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IN THE MATTER OF: DOCKET NO:

MEETING WITH CYGNA ENERGY SERVICES
ON COMANCHE PEAK STEAM ELECTRIC STATION
INDEPENDENT ASSESSMENT PROGRAM (PHASE 3)

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UNITED STATES OF AMERICA

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MEETING WITH CYGNA ENERGY SERVICES

ON COMANCHE PEAK STEAM ELECTRIC STATION

INDEPENDENT ASSESSMENT PROGRAM (PHASE 3)

Nuclear Regulatory Commission
Room AR-5033
Air Rights III Building
4550 Montgomery Avenue
Bethesda, Maryland

Thursday, January 10, 1985

The meeting of the NRC Staff with CYGNA Energy Systems on the independent assessment program (Phase 3) for Comanche Peak commenced at 9:00 a.m.

ATTENDEES:

SPENCER H. BUSH	Review & Synthesis Association
ROBERT P. KENNEDY	Structural Mechanics Association
MICHAEL SHULMAN	CYGNA
DAVID R. PIGOTT	Orrick, Herrington & Sutcliffe, for CYGNA
JOHN R. FAIR	NRC/IE
TOM L. BRIDGES	EG&G Idaho
DAVID TERAO	NRC/TRT
GOUTAM BAGEHJ	NRC/TRT
GORDON BJORKMAN	CYGNA
JOHN C. MINICHIELLO	CYGNA
NANCY H. WILLIAMS	CYGNA
RICHARD G. BACHMANN	NRC/OELD
GEARY S. MIZUNO	NRC/OELD
W. P. CHEN	ETEC
SPOTTSWOOD B. BURWELL	NRC/NRR/DL/LB #1
C. NELSON	TENERA
J. B. GEORGE	TUGCO
DAVID H. WADE	TUGCO
JACK REDDING	TUGCO
WILLIAM A. HORIN	Bishop, Liberman, Cook, Purcell & Reynolds
SUSAN BRENNA	Dallas Times Herald

-- continued --

ATTENDEES (Continued):

VINCENT S. NOONAN	NRC/NRR
RICHARD H. WESSMAN	NRC/NRR
R. KENNEDY	CYGNA
RON HUTCHESON	Ft. Worth Star-Telegram
DONALD LANDERS	Teledyne/TRT Member
VICTOR FERRARINI	EAS/TRT Member
LARRY SHAO	NRC
BILLIE GARDE	GAP/CASE
D. F. LANDERS	Teledyne Eng. Services/ NRC Consultant
B. J. YOUNGBLOOD	NRC
R. VOLLMER	NRC
DAVID REAL	Dallas Morning News
JIM LANDERS	Dallas Morning News

P R O C E E D I N G S

MR. NOONAN: I guess we'll go ahead and start the meeting this morning. My name is Vince Noonan, I'm director for the project and the Comanche Peak project. The meeting this morning is basically the meeting we requested, the NRC requested to have. And we basically want to sit with Cygna and talk to them about some of the technical matters that we have.

Our SER has basically been prepared and it's in draft stage right now, but we have it in the review cycle and there are some questions that we need to ask so we can make those -- feed those back into our safety evaluations. I fully understand, we'll be asking questions on phase 1 and 2, which is basically the Staff's part of it. On phase 3, that was basically something that the board more or less imposed.

We are going to ask questions. I understand sometimes, based on what the scope of work was, you might not be able to respond to them, but I'm going to put them on the record anyway so the record will at least show the concerns that the NRC has on that and later on we'll be talking to the Applicant. Not today, but I think we'll be talking to you about those things that maybe Cygna hasn't done yet that we still feel should should be done. That will be some other time, not at this point.

I think what I want to do though, today, is basically have my staff sit there and talk and address the concerns they have today on the Cygna reports, because I really plan to get this SER out this month. I'm not going to wait. It's going to go out.

So this is it today. I'm going to use this record as the -- as the basis for any revisions to our SERs. I'm not going to ask you to come back with questions. If there's a need for you to come back and tell me something different, and you can't tell me today, that's fine, but I really need to have it back as short a time as possible.

MR. SHULMAN: One other point is one of the original purposes of this discussion was to have discussions with the senior review team. We'll just get into the meeting.

MR. NOONAN: Dave Terao, here, can express concerns and Mr. Spence and Kennedy can hear those kind of things, and yourself.

I guess with that I'm going to basically have start out. I have Dave Terao, and also John Fair, who are Staff members. I have Tom Bridges, from Idaho. He's the person that did the review for phase 3, and I'm looking around to see -- I have Paul Chen, he's from ETEC, and I'm looking for Don Landers. Is he here this morning? Those are the people that are involved in writing the summary

depositions.

One other statement at this meeting, I have brought one of my section leaders into this effort, his name is Goutam Bagehi. Goutam is basically going to help with the SCR, he's also going to be the project manager for the summary dispositions. We need to get those things done too.

With that, Dave, I think I'll go ahead and let you go ahead and take it from there.

MR. TERAO: Today, what we would like to do is talk about three major topics. The first topic has to do with the status of the Cygna open items, and any items where additional assessment was forthcoming as reported in the Cygna phase 3 report.

The second topic is a discussion of your observations and checklists, where we have some questions or concerns we would like to discuss, I believe six or seven of those observations and checklists in general. The type of -- in other words, we would like to discuss the type of review that was performed on some of those checklist items. And the third topic is a general discussion of the overall conclusions in the Cygna report. Not only on the phase 3 report, but also on the phase 1 and 2 reports.

Probably we won't have any discussions with the senior review team until we get into, perhaps, the observations and towards the overall conclusions, but to start off -- I

think what we need to know as of today is the status of the open items and where additional assessments were forthcoming. We might as well just start at the top. I realize you haven't prepared anything but if you can give us, as best you can, a summary of where the status of those observations are.

The first one is PI-00-01. This was not open in the Cygna report but there was an additional assessment forthcoming. The topic has to do with the stress intensification factors that were used for tapered transition joints and Bonney Forge fittings.

Would you briefly explain where we are with that item?

MS. WILLIAMS: My name is Nancy Williams. John, correct me if I'm wrong, but the reviews that Gibbs & Hill committed to do on the tapered transition joints were completed. Cygna spotchecked those reviews conducted by Gibbs & Hill, and have closed it as stated, I believe in revision 1 to the observation review record.

MR. NOONAN: Let me go off the record a minute.

(Discussion off the record.)

MR. NOONAN: Let's go back on the record. I was asking Dave -- for my purposes, I have to go to a contention five panel -- I would ask Dave to go to the technical stuff and then go on to the open items.

MR. TERAO: We'll start on our discussions about

the Staff concerns and questions about the observations themselves. Most of this discussion will be handled by Tom Bridges and Idaho.

Basically the observations we'll be discussing are EI00-011, PI-00-02, PI-00-06, PI-09-01. PS-01, PS-0 and DC-02-04.

So, with that I would like to turn the discussion over to Tom Bridges. If I may suggest, Tom, as we go into each of the observations if you could at least summarize what the observation is for everyone else in the room so we can get some handle on what the topic we are discussing is.

MR. BRIDGES: Tom Bridges, EG&G Idaho. Observation PI00-01, which deals with the usage of unconservative stress intensification factors in performing piping analysis, primarily tapered transition joints and Bonney forge fittings.

Cygna concluded in their report that this concern should be closed. I would like to ask for a little rationale for this conclusion. In a sense there are many -- several other open items and calculation of the stress is the last thing in performing an analysis. My concern is if the moments aren't right, and the stress intensification factors are not right, how can you close this particular item? In light of cumulative effects.

I would like to point out an example. Something that

was not made an observation but was entered as a sort of a discrepancy in the check off list, had to do with stiffness of anchor points. And that was written off as being a minor item.

Evidently, these containment penetrations were slightly stiffer than as modeled, and if I'm not mistaken, that is at the exact location of these tapered transition joints. So my concern is would an increase in stiffness there -- even though that may appear to be conservative from the standpoint of overall piping response, it may result in an increase in moment at this particular location.

MR. NOONAN: Mike, while they are waiting let me ask one question here. Can you address, at the end of this phase 3 discussion, can you tell us what your findings were in the phase 3 part? Can you go into those a little bit?

MR. SHULMAN: Findings?

MR. NOONAN: The conclusions you drew from your phase 3 report, some of the things that came out of that.

MR. SHULMAN: I think we can talk about some of the key things that came out of the report that are findings different than what we discussed last time.

MR. NOONAN: I think I would like to bring that out at the end of the discussion before we go into something else.

MR. SHULMAN: Yes.

MR. NOONAN: Thank you.

MR. MINICHIELLO: We reviewed -- this is John Minichiello -- we reviewed 32 Gibbs & Hill stress problems, as a random sample, to see what the effects for tapered transition joints were. And what we found was that the area that Gibbs & Hill typically did not employ a SIF for a tapered transition joint was, as stated in the observation, equipment nozzles. Our review showed that that was the point where they missed it, in our random sample.

We went back to Gibbs & Hill and said: It happened one-third of the times.

Gibbs & Hill then looked at it and reviewed all large bore problems for SIS and equipment nozzles, and wrote a letter to Cygna which answered both our questions on the problems we had looked at, which is this 8/17/84 letter, and the questions we would have on the other nozzles in the plant.

We spotchecked the calculations that they did on other systems. As I remember the spot check, we were concerned with cases where they used an equipment drawing to look at the effect of the tapered transition joint and the tapered transition joint weld. I think there were just one or two cases.

Basically, what Gibbs & Hill had done was they went back and looked at all the tapered transition joints with a 1.9 SIF, and they checked to see if the stresses would be okay and we spotchecked that.

MR. NOONAN: When you say "spotchecked," what do you mean by that?

MR. MINICHIELLO: Well, we had done a review of 32 problems and we found a number of errors. So we said, you know, your process doesn't work at this point.

MR. WILLIAMS: We have a statistical sampling methodology that we use, mill standard 105 D. Depending on how many of a particular total population there is for a given, say tapered transition joints, we go to the tables there, 1.5, quality acceptance level, and use the accept/reject and sample size out there.

MR. NOONAN: You said 105 D?

MS. WILLIAMS: Yes.

I would like to add something also on the cumulative effect aspect, which I think is what you are getting at, Tom. We are still reviewing what we consider to be one of the more major issues that we found during the review and that's mass participation. And we really can't stand back and look at the piping systems completely until we have all of the facts before us of all of the major problems that we found. And, as I say, we haven't had any

discussion with the Staff or anything on mass participation, but we clearly made that one of our points of emphasis and we have gone in and reviewed what they've done. We are in the process of writing a letter but part of the problem we are having writing the letter is that there are so many things to be considered now with the cumulative effects and how they are handling the results, that we have been a month in the works trying to get that out.

So, you really have to -- and this is also part of the problem of having done this thing in phases -- each phase, you know so much information and you sit down and you look at that and then you try and draw some conclusions. But now we are sitting here with four phases worth of work and the picture is looking a little different than it did at the end of each of the phases.

I think it's really necessary to go back -- and this particularly applies to some of the design control issues that come out of the technical reviews, but also things like the cumulative effects on the stress analysis -- and put all the observations together one more time.

I think yours is a very valid point but we are still missing one big piece of it and that's the mass participation.

MR. BRIDGES: Tom Bridges. Does, in fact, the

tapered transition joint occur at that penetration? I'm not sure.

MR. MINICHIELLO: Yes, the penetration does have a tapered transition joint.

MR. SHAO: What kind are you talking about?

MR. MINICHIELLO: I would have to look at it?

MR. SHAO: It is a regular taper, 1-2-3-slope?

MR. MINICHIELLO: The taper, actually for containment penetration, may be more gradual than that; may actually be more gradual penetration which would result in a lower stress intensification factor, but really without looking at the drawing right now I can't recall it from memory. I just cannot recall.

MR. NOONAN: Please talk loud because the reporter can't hear. It's hard to hear up here.

MR. SHULMAN: Maybe we should identify questions like that where we don't have a definite answer to try to get the answer today --

MR. NOONAN: You ought to tell us you don't have the answer and tell us. Like I said, I need it as soon as possible.

MS. WILLIAMS: Could we have the checklist number? Do you have that, Tom? Because we didn't bring the checklist and everything from the car, but we can have someone pull it out.

MR. BRIDGES: For the penetration?

MS. WILLIAMS: Yes. That way we can figure out which stress problem it is. Or the stress problem might be good enough as well --

MR. BRIDGES: I don't have them.

MR. SHAO: Excuse me, I have one more question. The taper in the class 2 piping?

MR. MINICHIELLO: Yes. It's class 2, it's a main steam line so it is class 2 piping.

MR. TERAO: I think the stress problems you are looking for at the main steam inside containment is AD-1-1 through AD-1-4. Is that what you are looking for?

MS. WILLIAMS: Well, his particular problem we would pull the drawing out, the checklist reference that Tom was referring to for the cumulative effect question. We need to pull the drawing out on that.

MR. NOONAN: If he can't find it, what he'll do, sometime today he'll get it back to you.

MR. BRIDGES: Yes, I have it. Let me find it here. It's item 13 B of checklist PI-01, PI-03, and PI-04. There's a similar one for -- that was mentioned for the -- I think it was steam generator nozzle, checklist PI-04. We had noted a discrepancy where the dead weight allowable -- calculated moment, exceeded allowable moment. And I would like to know the explanation of how that one got

written off? It was written up in the check-off list as being based on another load combination that was passing. Is that acceptable?

MR. MINICHIELLO: Gibbs & Hill -- this is John Minichiello again. Gibbs & Hill had discussed this with Westinghouse and had received the letter from Westinghouse which stated: If dead weight does not meet allowables, dead weight plus thermal expansion must meet allowables.

In other words, normal condition operating loads have to meet normal condition operating allowables. Dead weight alone does not have to meet its allowable. Westinghouse accepted.

MR. BRIDGES: In your design criteria, this is related, the major equipment, you assumed an anchor?

MR. MINICHIELLO: Yes.

MR. BRIDGES: Gibbs & Hill have. Is that really the case at the upper end of the steam generator? I realize that the steam generator has, I think, multi horizontal restraints, but that's probably the reason this moment exceeded allowables. You can't have it both ways, you assume an anchor and your moments go up.

In your criteria document it was listed as acceptable, but I was wondering if you looked at, particularly the steam generator nozzle.

MR. MINICHIELLO: Our criteria is based on

modeling techniques. It is standard to use equipment as anchorages in pipe stress analysis. I -- does that answer the question? I want to understand what the question is.

MR. BRIDGES: That answers it. Okay.

MR. TERAO: I have a couple of questions on the same observation. When you attribute the probable cause for this observation as design oversight, I'm trying to understand was that a design oversight by a particular reviewer -- a particular analyst, or is that a design oversight of the company in general?

MS. WILLIAMS: I think I would augment the probable cause to say design oversight, but also, in something that we are looking at in light of all the technical problems, whether it's a breakdown in a review cycle. And in their design verification cycle.

Part of the thing that's concerning me at this point in time is, given all these problems, why aren't the reviewers catching them? It's not because the process isn't in a procedure. It's because the reviewers weren't catching it. And we haven't really formulated an opinion on that yet but I would add that now at this point in time, to probable cause. I think I would add it to a couple of the other observations as well.

MR. TERAO: If I may jump ahead just for a second, I'm glad you said that because we share the same

concern. On the other hand, when I read your observation DC-02-04, and this has to do with Gibbs & Hill's observation of design reviewers, there's a statement that Cygna concluded that -- let me read it. Hold on one second. "Cygna concludes the failure by Gibbs & Hill to follow design reviewers does not itself impact design."

Now, when we read that I think the Staff concerns were the same as yours. In other words, if, in this particular observation you noted that design reviewers were not evaluated but rather it was written off because standard checklists were used to show -- to assure adequacy of the design, our problem was that standard checklists are adequate to show what was reviewed but it doesn't provide any measure of the adequacy of the design review nor of the design reviewer's capabilities. So we could not concur with Cygna's conclusion that the failure to follow procedures does not in itself impact design when you are coming up with so many of these observations that you just mentioned.

