay, well, if these lines had been installed in this particular case, the problem was, unless engineering had directed the layout, they probably wouldn't have gotten the inside correct under any conditions because there was this combination seismic and loca and the seismic had changed. On the outside, however, there was another problem that happened. If, well, the outside it was still a problem in this particular case. There were other cases, however, where we had a large _____ line and a small line coming off of it. These small lines had code break valves. In these particular cases, this valve was too close to the large line. Those particular lines made it additional offset so that the valve would be placed far enough downline that you could support individually and the snubbers on the first section, the spring cans to allow this kind of line to move. Because these had a lot of high movement. They did not want to have these additional line sections on these lines. In this case, if they had an instructed construction, the people who installed the lines, in the region of the, and this was admitted by Mr. Lepke, if they had told him that actual line operating temperatures of these lines, and given them the adequate directive, these valves could have been offset enough that they could have been supported without rerouting. Mr. Lepke told me himself that these lines probably would have been worked had they been told correct information or the vendors had been

instructed correctly. These, on the other hand, coming off the table walls, I didn't feel that they would have ever been built correctly unless engineering had directed it, and didn't begin with the new changes from the _____, I didn't expect that they would probably still work. But they would have come closer to work than they did.

BEZLER: Yeah, but I'm still confused now as to what your contention is. I agree that it was poor design what they did, but I presume eventually they corrected it in some fashion. Or have they corrected it in your opinion.

STOKES: Well, I know they didn't want to admit there was a problem. They ignored our M-40 calcs. They ended up running them on ME101. I am not sure that they rerouted the lines.

BEZLER: You presume they've since shown that they qualified lines by one fashion or another?

STOKES: One way or another.

??: I think what he is saying that they describe the condition, and Paul is saying yes, that condition is bad. To say, you knew it would not have worked, if engineering had not redirected it?

BEZLER: The inference is that they have done something to correct these problems?

STOKES: Well, I recommended they add additional offset to keep from overstressing. They took it out of our hands. It's like everything they did. We told them their hangars were bad, they put them in somebody else's hands. In this case, they didn't like our M-40 calcs, they put it in ME101. They may have

been able to juggle out some of the ME101 if they assumed gaps on supports that didn't exist. They did not want to reroute those lines. They'd been hydro'd. They didn't want to have to rehydro them. To me, all the schedules had been met, I'm not sure they rerouted very many of them. I'm not sure they rerouted any.

BEZLER: But, presumably, either through calculation or rerouting, they've qualified those lines. And this particular code break is a break from Class 1.5 or Class 2 or seismic to non-seismic?

STOKES: Right. Seismic to non-seismic.

BEZLER: So in the end you don't know how these conditions were resolved.

STOKES: I don't know if they provided the offset or just modeled out the problem.

BEZLER: On page 12, you talk about taking a reverse order of things, that is, the support load carrying capacity was specified to the piping designers and then presumably somehow you make the statement, they changed their minds about the models and resulting loads. I could infer from that they redid calculations assuming those stiffnesses possibly rerouted the lines, and what is your impression they did? I'm not quite sure I understand what you meant by they changed their minds about the models and resulting loads.

STOKES: Can I ask you which paragraph?

BEZLER: The second paragraph, the one that almost starts at the top. In the middle of the paragraph, you have that statement. In other words, the supports could only withstand a

certain load, they didn't want to change the support. So they told the pipe designers ...

STOKES: Yes, that's exactly correct. Initially, we were given loads to experience. Typically, that's the way all the hangars are done, stress tests, the ISO calcs, by loads based on the configuration of the system, irregardless of what supports can take. The supports are designed to take a load. In this case, here, in the review program, that's the way they started out, the way you normally expect. However, when hangars fail, they resulted in a reverse turnaround. They requested that we do a calculation to determine max load in each direction. It's okay if it's a one-directional support. It's fairly easy to do a one-directional load cap for max. But in the case of an anchor, it was almost impossible. Because you have variance magnitudes in any one particular section of the loading that it would affect it. But what they did was they asked us to determine the max loading. Then they carried that back to stress and gave that max loading condition to stress and asked stress to do their best to lower the load to that allowable. They knew the hangar would take it because they had already performed the calc that way. If stress came back and said they couldn't, which they did do to start with, then they let them go as failures. Because they were working up to the 95% of the 10% sample. They had a few they could live with. The thing was there was so many that they couldn't get to work. And stress wouldn't lower the, some of the stress guys wouldn't jeopardize what they were doing. They wouldn't agree to lower it beyond the reasonable amount. Then,

later on, they went back and those same guys that objected were moved to another group. The stress group people that were doing the calcs when I first came here, a lot of those guys were transferred to other groups. There has been such a turnover in the stress group that the lead over there has changed roughly four times in the period I was here. The people doing the calcs, their faces have changed equally. And, I personally, doing the hangar calcs, have discovered defects in their assumptions and have gone back to stress and requested they change the loads that they supplied to me.

BEZLER: Okay, are you implying then that the stress people would then use the same models but some different assumptions to try to qualify rather than rerouting the pipe or redesigning the system?

STOKES: There are some gaps. I wasn't in the stress trailer. I do know things they did. They, in one case, when I was in quick fix, the guy who had done the calculation, had assumed because the pipe was resting on a piece of unistret electrical support that it was a support. Because, he either had to remove it or show it. The computer analysis, ME101, if you put in one direction seismic, it assumed the opposite. Well, it ended up coming back showing two directional seismic loading. Rather than put down on the cover that that should have been moved, removed, and the analysis done without it in there which would have shifted load slightly, he instructed that the support was supposed to be modified. It wasn't a support. It ended up almost being a support. The person who removed the piece of

unistret in the fill called me, and because of the proximity to all the supports, it was questionable to him. He asked me if it looked valid to me. I told him I'd check on it and be back within 24 hours. When I chased it all the way back through the stress group to the guy who did the stress calc, he told us that yeah, it was just an unintentional restraint, it shouldn't have been there. He agreed to help me even change the cover sheet. He gave me a new copy, completely taking off that hangar as a hangar, told me I could delete the support. But he didn't redo the calc at that moment. Technically, all the support loads would have varied some amount because of the change in the model. He didn't change it at that time. And as far as I know, I'm not sure they've redone all the calcs on the other hangars with the updated loads. But, they did either intentionally, unintentionally, or just out of, well, maybe, because they were instructed to, make erroneous assumptions in their modeling and that in itself, affected the loads to our supports.

BEZLER: Okay, could you describe what you mean by erroneous assumptions?

DUKOFF: This is Dukoff. We're going to go off record at approximately 4:11 to flip the tape.

DUKOFF: It's approximately 4:12 p.m. Back on the record with a new tape. Mr. Stokes will be responding to the last question.

STOKES: Um, well, I had several friends working in the stress trailer. I still do. I was aware that in many cases to lower loads they would do similar things to what we had done or

some of the guys in the new trailer was (sic) doing to our supports and assuming gaps which didn't exist. Assuming no gap where a gap did exist.

BEZLER: How does assuming a gap help pipe stress calculations?