MS. WILLIAMS: You bring up a very good point and it's a tough call. This was written based on our quality assurance review, as we have stated before in other meetings. It is, I think, imperative at this point in time to reassess at least three aspects of the design control system with exactly the kinds of things that you

are bringing up here. And at the time we wrote this observation up, we discussed it and, you know, you are faced with a set of historical facts that, well, okay, they didn't do it, they can't go back in time and correct it. We are talking about, I think, a one-year timeframe here, when it wasn't done. And we said: Well, it really didn't have a good enough handle on whether we were seeing errors because they weren't following procedures or because they weren't technically equipped to detect the errors or they weren't conducting reviews or they weren't training the reviewers -- there's a gamut of possibilities here. And until you get enough examples to sit down and say: All right, how do these look from a trend standpoint -- I think at this point in time my feeling, at least, is that the reviewers aren't doing their job.

Exactly why, I don't really think I have the answer at this point in time.

How serious it is is really coming out of the technical reviews more than out of our QA reviews. And I think there's enough examples now, and then we are looking at some of the things out of phase 4 as well. And phase 4 has been cause for some of this thinking on my part as well; that I'm not sure I would concur with this conclusion right now on the observation.

MR. TERAO: Okay. Thank you.

I have one more minor question. On the Bonney forge fitting, I believe you stated that the correct stress intensification factor was 4.05?

MR. MINICHIELLO: Yes.

MR. TERAO: What was used in the analysis?

MR. MINICHIELLO: The analysis calculation had a SIF of 7.9. The analysis in the computer input had 1.5.

The analysis calculation then went through a process to correct the stress levels from the computer to the higher SIF. However, I did not agree with the method that they had used but I also did not agree that the SIF of 7.9 was appropriate. And the correct -- the correct SIF is about 4, 4.05.

MR. TERAO: Are you saying they had used a higher SIF so they came up with higher stresses?

MR. MINICHIELLO: Yes.

MR. TERAO: Is that why there's no safety impact with that particular observation with respect to Bonney forge fittings? I'm not sure I understand.

If they used 7.9 instead of the correct value of 4.5, it would tend to give them much higher stresses?

MR. MINICHIELLO: That's correct.

MR. TERAO: I just wonder why Cygna didn't say that in their write-up? I guess it was implied they used a much lower SIF, rather than the correct one of 4.5.

MR. MINICHIELLO: Okay. The write-up tries to talk about two things. One is their QA book, is what they call it. That's the piping report, if you will, the calculation file. The other is the computer analysis. The QA book used a SIF of 7.9. The computer analysis used a SIF of 1.5.

The calculation file corrected the stress levels to the 7.9 SIF.

MR. SHULMAN: Corrected the computer analysis stress levels?

MR. MINICHIELLO: Correct. However, I did not agree with the method they used to correct those stress levels.

MR. TERAO: Okay. I understand.

MR. SHULMAN: I guess Dave asked a question, which I didn't hear a definite answer on. The question was: Did you say there was no safety -- I don't know if it's using the exact same word -- did you say there was no safety impact because the stresses that they arrived at at the end of that, whether their method was correct or incorrect, were higher than what they would have gotten with the computer analysis with the appropriate stress intensification factor of .5? What's the answer to that question?

MR. MINICHIELLO: They weren't using 4.5 in the

SIF in the computer analysis. If they had, the stresses would be and are acceptable.

MR. SHULMAN: Are they lower than what they got with the method that they used?

MR. MINICHIELLO: I don't have the numbers in front of me. I can't tell you.

MR. SHULMAN: All you know is that 4.05 would have given --

MR. MINICHIELLO: Does give acceptable stresses.

MR. SHULMAN: But you don't know whether those are higher or lower than what they got with their method offhand?

MR. MINICHIELLO: No. No.

MR. TERAO: Now I'm even more confused. I thought you just said that the method that they used for the analysis calculations was 7.9. Why wouldn't that give you higher stresses?

MR. MINICHIELLO: Because they used -- they didn't just ratio up the stresses from the computer output. They modified the section modulus of the fitting.

MR. TERAO: In other words, you are saying there are other factors they modified in addition to using the higher stress intensification factor which might have offset the correct method to calculate the SIF?

MR. MINICHIELLO: That's right.

MR. BRIDGES: What was the conclusion?

MR. MINICHIELLO: The conclusion was the stresses with the correct SIF and the correct method are acceptable.

MR. SHAO: Is that indication, if this is all right for that particular joint, if you are doing your derived methodology in other areas may be wrong?

MR. SHULMAN: That's a good point to make --

MR. MINICHIELLO: We reviewed 176 additional branch connections with Bonney forge fittings. This was the only time I had ever seen this method used.

We considered it an isolated occurrence.

MR. TERAO: Let's go to the next observation.

MR. BRIDGES: PI-00-03 had to deal with local stress in a break exclusion area where the Applicant had -- no -- I guess it wasn't Applicant, this is Cygna -- for these cases, welded attachments, evaluated local stresses using a computer code CYLNOZ.

My understanding of that code is it's some version of the Welding Research Council's method of calculating local stresses at the junction attachments to cylinders and spheres.

MR. MINICHIELLO: That's correct.

MR. BRIDGES: That Welding Research Council's work is based on Bijlaard's work, which has some geometry

parameter limitations. And, per your write-up, it was obvious that those limitations were exceeded. I would like to hear some discussion on the basis of testifying that the results were representative and, in fact, conservative.

This loading, for the record, is a radial-type loading from an U bolt which presses against this saddle-type reenforcement which attaches to a pipe.

It's not apparent that the method is applicable and representative.

MR. MINICHIELLO: I would like to correct one thing. Cygna did not do the reanalysis. The reanalysis was done by Gibbs & Hill.

MR. BRIDGES: That's right.

MR. MINICHIELLO: The attachment as it actually is exceeds the parameters that you would normally expect to use in a Welding Research Council bulletin 107 analysis.

What Gibbs & Hill had done was to modify the attachment parameters to fit within the size limitations of Welding Research Council bulletin 107.

For example, they — the discussion here is the actual pad is 50 inches long. They shortened the pad to 17 inches long, in the analysis.

The actual pad was 3 inches wide. They widened the pad to 4.3 inches in the analysis.

They did explain why they felt that increasing the size of the pad in one dimension was more than offset by decreasing the size of the pad by factor of three in the other dimension.

For this pad, given that the load is a vertical load, a pushing-in load on this pipe, my judgment at that time, my estimation at that time, was that the total area of the pad and the total perimeter of the pad is conservative for the evaluation that Gibbs & Hill did.

Stated another way, if you ran or could run a Welding Research Council bulletin analysis with the correct size of pad, I would expect the stresses to be lower than calculated by Gibbs & Hill.

MR. SHAO: That's based on a lot of experimental work from Bijlaard. Bijlaard has written a lot of papers and covered different kinds of geometry. Could you check the other papers they have done in fitting with the geometry? He must have run hundreds of experiments to getting into the Welding Research Council -- 07.

Usually the limitation is too large compared to --

MR. BRIDGES: That's the normal case.

MR. SHAO: Usually his is a normal cylinder and big sphere.

MR. BRIDGES: What we've got is an attachment that goes halfway around this cylinder here and it's, in

fact, a radial load. I assume the case Gibbs & Hill ran was probably an axial load on it?

MR. MINICHIELLO: A punching load, if you will.

MR. BRIDGES: Okay. It's axial with respect to the attachment.

MR. SHAO: The major limitation of the cylinder cannot be too big compared to the sphere.

MR. BRIDGES: No, the other way, the attachment --

MR. SHAO: The attachment, the attachment cannot be too big.

MR. MINICHIELLO: I agree. And what's pointed out here is that Gibbs & Hill realizes that also and, therefore, to meet the limitations of Welding Research Council bulletin 107, they decreased the size of the attachment in the analysis, to fit within the limitations of the program.

MR. SHAO: So you decreased on one side, you didn't decrease on the other side?

MR. MINICHIELLO: They did. However the total area and the total perimeter is still less. And the area in the -- the area is going to affect how the load is spread out on the pipe. The perimeter is going to affect how that load is input to the walls of the pipe.

MR. TERAO: How do we know, John, whether that is conservative or not conservative? How do we know what

Gibbs & Hill did was appropriate?

MR. KENNEDY: You reduce the total area by almost a factor of three and you reduce the perimeter by somewhat more than a factor of three; two in the perimeter -- I think there's very strong logic that that introduces substantial conservatism.

To know it you'd have to do another analysis but --

MR. TERAO: I guess what we are saying is when conventional analytical techniques do not extend to those type of sizes, how do we know that reducing that welded attachment size to an area where conventional techniques are appropriate is appropriate?

MR. BUSH: There's been experimental work on sections that are not totally represented, even thinner sections, et cetera, but you'd expect more of a buckling because of this type of thing. I think the intent is you do have substantial conservatism. A lot of this work was done in support of the fast reactor program which wouldn't normally surface.

MR. TERAO: Could that introduce other problems in the design that do not --

MR. BUSH: Obviously it's geometrically essential. You'd have to look at the geometry.

I'm not talking about the pad now. He's talking about the juncture aspect, are you not, now? Aren't you talking

about the change in the two sections relative to one another, or are you talking about something else?

MR. TERAO: I'm talking about when you use such a large pad, are there any other effects of using such a large pad that may not be accounted for?

MR. SHAO: There's a lot of original work besides originally --

MR. BUSH: Bijlaard was originally experimental -- there's 198 and a couple of other versions of that experimental work, I think, supports the theory.

I was thinking of a change in the absolute sections, is what I was thinking of.

MR. SHAO: 107 was written many years ago. There must be some improvement after that.

MR. BUSH: I think there has been an update of that one. I don't try to follow it -- here's the expert right here who just walked in. But I believe there's a later version of WRC. Didn't Bijlaard's work get updated in a WRC in the last six months or get released in the last six weeks?

MR. LANDERS: Yes.

MR. NOONAN: Don Landers, who is one of our consultants, the NRC consultants, just came in.

MR. BRIDGES: I think something that should be pointed out with regard to this particular support.

U bolt loading using the total load isn't necessarily conservative because, since loading is radial, the component that isn't vertical doesn't contribute to the support load.

So just reducing the area is in the right direction, granted, but it requires a certain amount of justification.

MR. TERAO: Going back to the same welded plate, has Cygna ever seen this in other plants? Pads of this size?

MS. WILLIAMS: We were just debating on what our experience was here. I haven't. John has.

MR. MINICHIELLO: I have seen pads all the way around the pipe.

MR. TERAO: You mean other than at Comanche Peak?

MR. MINICHIELLO: Yes. I don't know whether that answers your question or not. That is certainly larger than this.

MR. TERAO: You may have seen other examples of it. I'm trying to get a feeling for whether or not this is commonly used.

MR. FERRARINI: Victor Ferrarini from the TRT. It's very common in power plants to put pads on the pipe to protect the pipe wall. This particular one is a little different than are on many plants. It's very common.

MR. TERAO: I agree it's common to put pads on

pipe but when you said this one is different; why is it defendant?

MR. FERRARINI: I assume this one just wraps around to protect the U bolt, to distribute the U bolt loading on the pipe. I haven't seen the drawings. I just picked that up from the conversation.

This goes back to the fact whether U bolts used in this particular manner is common to many other power plants. That's a whole other question. But plates welded to pipes to protect the pipe wall, that in itself, because that's what they are analyzing right here, is very common.

MR. TERAO: But the concern, Vic, is this one goes 180 degrees around the pipe.

MR. FERRARINI: That is still common. Like a pad for an anchor attachment or reinforcing pad to distribute the local stresses, when you weld a, say, a stanchion to a pipe. And again you have the exact same problem there, how do you analyze that particular? That's your question.

The answer to the question, "Is it in a lot of plants?": Yes, it is.

MR. BRIDGES: We understand the purpose of the plant is to reduce local stresses which brings about an interesting point in this particular support. In the bottom side, this particular support, there's a gap, I

believe. I think you want to talk about the support some more -- go ahead and get into that right now.

This particular support has a gap between the U bolt and the pad. Under normal conditions I assume -- I couldn't say for sure whether thermal -- maybe thermal will eat up that gap. I'm not sure. But on the bottom side also you have a line of contact because the pipe is resting on a flat plate. I guess the question is, why wasn't there a pad there that reduced the local stresses? And, in fact, I believe the load on the bottom side was some five times greater than the top side.

MS. WILLIAMS: I think we talked about this on the phone. This gets into the line contact stress question which is what we were just discussing in the background here. It's one of the issues that we did not pursue based on our understanding of industry practice and our experience. We did have discussions on line contact stresses and this is a good example. I don't know if Dr. Bush wants to add anything to that, but we can explain what our understanding of practice is there and that's as far as we took it.

MR. BUSH: Spencer Bush. I did talk to people at the research committee meeting asking this not quite hypothetical question because it exists a lot. I certainly didn't get any major expressions in the concern.

Obviously this is going to be dependent on the schedule of the pipe, for the wall thickness. You begin to worry if it is below a certain wall thickness. But if you looked at the cumulative loads on the things, the temperatures -- because the reading I got, at least from the people I talked to, it's something that done. And I'm not talking about nuclear plants, realize. I'm now talking about petrochemical plants and the fossil fuel plants.

MR. BRIDGES: So when you asked the question it was in terms of something 32 inches in diameter? Such as this one?

MR. BUSH: I was talking about a large pipe, fairly large dead weight, fairly thick wall and fairly high pressures. Of course there could be even higher pressures and the wall thicknesses would be in the 1-1/2 to 3-inch thickness range. Something like that.

MR. TERAO: Do you have any concern about the fact that there's a safety relief valve right next to this restraint which is giving you such large loads?

MR. BUSH: I might have. I'd have to look at what the situation, the particular geometry was.

When I look at a question, Dave, I may ask it in one context but obviously you can't isolate it from all of the other concerns. Obviously, if you get severe dynamic

loads, I don't think I'd be concerned about the line contact so much. I'd be more worried about what the thrust loads are at the safety valve, things of that nature, than I would about line contact per se.

MR. TERAO: Well, I think those are also our concerns, too. The line contact is just one of the many concerns, especially with the one support we are looking at. Maybe we should identify the support. Front checklist items PS-1-01, in support number MS-1-003-006-S72 R.

Is that the support you are looking at there, Gordon?

MR. BUSH: Of course it doesn't help very much because all it does is show a two dimensional cross section and doesn't relate it to what the system looks like.

MR. TERAO: That's true.

MR. BUSH: In other words, I can't look at this and tell you anything about what the situation is with regard to a relief valve or SRV or something like that.

MR. TERAO: Isn't that a concern, then? If a designer is not aware that the loads would be coming from relief valve discharges quite frequently, and to come up with a design like this which can educe very large stresses on the bottom of the pipe, literally flatten the pipe.

MR. BUSH: I would be a lot more worried about the loads at the top, I must confess, than I would at the bottom.

In other words, at the juncture of the SRV.

MR. TERAO: But at the juncture of the SRV, isn't that where the Bonney Forge fittings would --

MR. BUSH: That's where the failures were in the past. That's where I would look -- if I were worried about a failure I would look at those locations more than the line contact.

MR. TERAO: It may be true that failures might be at that contact, but would they ever have designed such a line contact right by a safety valve in the past?

MR. BUSH: That I can't say. If you are asking me if it's good practice, that's one thing. If you are asking me if they've done it in the past, I can't answer that.

MR. TERAO: Is it good practice?

MR. BUSH: Do you want a personal opinion?

MR. TERAO: Yes.

MR. BUSH: I don't think it would be very -- necessarily good practice. That's, obviously, a personal opinion. Because I can get worried about the response. But you'd have to look at the system. By that I'm talking about the thrust loads and everything else there, and what

type of -- whether they were balanced loads, things of that nature.

I can't answer that question.

MR. KENNEDY: Kennedy. A line contact like this can lead to, you know, local overstress -- calculated stresses higher than code allowables. But at least in my opinion, it's inconceivable that it's going to lead to failure of the pipe.

What will happen at the worst, the worst that could happen is you could flatten the pipe locally. As you flatten the pipe this is no longer a line contact, now it becomes an area contact. And that's the worst that could happen to you.

And I don't -- I really can't -- you know, it's not an ideal design, but I can't see -- that type of design is used in industrial facility piping. I don't know offhand whether I've seen it in a nuclear plant before or not but I don't see how you can get particularly concerned at that local line contact because it quickly becomes an area contact. Plus this type is over an inch thick, as I recall.

MR. BUSH: Inch and a half thick -- inch and a quarter, inch and a half.

I think, Dave, where this is a problem -- and even here it isn't a problem -- in what I call a modern facile plant

you are now talking about several hundred degrees higher temperatures in your steam lines, you are now talking about being in the pre -- which you are definitely not here -- and exactly what Bob said would happen over a long period of time, you wouldn't be too surprised to see a slight flattening of the pipe. And what it does is a redistribution of the stresses. As soon as it redistributes the stresses, it sits there because you don't have the concentration of stresses any more. Don, you must have seen that type of thing.

MR. LANDERS: I have one other question which is related to the supports in this system and related to another load, which is not the safety relief valve. I wonder if the supports have been reviewed for a turbine trip event which is the load --

MR. BUSH: That's a biggy. Because you can get an axial thrust back --

MR. LANDERS: That's in that line and we are talking about a secondary effect with respect to the relief valves blowing but certainly the turbine trip load is applied to all of these restraints and I wonder if the review of the restraints considered that situation?

MR. MINICHIELLO: The main steam lines we reviewed were analyzed for steam hammer.

MR. TERAO: I think the particular support that

we are looking at, obviously if there were steam hammer loads it wouldn't be reflected in this particular support because the steam hammer loads would be in the axial direction of the pipe.

MR. BUSH: That's right. Unless it's near an elbow.

MR. LANDERS: If it's near an elbow you get reactions.

MR. BUSH: I think that's what Don is worried about.

MR. TERAO: But this is by the safety valves and that should be a long straight run of section. It's only an axial load.

MR. LANDERS: You are still going to get moments distributed throughout the pipe as the wave travels around the elbows. So, moments are created throughout the whole main steam system as a result of turbine trip forces and moments.

MR. MINICHIELLO: The piping outside containment which this is in is a straight run of pipe from the containment penetration to the moment restraint at the steam generator wall, steam generator -- the safeguards building wall.

Analysis for steam hammer was done and inside containment, steam hammer loads were considered. Outside

containment, in between -- in this straight run of pipe, you just have an axial run of pipe between two effective moment restraints.

MR. NOONAN: Dave, if I can interrupt you I would like to take a five-minute break at this point. I have to get to the other building. But I have a few copies of the QA letter that we issued yesterday to the Comanche Peak Applicant. These are the results of a study that the TRT did on the QA findings. I'll make them available. I also put a copy in the record. I didn't bring many with me, but maybe for the Cygna people. I'm sure you didn't receive a copy of this yet and I'll make these available for you. Let's take five minutes and come back at 25 after.

(Recess.)

MR. BURWELL: Back on the record, please.

MR. TERAO: I would still like to stay with the support. What I would like to get intoto next is any instability concerns that might have been identified by Cygna with regards to these particular supports.

In your checklist there apparently was no instability concerns noted. Does that mean that Cygna feels that the support is stable?

MS. WILLIAMS: No. With stability and a couple of the other more major issues -- by "major," I guess

that's a bad choice of words, because we haven't completed our evaluation -- but more global issues, we did not give that task to the reviewers who were actually doing the review. The checklists are simply their worksheet.

We took stability out, made it a separate topic which is not yet closed. And this is clearly one example; box frames functioning as clamps is another example; cinching of U bolts, whatever comes out of that program, has to be considered; and then we'll be ready to offer an opinion on stability.

MR. TERAO: But in reviewing your write-up of the general notes on the checklist on your write-up of stability, it was -- as you pointed out, it was addressing box frames and it was addressing cinched U bolts, but here, at least in the drawing is an uncinched U bolt.

MS. WILLIAMS: Well, that is correct, but it's also pinned. But it also has to be assessed for its stability. We haven't completed that yet.

MR. TERAO: In what way are you looking into the instability concerns? How was this support unstable?

MR. YORK: Let me just address -- in looking at this support, let me give you some ideas of what we are thinking about in terms of instability with respect to a support such as this.

As you can see, this has a number of means of

articulating. It can, of course, rotate at the upper pins. Okay?

MR. TERAO: Yes.

MR. YORK: The piece of tube steel can rotate, which means the U bolt can rotate about an axis in the plane of the pipe.

MR. TERAO: I see.

MR. YORK: Which is an axis perpendicular to the plain of the pipe.

What you can have in this particular case, for example, is, should the pipe want to move in the upward direction, we don't know what the condition will be of -- of the pipe at the time of operation, but let's say it is almost in contact with the U bolt. And let's say that during a seismic event, the pipe wants to move up. One of the things that this support would want to be or was designed for would be to resist that upward movement.

If during a seismic event the upward movement takes place, and should, at the same time, a movement of the support longitudinally take place, there is the possibility of the geometric configuration that would result in where that support is, some movement axially of this support along the pipe, that that support can move up with the pipe and not resist any load.

So it would not be performing its design function, and

in this sense it would be unstable, because it is not able to resist load, simply due to its rigid body motion.

MR. TERAO: Let me show you a very crude model. Okay? Here we have our support. This is a crude representation, but close enough; all right? And let's assume the rubber band is the U bolt. You are saying if I were to put a load in the upward direction that the support could be unstable in the lateral direction?

MR. YORK: No. I'm talking about, if you have an upward load -- let's not talk about an upward load, because there will be no load on the support. This is what I'm driving at.

What will happen is as the pipe wants to move up, should at the same time there be sufficient inertial loads in the support itself, that it would want to move axially in the axial direction of the pipe. The normal deformation of this support as a rigid body as it moves axially along the pipe would be for it to also move upward.

MR. TERAO: What prevents the support from being unstable for twisting motion? (Indicating.)

MR. YORK: That's another mode of instability. This has numerous ways in which, if it can move as a rigid body, it cannot resist load. I'm talking about one.

In other words, an actual motion with a rigid body motion that it wants to undertake is consistent with the

movement of the pipe. And if both are consistent, the support won't resist load.

MR. TERAO: Now, this support in the upward direction, I see in the emergency -- it's a very poor drawing -- but something like 225,000 pounds in the upward direction; is that correct?

MR. MINICHIELLO: No, you have to reverse the signs, Dave. It's a downward direction.

MR. TERAO: It's 168,000 in the upward.

MR. MINICHIELLO: My drawing is unreadable now, at this point.

MR. TERAO: In any event it's over 100 kips in the upward direction. I guess my concern is what prevents the support from being unstable is the U bolt itself to take a twisting load, which of course --

MR. YORK: You can't take the gap --

MR. TERAO: Maybe one thing you are aware of is Texas Utilities has closed the gap on this particular restraint.

MR. YORK: You are unaware of it.

MR. TERAO: But, regardless of this, even with the gap closed, would the support still be unstable?

MR. YORK: If the gap is closed you have to evaluate what type of restraining forces exist. As you know, to maintain stability, just the rod, pin at the

bottom, rigid body with a lateral spring at the top, the stiffness of that spring must satisfy certain stiffness requirements in order for the support to remain stable under a load --

MR. TERAO: But what is the component in this design that is providing that spring stiffness?

MR. YORK: It would only be the U bolt.

MR. TERAO: That's right. And for what direction?

MR. YORK: For rotation about a vertical axis.

MR. TERAO: It's a twisting motion.

MR. YORK: Correct.

MR. TERAO: Of course, are U bolts qualified for that type of load?

MR. YORK: No. They are not qualified for that type of load. In terms of looking in a catalog and finding an allowable load, they are not qualified for that load.

MR. TERAO: That's correct.

MR. YORK: But this is a whole area of investigation, and each support has different modes in which it can possibly become unstable. I was talking about one, the lateral movement along the pipe. Okay? You are looking at another one here. These are our concerns and that's why this issue is open.

What are the possible configurations for instability? What supports can we identify that possess these possible configurations?

MR. TERAO: Well, I think that is one of our concerns, and we were in a quandary on why it wasn't specifically addressed in the phase 3 report. Stability is one of the major issues in this whole hearing and many of the supports that are in your phase 3 reports are of this design. Maybe not necessarily with a gap, but even without -- not necessarily -- yes. Many of the supports do not have a gap. But the question is, are even those supports stable?

MR. YORK: This is under --

MS. WILLIAMS: It's still open, Dave. I'm not clear what you are driving at. We are explaining to you what our thought process is that we are currently going through, but we are not ready to give you an answer today.

MR. TERAO: When you say it's open, when I look at the open issues, I don't see it.

MS. WILLIAMS: In our cataloguing systems it's tagged in U bolts and -- no, it's not very clear in the report. It's tagged with U bolts, because we are not going to offer an opinion until we get that issue settled, because it's related.

MR. TERAO: Are there other items of that nature

that are not identified in the Cygna report which you are working on but still have concerns about?

MS. WILLIAMS: I think the summary on December 20th is about the best I can give you on that. We can give you updates on it, QA would be another good example that is not explicitly addressed in the phase 3 report. But, yet, we explained on the 20th why we think that should be reopened, if you will. And there is clearly a couple of times where things got reopened that were previously closed. Stability is not one of them. But that's another reason for reopening something, would be in the QA area.

MR. LANDERS: Could I, addressing this same issue, instead of dealing with the potential of motion due to the seismic event, of the support, what about when these are cinched down? I hope you are going to look at the thermal movement of the pipe at this location, and particularly on this one where all we are getting is motion along the pipe. As I understand it you've got moment restraints on either end but you are free to move longitudinally along the pipe.

In looking at the offset between the structure and the pipe attachment, I don't think you have to worry about the fact that the support has moved due to the seismic event. The fact that it's moved thermally for those that are

cinched up puts you in a tough possession with respect to vertical load.

MR. YORK: This is because the vertical load develops a lateral load which then can lead to potential for this twist, which may not be able to be resisted by sufficient stiffness in the system and can lead to the potential kind of failure I have illustrated.

MR. LANDERS: Just thermal expansion is going to create displacement along the pipe, the fact that you move the bottom of the support relative to the top so that they are offset in a vertical position.

MR. YORK: Exactly. That will develop the kick-out force which must be resisted by the twist.

MR. TERAO: Okay. I think we have talked this support to death. Why don't we go on to the next observation.

MR. GEORGE: Joe George here. We have gone through two hot and we have just come off of one, and I'm sure we can give you the measurements of what occurred on that support.

MR. BURWELL: Fine. If Cygna needs those -- you may -- you may send them to Cygna.

MR. BRIDGES: The next observation we would like some clarification on is PI-00-06. This observation had to do with a few instances where support loads used in the

design supports did not match values obtained from piping computer analysis.

We would like Cygna to clarify what really happened here? It appeared in my mind, reading the write-up, that you guys had privy to a computer analysis for some reason subsequent to when the supports were vendor-certified, and that was the reason for this inconsistency. And yet, when I read your conclusion, I read a little bit of a warning in there, that this condition shouldn't have existed.

So I would like to know whether it was a valid observation or not.

Was there, indeed, an interface problem at the plant?

MS. WILLIAMS: I think you are accurate in saying, yes, there was a reanalysis. It is the analysis of record at this point in time. The revised analysis is the one that we found this problem with, is the most recent analysis and is the analysis of record.

The reason it was rerun, I believe, was because in the main steam they added axial rotation restraints. They modeled in the rotational restraint for double trunions and this sort of thing. We found this discrepancy where, apparently, it appeared to us at the -- in the stress analysis shop they made the decision that the loads weren't significant. We don't think that that

decisionmaking process should take place for the stress analysis. We think the pipe support designers should be reviewing the loads. They are the only ones who could make such a decision. If you look at this you see it varies anywhere from 1 to 9 percent or 10 percent, something like this, on the springs, and we felt very strongly that it was not appropriate. And they did have a procedure in place which would have caused the stress analysts to transfer the loads to the pipe support designers, but in this case a judgment -- or for whatever reason, it wasn't done.

I believe that they wrote back a letter and it was done, that -- did they transmit the loads after that?

We were trying to find the TUGCO letter on this one, as a matter of fact, this morning. And we can get back to you on that. We got a follow-up commitment from TUGCO based on our recommendation here and the observation.

This is one of the reasons, though, that I feel there's a breakdown in design input control. And we had done a design input control, QA review, as part of phase 2, I believe. But we didn't see any examples of problems in that. And now we have this.

So this is one of the impetuses for reopening --

MR. BRIDGES: So this will go from closed to open?

MS. WILLIAMS: We might write another QA evaluation, is what might come out of it, but that's just how we categorize things.

MR. LANDERS: Excuse me, what were the changes in those? 1 to 10 percent? At what point would it be reasonable for the analysts not to transmit the loads to the support design?

MS. WILLIAMS: We don't think there's ever a point where they shouldn't transmit the loads to the designer. And their as-built recommendation procedure calls for them to transmit the loads.

In this particular case, for some reason they didn't. We don't feel it's appropriate.

MR. LANDERS: They transmitted all the others but didn't transmit this one?

MS. WILLIAMS: All the others we reviewed.

MR. LANDERS: Thank you.

MR. BRIDGES: The next observation, PI-09-01. That questions -- this observation dealt with lack of mass points between supports of the same direction. This is a serious technical concern, not unlike a couple of others that you raised to a level of potential finding.

I'm wondering what the basis was for not raising this to the same level?

MS. WILLIAMS: I'll see if we can try and

explain this or not. It got tangled up with mass participation, is the bottom line.

We found one example and -- we discovered it as part of the SIF review, I guess. It's a very contorted history. I'll maybe not get tied up in it, but it got tied up in the reanalysis of mass participation, and Gibbs & Hill committed to undertake corrective actions and review the situation in part. We wrote one on mass participation on this not only because at the time we thought this was more isolated, but as part of the mass participation review we found out it really wasn't as isolated as we thought it was. And yes, it is just as serious, if not more serious, in its implications. They are both serious problems. But at the time of writing this we really didn't realize the extent of the problem. But, as I say, now we do, and it is being pursued as part of mass participation.

And, in fact, to give you a status on it, we went in and checked Gibbs & Hill's work on the -- rework on mass point spacing. We took a sample of 32 problems that they had gone through and checked to make sure that it was modeled correctly, and we found three rejections. And by mil standard 105(d), that's unacceptable.

So we have a lot of cause for concern. Now, where Gibbs & Hill has gone back and actually done a review for the express purposes of correcting a problem it knew about,

and still made errors, and that's a big concern.

MR. BRIDGES: Along the same lines, the problem on the pipe support, PS-01 --

MR. LANDERS: Excuse me, could I back up again? Because you just mentioned something very important: mil standard 105(d).

If we can go back to that transmittal of load, you said you found one out of the number you reviewed. How did that compare with the sampling requirements of mil standard you just applied here? Would that have been acceptable in accordance with the mil standard sampling?

MS. WILLIAMS: The 1 mass point error?

MR. LANDERS: No, going back to the support load transmittal. I'm sorry I jumped back on you --

MS. WILLIAMS: We found more than one there, though. So that was a rejection. We just found it was unacceptable and wrote an observation. The fact that we write an observation says there was a problem there. We found enough of a problem in this case that we did not make it isolated.

MR. LANDERS: Okay. I understood you to say there was one out of all of them that you reviewed.

MS. WILLIAMS: I think the only one was the mass point spacing.