STOKES: Well, they had the ability in doing the modeling to allow the pot to displace before it started loading a support. We did that same thing in an M-40 calc. If we could thermally, if we determined the displacements from thermal, then we could specify a gap to allow the pipe to move that direction before the pipe support started being loaded from thermal. It still caught all the seismic loading technically, or theoretically, but the thing was if you displaced a pipe a half inch and you put a gap there of three-eighths of an inch, then you could calculate a reduced load from thermal, based on that smaller displacement. By doing that, they could reduce the load to the support. If they assumed a gap which didn't exist, then they could lower that load. They were supposed to go out and check the gaps as they existed and model only in critical cases, what actually existed. I do know that to make some of the hangars work they had to do more than what was there. That was supported by an earlier disclosure by someone who did work in the stress trailer by another report which had been turned in. Matter of fact, that paper came out roughly the next week after I was terminated and from my friends here at the site, which I still maintain contact with, Mr. Lepke and all of management knew, they personally felt I was the one who had submitted that paper. However, it was anonymous. I, however, had not had the direct contact with...

BEZLER: What paper are you referring to, the 55-page document?

STOKES: Right. I had not, however, had been assigned to the stress trailer enough to be able to obtain those documents. I had trouble getting the hangar documents I got for my own group. Because I did stir up problems and every time I went to look at a hangar calc, they didn't want me to look at it. But that person, I don't know who he was, supported what I had been told. I had talked to one of the ex-stress trailer people, who had been reassigned. He was aware of that hangar being added six inches away from one failing. I can't give you his name without asking him if he'd be willing to say something about it. But we did discuss it and he admitted that he was aware of it. You know, it's very hard to prove that management's intent is to cover up stuff because they move people around every five days. Becntel sent all their people down here for one year maximum tour of stay. Some of the people were sent down here for three weeks, and then went back in three weeks. But there was an awful lot of movement of people from one group to another when they had been doing the job and doing it good. It didn't make sense for them to reassign people to a new task other than the fact they were doing it because they didn't want people to have an extended stay and learn too much. Hopefully, that...

BISHOP: Bishop. Mr. Stokes, this was the second time, I believe, you've identified a person who knows of a problem and you're not comfortable in giving us his name. Is this a different individual or is this the same individual as the first?

STOKES: I'd like to say in all the documents that I've already submitted, the person's name exists. And he went from stress group to a supervisor position. You do have his name. But I won't tell you what person that actually is without having asked him if I can. But it wouldn't be too hard if you questioned all the people in it that I've given you names for you to probably locate him.

BEZLER: In any case, then, you've stated that one method of changing a model was to take credit for gaps, whether real gaps or assumed gaps. And this was done both in the pipe stress area as well as in the pipe support design area. Where there any other mechanisms to change one's mind about the pipe stress model? Was there any other technique to adjust the model? Well, as I had already said, if they couldn't lower the loads, through taking account of gaps or configuration changes within what was there, to the point of lowering the loads for support, they ultimately added a support. That was the last thing they would do. Everything else was very subtle. In other words, in the calc package, your assumptions are, they don't ever really spell them out. It's between you and your checker. To find those assumptions after the fact is a very deep involved type thing. I 's very easy for them to cover those kind of things. Both in hangars and in stress. The adding of the hangar, on the other hand, is something that's not that easy to cover up. It was the absolute end result used to make an existing support pass. When, well, in particular, one of the supports that I hope I have a copy of the calc, or I had it in my list, one of the friends of

mine in that trailer of Leo's, he instructed me in the problems they had making the hangar work. They had done all the things I said so far except adding the support. They had ultimately, the pipe stress lead from San Francisco came down and they were instructed to do the analysis with one pound load and each of the restraint directions individually. Not all at once. It was a token loading. They ended up adding the support following that, to take all the rest of the load. Excuse me.

DEVINE: Charles, it's 4:20. Is this too late to try and call your friend? When will he be off his shift?

STOKES: Um, he's not on ...

??: Shall we go off record Mr. Stokes?

STOKES: Well, we already know his name, we mentioned it in the field. I think he goes off at 4:30. It might wise to try to catch him.

YIN: Well, most people in the stress and the hangar group working long overtime?

STOKES: Well, he's not in the stress or the hangar group. Or he wasn't. He was in a feasibility group and his primary function was to walk out and review things and suggest designs. The person I know, he may be scheduled for a lot of overtime, he used to keep a very liberal schedule. In other words, he might leave at 3 o'clock today and work till midnight tomorrow. He had more freedom in that group because the leader of that group allowed him that freedom. We didn't have that freedom ourselves. I'd rather try to get him now or someone in the group.

DUKOFF: This is Dukoff. The time is approximately 4:22. We'll be going off the record. Mr. Stokes will be making a phone call.

DUKOFF: The time is approximately 4:28 p.m. We'll be going back on the record.

BISHOP: Bishop speaking. I forgot my question. I'll turn it back over to Mr. Bezler.

BEZLER: I guess I have really just one last question. Back with the U-bolts and this matter of calculating deflections. I take it the normal procedure to calculate a deflection would be to consider the entire support except for the plates, or were we referring just to the U-bolt type supports? In other words, you took the deflection of the U-bolt but not of the plate, that's what you inferred, is that correct? You were told that's the way to do the calculation.

STOKES: How to do the calc is generally left up to the engineer. Especially in my case. If I do a cantilevered support, where the base plate has an effect on the displacement so the upper support point, then I include the plate if they allow me to do a finite element analysis to determine that displacement. And I have done that. In a rigid frame, or a brace frame, it's not as critical to worry about the plates because it's strictly an upward _____ most of the time. It's an engineering judgment decision whether or not to include the plate and myself I usually include it on a cantilever of extreme length. Short cantilevers I don't feel it's critical. It also has the relative loading. It's always, in every job I've

worked, a requirement that you check it from the plate to the support point. As far as I know, all the engineers perform displacement calcs in that method. I was not the only one though questioning the fact that in many cases the plate was critical and had been omitted.

BEZLER: I'm a little confused, though. I had the impression you said it was at the discretion of the design engineer to consider plate flexibility or not. But then I get the inference that you were told not to consider it, now, which is it?

STOKES: Well, we were definitely instructed on this job not to. We, even if I wanted to, they didn't want me to do it. In other words, if I had of done it, if they didn't like the calc, they probably would have changed it in the other trailer subsequently. From looking at the calc logs that I have copies of, I should have been in the calc log as far as performing calcs probably in the neighborhood a minimum of one every thirty-five and more than that. However, when I look through the log I can only count five calcs that I've been credited with out of a couple of hundred. Undoubtedly, the ones I, I had felled an awful lot of supports and the only adjustment thing I can see is they didn't like me failing them and they redid them. And when I check out a support, I checked it out based on engineering judgment thoroughly. And if the plate had more contribution to displacement than the cantilever, then I include the plate. When I was working at a previous job, we were told not to include base plate flex, as far as the displacement. And I got an eight foot

cantilever tube steel. I ran an ANSIS calc on it, took the displacements from one side of the plate based on the ANSIS calc, and the displacement of rotation of the plate over the eight foot was more critical than the tube steel attached to the support. It passed before you include the plate, and it failed by two inches after including the plate. They told me not to do it. They told me here not to do it. We were, initially, we were told the plates the rigid, even in considering the bolt calcs, we were instructed not to include any plate flex. Regardless of the configuration, we couldn't even make the decision on our own whether it was critical. We had plates there in that plant that were three-eighths inch thick, eight feet long and one foot wide, with multiple supports on it. They didn't even want us to, and the bolts were really random configuration. But they didn't want us to even look at that plate and any other thing than rigid. That plate wasn't rigid over no eight feet. Not three-eighths plate. It wouldn't have been rigid if it was a twelve by twelve plate. Depending on the loads. But the thing was they cut out that part of our abilities, constrained us. They didn't want us to check on it very thoroughly is what I am trying to say. They wanted us to overlook things. Stretch our engineering judgment as far as. If we were willing to sign off every calc we did, just strictly with engineering judgment decisions, they was perfectly in agreement with that. They didn't care if we did a calc.