MR. PIGOTT: Back up. You are talking about

separate --

MR. LANDERS: When we go back to that support load issue --

MS. WILLIAMS: We found many examples -- we found one piping problem? That what you are thinking --

MR. LANDERS: All of the loads you'd gone back on, or one support?

MS. WILLIAMS: On four main steam problems which were reanalyzed we found what we thought was a breakdown in their procedure or their failure to follow the procedure. The as built reconciliation.

MR. GEORGE: The as built reconciliation, each support was supposed to be reviewed by the designer and the analyst as per our procedure. You are talking about procedure violation here.

MS. WILLIAMS: Right.

MR. LANDERS: Okay. Thank you.

MR. BRIDGES: The next discussion I would like to refer to the pipe support observation PS-01.

This observation, we discovered that there were some computer input errors for analyzing this particular pipe support and that the calculations had not been checked. Back, I guess -- this particular support, it was determined that it was sufficient, design-wise, and modifications were required.

Your conclusion was that this was -- it appeared you concluded this was an isolated case, because that was the only one sampled that led to design changes. And yet, there were similar errors that did not result in design changes.

I'm wondering if on the same basis as the mil standard, if -- what did you use for the statistical calculation? One out of -- or if you looked at the number of errors? I'm wondering if you can justify the words, "that was an isolated case" or not.

MS. WILLIAMS: A couple of things. The original scope of the program -- meaning selection of systems, numbers, supports, all of that -- that is not based on 105(d). Okay?

Where we used 105 D is in our follow-up reviews. Whenever we find something that we need to decide, okay, statistically how many do we need to sample across the board or in the rest of the plant, then we invoke 105(d). Otherwise we review everything in the systems that we select.

Now, as far as what do you use as your sample population once you find an error to decide if something is isolated or not, the question is do you use number of supports? Do you use number of elements where they made errors in each support, so you've got 131 supports times

so many elements that are modeled, and how many elements did you find errors with?

We have a lot of discussion about that in-house, and it is a little bit qualitative, in the sense that you are trying to stand back and say: Was this really something that shows a breakdown? And then, if we think it does, how much further do we have to look in the plant? And that's when we start to develop sampling sizes and populations and accept/reject rates, and pursuing it more from the purely statistical standpoint.

But our initial review is 100 percent, and then a discussion as to whether we've seen anything to cause us to dig further into the problem.

A DVP is not a statistically based scope selection, anyway. I don't want to leave the impression that everything that's done and the original selection of the systems and every judgment that we make, we turn to 105(d). We use that to expand our samples and decide whether something is acceptable plant-wide, would be a better interpretation of what we do.

MR. BRIDGES: Okay. Back to the question, was the basis for determining this to be an isolated case the fact that there was only one of these that you found that led to design, or was it based on the number of similar instances?

MS. WILLIAMS: This is the only one support where we found that there was enough cumulative error to warrant reanalysis. But yet we find other isolated errors within selected supports where you would find a discrepancy on your checklist.

This is one out of 31. One support -- one out of 131 -- it's actually one out of 160-some if you consider all the places where the analyst had made enough errors that there was no recourse but to reanalyze it. In this case it had to be redesigned.

On that basis we made it isolated.

Now, we did find errors in other pipe supports, and if you want you can add those up. But there I don't think I would use a sampling population of the number of pipe supports, there I think I would look at number of calculations or number of times where they calculated section properties wrong, or something like this where you have a much larger sample.

MR. BRIDGES: The second part of the observation was that calculations had not been checked. How many instances were there of that?

MS. WILLIAMS: This is the only one.

MR. BRIDGES: That's the only one.

MS. WILLIAMS: And not checking calculations gets us right back to the reviewers and are they doing

their job, and the thing we discussed earlier on today.

MR. TERAO: Okay. But this is a different group; right? Now we are talking pipe supports?

MS. WILLIAMS: That's correct.

MR. BRIDGES: The final one I have is pipe support observation 04, had to deal with the minimum size of the fillet welds. You concluded that this observation should be closed, based on a stress analysis. And my concern here is that the requirement for those minimum size welds isn't a stress requirement, but it's a procedural requirement to assure weld penetration. And it seems like you have two options to get around this: The code allows you to get around it by using special welding techniques -- for example, preheating the thicker plate -- or doing something special in terms of inspection.

So I question qualifying this based on stress analysis since it's a --

MR. TERAO: Let's see if I understand the concern here, Tom. You are saying it's not that they found undersized welds but undersized welds were specified on the design drawing; is that what you are saying?

MR. BRIDGES: That's correct. The welds were in accordance with the drawings. They were specified.

MS. WILLIAMS: We agree that there's a code violation there, so we agree on the definitional problem.

I think all we were trying to say here was the basis why there was no design impact when we went back and checked the numbers.

MR. BRIDGES: My comment is the requirement isn't a stress requirement, but it is something to assure that you have a sound weld.

MS. WILLIAMS: Oh, from an installation standpoint.

MR. BRIDGES: That's correct. Don, is that a correct interpretation?

MR. LANDERS: Yes.

MS. WILLIAMS: We agree.

MR. LANDERS: I would also suggest that the concern with respect to compliance with AWS D-11 weld sizes is disappearing very quickly, so we've got to be careful about that, I think, with respect to jamming that down an applicant's throat in this kind of situation. Because in fact the industry is pointing out very quickly that the whole technique to welding supports is different under NF, and therefore the minimum weld size that's required by AWS has no meaning any more. So that the approach taken may well be very good, depending upon the weld size and everything else.

MR. BUSH: In fact, Don, I believe it has been accepted by AWS.

MR. LANDERS: Just waiting for regulatory approval --

MR. BUSH: Just waiting for approval on the regulatory side.

MR. LANDERS: So this approach may well be acceptable in today's environment, irrespective of licensing commitments and all that; the fact that one can use a weld smaller than AWS requires.

MR. BUSH: I think your question is more basic, though, and that is, do you have a good weld? That's a different matter, and that gets into what you should do to establish that you have a good weld, if it's there.

In other words, if they are consistently "undersized" as defined by that, the argument is that you don't have enough heat input that you might have cracking. That's another animal.

MR. LANDERS: Except if the design drawing calls out X size weld and the procedure is adequate for an X sized weld, that's the difference; the assumption is the weld can be made to whatever size it's qualified to be made to.

MR. BUSH: All I'm saying is you don't know that per se.

MR. LANDERS: You have to look at the weld procedures; but the fact that it's smaller than the code

requirement -- in today's world --

MR. BUSH: Is it to the procedures or not, is it below or not, and then more importantly, is it a good weld or not? That's really the gut issue on the thing.

MR. LANDERS: But I think with respect to the Cygna review their approach is well taken. The weld doesn't meet minimum size; however, with the loads on it it's acceptable in a design sense, and now the procedures -- if they do allow us to make that size weld because we've qualified it, it's a closed issue.

MR. TERAO: It may be a closed issue from the Cygna standpoint, but we are still left with a violation of the code. And a violation of the code is important in its own right, because it contributes to the worker's understanding of the extent to which codes are to be followed scrupulously and taken seriously. So the question really focuses on why did this occur? How can someone specify a weld size less than minimum code when it's very clear all he has to do is look in the table and see what weld size he needs? How could that occur?

MS. WILLIAMS: Made a mistake.

MR. LANDERS: Unfortunately, he probably did it based on analysis. And that was demonstrated to be acceptable by Cygna in their review.

MR. BRIDGES: Strength really isn't the question.

The concern is, is the weld --

MR. LANDERS: I understand your concern. What I'm suggesting to you is under NF that concern no longer exists, because NF requires a totally different approach to weld procedures and welders than AWS does. AWS assumes taking a single rod and putting a quarter-inch fillet to it. NF assumes a number of passes; so the same metallurgical requirements don't exist.

MR. BRIDGES: They may come to the same conclusion, if they can't get them to pass.

MR. LANDERS: Yes.

MS. WILLIAMS: TUGCO did take some corrective action in the first paragraph here, just to be clear on this one too, Tom.

MR. BRIDGES: Which was?

MR. MINICHIELLO: Basically -- TUGCO had committed to review the drawings, reissue them for vendor certification, and basically fix the supports. Bring the welds up to code.

MR. BUSH: You can do that by putting a wash pass on and that will make it worse, not better. You've got to be careful of that.

MR. LANDERS: That's right. If what we are worried about here is safety, that's not the best approach.

MR. BUSH: That might make it worse, not better.

Because the standard procedure is often to put a wash pass on and that doesn't accomplish much of anything, based on practical experience. I'm not talking, now, about precisely meeting the code.

MR. GEORGE: We have done just that on a lot of welds that were supposedly quarter-inch fillet welds. QC put gauges on them and they come up with findings like those -- in fact 7/32 instead of one quarter; and the corrective action is we go in there and do just what you said. It's been done all over the plant.

MR. BUSH: I know it. At about $1500 a weld.

MR. GEORGE: That's correct. And we are now working industry-wide, in this group that's got some problems with AWS, and we are working to revise our procedures. As soon as MEB approves it on a generic basis, with our visual weld acceptance criteria that hopefully will lay some of these problems --

MR. BUSH: If they put tolerances on the weld, the problem basically goes away, won't you agree?

MR. LANDERS: That's one part. The second is understanding the difference in the whole weld approach so that the quarter inch may not have any meaning any more. In fact it doesn't.

MR. BUSH: I think, though, Dave, your concern is did it meet the code as it was as of time X. That's

one thing. If you are concerned with what the significance is, that's another thing. So you have to make a decision.

MR. TERAO: That's right. I agree there's two aspects to look at.

MR. BRIDGES: I have just one other question with regard to Cygna's review and that has to do with did you consider looking at snubbers from the standpoint of resisting other hydrodynamic loads, in fact steady state hydrodynamic loads, to be sure that snubbers did not lead off and not provide required support? Did they not lock up --

MS. WILLIAMS: That wasn't part of the required review.

MR. HORIN: Could you repeat that for our benefit?

MR. BRIDGES: Snubbers are supposed to bleed so that you allow thermal expansion, yet lock up for seismic; and for hydrodynamic such as steady state-type relief valves, the relief rate may be such it won't provide any support.

MR. HORIN: Are we talking about hydraulic?

MR. TERAO: The same thing occurs with specific snubbers -- if a steady state load is imposed on a mechanical snubber, the snubber can literally walk -- not

walk on the pipe, but literally collapse on you due to a steady state load. It's only designed for a cyclic load.

MR. HORIN: What's your concern?

MR. BRIDGES: Will the snubber do this?

MR. BUSH: Under what conditions?

MR. BRIDGES: Hydrodynamic.

MR. BUSH: Under severe hydrodynamic loads they don't do their job.

MR. LANDERS: Heavy hydrodynamic loads are in fact sufficiently dynamic in nature so it's there. I think it's just steady state now, so the magnitude of the load is significant as compared to what we would see as a peak. So the degree of --

MR. TERAO: I think the concern still can go back to the relief valves themselves and how they have those designs. Are there any snubbers there that are intended to take the steady state relief valve load that may not perform its function?

MR. MINICHIELLO: On the main steam lines outside containment, which is why the five relief valves are -- they are all rigid restraints on the main steam valves.

MR. TERAO: You are saying there's no snubbers in those areas?

MR. SHULMAN: That's true.

MR. MINICHIELLO: That's -- yes. Going back in memory -- but, yes.

MS. WILLIAMS: We can double-check that if you want, Dave. John is saying on the Fisher valves there are snubbers, which are on the main steam lines.

MR. BURWELL: Right. May I interrupt at this point in time and make a suggestion that if you -- you may want to correct -- check that, as you said. And, if that is -- if you do want to change your statement on that, or any other response in the course of this meeting, I would suggest that you might get a letter off to us, to the Applicant, very quickly.

MR. BRIDGES: That's all the questions I have.

MR. TERAO: And I believe we touched on the DC-02-04, about evaluation of design reviewers. So I believe that would conclude our discussion on the observations on checklists in general.

Maybe at this point we should go back and get a status of the open items and where additional assessments are to be done by Cygna.

MR. BAGCHI: We haven't finished all the questions --

MR. LANDERS: Well, I wanted to bring up that question with respect to operating transients which in fact produce steam -- in anticipated events, not

unanticipated -- and ask if in the piping checklist that you used, in the support checklist, that that consideration is in there, particularly in respect to the stability question and U bolt cinching and that type of thing? Is that part of the process you are going to be looking at? The dynamic motions of the piping system when subjected to turbine trips or auxiliary feed water pump operation and that kind of thing? Not just the loads that are printed out on the support sheet, but in fact the position of the pipe during that event and the motions of the pipe that are occurring?

MS. WILLIAMS: So, is your question when we are looking at the stability question will we consider the placement of the pipe or the possible relative position of the pipe in the support and not just look at the drawing and take that as the given location? We would consider the thermal expansion and movement and offset that would develop?

MR. LANDERS: Yes, and the dynamic movement associated with operating transients which we know will happen? You have looked at displacement of the pipe?

MR. YORK: When we have looked at frictional forces required to resist sliding and slippage of U bolts and things like this, we took into account the seismic and thermal movement, the displaced configuration of the

piping.

MR. LANDERS: I recognize that, because that's all I read, and here is the seismic and thermal expansion. What I'm asking is -- for example in the main steam line, which we all understand when we get the pressure wave due to turbine trip we get dynamic excitation of the piping system, when we look at that system with the supports on it, and look at the displacement of the pipe at the support attachment, and look at the -- how the support is attached to the structure, and any offset that may occur -- the bottom line question is, in considering stability, in considering supports, all of the aspects of supports, are you considering that phenomenon, not just the load associated with it?

MS. WILLIAMS: I think the answer is "yes." I just want to make sure that you are not thinking of a load that maybe we are not -- we would consider thermal, seismic, steam hammer --

MR. LANDERS: It would be a load considered in the design spec. I don't want to consider any loads that are not in the design spec.

MS. WILLIAMS: Okay. The answer is "yes."

MR. BURWELL: May we go off the record just a moment?

(Discussion off the record.)

MR. BURWELL: Shall we go back on the record? During the break I inquired about the change in order of the meeting agenda. We agreed that at this point in time we would return to item 1, "Discussion of Cygna open items," And on completion of that go to item 3, "Discussion of Cygna conclusions."

With that I'll turn the meeting back to Mr. Terao, and ask him to proceed on the discussion of Cygna open items.

MR. TERAO: I believe we have discussed PI-00-01. I believe you said rev 1 to your document covered that.

I have to apologize, because our EG&G people did the review. I don't believe they got the rev 1 in time; by the time they submitted the SER to us and by the time we read the SER, we didn't have a chance to go back and see what rev 1 really covered.

On mass participation, I believe you said that was still open. Is there any indication on when that might be closed? Or what --

MS. WILLIAMS: We are trying to -- in fact I have it here with me today, I have a draft letter. I'm going to try and issue that next week. The problem with the letter is it's not going to close the issue out.

We reviewed the mass point spacing, and I explained that by the sampling standards, they did not pass. We don't really know quite -- we don't want to tell TUGCO

what to do about it. We don't think that's our job. But we are certainly concerned with the fact that Gibbs & Hill pursued a review and still we found that many errors.

Short of telling them to review it again, we don't know what else to tell them.

Mass participation, they ran it on accepted versions of ADL pipe, so that was pretty straightforward. They had accounted for the participation. We then looked at how they handled the load increases down at the site and we have some concerns there. And we also have some concerns with a couple of problems that weren't run. They did not run 100 percent of the problems.

So, you should be getting at least that part of it next week, hopefully. But it's not going to close the issue out.

MR. TERAO: I would like to discuss a little more about this particular observation. How did Cygna identify this particular issue? I remember in phase 1 and 2 you raised an issue that piping stress analyses were not run above 33 hertz.

I guess at that time Staff was not aware of this particular problem. In fact at that time it was just a question of whether or not you have to run stress analyses above 33 hertz. But now that you have identified this particular problem it puts that particular issue in a

different perspective.