BEZLER: Okay, I think I'm just about done. Let me just summarize then your calculations if you are basing it on a

deflection criteria, you would calculate the deflection of the beam members and of the U-bolt in determining whether the structure was below the .025 limit.

STOKES: They didn't consider U-bolt the spring.

BEZLER: Okay, but then just the beam...

STOKES: The U-bolt in the calculation was assumed rigid. However, the load allowables allowed a maximum .025 displacement. There was no displacement at all considered. The hangar was allowed to go to .025 which was failure according to their criteria. If you had added the marginal amount of displacement at a minor load, it still would fail. If you added base plate flex in a lot of cases on top of that and failed even worse, it's a series of things they looked at one at a time but then they didn't combine them.

BEZLER: And you said before the .025 that corresponds also to the, essentially 2,000 pound load limit on U-bolts, is that correct or roughly correct?

STOKES: Well, it doesn't correspond to the loading. That was the displacement they used to consider the U-bolt failed. It was like the hangar restraint condition according to their criteria was that it's supposed to be equivalent stiffness of 20 hurts. They carried the U-bolt to displacement comparable to that. And then they ignored that when they did their supporting steel. They did that to the 20 hurts. And then they ignored the plate. If you added it all together, it was a very flexible support.

BEZLER: Okay, what you're saying then is the .025 deflection limit would be placed on just beam members in the support structure, ignoring the flexibility of the U-bolt or plate?

STOKES: Right.

BISHOP: Bishop. You mentioned that there were the base plate flexibility problem occurred with you once before at a different reactor site. I gathered it was a reactor site, where there too you were told not to consider base plate flexibility. Would you identify that site, please?

STOKES: That job was with Bechtel Gatesburg in 1980 and the plant site was Davis Bessie.

BISHOP: Thank you. Bishop again. On the modifications of your transcript, your affidavit, page 12, you, and in your testimony a few minutes ago, you mentioned that the ultimate solution to these problems was to add a support to make the pipe pass the design criteria. Is is, are you aware of any supports that were added to small board pipings in the time frame that vou were here for reasons other than to pass the seismic qualification concerns?

STOKES: We did, oh boy. On Unit 1, other than the support used to justify an existing support, I'm not aware, except that within the percentage of allowed failures of any corrections or additional hangars being added.

BISHOP: I guess one could... The reason I asked that question was for example, if we went out and looked at all new supports that were added to small bore piping in the eleven month

period you were here, from your perspective anyway, you would believe all those new supports were added to justify other, the adequacy of other small bore systems as opposed to some other conditions, that new supports wouldn't have been added for any other reason.

STOKES: The only other condition we added supports that I'm aware of that were added, were code break locations. They did allow us to justify code break locations. Seismicly, they didn't want to do a complete seismic reanalysis. We did check out the code break. As far as I know, all the code break lines, there are not that many, and they initially didn't want us to add any supports. They didn't want to reroute any lines but they didn't mind adding supports. Their recommendation for management was to add a single anchor following the valve if possible. And if that wasn't feasible in many cases, there were up to two laterals required and one axial to protect that valve. They didn't object to us modifying those particular supports. They did not want Haver (?) to modify the line itself. Other than code break locations, and on a limited basis those, I'm not aware of a hangar being modified at all in seismic, samtam, thermal, or any other system.

BISHOP: Thank you. I think we're ready now to proceed with looking at the actual data package. And we probably want to go off record while we set up for that.

DUKOFF: Time is approximately 4:40 p.m. We'll be going off record to set up to look at the calculations.

Today's date is December 7th, 1983. The time is approximately 5:10 p.m. This will be a continuation of the interview of Mr. Charles Stokes. Present with Mr. Stokes is his counsel, Mr. Thomas Devine. Present for the NRC Staff will be Mr. Thomas Bishop, Mr. Esa Yin, and Mr. Paul Bezler, NRC Contractor from the Brookhaven National Laboratories. Also present from the Office of Investigation will be Mr. Eugene J. Power and Philip Dukoff. And Mr. Bishop will start the session.

BISHOP: Bishop. I guess we'll turn it over to Mr. Stokes to start the discussion. We have the documents we're looking at, a document called "The On-Site Engineering Small Bore Pipe Support Calculation Log Unit 1". It's currently turned to page 60. We're looking at the original document and we will take it from there.

STOKES: Okay, this is Charles Stokes. What I have here, and what I am going to try to show is that the calculations that were originally done were destroyed. The calc log that is here, there's two versions, the original, there's also a listing of Samtam, Thermal, and Seismic sampling. Those were done by someone separately from the original logs which were filled out by the individuals who did the calcs. We're going to be looking at a calculation number for pipe support 100-132. It's a part of the Samtam sample. I have a copy which I'm going to provide to the NRC as a reference. It was dated 2/7/83, no 2/1, yeah 2/7/83. The calculation was done on this particular hangar by G. D. Ketcher. It shows that it was Rev 1, 0 revision referring to the GC calc log, or calc file, as all the other calcs did. It

was signed off as performed and checked. This particular calculation, if you look at the results or the summary of the results, on page 1 of 34, it says, under conclusions "field modification required for the following reason, base plate failure overstressed and anchor bolt failure, see pp. 20-21, and it gives the plate stress as 91.8 ksi versus allowable of 25.4 ksi. A bolt interaction equal to 2.3 greater than 1." I would like to note that in the first or master section of the On-Site Engineering Small Bore Log Calc No. MP988 for Hangar 100-132 shows that Rev 0 has been performed by a G.R. Shaw dated 3/1/83, checked by K. V. Cotcham, 3/5/83, approval 3/6/83. Those particular names aren't referenced in the calculation I have as being the Rev 1 or Rev 0. If we can pull that calculation which has been supplied to us, and we turn to the cover sheet which, okay, looking at the calculation that exists as a final for MP988 hangar 100-132, and looking at the record of revisions and the work performed on this calculation, this calculation shows that the calc was done Rev 1 by G.R. Shaw and K.V. whatever per the log. It does not reference the revision which I have showing Mr. Ketcher as having performed it on 2/1. I don't know what happened to that particular calculation. It should not have been destroyed. If anything, any future revisions should have been only added to. As does the cover sheet exposes, as it's already up to Rev. 4 for final support evaluation. If we were to thumb through this calculation package, and try to find out the history of the calc that is shown as final, it shows here, there are several versions, first one revision which is shown, the