Now, is this something that can easily be spotted when you review a computer stress analysis to assure what participation the mass has in this system? Is it a very simple check? Or how did you identify this issue?

MS. WILLIAMS: I don't think there's any problem with checking it. It's just the order of magnitude, the numbers you come up with. When we looked at the main steam lines we saw zero participation, and that really raised a flag. We had not seen zero participation, or anything so extreme.

MR. TERAO: Is there a reason why that occurred? It doesn't seem like this is a very common problem in the industry.

MR. MINICHIELLO: The main steam lines outside containment, straight axial piece of pipe, two moment restraints at either end, at least two or three vertical restraints in the system to take up the relief valve loading. You have a very rigid system in the vertical direction.

MS. WILLIAMS: I think we have to explain that. The Gibbs & Hill practice is also, I believe, not to do a static run, so their support loads were underestimated. And their analysts didn't have a standard practice of doing, say, a static run so they could at least do a

sanity check on the result they getting out. They went ahead, did a dynamic run, and put it on the shelf. So we were then concerned with the fact that their practices didn't allow them to detect the problem.

MR. YORK: Basically what you have to do, any time you make a dynamic analysis, whether you cut it off at 33 hertz or 40 hertz or 50 hertz, is you have to, if you don't have any other means -- in other words, if the computer program itself doesn't print out enough information for you to make a judgment such as "mass fraction" or "mass fraction partnership," in this version of the ADL pipe they were running I believe they did, so they could have just checked that information. So that's --

MR. MINICHIELLO: It prints out participation factors. From the participation factors if you work through it I think you can get to a mass fraction, but it's not just a number printed there in the output. You have to work to get at it.

MR. YORK: There is sufficient or was sufficient information in the computer output to make that hand calculation, just by basically determining what the mass fractions are and adding them up for the number of moments that were considered in the analysis to find out how much mass was participating.

But even prior to that, what you have to do -- and

correct me if I'm wrong -- but one of the ways, or the way in which this was initially discovered was in one of the reviewers looking at the calculation and comparing the dead load results to the seismic results. When the dead load was -- and I'm just going to use numbers off the top of my head, but it will give you an idea -- when the dead load results, resulted in loads of 10,000 pounds and seismic results in the vertical direction resulted in 1000 pounds, when you had a 2 G vertical excitation, you then would question the output.

This is the kind of check you have to make. You have to look at your output and you have to look at your numbers to see if they make sense as an absolute minimum.

Now, if you have a computer code that also prints out additional information from which you could calculate the fraction participating, then that's also something that should be done.

MR. KENNEDY: This is a problem that has been treated in a highly variable way in the industry back in the early '70s.

Within my experience, the only times that this missing mass problem becomes a serious, significant problem, is when you violate a check that can be made statically, which was just described, taking the mass times the zero period acceleration and be sure your reactions at least

add up to that.

A number of these cases, they do not add up to that. And that's a check that's fairly straightforward. You don't need the model data to make that check.

MR. TERAO: John was saying that the main steam line was rigidly supported in the vertical direction, but apparently the concern extended much more to other systems besides main steam. Is the same reason applicable that the other systems are very rigidly supported? Is that what would have caused it in the other systems as well?

MS. WILLIAMS: I think their average participation is 40 percent, and they just have very rigid systems in general.

MR. BAGCHI: Is it true that they have a practice of not ever running a static analysis?

MS. WILLIAMS: That's my understanding. We didn't see any.

MR. BRIDGES: You are pointing to ZPA effects only. Certainly there were static dead weight and thermal --

MS. WILLIAMS: Oh, yes. I'm sorry.

MR. BAGCHI: Thank you.

MR. LANDERS: I think the stiffness in the systems and the problems that arise is directly related to the number of restraints that we see.

MR. KENNEDY: Yes. It's clearly only a problem

on piping that has a lot of restraints. On piping that doesn't have a lot of restraints, by the time you get to 33 hertz you've got enough of the mass. You don't have to worry about the problem. But any time you make a run and the results come out less than just the ZPA times the mass, you know you have a problem. And when it comes out above that, you've got pretty high confidence you don't have a problem.

MR. TERAO: Okay. I'm ready to go to the next item. Any other questions?

On PI-00-07, regarding the Fisher main steam relief valves not qualified for as-built loads, what is the status of that particular observation?

MS. WILLIAMS: That one was also revised, I believe. It's closed. We got a response from TUGCO stating that they had, in fact, sent loads to Fisher, and Fisher had evaluated the valves and that they were acceptable.

Did they do any modifications on anything?

MR. WADE: We also requalified the valves for operability and all that information has been provided. The whole issue was closed.

MS. WILLIAMS: PFRO2, revision 1, gives you the referenced commitment from TUGCO and their response, October 2, '84, we received a letter.

MR. TERAO: We'll take a look at that. Thank you.

I believe on the PI-09-01, which is the mass point spacing, are you saying that that is now incorporated back into the mass participation issue?

MS. WILLIAMS: They did them together; yes.

MR. LANDERS: Could we, or could I hear a little more about that what problem is? Or is that out of order?

MR. BURWELL: No. That's fine.

MR. BRIDGES: Do you want me to define it? I think Cygna found instances where there were not mass points between supports in the same direction.

MR. LANDERS: Thank you. Okay.

MR. BRIDGES: Is that right?

MR. MINICHIELLO: Yes.

MR. TERAO: OPS-02, this was the concern on the stability bumpers which didn't have any calculation.

What is the status of that issue?

MS. WILLIAMS: They reran -- there's two main steam lines instead of four. There's also a revision to this observation.

They reran the analysis taking the supports out of the stress analysis and checking all the supports loads and the pipe stresses.

They did that when they were doing the reanalysis for

mass participation. They ran it through versions of ADL pipe and we checked it -- so that's closed.

MR. TERAO: Did they remove the supports physically or just from the model?

MS. WILLIAMS: No. Just from the model.

MR. TERAO: Are there any concerns with the supports still being in there, say from an interference standpoint?

MS. WILLIAMS: Our problem with the support originally is we didn't think they would be functional. For that reason we didn't feel that there was -- we felt it would be appropriate, if they were not functional, to take them out of the stress analysis.

No, we didn't see any reason why it would be a problem either way. They have the stress analysis with them in assuming they function, and stress analysis with them assuming they don't function; and both of those had acceptable stresses, and the pipe supports were acceptable to the loads.

MR. LANDERS: How do you assume that they won't function? I mean, what is it that's going to happen to them that they won't function? Are they going to lock up? Are they going to become tilted?

MS. WILLIAMS: Tilted?

MR. LANDERS: Well, is, then, the removal of the

restraint in the analysis representative of what's going to happen there if a seismic event does occur? Have you bounded the problem, in your opinion, by having it in and by taking it out? Have you really bounded the problem of your concern with respect to functionality of that restraint? That's the real concern, I think, is what is going to happen to the system with that in there?

MS. WILLIAMS: Yes. I don't see a problem with that.

MR. LANDERS: Okay.

MR. BRIDGES: I think I might have a little bit of a problem. Let me ask the question. When you were concerned they would not work, I assume you were implying they would not work in the horizontal direction; is that right?

MR. MINICHIELLO: No. These are vertical restraints.

MR. BRIDGES: They are vertical restraints, but the pumper is horizontal?

MR. MINICHIELLO: Yes. The pumper would work horizontal.

MR. BRIDGES: You weren't questioning the ability to be a vertical restraint; is that true?

MR. MINICHIELLO: It's only a vertical restraint. It's not a two-way restraint. It's only a vertical

restraint.

MR. YORK: It's a stability problem. The bumpers are there to prevent the rotation of the tube steel to which the U bolt is attached; to prevent the rotation of that around the pipe. The bumpers are there to prevent that rotation.

There are no calculations -- my understanding is there were no calculations done on the bumper for strength, and neither were there any calculations done on it for stiffness, because they have to satisfy both the strength and stiffness requirement in order to maintain stability.

MR. BRIDGES: Is the issue of stability closed for this? Evidently they switched their thinking how they were going to make the support stable. Rather than use the bumpers they went to friction on the U bolts; is that correct?

MS. WILLIAMS: Two U bolts were cinched and two weren't. The ones that were not cinched they have the bumpers on. They also have the bumpers on the ones that were cinched, too, so for whatever reason there's a difference between the four lines.

The reason that we discovered this, or the reason the issue came up with our reviewers, was because of the lack of calculations on the pipe supports, as opposed to it being raised out of the stability assessment that we are

doing.

MR. TERAO: All right. Let's go to PS-03; this is the rotational effects on trapeze supports.

MS. WILLIAMS: That's still open. We have no date from TUGCO on that one right now.

MR. WADE: I think our current plans are to have an answer to Cygna by the 21st of this month. That's contingent on us being able to complete the analysis we are working on.

MR. BURWELL: Thank you.

MR. TEREO: I believe that's all of them, then.

MR. BAGCHI: We are making some progress here.

MR. TERAO: Yes.

MR. SHULMAN: I guess --

MR. TERAO: Can we go off the record for a second?

MR. SHULMAN: Before we go off the record, we would just like to point out that there are other open items, as we identified in the last meeting.

MS. WILLIAMS: Maybe these are the ones you are concerned with, but there's other open items.

MR. BURWELL: You are now referring --

MR. TERAO: You are referring to the report itself. I was referring to the open items in the report.

MR. BURWELL: Maybe, shouldn't we at this point

in time go on to provide an opportunity for Cygna to identify the open items? I'm assuming that we may be -- were some of these items opened in your revision and our, shall we say delay in holding the -- in working the revision into our review, did that lead to items that you could point out to us that maybe we are not familiar with at this time?

MR. SHULMAN: Primarily I think you are familiar with them. At least we have identified them to you. There may be one or two additional which resulted from continual review process, but they are mostly on this list that we gave out at the December 21st meeting. Is that a true statement?

MS. WILLIAMS: Yes. Category 3 and category 4 allegations, but that's just the allegations.

There are some QA issues that were closed here, or were closed in phase 2, that would be open that were discussed also in the December 20th meeting very briefly.

I think that some of those bear on some of your questions, too. For example, the design reviewers and this kind of thing. Also design verification control, design input control, design analysis control -- well, design verification control is really part of phase 4.

I'm trying to think if there's any issues that we have open which are not on the allegation list. I'll have to

double-check on that one, Spots. They are all covered on the presentation of the 20th; and on this one, on this discussion today, and then this reopening of things, I think we covered on the 20th. So I can double-check. Got to go through my list.

MR. SHULMAN: We'll double-check, but what we would like to do is get that back to you with whatever written letter we send to you in the next several days for purposes of your SER, I guess.

MS. WILLIAMS: What I need to do is do a little status letter of what we have open and you can cross-reference them to which ones are affected by your SER.

MR. BURWELL: When we issue the SSER, we would like to be as current as we possibly can.

MS. WILLIAMS: We'll get a status letter out to you.

MR. BAGCHI: Let me just request to identify any open item that you have just found out that we are not aware of. Any significant open item that would bear on our safety evaluation report.

MS. WILLIAMS: Are there any?

MR. SHULMAN: Right now or in the letter?

MR. BAGCHI: Yes.

MS. WILLIAMS: A couple come to my mind off the top of my head. We conducted -- there's about five or six

issues at least that we have done really an independent review of within our own organization. Some of that is still going on.

A couple of things that have developed in the last month. As a result of doing some of these independent reviews or as a result of reviewing some items in phase 4 that had been reviewed briefly in phase 3, we are going to ask some additional questions on the Richmond inserts, we are going to ask some questions on the tube steel Richmond inserts and we are going to ask some additional questions on the RHR box spring. I think that those are probably directly related to what you are doing now.

MR. SHULMAN: All the others are covered? Cable tray issues and --

MS. WILLIAMS: Cable trays would not be in the SSER. So it's basically piping, pipe supports. Corrective action and -- well, corrective action in some ways is affected by this reopening of the QA discussions.

There's nothing we said in the write-up of corrective action that we are going to change. I think what we are going to be doing is assessing, given the technical observations, whether there is any impact on, or any breakdown in the corrective action system. So I don't know if any conclusions are going to change there, but we are going to ask ourselves the question.

U bolts, of course, are still open.

We are also preparing a letter on the U bolts. That will be out after the mass participation, however. Stability is open. We discussed that. Punching tube steel with bolt holes. That's still open. That is not step 2 punching. That one we've closed. It's the one with the bolt holes.

MR. BAGCHI: Is that a new issue, or an earlier issue that's now --

MS. WILLIAMS: It's really phase 4. It's something we starred evaluating in phase 4. You could construe it to be related to the punching shear question, but it's really a variation of that where you have tube steel with through bolts and you have a hole and they are you are asking about the effects of punching. Whereas before all the discussions have centered around a tube to tube, with a smaller tube punching around a larger tube.

MR. TERAO: Nancy, could you clarify that one more time? When you have a tube with a hole in it, the bolt going through it, what is punching on what?

MR. YORK: Basically we are talking about a hole through a piece of tube steel where you are pulling on the bolt and the nut is pushing against the cord, or flange of the tube steel.

MS. WILLIAMS: We are using it as a backing

plate for a U bolt. That kind of thing. Not as an anchorage. Where they are using tube steel -- I think that's the system we have there, using tube steel for the backing plate.

MR. TERAO: It's the crossbar to the U bolt?

MR. YORK: Cross bar, in this case the cross bar is a piece of tube steel.

MR. TERAO: And you are concerned about the washer punching into the tube steel?

MR. YORK: Concerned about the nut bearing onto the tube steel and the fact that the use of the AWS equations which relate to tube-to-tube types of connections and punching shear may not be applicable to this particular problem, directly applicable.

MR. TERAO: Okay. I understand. Thank you.

MS. WILLIAMS: That's the best I can do right here.

MR. BAGCHI: Thank you.

MR. SHULMAN: Would this be a good time to break for lunch and do the conclusions right after lunch?

MR. TERAO: Maybe we could go off the record here.

MR. BURWELL: Off the record.

(Discussion off the record.)

MR. BURWELL: Okay. Back on the record. While

we were off the record we took a short break and discussed the next order of business. During the course of our discussion we agreed that we would proceed with a response from Dr. Bush and Dr. Kennedy concerning their participation in the Cygna phase 3 review.

MR. BUSH: This will be rather short. In my instance, I worked predominantly on 3 and 4, although obviously by iteration one goes back through. I would say, rather -- it has been more of a case of looking at the issues and looking at the significance there as contrasted to what I would say whether it precisely meets the code or the book.

In other words, if there's a deviation, either based on experience or based on contacts and follow-ups, you close the loop. We have attempted, or I have attempted to provide input as to the physics, the physical significance of an actual geometry as contrasted to what I would call a design procedure. And this has been done in a number of instances, some of which were discussed today.

Predominantly it has been by that mechanism. Of course I have looked, attempted to look at it -- and I must confess more in a piecemeal fashion, because the only way one can get an overall grasp is immerse oneself and probably physically walk the plant, which we haven't -- which has not been the case. So it has been looking at

somewhat disconnected pieces and attempted to physically relate to those particular pieces and supply information by a feedback mechanism.

That's been the approach. It has applied to such things as U bolts, supports, things of that nature to a degree on weld geometries, and those are some examples.

And that's about what I would say.

MR. GEORGE: Joe George here. I would like to take this opportunity to extend Dr. Bush the invitation to come down and walk the plant. We'd be happy to have him. I think you'd find it interesting.

MR. BURWELL: Fine. Thank you. Do any other members in the Staff have questions concerning Dr. Bush's role?

Hearing none, for the moment I will pass to Dr. Kennedy, and I may come back.

MR. KENNEDY: Kennedy. I was primarily involved in the phase 3 review. The main involvement was the same as Dr. Bush. We were asked by Cygna to review the more significant potential findings that they had. We were asked for advice concerning whether the practice was common or standard practice at the time the plant was being designed, and we were asked whether we felt potential findings were significant or not and whether we felt there was any safety aspects to the potential

findings.

Of all of the observations of Cygna, any of these that cause me concern remain in the open list. So on all of the items that Cygna has closed, I certainly concur with their closure.

Of the open items, some of them I have greater concern about than others. I certainly have greater concern on this missing mass, problems in the seismic evaluation of the piping and on the supports from that missing mass effect.

I probably have less concern than possibly some of the Cygna people have with the potential instability problems for some of these vertical supports, particularly -- because most of those only tend to have an instability problem against upward movement and I don't see what could possibly happen negatively to the piping systems from upward movement, even if the supports are unstable and don't resist upward movement in a seismic event.

Now, most of my concern, most of my reviews were for seismic. And, so, I guess of the open items, the missing mass remains a serious concern to me. The instability is a much lesser concern, in my mind.

MR. BAGCHI: How about instability with respect to things, loads that were not specifically written into the design specs, some of the loads that Don Landers

talked about this morning?

MR. LANDERS: I would hope those are in the design spec, the ones I'm talking about.

MR. BAGCHI: No, the wave propagations due to turbine trip. Was that in the design specification?

MR. LANDERS: I would hope it was in the design specification.

MR. BUSH: The question was whether it was handled correctly. That was the question that was addressed.

MR. KENNEDY: I have not reviewed that loading so I don't feel I want to comment.

MR. BAGCHI: You emphasized seismic loading. I just wanted to know whether or not you felt there might be other loading conditions for which some of these supports would give you more concern?

MR. KENNEDY: Before I would want to comment I would want to look at how much displacement I thought the pipe might undergo if the support was unstable in the vertical upward direction. Off the top of my head feeling would be that those dynamic loadings also would have limited displacement. If they did have relatively limited displacements associated with them, I don't think I would have a great deal of concern about the vertical instability -- upward instability.

Now, downward, you know, if these supports were unstable in the other direction it would be much greater concern.

But for seismic, in specifics, that concern I -- I don't see the supports really even being needed in the upward vertical direction.

I think that concludes my summary comments.

MR. BURWELL: Dr. Bush?

MR. BUSH: Yes, sir?

MR. BURWELL: Dr. Kennedy's discussion took a slightly different twist than yours. Do you care to make any remarks about the items, the open items that are on the Cygna list, relative to your views on their significance?

MR. BUSH: Obviously, so long as they are open there can be changes, you can't comment. I think your concern is whether I am relaxed about the closed items.

I think Cygna is aware that in some instances in support designs -- I'm not enamored with the support design but I consider them acceptable. That's a different situation.

In other words, I do not find them unacceptable. I just personally wouldn't have done it that way. I prefer to see it some other way.

That's a different issue, I think, than we have here.

So we have nuances here between something that is unacceptable, and I haven't found that instance, to something where I unequivocally agree. And in between there may be cases where I'd say: Well, I don't really care for that design but the analysis would indicate that it would provide its function.

MR. KENNEDY: Could I make a comment on that same subject? Kennedy.

I agree with those statements. If this plant was -- if the piping wasn't already built and we had a chance to be making comments concerning preferable ways of supporting the piping there's a number of the supports that I would not find preferable. But I do believe they are adequate.

There are better ways of supporting this piping, though.

MR. TERAO: I think that last comment that you made, Dr. Kennedy, is very appropriate for our next topic which is the design process itself.

I would like to discuss the design process as it relates overall to Cygna's conclusions, not only in phase 3 but in phases 1 and 2; just to see where we are with respect to what is Cygna concluding versus what are the board's concerns with the design process.

This might take a little while. I'm going to try to go through my notes as best I can. But Cygna has addressed the design process. But what I would like to do is, at

least for the purpose of some people here, is to try at least to explain what the Staff's understanding of the board's concern is with the design process.

In our SIF report we did go through and try to explain what the steps are in the design process. I would like to focus on two steps. This has to do with the field changes that are made with the modifications using these CMCs. CMC is component modification card.

Apparently, my understanding is that the original, or the initial support designs were done at the home offices of ITT Grinell, NSS and NPSI, and also PSE on-site. When those designs -- and those designs were reviewed and approved through the normal process and sent out to the field for construction.

When the supports -- when the support drawings reached the field, there were cases where interferences were noted. In many cases, some significant changes had to be made to the support designs in order to install it. And this is where the CMCs came in. Apparently, the field engineers took it upon themselves to design the support in the field and draw the support on CMC, which is an interim piece of paper, which is then sent to the appropriate design groups for review and approval while construction proceeded.

Now this bears on what you were saying, Dr. Kennedy. When you said many of these support designs you would not

have liked to see those, but because they are in the field you are now in a position where you can't easily change them. But now you would have to either show that they are adequate, justify them in some sense.

I think this is exactly what one of the board's concerns is. I would like to read exactly what the board says. It's two pages from their December 28, 1983 memorandum and order. This is a quote from the board order.

"The fourth subparagraph of paragraph III recognizes the 'iterative process' for the design of plants. It provides a method for making field changes in design. It states:

"Design changes, including field changes, shall be subject to design control measures commensurate with those applied to the original design and be approved by the organization that performed the original design unless the Applicant designates another responsible organization.

"We interpret this provision as intending to assure that whatever design changes are made be of high quality. Furthermore, that quality, which affects the entire process of construction, was intended to be subject to all the requirements for an ongoing quality assurance program.

"We reject the view, propounded by the staff, that 'the regulations do not have a time sequence built into them as

to when you have to run an analysis.' Applicant is incorrect in believing that it is permitted an indefinite period of time to catch errors committed early in the design process because, 'in the later stages of design review' it will have highly experienced and capable engineers check the system once again.

"It is our view that the regulations require timely identification and correction of errors. We reject the view that the promptness requirement of the regulations applies to construction deficiencies and not to design deficiencies. Such a view necessarily rests on an illogical interpretation of the regulations; it would require us to believe that the Commission sought prompt correction of construction deficiencies, defined as a failure to comply with design documents that are themselves exempt from the need for prompt correction of deficiencies. In that view, quality assurance is a scholastic pursuit not related to the actual quality of the plant. A preferable view is that both construction and design deficiencies must be identified, reduced to writing, and corrected with reasonable promptness."

Now, that is the one particular area that we, the Staff, and the board are having particular difficult time, trying to establish whether or not these field changes resulted in an adequate design.

As you recall, in phases 1 and 2 we asked Cygna to focus on unconventional designs, you know, designs that were not common industry practice. And there is a reason why we asked you to look at that. Because, if, in the development of a support design, unconventional utilization of hardware is employed, then one must question the validity of that design. The reason for doing so is because codes and standards are developed on a consensus of design.

For example, the ASME code would not provide a means for evaluating the effects due to a support design which no design group utilizes. So, with an unconventional design, it's not necessarily acceptable, just by meeting code requirements. So one must question the potential problems of the unconventional design for considerations not covered by the code. And to justify these unconventional potential problems by engineering judgment is not totally adequate because one, again, is exceeding the limits of standard practice and into an area where judgment has very little basis.

Of course, one could argue that one can extrapolate their engineering judgment to those areas, and this is precisely what the Staff and the Applicant have done in the hearings. This is exactly what the board ruled was not acceptable.

So we are in this position now, where many of the designs that we've seen, especially in your phase 3 report, are very unconventional. And many questions do arise from it. And these questions are not necessarily related to the code or to standard practice. But they do raise questions. And these are the kind of questions, as you are familiar with, that Walsh & Doyle has raised.

What the board is really looking for is, how do we qualify these supports to those type of problems?

As you are aware, and I'm sure the Applicant is aware of now, it's very difficult to do it. You can do extensive analyses and testing and it's still very difficult to prove that the design is adequate.

So, but once we embark on that route to address these unconventional problems from an analytical or from a testing program, it tends to avoid addressing the real concern, which is: Why did these designs develop in the first place? Such as these problems came up. And, how does the design QA process identify and correct these type of deficiencies?

Those are the two main questions that the board is asking. And I guess, in looking at the Cygna conclusions, what we would like to know is: How does the Cygna report in any way address these two concerns?

MS. WILLIAMS: Where do I start? All right.

I'll try and work backwards from what I garnered from what you summarized there.

Corrective action, what we did was a review of the systems they have in place using our quality assurance personnel. And we found that in fact they had appropriate systems in place. But, taking the next step, that's what we reported in phase 3; the results of our corrective action assessment are a quality assurance assessment.

But now, when you put the two halves together, you know they've got systems in place but now you are sitting here looking at these designs that you've just described. So why aren't they entering into the process? Or should they have been entered into the process? And I'm not sure that we are really ready to answer that today.

We've sent you a letter with some examples of things that could be construed to be unconventional, but from my personal standpoint, I haven't even arrived at what I think is a good understanding of just what is this list of unconventional designs? You have to go through -- U bolts, we agree these are unconventional.

Step two, maybe it's not so much that they are unconventional, but maybe that their analysts aren't checking it. You have to take each of these issues to go through and sort them out, and I don't feel prepared to offer a conclusion on that. But I will add that, for two

months now I have had in my possession revision 2 of the phase 3 report text, in which we just issued the observations and checklists, because we knew that EG&G was doing the review. And at least to clarify those things that we could readily do, we issued that. But that's not to say that the text isn't being revised as well. And I'm working on the QA section right now with our QA people, and then considering the technical issues, and it's a very -- as you said, it's a very tough question. And I guess, also, the adequacy of the supports is maybe why we are doing the review in the first place, so that we can provide you the results of what we found when we did a review of the supports as an independent reviewer, so you can also look at this information and decide whether the process resulted in inadequate designs or not.

For the most part we don't have ones that would be considered to be, maybe, the best -- or failures, if you will. They pass in terms of going back and reanalyzing them, but the adequacy of the initial calculations and the initial effort put forth by the pipe support designers leave something to be desired.

MR. LANDERS: How do you categorize the problems you found with modal spacing and mass participation, which is not related to trying to determine whether a support is going to work or not?

MS. WILLIAMS: I, right now, am seeing, given the number of errors and now given our review of what was then done as corrective action, that they are having problems with the thoroughness of their reviewers. It's tough to know why that is, whether it's because they don't understand or because they are not doing it thoroughly.

MR. LANDERS: Do they have a process, and procedures in place, which tell the analyst what he should do and what he should look for -- the comments that we heard you people make on how you would find out whether this problem existed or not?

MS. WILLIAMS: Well, they do for some things, but not others. For example, mass participation is not addressed in the procedure. We had many months of discussions, in fact, with Gibbs & Hill, before we could arrive at a mutual understanding of what the issue was. They weren't thinking in that vein, I don't they think, whether they were doing the analysis. But they do have engineering guides in Gibbs & Hill to do the stress analysis for your basic modeling techniques. But they are obviously not all-encompassing, because things like mass participation weren't in there.

MR. LANDERS: Is modal spacing in it?

MS. WILLIAMS: Do you know --

MR. MINICHIELLO: Yes. Mass point spacing is.

MS. WILLIAMS: There they weren't following the procedure and the reviewers weren't picking it up.

MR. LANDERS: So in one case we have a procedure in place that may not be being implemented and in the other case we may not have a procedure in place?

MS. WILLIAMS: And you have to really go through one by one and sort them out, which is a fairly tedious process. And in order to, I think, digest the problems that the board has cited in the memorandum, I need to sort them out.

MR. BURWELL: Mr. George?

MR. GEORGE: I would like to concur that NPSI, ITT Grinell and the site design group did do the original design of some 24,000 supports for Unit-1. In fact, there were some interferences encountered that required some modifications to the supports. I am not aware of any major redesigns. And the procedures would have called for that original designer to design review any modification that was ever done to that support.

Beyond that, in the as-built program of these 24,000 or so supports, and then in the modification program -- and the Gibbs & Hill pipe designer was in that chain -- whereby every one of those supports, as they are, were reviewed by all of those original design parties, as well as the architect/engineer and the pipe designer who

designed the system. And in that review they did rigorous analysis to determine if, in fact, that system would be in static equilibrium under the worst design basis earthquake.

Now, I'm confident there may be a few errors made in that process, by the sheer magnitude of the supports that were there. But we think -- I think, as the general manager of the project and having had interface with these people and being on-site through these years, the systems are good and certainly the plant will be safe under any earthquake conditions that we've experienced.

We do have the benefit of being in a low fault zone. And the reason I was not being facetious, anyone that hasn't visited Comanche Peak, I really don't see how you can make judgments too well. I believe if you walk the field, look at the supports, look at main steam, you'll see that they are adequate.

MR. BURWELL: Thank you. Don Landers?

MR. LANDERS: Yes. Now that you have spoken up, I asked a question of Texas Utilities people on August 9th, with respect to what we are talking about, and I would address the question to Cygna, and you people.

In the initial process of getting from the offices to the site, as I understand the process, Gibbs & Hill did the design, did the analysis, located supports, and that information went to the support manufacturer who designed

and built supports and shipped them to the site. Those designs initially -- did they or did they not go back to Gibbs & Hill for review and acceptance?

MR. GEORGE: The designs initially went to Gibbs & Hill. This was, we thought, maybe not necessary, since we knew that we were going to include them in the as-built flow, and their interface would be in that flow when we actually as-built the support.

One of the reasons for that decision was that this plant, if you look at the systems, you'll find there's not all the room in the world, and it was apparent that some of those would require relocation and probably what I call, "reoptimizing." I don't think we hurt them. We think we optimized the supports.

So it was logical to make a decision, of cost and schedule, to put them on the end of the cycle and give them the last shot at it. And indeed there have been modifications made in a very lengthy as-built vendor certification program.

MR. LANDERS: But in fact you are saying they were on the front end of the cycle review also. And if they were, I would like to see the procedure that calls that out, because I haven't found that out yet.

MR. WADE: Excuse me, they did not review and approve the hanger drawings. They had copies of them that

were provided to them. It was not an official review.

MR. GEORGE: We started where they were and we decided that would not be necessary, is my recollection of it.

MR. LANDERS: That is the answer.

MR. GEORGE: What he said is correct. But it was a conscious decision, in that it was known that they would be on the as-built, and reviewed in the as-built condition, you might be wasting time and money.

MR. LANDERS: Did Cygna investigate this and find out that that is the case, or what?

MS. WILLIAMS: We didn't see any evidence that Gibbs & Hill reviewed the drawings.

MR. LANDERS: Thank you.

MR. BURWELL: Okay. With that I suggest we get back on the subject. Dave?

MR. TERAO: What I was trying to do is open up the discussion so Tom can join in, and he just did.

MR. BURWELL: All right.

MR. LANDERS: I have another question which came up as a result of Mr. George's discussion, and that is: Did the reconciliation process -- does that cover all plant conditions, or is that just related to the DBE, as I heard?

MS. WILLIAMS: All loading conditions.

MR. GEORGE: Sir, if you are speaking of water hammers and steam hammers, that has been rigorously evaluated and as a matter of fact we made modifications to our feed water system, probably from the fast closing of the jet valve in that system as uncovered by Westinghouse as one of our biggest problems, and we did a lot of redoing to those supports for the feed waters.

Spots, I'm getting into too much detail. I would like to offer, though, as the Applicants, anyone that has questions for me to get the experts together that actually were involved in all these interfaces and any of these people -- there's more people here today than I visualized. I thought it was Cygna and the Staff. And apparently there's more consultants. I didn't know the senior review team was here.

So, I offer at the site where I live, and with the people that have put this plant together, for anyone that's interested in these details, we believe we can provide it to you fairly accurately and convince you the plant is a good safe plant, and is ready to run, by the way.

MR. BURWELL: Fine. Thank you. Don?

MR. LANDERS: With respect to the reconciliation process, does that include verification of as-built designs to all loading conditions?

MS. WILLIAMS: Yes.

MR. LANDERS: Thank you.

MR. BURWELL: Cygna? Did you have further conclusions?

MR. SHULMAN: I guess I think it's important -- I would like Nancy to talk further, but I think our position on this is the kind of conclusions you are looking for we feel are still part of the process that we are completing and it's more of overview conclusions, and that's exactly what Dave wants, the overview conclusions.