conclusion is no field modifications. That was dated, that's Rev 4. There was new loads. Rev 3 shows no modifications. Rev 1, which was originally performed by Mr. Shaw, no field modifications. There should be another revision here, Rev 1, showing Mr. Ketcher recommending modifications. Then maybe Rev 2 would show no modifications, but somewhere along the line, somebody decided to destroy that calc showing that it could have failed. To my knowledge, this particular support not only, well, let me point out something else. In the Samtam log, which is at the end of this master file, for hangar 988, if you'll look, it does give Mr. Ketcher credit for having done this hangar on 2/7/83, checked by Mr. Patel 2/9/83, but somehow he got mistaken off of the cover sheet of the calc and his calc got destroyed. It shouldn't have been done that way. I've never seen this kind of thing done. It may look like it's strictly an accident but I will attempt to show through some other calcs, which I don't know if they've acquired yet, that every calculation that I have a copy of the original where it failed, that calculation no longer exists. In some cases, the calc log has been changed both in the original and in the final. Samtams sampling sheets, and in some cases it hasn't. At this time, I'd like to ask anyone here if this, if they have any questions concerning what I have to show them at this time.

YIN: Esa Yin. I would like Mr. Stokes to show us perhaps a couple more examples, if he has the documents available.

STOKES: Well, before we do that, I think I'll take a break to get a little organization because I'd like to get all the documents in front of me before we proceed.

DUKOFF: At approximately 5:20 we'll be going off the record.

DUKOFF: This is Dukoff. The time is 6:46 p.m. We're going back on the record now. During the time we've been off record, Mr. Stokes has had some informal discussions with the technical staff regarding some calculations and two points have been brought up that we're going to put on the record. Mr. Stokes could you please repeat for me the comments you made in reference to Mr. Gray and also your feelings on the seismic versus non-seismic lines for the record, please?

STOKES: Well, I'll be glad to expound on Mr. Gray's, uh, what I said about him. That's okay. I'm out of tape. The comments concerned a drawing which we just happened to be looking at, 2171-16 which I couldn't believe that I did a Rev 0 calc when I rev 0, it says that's done per ASM and Dave Carr. But it does give me credit for Rev 1. At which case, having thumbed through the calc and looking at my sketch, I noted that my sketch, this particular hangar was one which I had recommended a fix for of the installation of an additional U-bolt and a short section of angle because the U-bolt fell side load. I had added a second U-bolt and an angle and used both U-bolts strictly for the tension loading to which case both were adequate. This brought back memories of things that had slipped my mind. Mainly, when we did these calculations, we supplied Pullman a sketch of our proposed fix. These went through a Mr. Dick Gray, who was supposedly only supposed to originate a cover and route these to Pullman and handle the documents. However, what happened in this

particular hangar's situation is shortly, when the sketches came back to me for review and signatures as far as issuing to the field, I discovered that the sketch had no semblance to the sketch that I had included in my calculation. The duplicate U-bolts had been replaced with a boxed-in configuration. I traced this down through Pullman to find out what they had been, the sketches they had been submitted, what they looked like, because I couldn't believe that my drawings had been changed, I thought Pullman was responsible. They showed me sketches which had come through Mr. Gray to them with cover sheet from Mr. Gray, showing it boxed in. I, at that time, went back into my trailer and discussed this with Mr. Leo Mangova and Mr. Wah. I told them that one or the other was incorrect that the sketch needed to be changed to my configuration or I needed to change my calc. They said, well, it's obvious it's conservative, there's no need to change your calc and at the same time I complained because Mr. Dick Gray obviously the only person between us and the Pullman people, had changed my sketch. He had done this without doing any calculations. Strictly on his own accord, without an independent checker or any other person looking at it. This, to my knowledge, was extremely wrong. I told him I didn't like it. I went in with Kevin and told Mr. Bob Omen what was happening and recommended that he stop Mr. Gray from being allowed to review our drawings if he was going to change them without having authority to do so. He was removed from that position. However, he has never been reprimanded to my knowledge, and he's still at the site in a new position as lead

of the pipe stress group. I don't feel he has the, or should be in that position.

Also, concerning the second part of the question, I don't usually make comments on a personal nature. I tend to stick only to design criteria, design considerations, per codes. In this case, it's something I think should have been considered in a code but somehow it's been overlooked. That's the fact that in actual installation in the field of pipe, many non-seismic pipe systems are installed right over seismic lines. When the seismic lines are evaluated, they do not consider the other pipes as falling on them. In many cases in the plant, there are extremely large non-seismic sit lines which are over Class 1 safety-related systems that have not been evaluated. The supports probably are inadequate if checked against the critical load condition. And I do know from past experience and personal knowledge that I have seen very large twelve inch lines over the control drive ride systems on other plants. And these lines were never analyzed to the same standard that the seismic were and could be very much a safety related problem. I will say that.

BISHOP: Bishop. Going back to point one, the document that Mr. Gray changed, in the record package that we're looking at, could you state what revision of the record package that you reviewed and could you tell us if there are subsequent revisions to that whether the package as of today's date, in your estimation, is proper, or whether it still reflects calculations which don't reflect the actual construction?

STOKES: Well, there was on this particular calc an existing calc rev 0 which had been performed earlier. However, I was asked to reevaluate the hangar. And I reviewed what was Rev 1. There are subsequent revisions to my revision. Rev 2 includes a sketch of the as built conditions but no calcs on the change in configuration from my calc to it. It does have a kind of a, well, it has a sheet, page 2, and there's a few comments here under deviation from engineering design, under minor, minimum difference in dimension, 1 1/4 inch max from design, and it says plate design used rather than continuous angle in design modification. The first one was rated insignificant. The second one says design mod as as built, plate design is preliminary for U-bolt, primary for U-bolt failure, as built is still okay. It's basically only engineering judgment decision on that. There's no calcs. And then there's a subsequent revision, which is strictly a final load condition, looks like. Compares loads used in calc with final loads. And, looking at that, well, it says that the final loads are lower, boy, this is really neat, it lists the loads here, it shows the D, E loads to be in the Z direction. O loads, both loads were 100 plus or minus, Y and Z. The final loads on the new one show 63 in Y and 125 in Z. Just a little bit less in one case but higher in one case. It shows D, E loads and Z to be higher. It shows the Y loads to be higher, 32 versus 2.3. It shows the dead weight to be a little less than what I originally used of 40. It shows the high _____ loads to be, that I used to be 214.5 and the new high _____ loads to be lower. It states the final loads are less than loads used

in analysis and no reanalysis required. However, unless the high _____ loads were governing, it looks to me like the final loads are as high or higher in one case and lower in one case, depending on which direction is the most critical, may not be less than the original in any case. So I'm not sure that there's no reanalysis required on that but it would definitely take quite a bit of looking into other than just looking at comparing those two load cases. I hadn't noticed that previously. [more talking, but not intelligible]