We have got some local conclusions on these issues and we've made those. But the point I think we have been trying to get across, particularly in the last month or two, is that some of those conclusions maybe also have another sentence that says: Because of what we found here we conclude this is okay, but there's an aspect of this that has to go into another hopper and that hopper is a hopper that requires putting it all down on the table at the end and saying, "Now these are all our conclusions about the design process and the QA issues and those overall issues that you can only make a judgment on when you look at everything that you've seen."

I don't know if that's the best way to say it. Maybe Nancy should -- I'm speaking for her, to some extent. But that's the way I see what Nancy has been saying to me for

the last month or two, anyhow.

MS. WILLIAMS: I guess I feel that the conclusions in each of the phases are based on what we knew in the phase. And now we need to put it all together. And I feel somewhat uncomfortable, actually, with what I know now from phase 4, with some of the conclusions in phase 3.

We know a lot more now and I'm learning some stuff in the design control area from cable trays which is causing me to rethink what we see in that program.

MR. BURWELL: Mr. Landers?

MR. LANDERS: One more question. It's a detail question. I apologize.

In reviewing support designs, where you found box beams with either snubbers or pin struts on them, did you ever in any of those cases go back to the original design and find a pipe clamp in place of the box beam? That's a tough question. You did talk about reviewing that --

MS. WILLIAMS: I don't think we can answer that for you, but we did send some reviewers back to the offices of Grinell and MPSI because we needed to see some of the original sizing calculations and I would have to ask them.

It was our understanding, and this is purely hearsay, that there was a point in time where the clamps were

difficult to get or whatever and there was a change.

MR. LANDERS: That's what I want to get rid of is that hearsay, and that hearsay is becoming a big issue, I think, and I would like to get an answer to that question from someone.

MS. WILLIAMS: The only thing I can do is check with the reviewer who went back to the offices. But it would be very limited; the information you get back is very limited.

MR. LANDERS: I would appreciate it.

MS. WILLIAMS: We didn't look at all supports back in the offices --

MR. LANDERS: I understand, but I just wondered if you did find that case to exist.

(Discussion off the record.)

MR. SHULMAN: Do you have any more comments?

(Discussion off the record.)

MS. WILLIAMS: Dave has just recommended for the purposes of your SER, just to make sure everyone here is clear on that, particularly in the quality assurance area and the many aspects of it, that we are reassessing the phase 3 conclusions, phase 2 conclusions, phase 1 conclusions, all of them in that regard. So that you are aware that that's going on.

MR. BURWELL: All right.

MS. WILLIAMS: We are not changing what we are saying about the procedures being in place and all that. All of that information is still factual and is there for your review. But what that means when you fit it together with all these other findings still has to be sorted out again.

MR. BURWELL: Certainly. Now my next line of questioning really goes to -- I hear you say that you have -- and you talked about them -- open items in Cygna phase 3, and perhaps you have different views on phase 1 and 2, and certainly you appear to have some concerns from phase 4.

I am trying to think in terms of what -- how do we reach an endpoint on some type of schedule? Are you thinking in terms of being able to submit 4, bring that to some conclusion within the next month? Or can you address any idea or opinions, even, on when that might become available?

You see, I'm kind of sitting in the position that you have indicated a need to reach an overview on all of your independent assessment work, and I'm trying to look down the calendar and see when these things might occur.

Could we have any opinions on that?

MR. SHULMAN: I guess that depends on two areas. One is some of the issues that are open that we are

requesting responses. And second is how comfortable we are going to feel in the next month or so with drawing the conclusions. And I don't think I could tell you right today whether it's going to be a week, two weeks, or three weeks before we feel comfortable making that conclusion.

MS. WILLIAMS: We can start -- we certainly have enough information to start wrapping up the sorting process that we have talked about, with the observations we have before us. And we could have some opinions on that before we actually issue the phase 4 report. In other words, I don't think that we have to, in the design control area, necessarily wait until phase 4 comes to a conclusion. I think that I've seen enough in phase 4 now to know pretty much what's coming out of that. And I can take that and follow that with what we know in 1, 2, and 3.

But the open items, I don't really have a schedule for some of those because -- well, some of them are in TUGCO's responsibility right now and it's a function of whether we get that back and there's others that we have done follow-ups that are still unacceptable, so they keep bouncing back and forth, unfortunately.

It sounds to me, though, that there are some priorities in your mind as to which ones are more important to know about and I sense that the design control area is one that you are maybe particularly interested in. So what we need

to do is sort out our priorities to maybe support what your needs are and we can do that. And as I say, we can certainly start the design control aspects of the problem with the information we have right now.

MR. PIGOTT: Let me add one thing, being nontechnical. The conclusions that we ultimately get to, even at the end of phase 4, may not be able -- we may not be able to make ultimate end conclusions. The work that will have been accomplished, and the scope of the work accomplished, depending on what it turns up, may or may not allow plant wide type of conclusions. That's not something we know now. But I mean if anybody thinks that when we get to the end, automatically we will be able to make conclusions about the entire plant, it just may not be adequate to do that.

I'm not saying that will happen, but that's a possibility, depending on what turns up.

MR. BURWELL: You looked like you had something else to say?

MS. WILLIAMS: No. I was thinking what Dave said and I was thinking about plant-wide conclusions and whether that was our role or not, actually. We offer, you know, the facts as we see them, and we give you conclusions on what we have seen. But plant-wide conclusions are really going to have to be based on

combining a lot of things that you people also know about since you are doing studies yourselves.

MR. BURWELL: May I break just a minute?

MR. MIZUNO: As a matter of fact I think -- let's take a five-minute break at this point and have a Staff caucus in the room next-door.

MR. BURWELL: Thank you. Five-minute break.

(Recess.)

MR. BURWELL: Ready to go back on the record? Okay. I think the meeting is coming rapidly to a close, but from the viewpoint of the Staff I have one item I need to hit upon, and that is that I understand that you are still in your thought processes concerning your findings regarding, shall I say all of the Cygna reviews at this point in time.

However, from the Staff's point of view, we are in the process of trying to do our review also, and it is necessary that we be able to utilize our resources in a way that we don't encounter a change in your -- or that we don't subsequently find that a large part of what we have done is no longer appropriate because Cygna is having some new thoughts, in terms of -- as their review progresses.

And, therefore, I need to request, and in fact I almost say "insist," that once you reach a point in time that you can identify areas in these reviews which you feel are not

going to change, that you identify these to us.

If you can give us any information relative to the areas that you -- conversely, if you can give us any information about the areas in which you are encountering, shall we say difficulties, in bringing your findings, your observations, to a conclusion, that would be most helpful to us also.

In fact, if you find that area -- if you find significant portions of your review fall into that category, I would suggest that perhaps the Staff and Cygna meet again as soon as you can see that things are, shall we say, bogging down in your review effort.

We are most anxious to complete our review on the Cygna effort, and on the other hand, we do not want to prematurely, shall we say, cut off your effort in areas that you feel should receive more attention.

MR. MIZUNO: This is Mr. Mizuno. Perhaps to clarify Spots' request, the Staff's request that Spots transmitted, I think it would be helpful to the Staff if, within a week of this meeting, you send to the Staff a specific listing of all portions of the phase 1 and 2, and phase 3 reports, that Cygna did, indicating which areas you are not comfortable with or you are not in the process of saying "this is the final Cygna findings and conclusions." .

MR. BAGEHI: Including a commentary on the conclusions in phase 1, 2, and 3; kind of an annotated commentary.

MR. SHULMAN: We may not agree right at this point that we will have that to you that within a week from this day.

MR. BAGCHI: I was hoping the letter Nancy was going to send us would include that.

MS. WILLIAMS: I can do some of the more obvious things and what I can just do is tell you whether I think it's complete or not. There are some things that come to mind that I can very easily put in a letter right now and that will help you out, I think, but I need to do a complete review effort of the reports before I can tell you I have covered everything. That's all.

MR. MIZUNO: How long do you think that will take?

MR. SHULMAN: Not to draw all the conclusions, just the status.

MR. MIZUNO: Would something like two weeks be more appropriate? I don't want to have, I guess, a truncated -- several letters coming in saying "these are some additional items that you think are under review." I want to have an integrated list of the areas of phases 1, 2, and 3 reports, that are, you know, subject to

reevaluation, reassessment, changed conclusions, with regard to findings or ultimate conclusions. I think that is going to be imperative from the Staff's point of view.

MR. SHULMAN: You are asking for two different things. I hear one request on the one hand and another request on the other hand.

We can do the short list, which will take less than a week; okay? But you don't want that. That will be truncated. That will be two pieces of paper.

We can do the full-blown then you want --

MR. MIZUNO: I don't think we need an annotation as to why you are reassessing things; all we need is the areas, specific areas.

In other words, I would foresee something that says "Observation: this," or "the conclusion related to this item is under reassessment." Something like that, not necessarily an annotation saying why you are in the process of doing it. Just telling us that it is under -- and I think -- Nancy, do you understand?

MS. WILLIAMS: I think what you want is a summary of those areas we are further reconsidering, and a summary of those areas that we think will stand fast the way they are.

MR. MIZUNO: That's correct.

MS. WILLIAMS: And I think I can do that in two

weeks; yes.

MR. PIGOTT: In two weeks, did you say?

MS. WILLIAMS: You asked if two weeks was more appropriate.

MR. MIZUNO: Yes, I asked if two weeks was more appropriate.

MS. WILLIAMS: I'll try to do it in shorter than that, but I have to get mass participation letters too, but I realize this is probably the highest priority I have, so I'll put it on the front burner.

MR. BURWELL: Does that complete the Staff's thing? With that, then, I guess the meeting is adjourned.

(Whereupon, at 12:55 p.m., the hearing was adjourned.)

CERTIFICATE OF OFFICIAL REPORTER

This is to certify that the attached proceedings before the UNITED STATES NUCLEAR REGULATORY COMMISSION in the matter of:

NAME OF PROCEEDING: MEETING WITH CYGNA ENERGY SERVICES
ON COMANCHE PEAK STEAM ELECTRIC STATION
INDEPENDENT ASSESSMENT PROGRAM (PHASE 3)

DOCKET NO.:

PLACE: BETHESDA, MARYLAND

DATE: THURSDAY, JANUARY 10, 1985

were held as herein appears, and that this is the original transcript thereof for the file of the United States Nuclear Regulatory Commission.

(sign) Joel Breitner

(TYPED)
JOEL BREITNER
Official Reporter
ACE-FEDERAL REPORTERS, INC.
Reporter's Affiliation

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

January 8, 1985

Docket Nos. 50-445/446

Mr. M. D. Spence, President
Texas Utilities Generating Company
400 North Olive Street
Lock Box 81
Dallas, Texas 75201

Dear Mr. Spence:

Subject: Comanche Peak Review

On July 9, 1984, the Comanche Peak Technical Review Team (TRT) began an intensive onsite effort to complete a portion of the reviews necessary for the NRC staff to reach its decision regarding the licensing of Comanche Peak Unit 1. The onsite effort covered a number of areas, including the review of allegations of improper construction practices at the facility.

On September 18, 1984, the NRC met with you and other Texas Utilities Electric Company representatives to provide you with a request for additional information in the electrical and instrumentation, civil and structural, and test program areas having potential safety implications. On November 29, 1984, we reported to you on the status of our technical review in the protective coatings area and requested additional information in the mechanical, and miscellaneous areas. TRT reviews of construction QA/QC allegations and technical issues have progressed to the point where we can now provide you with the status of our efforts in the construction QA/QC area and a request for a program plan specifically addressing our concerns. Further background information regarding these allegations and technical issues will be published in Supplements to the Comanche Peak Safety Evaluation Report (SSER), which will document the TRT's detailed assessment of the significance of all issues examined.

The TRT effort constitutes one element in the process of the agency's review of the Comanche Peak license application. The QA review group on the TRT was comprised of about 20 individuals having a total of over 300 years experience in nuclear engineering, QA, and related fields. This group spent several months at the Comanche Peak site examining the construction QA program in depth.

The TRT findings are provided in the enclosure to this letter. We have not proposed specific TUEC corrective actions as we have in previous reports from the TRT. We request that you evaluate the TRT findings and consider the implications of these findings on construction quality at Comanche Peak. We request that you submit to the NRC, in writing, a program and schedule for completing a detailed and thorough assessment of the QA issues presented in the enclosure to this letter.

Your programmatic plan and the plans for its implementation will be reviewed and evaluated by the staff before NRC considers the issuance of an operating license for Comanche Peak Unit 1. The TRT considers the construction QA/QC findings to be generic to both Units 1 and 2 and your program plan and schedule should address both units. This program plan shall: (1) address the root cause of each finding and its generic implications on safety-related systems, programs, or areas, (2) address the collective significance of these deficiencies, and (3) propose an action plan from TUEC that will ensure that such problems do not occur in the future. Your actions should consider the use of management personnel with a fresh perspective to evaluate the TRT's findings and implement your corrective actions. Finally, you should consider the use of an independent consultant to provide oversight to your program.

The findings of TRT with respect to QA/QC allegations, along with the TRT's assessments of your response to this letter, will be provided to the Senior Management Panel on Contention 5 established by the Executive Director on December 24, 1984. The Senior Management Panel will determine an overall NRC staff position on Contention 5 based on an integrated review of a number of sources of information concerning QA/QC at Comanche Peak in addition to the TRT findings, including information from the CAT team, the SRT team, OI, Region IV and the Hearing Board.

The TRT's overall evaluation of the technical issues and allegations is nearing completion. As we finalize information received in conversations with allegers, and further assess the implications of our findings we will inform you of additional concerns, as they arise. In the mean time, your examination of the potential safety implications of the TRT findings should include, but not be limited to the areas or activities selected by the TRT.

In order to fully discuss these concerns with you we are scheduling a meeting for January 17, 1985 which will be held in our office in Bethesda, Maryland. This meeting will provide an opportunity to ask questions regarding these concerns prior to formulating your program plan. Additional meetings will be held at NRC request as your program plan is formulated.

This request is submitted to you in keeping with the NRC practice of promptly notifying applicants of outstanding information needs that could potentially affect the safe operation of their plant. Future requests for information of this nature will be made, if necessary, as TRT technical reviews continue.

Sincerely,

Darrell G. Eisenhut, Director
Division of Licensing
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Enclosure: As stated

cc w/enclosure:
See next page

COMANCHE PEAK

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Enclosure

Technical Review Team Findings Resulting From
Quality Assurance/Quality Control Allegations

In evaluating the QA/QC program at CPSES, the Technical Review Team (TRT) completed the following: (1) interviewed Texas Utilities Electric Company (TUEC) and Brown & Root (B&R) personnel and allegers, (2) reviewed quality assurance records, selected affidavits, transcripts and depositions, and NRC Regional and Office of Investigations reports, and (3) physically inspected hardware to evaluate the safety significance of quality assurance/quality control (QA/QC) allegations at Comanche Peak Steam Electric Station (CPSES).

1 QUALITY ASSURANCE PROGRAM

The TRT found that although the TUEC QA program documentation met NRC requirements, the weaknesses of its implementation in several areas demonstrate that TUEC lacked the commitment to aggressively implement an effective QA/QC program in several areas:

A. TUEC failed to periodically assess the overall effectiveness of the site QA program in that there have been no regular reviews of program adequacy by senior management. Further, TUEC did not assess the effectiveness of its QC inspection program.

B. During the peak site construction period of 1981-2, TUEC employed only four auditors, all of whom had questionable qualifications in technical disciplines. Although charged with overview of all site construction and associated vendors, these Dallas based auditors provided only limited QA surveillance of construction activities.

C. Repetitive NCRs were issued that identified the need to retrain construction personnel in the requirements and contents of QA procedures. One corrective action request (CAR) dealing with inadequate construction training and records remained open for one year. The identical problem was identified in a subsequent CAR, which still had not been closed at the time of the TRT's onsite review.