BISHOP: Okay this is Bishop. I think we can take that package with it. Let me list just for purposes of the record the documents we have collected from you this evening and made copies of. I'll just do this very quickly. These are pipe support calculations. The first one is for hangar No. 100-132 revision one. The next one is 98-82, revision 1. The next one is 2182-81 revision 1, 2182-74, revision 1, 2182-81 revision 1, 2182-94, revision 1, 4614, revision 1, 2182-66, revision 1, 2182-64, revision 1, and there may be one repeat in this entire process but I'll list them all anyway. 2182-93, revision 1, 2180-26, revision 1. And here's the repeat I believe, 2182-63, revision 1. And yes, there are two of those. We also received today from a separate individual, Mr. Gary Ketcher, a document that carries the number T60551-1A. It is hangar number 100-32, it's a computer program printout. And it is, I'm looking for a date on it. The rev number is blank, the date is blank. Input by Ketcher, dated 1/31/83. [I thought there was a second part to this. Oh, here it is.] The other document from Mr. Ketcher is

also a computer program and it carries the number T70916-4A. It also is for hangar no. 100-132 followed by a Y. It has a input date by G.R. Shaw, dated 2/26/83. We have a third document received from Mr. Ketcher this afternoon. It's a computer program also. It carries the number T70916.

DUKOFF: The last tape ran out at approximately 7:02 p.m. It is now 7:15 p.m. Mr. Bishop is going to finish reading the document numbers into the file. During the time that we were off record, Mr. Stokes and Mr. Yin had a discussion regarding the strudel programs.

BISHOP: Bishop. The last document that was provided to us by Mr. Gary Ketcher today is a computer program. It carries the number T70916-1A. It's in reference to hangar no. 100-132Y. It was inputted by G.R. Shaw on 2/26/83. I think what I'd like to do at this point, also while we were off the record, we've compared the document, the calculation package for hangar no. 100-132 rev. 1 that Mr. Stokes provided us with another document that's in the official PG&E record that carries the same revision and hangar number. We've also gone through hangar package 2171-16 which Mr. Stokes described his concern with on that package. I'm wondering would it be beneficial to go through some of the other official record packages while we're here? Are there other types of errors that we haven't discussed today that it might be helpful to have you identify for us?

STOKES: Well, other than the documents I gave Mr. Bishop so far which were concerned with the destruction of original calculations that showed a failing hangars, I gave him a list of

supports, or calculations to obtain earlier in the day and earlier on in the tape. The numbers that are not supplied by the copies I provided, those particular hangars are critical to the points I made earlier in the defective assumptions being made, erroneous assumptions, the juggling of loads by stress to make those hangars look good, and I'm fairly sure that within that list, one of those supports is the one that has a support located within six inches. I can't guarantee there's more than one, but I do know there is one. I do think it is more than likely the one Gary did but I would focus my attention there first. But I do feel that within that list, that hangar does exist next to one of those supports. I would give, if at all possible, a very detailed look at the calculations on those supports. Especially under the final load conditions. And probably, if I had it to do myself, I'd do my own calculation with the final loads, rather than look through the calc package and try to pick out where some guy made an assumption. I would make my own assumptions under my own knowledge and see if I come up with his conclusions. Per M-9, that was an accepted design procedure for us here in the field. We did not have to check what the guy did. We had the option of performing our own calc and coming up with our own decisions and I feel it's just as reasonable for the NRC to do the same and then look and see what was turned out as a final print here agrees with their engineering judgment. That probably would be a lot easier than trying to weed through all the paperwork. But, other than that, I can't really say what the other calculations may show on an individual basis. I do know

those calculations, like you said, are the hardcore problem areas that gave people here at the site in management extreme difficulty. And from what we've seen of the calcs, they all show no modification.

??: You mentioned again the calculation package that Mr. Ketcher did and that's on hangar no. 100-32. I'm looking at an ISO I guess of that hangar, and I'm comparing that with the Rev 1 ISO in the official record package. Does that show any obvious changes or examples?

STOKES: Yes, Gary, had already... In our discussion this afternoon, Gary had already looked at these two packages. And he explained something that I know that I consider critical. To the average person, it might not be so obvious. He told me that his model was roughly the same. But that there were fewer nodes. The critical thing that I can tell you immediately upon inspection, without any further evaluation other than this drawing and this calc, is that Gary modeled in the eccentricities of the attaching members, based on the fact they did not attach at the centroidal lines. These eccentricities seem minor on the drawing. They range from .5 inches to 3.5 inches. Let's see, dimension, 4, it's obvious and these are very short segments. They are items eleven, ten, six, and twelve. The end result is if you model out the eccentricities of the joints, you completely, you can definitely change the stress to the members. Anyone that models the hangars should try to model the hangar as closely as possible to the actual configuration constructed. There's an awful lot of people who think minor

eccentricities like .5 are worth considering. On a very marginal hangar that may pass or may fail, modeling it correct will fail it. However, not modeling it correctly, it will pass it. It may be that in this package the hangar failed and because it failed under Mr. Ketcher's calculation which was accurate, they didn't like that. They remodeled it, taking out the eccentricities, a very simple. The other thing is they also noted the load point here, item 13 had an eccentricity from where the final calc shows it. He didn't show any eccentricity on where the load was applied. That probably was accounted for in Mr. Ketcher's calc because the load was applied through a U-bolt. He modeled the load out the U-bolt location. The final calc, the guy modeled it right at where the U-bolt attached, thereby cutting out moment, if there was sideload, and reducing stress. I would say that if you review this hangar in the field it probably should have been modeled like Mr. Ketcher's and not like Mr. Shaw's. And like I said, in some hangar conditions, that probably wouldn't be critical, but in a failing hangar or very marginal hangar, being accurate will fail it. I've done that in many cases, I personally don't give a hangar a very thorough analysis if it looks like it will pass with flying colors. If it looks like it's going to be marginal, I give it the fifth degree. I give it everything that I know in my ability that is reasonable. If the hangar can't take that, then it's not any good. This hangar per Gary's calc, failed. And I feel it probably still does.

BISHOP: Bishop again. I want to ask our two technical experts here whether they have any specific questions they would

like to pursue further. Do you see a need to go through any other document packages with?

BEZLER: [unclear]

STOKES: I wish I could tell you. I don't have any knowledge of the number. I do know it exists. I am not the only person that knows that. We have not determined that it's next to Gary's because we do not know what's next to Gary's. I would look at that possibility first. There's two ways to go about, you can pull the ISO, look at the ISO, or you could go to the field, using that drawing location to find your way there and to see what's there. The hangar may not, however, be within six inches. It could be easily downstream. If Gary's hangar was failing from an actual load, say, it's easy to put a hangar at the 90 degree location within six inches of the elbow and per stress assumptions, assume that support takes that axial load. And thereby cut Gary's hangar load out. But I was told by the people that had problems with one hangar that it was added six inches away. I had a discussion with the stress guy who was working stress trailer at the time and I mentioned this same thing. He told me that he remembered that hangar being added. He no longer works in the stress groups. I would like to ask him before I give anybody's name if he would be willing to discuss that beyond my and his discussion. But I will say that without naming him point blank, that the names that I have mentioned in the documents that I have, the names I have given here today, his name is one of those people. If questioned, he should testify.

BEZLER: I have one last question. I hope it's the last question. Your discussions relate to small bore hangars. Do you feel the same procedures were followed for large bore piping supports? Was there the same effort to cover up or show passing supports by various methods?

STOKES: The only program I was assigned to is small bore. The only relationship I had concerning large bore was when I was in quick fix, I had ample opportunity because I was the quick fix engineer for both Westinghouse, San Francisco, Bechtel and our on-site group to evaluate Westinghouse drawings, Bechtel drawings. And based upon the drawings, I could draw conclusions as to how the calcs were made and defective things that were overlooked. And the weld DR I wrote, I specifically pointed out that I questioned Bechtel. [Tape is blank for a few seconds]. I do feel there are problems that are related to the large bore group that I have mentioned that I know are a problem with small bore. I can't say that all the problems exist. I can't say that the problem exists concerning the destruction of failing hangars, I'm not sure that they didn't fix all the large bore hangars that failed. There's a lot smaller number of large bore hangars. I do know they did not want to do a complete re-evaluation of all the seismic small bore or safety-related stuff here because they felt it would definitely postpone the operation of the plant and they did bend over backwards not to.

YIN: This is Esa Yin. The issue just raised by Mr. Stokes, relative to modeling of loadings, imposing at the actual locations, and also modeling of system geometries in accordance

with actual physical frame conditions is understood and we will take a look in those areas.

BISHOP: Bishop. We've filled out a document receipt for the documents we talked about earlier that we'd copied, borrowed, copied, and returned to you and I'll keep a copy of this receipt. Is there anything from the office of OI? Anything you gentlemen would like to talk about? Let me hold off on that question. I note Mr. Stokes you had some other documents there. They look like log sheets, or something like that? Xerox copies of log sheets?

STOKES: Well, these are copies of Samtam and the Thermal sample of the seismic sample sheets. I had requested these and I have been supplied them by Mr. Wah and all, these are my copies, you have in the log sheet, the log book, in the back, identical copies to what I have. These were used by me to determine that they had done intentional coverups and that the logs didn't agree with the calcs. And I was hoping to stop the management from going through the calc log and correcting their problems by acting very promptly and requesting that those documents be removed from their authority. And now that NRC has them, and sees them, and has seen what I pointed out, I'm perfectly comfortable with where I stand on that.

BISHOP: Okay, Bishop again. Do you have any other documents that might be useful in evaluation of your concerns?

DUKOFF: The time is approximately 7:32. We're going off the record. Mr. Stokes is going to review some of the other documents he brought with him.

DUKOFF: The time is now 8:09 p.m. and this interview is being concluded.

10-20-83
2151 Lariat Dr.
Los Osos, CA 93402

Mr. T.W. Bishop, Resident
Reactor Projects and Engineering Programs
Region V
1450 Maria Lane
Walnut Creek, CA 94596

Dear Mr. Bishop:

Thank you for your letter responding to my 8-20-82 allegations concerning the RHR (Residual Heat Removal) system at Diablo Canyon. Your office seems to have spent quite a bit of time on this investigation, and I appreciate that fact. I am concerned, however, that much of the information which I gave to Mr. Powers during the interview in August of 1982 was apparently not passed on to the Site Representative at Diablo Canyon. The inspector who "paraphrased" my allegations for Inspection Report No. 50-275/82-42 seems to have "missed the point" on several of them.

I would like to take this opportunity to restate my position on the problems at Diablo Canyon as I previously described them to Mr. Powers. I have attached a copy of "Allegations Regarding the Diablo Canyon Residual Heat Removal System" beginning on page 5 of Inspection Report No. 50-275/82-42, and will comment on these allegations paragraph by paragraph:

(a) I did not claim that there were no control and interlock circuit drawings for valves 8701 and 8702 as your inspection report stated. In fact, I provided Mr. Powers with excerpts from logic diagram 458840, and electrical schematics 437592 and 458846 explaining how this circuit functioned. I pointed out that it was not clearly shown on any of them that removing the power from the SSPS(Solid State Protection System) output relays would cause the RHR suction valves to fail closed. I said that the power source for the SSPS relays in this circuit should be shown on electrical Schematic 437592. The omission of this information from the electrical schematics at Diablo Canyon led to personnel error causing the inadvertent closure of valve 8701 and the isolation of the RHR pumps suction with a pump running (see NPPR DC1-81-OP-P1057 dated 9-29-81).

(b) I did not, at any time during the interview with Mr. Powers, mention the physical routing of the RHR control circuitry. I stated that neither the Senior Control Operator or the I&C Foreman were aware that the RHR control circuitry was routed through the SSPS and that removing the power from the SSPS output relays would cause valves 8701 and 8702 to fail closed. This fact was demonstrated on September 29th as mentioned in the previous paragraph.

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(c) This section contains several errors which I have listed below:

1) The SSPS does not amplify, or in any way change the signal from the Westinghouse "hagan" racks to the auxiliary relay cabinets. I explained this clearly to Mr. Powers, and gave him a [illegible] depicting the complete system function for your office to review. The person within PG&E who told you that "the solid state protection system completes the logic function and generates a larger output signal(amps.)..." had best review his basic electricity.

2) That this is a standard Westinghouse design is true, which explains why the Westinghouse reactors are prone to RHR suction valves going closed inadvertantly.

3) That the PG&E management is "unaware of any problems with this arrangement" is curious. On 1-16-82, I submitted Design Change Request No. DC0-GE-2518-Rev.1 to PG&E Engineering. This DCR requested that the RHR system at Diablo Canyon be modified to prevent reoccurrance of the incident of 9-23-81. Attached to it were copies of 16 Licensee Event Reports describing similar losses of Residual Heat Removal capability at other power plants in the Country. This DCR was approved by D.A.Rockwell and R.D.Etzler, both of whom were present during the NRC investigation into these allegations. Copies of these LER's were also provided to Mr. Powers.

(4) The major point which I made to Mr. Powers was that the SSPS relays in this system perform no function whatsoever, reduce the reliability of the RHR system, cause a potential for damage to the RHR pumps, and should be removed, regardless of the fact that this is a "Standard Westinghouse Design".

(d) I pointed out to Mr. Powers that several attempts had been made to "get rid of this problem", and gave him a copy of design change request No. DC0-GE-2518-Rev.1 which I described in paragraph (3) above. I also gave him a copy of Plant Design Comment No. 559 which concerned valves 8701 and 8702. Apparently, your Site Representative confused a "drawing change request" for a "design change request".

(e) I showed Mr. Powers that one portion of the Diablo Canyon FSAR claimed that valves 8701 and 8702 would close automatically on an overpressure/overtemperature condition, while another portion claimed that the power would be removed from these valves during operation. Obviously, a valve can't automatically close when the power is removed from its motor operator. As to the NRC finding that this contradiction in the FSAR presents no "noncompliance with regulatory requirements", may I call your attention to 10 CFR 50.71, paragraph (e), which requires that the FSAR be updated periodically (no less than annually) and shall "reflect all changes up to a maximum of 6 months prior to the date of filing."

(f) PG&E maintains that the spurious closure of a motor-operated valve is essentially impossible. As previously mentioned, copies of the following Licensee Event Reports, all instances of spurious RHR suction valve closures, were given both to Mr. Powers and to PG&E Engineering: LER-369-81078, McGuire-1; 338-78145, North Anna-1; 348-79068, Farley-1; 344-76010, Trojan; 348-80077, Farley-1; 316-80060, Davis-Besse-1;344-76000, Trojan; 346-80058-1, Davis-Besse-1;316-80013, Davis-Besse-1; 338-80001, North Anna-2;346-77000, Davis-Besse-1; 302-80015-1, Crystal River-3; 369-81129, McGuire-1; 317-74000, Calvert Cliffs-1; 348-80080, Farley-1; 318-79038, Calvert Cliffs. Why PG&E continues to ignore this evidence is beyond me.

(g) Yes, an RHR pump motor trip is annunciated in the control room. Unfortunately, the pump motor only trips after the pump has been damaged by overheating due to lack of flow; Yes, the monitor light boxes show RHR suction valve position, but only during accident conditions, not during normal operation. When valve 8701 went closed spuriously on 3-29-81, the Control Room Operator would have remained unaware of the fact until RHR pump failure had not a conscientious painter who was working near the pump called the control room due to the loud banging noises the pump was making. I stand on my original allegation: During normal operation there is no control room annunciation that an RHR suction valve is in the closed position, and there should be one to prevent damage to the RHR pumps.

(h)(j) As I explained to Mr. Powers, Nuclear Plant Problem Report No. DC1-81-OP-P1057 was initiated on 3-29-81, but signed off as complete <u>without any</u> plant management review. When I became aware of this, I contacted Juanito Diamonon, the head of the QC department at the time. NPPR DC1-81-OP-P1057 was resurrected from the "closed" files and signed off by Jim Sexton, but classified as "non-reportable" and without any follow-up action such as an RHR pump inspection or investigation into the cause of the incident. I alleged that both the loss of Residual Heat Removal Capability and the failure to report it were reportable; The former under 10 CFR 50.72 "Notification of significant events", which states that: "Personnel error or procedural inadequacy which, during normal operations, anticipated operations, occurences, or accident conditions, prevents or could prevent, by itself, the fulfillment of the safety funcion of those structures, systems, and components important to safety that are needed to...(ii)remove residual heat following reactor shutdown..." must be reported to the NRC.

(i) I am aware that the Diablo Canyon FSAR claims that the RHR pump suction from the RCS (Reactor Coolant System) Hot Legs is not safety related, but my question is <u>why</u>! This system is certainly necessary to mitigate the consequences of an accident of the small break LOCA type, so why is it not safety related? In the newer Westinghouse and Combustion Engineering designs this system is considered safety related and is totally redundant, so why not at Diablo Canyon?

(k) That the NRC Site Representative considers it "not of safety significance" that a problem report has been open, unresolved, and unreviewed for 3 years is puzzling to me.

(l) PG&E claims no awareness of the incorrect alarm listing [illegible] considering that I sent memorandums on this subject to both Mr. J. M. Gisclon, the Power Plant Engineer, and the second to Mr. R. C. Thornberry, the Plant Manager! I gave Mr. Powers copies of these two memorandums during the interview.

Although your office has gone through the motions of an investigation into these problems, it seems to me that the questions which were asked of PG&E were trivial or incorrect representations of those concerns which I conveyed to Mr. Powers. In addition, it appears that PG&E's answers to even those were accepted without question or follow-up. Furthermore, in the instances where I provided Mr. Powers with documents proving my allegations, the documents were not made available to your Site Representative or were ignored.

I can only hope this and the 14 month delay in answering my concerns can be explained merely as a lack of communication between the Office of Inspection and Enforcement, your office, and the Site Representative at Diablo Canyon.

Yours Truly,

John H. Cooper

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completed the as-built audit and has generated twenty-nine Open Item Reports (OIR). So far, the licensee has dispositioned eighteen of the OIR's. The inspectors will complete the review in this area when the remainder of the OIR's are dispositioned (82-42-02).

No items of noncompliance or deviations were identified.

8. Open Items Followup

Plant Administrative procedures C451 and D756 have been prepared to assure reinstatement of Environmental Qualification conditions after maintenance or surveillance testing. This closes open items 80-16-01 and 81-15-41.

9. Allegations Regarding the Diablo Canyon Residual Heat Removal System

On December 2, 1982 the inspector met with licensee representatives to discuss allegations regarding the Diablo Canyon residual heat removal (RHR) system. These allegations had also previously been examined at the jobsite and documented in Region V inspection reports 50-275/82-26 and 50-323/82-13. The following paragraphs paraphrase the allegations, summarize the inspection, and state the findings of the inspector.

(a) Allegedly there were no control and interlock circuit drawings for motor operated valves 8701 and 8702 (RHR hot leg suction isolation valves). The inspector examined PG&E drawings 437592 "Residual Heat Removal Flow Control Valves", and 103058 "Circuit Schedule 480 Volt for Busses F, G, H" circuits H19P00 through H19P12 and G25P00 through G25P13. The inspector observed that these drawings describe the power, control, and interlock circuits for the subject valves. The allegation was not substantiated.

(b) Allegedly no one knew how these circuits were routed in the plant. Licensee project engineering personnel stated that in addition to the drawings described above, the raceway schedule depicts circuits in a particular conduit, the conduit drawings show conduit locations in the plant, and the circuit schedule itemizes the pull data for each wire in the plant. They also stated that the drawings and schedules were available to the plant staff through the site document control center if this material was not available in the control room. The inspector had previously verified that this type of documentation was properly controlled and readily available to the plant staff. This allegation was not substantiated.

(c) It was alleged that the design was no good in that the control/interlock circuits are routed from the "hagen" racks via the solid state protection system to the relays which shut the valves. Licensee engineers explained that this was a standard Westinghouse design and that the "hagen" racks took low level analogue signals and (in this case) used bistables to

generate signals in the milliamp range. The solid state protection system completes the logic function and generates a larger output signal (amps.) which in turn actuates relays in the auxiliary logic cabinet. They explained that they were not in a position to change this arrangement (since it is a Westinghouse design) and that they were unaware of any problems with this arrangement. The inspector examined the location of the components of the RHR isolation valve control and interlock circuits to verify the licensee's statements. The allegation was substantiated to the extent that the circuits were as alleged, however there was no apparent deviation from regulatory requirements or safety criteria.

(d) It was alleged that a design change request (DCR) submitted about February 1981 to get "rid of that system" (i.e. RHR hot leg suction isolation interlocks) has never been acted upon by PG&E. The inspector verified that there were no outstanding DCRs on PG&E drawing 437592 (which depicts the system in question) and that none were originated from or arrived at the Diablo Canyon project. The site Resident Inspectors verified that no DCRs were outstanding for this drawing at the jobsite. This allegation could not be substantiated.

(e) It was alleged that the FSAR, Chapter 5, paragraph 5.7, pages 37b and 38 as well as Chapter 7, paragraph 6.2, pages 3 and 4 describe the automatic high pressure/high temperature isolation of the RHR system from the reactor coolant system, and that this is inconsistent with the technical specifications section 3.4.9.3 which requires AC to be removed from the associated valves (8701 and 8702) thereby disabling the automatic isolation features. Therefore the FSAR should be amended. Licensee representatives showed the inspector Table 6.3-10 of the FSAR which shows that the valves are to be shut and racked out at power and open and racked out during shutdown cooling mode. This is in accordance with NRC direction. The licensee representatives also stated that the entire FSAR would be updated (with inconsistencies removed) in September 1983 in accordance with 10 CFR 50. The allegation was partially substantiated, but no safety problem or noncompliance with regulatory requirements was identified.

(f) The alleger stated that the FSAR section 3.1.3 states that spurious closure of normally open/fail open valves is not considered as either a passive or active failure and is not analyzed for at all which is a problem. Licensee engineers explained that there were no reasonable failure modes which would cause normally open/fail open or normally closed/fail closed valves to change state. The only possibility they could imagine was a "copper octopus" which caused selective shorting. This issue had been dealt with in the Fire Protection Review and was one reason that certain valve circuit breakers were racked out after the valve was placed in the desired position. As far as control circuits are concerned, any short with 120 volts or higher would cause the logic circuits to go to a fail safe condition due to the overwhelming signal strength (normal signals are 4 to 20 milliamps). The allegation could not be substantiated.

(g) It was alleged that there was no low flow alarm for the RHR system and that there should be one. The inspector verified that an RHR pump trip is annunciated, that shut RHR suction valves are indicated, and that the subcooling meter was available to ensure adequate core cooling. Licensee representatives pointed out that the RHR pumps have a miniflow recirculation to maintain some flow, and that the monitor light box indicates valves or circuits in the incorrect state. The inspector concluded that the allegation was correct in that there was no "low flow" alarm, but also concluded that there appeared to be no requirement or necessity to have one.

(h) It was alleged that an RHR pump ran without flow for 5 minutes in September 1981, and that this event was not reported as required by administrative procedure C-12 and 10 CFR 50.72. The site resident inspector verified that a Nuclear Plant Problem Report (DCI-81-OP P1057) and the associated corrective action was completed. The allegation was not substantiated.

(i) It was alleged that the RHR hot leg suction does not meet the single failure criteria for function (suction from reactor coolant system hot leg), that newer plants had this feature, and that this portion of the system should be redundant to meet 10 CFR 50 Appendix A Design Criteria. The inspector verified that this function was not safety related in the Diablo Canyon plant design by examining the FSAR. The inspector observed that the suction from the containment sump and from the refueling water storage tank were both safety related and arranged to meet regulatory requirements for redundancy. The inspector also observed that some other plants did have two RHR suction lines but that these plants used a different nuclear steam supply system vendor. The inspector concluded that the allegation was correct in that the RHR suction line was redundant only for the purpose of reactor coolant system isolation, but that there was no apparent safety problem or deviation from regulatory requirements associated with this design.

(j) It was alleged that nuclear plant problem reports (NPPR) were not getting management review which is a violation of administrative procedure C-12 and that NPPR DC 1-81-OP P1057 had been signed off after this shortcoming was identified to management. Other NPPRs should be examined. The Resident Inspectors observed that other NPPRs were being given appropriate management review and resolution. The allegation was not substantiated.

(k) It was alleged that NPPRs DCO 79 TI P0006 and 79 TI P0117 are still open after three years and should be closed. The Resident Inspectors observed that response to NPPR P0006 was complete and that response to P0117 was underway. The allegation was substantiated, but no particular safety or regulatory significance could be attached to this situation.

(l) It was alleged that a change to the Plant Manual Volume 16, reactor coolant pump "lo oil level" alarm should have been changed to "lo-hi oil level" but had not been corrected eight months after the correction had been submitted. The Resident Inspectors identified this allegation to the licensee. The licensee initiated a NPPR (DCI-83-TN-P0001) and the problem is to be resolved. The licensee personnel that were interviewed, were not previously aware of this problem. The allegation was substantiated.

The inspector concluded that the allegations were partially correct but that these had no apparent safety significance or deviations from regulatory requirements.

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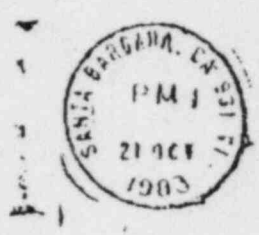



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UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION V
1450 MARIA LANE, SUITE 210
WALNUT CREEK, CALIFORNIA 94596

OCT 26 1983

MEMORANDUM FOR: D. G. Eisenhut, Director, Division of Licensing, NRR

FROM: T. W. Bishop, Director, Division of Resident, Reactor Projects and Engineering Programs, RV

SUBJECT: ALLEGATIONS CONCERNING THE RESIDUAL HEAT REMOVAL SYSTEM, DIABLO CANYON UNITS 1 AND 2, DOCKET NOS. 50-275 AND 50-323, ALLEGATION NO. RV-83-A-0047

Region V recently received correspondence (Attachment 1) from an alleger concerning the Residual Heat Removal System at Diablo Canyon Units 1 and 2. These allegations were previously addressed by Region V in NRC Inspection Report No. 50-275/82-42 in response to allegations received on August 20, 1982. A copy of the appropriate paragraphs of report no. 50-275/82-42 are provided with Attachment 1.

Evidently the alleger feels that Region V failed to adequately address his original concerns. Accordingly, Region V requests NRR assistance in resolving the concerns identified in paragraphs (c)(4), (e), (f), (g), and (i). These concerns were discussed with Mr. George Knighton by telephone on October 25, 1983. It is suggested a Task Interface Agreement be initiated on this subject.

The following information is provided to aid in your evaluations.

Paragraph (c)(4): Evidently, removing power from the Solid State Protection System causes the RHR suction valves (8701 and 8702) to fail closed. The alleger feels that removal of the suction head from the running RHR pumps will cause pump failure. Thus, the alleger considers that such an arrangement degrades the reliability of the RHR system below an acceptable level with the attendant result of RHR pump damage. Therefore, NRR is requested to evaluate the acceptability of this "Standard Westinghouse Design".

Paragraph (f): NRR is requested to evaluate the potential for RHR suction valve closure, and the effects thereof, in light of the LERs identified by the alleger.

Paragraph (g): NRR is requested to evaluate the acceptability of using (1) the RHR Pump Trip annunciation in lieu of a low flow alarm and (2) valve monitor light for indication only during accident conditions and not during normal operation.

Paragraph (i): NRR is requested to evaluate the configuration of the RHR hot leg suction for compliance with 10 CFR 50, Appendix A, and evaluate the acceptability of classifying the hot leg suction as "not safety related".

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Please document the results of your evaluations and forward these to Region V in order that these may be included in appropriate inspection documentation and, thus, closed in a formal manner. Your prompt attention to this matter would be appreciated.

It is further recommended that consideration be given to appropriate board notifications.

T. W. Bishop, Director
Division of Resident, Reactor
Projects and Engineering Programs,
Region V

cc:
L. Chandler, ELD
G Knighton, NRR
H. Schierling, NRR
D. F. Kirsch, RV
P. J. Morrill, RV