D. The TRT found many examples of incomplete and inadequate workmanship and ineffective QC inspection in TUEC's evaluation of the as-built program. (See Section 4 for a detailed discussion.)

E. Some craft workers newly assigned as QC inspectors were in a position to inspect their own work and records. Site management did not view this lack of separation between production and inspection roles as a potential conflict-of-interest.

F. There were potential weaknesses in the TUEC 10 CFR 50.55(e) deficiency-reporting system. Applicable procedures did not identify what types

of deficiencies constituted significant breakdowns in the QA program, nor how they should be evaluated for reportability to the NRC. Evaluation guidelines for reporting hardware deficiencies lacked clarity and definitive instructions and the threshold for reporting deficiencies was too high. Specific past and present construction deficiencies that were not reported by TUEC are listed in Sections 4, 5 and 11 of this enclosure.

G. The TUEC exit interview system for departing employees appeared to be neither well structured nor effective, as evidenced by the lack of employee confidence, limited implementation, failure to document explanations and rationale, and failure to complete corrective actions and to determine root causes.

H. The B&R corrective action system was generally ineffective and was bypassed by the B&R QA Manager, as exemplified in the following instances:

1. There were no definitive instructions to describe the types of problems that required corrective action. Minimal procedural instructions resulted in corrective action decisions frequently being left to the judgement of the QA Manager.

2. Since June 1983, B&R had issued no Corrective Action Requests (CARs), and was substituting memos and letters of concern for this function. This shortcut had become a regular method of operation and appeared to bypass the CAR system.

I. The TUEC corrective action system was poorly structured and ineffective in that:

1. Controlling procedures were brief and general.

2. There was no translation of FSAR requirements on trending and no details on how trend analyses were to be accomplished.

3. Quarterly reports were not issued in a timely manner.

4. The method of categorizing problems by building did not assure meaningful trend analysis.

5. A 1984 CAR report identified three items requiring action; however, none had been taken.

6. CAR 029 was used as a vehicle for a specific disposition rather than for generic action, as intended by the CAR system.

2 QUALITY CONTROL INSPECTION

The TRT evaluated the CPSES QC program to determine if it was functionally effective and if the QC system and organization effectively ensured consistent quality of design, procedures, processes and product at the plant. The results of this review showed the following problems.

A. Based on the TRT review of about 200 fuel pool travelers, TUEC was unable to maintain an effective and controlled QC program for fuel pool liner fabrication, installation, and inspection. Typical fuel pool traveler irregularities were:

1. There was apparently a routine practice during construction of the fuel pool that allowed craft personnel to complete a portion of the inspection report forms prior to the actual inspection. Craft personnel entered the word "SAT," dated the entry, and left blank only the space for the QC inspector's signature. It appeared that the craft personnel were judging the inspection results prior to inspections.

2. The date accompanying the signature for visual examination of an inside weld was changed to a date that appeared to precede the examination.

3. Entries by the same inspector for two different inspections did not appear to match in that one entry appeared to be written by another person.

4. The procedure number for a dye penetrant inspection was changed by an inspector different from the one who conducted the inspection.

5. The date for a dye penetrant inspection was changed by an inspector other than the one who performed the inspection.

6. Fuel pool travelers were found with missing QC signoffs for fitup and cleaniness. No proof could be found that some of the required weld fitup and cleanliness inspections were ever performed.

7. The TRT review disclosed the following irregularities with traveler entries in addition to those listed above:

   (a) Date changes after the fact
   (b) Signoffs for functions out of sequence
   (c) Corrections after the fact
   (d) Changes to first party inspector date signoffs
   (e) Missing signatures

B. There were examples of limited corrective action, including vendor-supplied pipe whip restraints that had received inadequate source inspections. Twelve NCRs were issued involving weld defects on these restraints. TUEC corrective action included paint removal from only a sample of the welds and 21 restraints were selected for reanalysis; however, the TRT found no basis or criteria for paint removal or how the worst case restraints were identified.

The reviews of allegations in the Civil and Structural, Coatings, Electrical, Test Programs, and Piping and Mechanical areas also indicate QC inspection deficiencies, as provided in our letters of September 18, and November 29, 1984.

3 T-SHIRT INCIDENT

The T-shirt incident has previously been explored in many forums, including hearings before the Atomic Safety and Licensing Board. The TRT has examined this matter, but will not now describe all of the associated issues. Importantly, however, the TRT believes that TUEC management failed to adequately investigate the incident to determine its root cause, but reacted as though the QC inspectors involved were guilty of disruptive behavior. Of particular concern to the TRT is the strong perception that TUEC QA management may have acquiesced to pressures and complaints from construction personnel and may have failed to adequately support their QC workforce.

4 INSPECTIONS OF AS-BUILT PIPE AND ELECTRICAL RACEWAY SUPPORTS

The TRT conducted a series of inspections encompassing as-built safety-related pipe support and electrical raceway support installations. These inspections were of completed systems or components that had been previously inspected and accepted by TUEC QC as meeting the respective construction and installation requirements.

A. Pipe Support Inspections

Tables 1 and 2 are indicative of the scope of the TRT pipe support as-built inspection effort. Of the 42 pipe supports inspected, 37 were randomly selected, while 5 originated from an alleger's list. Forty-six deficiencies were identified in the supports inspected. Following are examples of the deficiencies identified and the applicable criteria. TUEC's final QC inspections of this sample ranged from December 1982 to October 1984.

1. Component Support Welds:

(a) Applicable criteria

ASME Section III, NF Subsection and subarticles NF-4424 and NF-5360 set forth rules for examining welds.

B&R Q1-CAP-11.1-28 Revision 25, Paragraph 3.5.5.1 delineates criteria for the examination of welds, including inspection parameters for acceptable weld sizes.

The TRT found supports exhibiting welds that did not appear to be in accordance with the above-referenced codes and procedures.

(b) Examples of deficient welds

(1) Support No. AF-1-001-001-S33R. Discrepancies included porosity; insufficient weld leg; incomplete welds and insufficient fill. This support was removed, scrapped, and completely rebuilt subsequent to the TRT inspection.

Table 1 Pipe supports in unit 1

Supports Inspected by TRT As-Built group	*42
Class 1 supports inspected	4
Class 2 supports inspected	14
Class 3 supports inspected	24
Hangers with problems	26
Total problems identified	46
Procedure adequacy problems	5
Hardware-related problems	16
As-built drawing related problems	8
Component identification problems	2
Weld-related problems	10
QC record problems	1
Material identification problems	4
Welds inspected without paint by TRT	305
Welds inspected with paint by TRT	89
Total welds inspected by TRT	394
Welds needing weld repair	10
% of welds inspected	2.5%
Supports needing welding repair	6
% of supports inspected	14%

Bldg	System	No. of Supports Inspected
Containment	Safety Injection (SI)	1
Containment	Reactor Coolant (RC)	6
Containment	Residual Heat Removal (RHR)	2
Fuel Handling	Component Cooling (CC)	11
Safeguards	Residual Heat Removal (RHR)	1
Safeguards	Containment Spray (CT)	8
Safeguards	Demineralized Water (DD)	1
Safeguards	Auxiliary Feedwater (AF)	8
Auxiliary	Chemical Volume & Control (CS)	1
Safeguards	Main Steam (MS)	2
Safeguards	Chilled Water (CH)	1

*All 42 pipe supports inspected by the TRT had been previously accepted by site QC.

Table 2 Pipe supports in unit 1*

Problem Category	Hanger No.	No. of Problems	Type
1. No locking device for threaded fasteners	RC-1-901-702-C82S	2	Hardware problem
2. Min. edge distance (on base plate) violated	CS-1-085-003-A42K		
3. Baseplate hole-location dimensions out of tolerance	CC-X-039-006-F43R	1	Hardware prob.
	CC-X-039-007-F43R	4	As-Built prob.
	CC-1-126-010-F33R		
	CC-1-126-011-F33R		
4. Spherical bearing/washer gap excessive	CC-1-126-012-F33R		
	CC-1-126-015-F43R	4	Hardware prob.
	RC-1-052-016-C41K		
	RC-1-052-020-C41K		
5. Spherical bearing contamination	MS-1-416-001-S33R		
	SI-1-090-006-C41K	2	Hardware prob.
6. Snubber adapter plate-insufficient thread engagement	MS-1-416-002-S33R		
	MS-1-416-002-S33R	3	Proced. prob.
	SI-1-090-006-C41K		
7. Insufficient threaded eng'mt, threaded rod (sight holes)	CT-1-013-012-S32K		
	RC-1-901-702-C82S	1	Hardware prob.
8. Snubber/Strut load pin locking device broken or missing	AF-1-001-014-S33R	1	Hardware prob.
9. Load side of pipe clamp halves not parallel	AF-1-001-001-S33R	2	Proced. prob.
	AF-1-001-014-S33R		
10. Pipe clearances w/support out of tolerance	CC-1-126-013-F33R	2	Hardware prob.
	AF-1-001-702-S33R		
11. Pipe clamp locknut loose .	AF-1-035-011-S33R	1	Hardware prob.

*All 42 pipe supports inspected by TRT had been previously accepted by site QC.

Table 2 (Continued) Pipe supports in unit 1*

Problem Category	Hanger No.	No. of Problems	Type
12. Snubber/Sway strut misalignment	CC-1-126-014-F43R RC-1-052-020-C41R	2	Hardware problem
13. Snubber cold set dimension does not match drawing	CS-1-085-003-A42k	1	As-Built prob.
14. Snubber orientation does not match drawing	CT-1-005-004-S22K CT-1-013-010-S22K	2	As-Built prob.
15. Component type/model no. installed does not match drawing	SI-1-090-006-C41K RC-1-052-020-C41R	2	Compon. ID prob.
16. No identification for support materials, parts, and components	CT-1-013-014-S32R CC-1-126-012-F33R CC-X-039-005-F43R AF-1-035-011-S33R	4	Matl. identific. prob.
17. BRP column line dimension does not match BRHL Dimension	Support not affected	1	As-Built prob.
18. Weld porosity excessive	AF-1-001-001-S33R	1	Weld-related prob.
19. Weld undercut excessive	AF-1-001-702-S33R	1	Weld-related prob.
20. Weld length undersized	AF-1-001-001-S33R	1	Weld-related prob.
21. Weld leg or effective throat undersized	AF-1-001-001-S33R RH-1-006-012-C42R CC-X-039-007-F43R	3	Weld-related prob.
22. Weld called out on drawing does not exist in field	CC-1-126-013-F33R	1	Weld-related prob.
23. Welds added in field are not reflected on drawing	AF-1-001-702-S33R numerous welds	1	Weld-related prob.
24. Excessive grinding resulting in min. thickness violations (weld clean-up)	AF-1-037-002-S33R CT-1-013-014-S32R	2	Weld-related prob.
25. No QC Buy-off on weld data card	CC-1-126-013-F33R	1	QC record problem
		46	Total problems identified by TRT

*All 42 pipe supports inspected by TRT had been previously accepted by site QC.

(2) Support No. AF-1-001-702-S33R. Exhibited extraneous welding that was not documented on the as-built drawing. One of the required welds was undercut beyond the limits of acceptance (this weld was subsequently repaired).

(3) Support No. CC-1-126-013-F33R. Support drawing required a 1/4" fillet weld to connect item 5 to item 6. This weld was omitted in the field.

(4) Support No. CC-X-039-007-F43R. A required 5/16" all-around fillet weld had an approximately 1/16" undersize weld leg for the length across the top flat of the tube steel.

(5) Support No. RH-1-006-012-C42R. An all-around 1/4" fillet weld connecting item 5 to item 7 was undersized by 1/32" to 1/16" across the top.

(6) Support No. AF-1-037-002-S33R. This support exhibited a 1/16" to 3/32" reduction in plate thickness and weld size due to excessive grinding of the weld at the base plate. Base material thickness of the support plate was reduced beyond the limits of acceptance in three locations.

(7) Support No. CT-1-013-014-S32R. Excessive overgrinding of welds resulted in notching of the sway strut rear brackets. This condition was repaired subsequent to the TRT inspection.

2. Locking Device for Threaded Fasteners:

(a) Applicable criteria

Subarticle NF-4725 states in part that all threaded fasteners, except high-strength bolts, shall be provided with locking devices to prevent loosening during service.

ASME Sect. III, Div. 1, Interpretation No. III-1-83-49R provides that the user should satisfy himself that any other device than those described in NF-4725 is capable of acting as a locking device under all service conditions.

Brown & Root Procedure QI-QAP-11.1-28, Attachment 2, Operation 7, Inspection Attribute h., requires that all exposed threads be free of extraneous material.

CPSES/FSAR, Paragraph 17.1.2 states that the design verification procedure assure that drawings, specifications, procedures, and instructions meet stipulations of related codes and standards.

10 CFR 50.55(e)(1) directs that the holder of the construction permit shall notify the NRC regarding each deficiency found in design and construction which, if not corrected, could adversely affect the safety of operations at any time throughout the expected lifetime of the plant.

There appeared to be a difference in locking devices on threaded fasteners for similar pipe support hardware made by two separate vendors. Whereas in some cases Nuclear Power Service Incorporated (NPSI) specified only one nut and no locking device, ITT-Grinnell required two nuts in those same applications. If the design of NPSI models indeed should be found to need the locknuts or their equivalent, there could be hundreds of pipe supports installed without adequate locking devices.

The TRT found examples in Unit 1 where deficiencies existed so that TUEC was in potential violation of the codes, procedures, guidelines, and commitments concerning locking devices for threaded fasteners. In spite of the requirements pursuant to 10 CFR 50.55(e)(1), TUEC did not report to the NRC the omission of thread-locking devices in the Unit 1 nuclear safety systems and did not attempt corrective action until May 1984, when TUEC tested previously applied paint for thread-lock capability. That test was inconclusive, since it did not establish that the paint, an epoxy process, would reliably perform as an effective locking device under all service conditions and throughout the expected lifetime of the plant. Further, TUEC could not identify to the TRT which paint was the subject of testing.

TUEC had a potentially inadequate quality assurance specification No. 2323-AS-31, which did not cover inspection of painted threaded fasteners. The paint was applied to ASME code-controlled, NF hardware per specification 2323-AS-30 (non-Q) which required no inspection. This issue appears to be generic for Unit 1.

The TRT notes that TUEC did not initiate an NCR identifying the widespread problem of missing locknuts; only a Request for Information was generated, which TUEC could not locate for the TRT. An NCR, required by procedure, would have brought the problem and its ramifications to management attention and would have provided a vehicle for controlled, organized, and approved engineering disposition.

(b) Examples of deficient locking devices.

Pipe support RC-1-901-702-C82S had a load bolt at a beam attachment which did not exhibit an approved locking device. (The bolt material type was SA-307 grade A.) Additionally, pipe support CS-1-085-003-A42K had no approved locking device on the "special clamp" bolts, even though the design drawing for this clamp showed each bolt with a nut and a locknut.

3. Minimum Edge Distance for Bolts:

(a) Applicable criteria

- QI-QAP 11.1-28 Revision 19, Paragraph 6.1 required that bolt holes in structural members shall not be closer than 1-1/2 times the bolt diameter from the edge of the member to the center of the bolt hole.

ASME Sect. III Div. 1, Subsection NA, Appendix XVII, Table XVII-2462-1(b)-1, gives specifically allowed minimum edge distances for bolt holes (reamed, punched or drilled) at sheared or rolled edges of plates, shapes, or bars.

(b) Example of minimum edge distance violation

- The baseplate for pipe support CC-X-039-006-F43R, located in the component cooling system, Room 249A, Fuel Handling Building, violated minimum edge distance criteria for bolt holes.

4. Base Plate Hole-Location Dimensions:

(a) Applicable criterion

QI-QAP-11.1-28, Revision 19, Attachment 4, Paragraph 2, under fabrication tolerances, limits a "hole centerline location to ±1/4" or as shown on the design drawing."

(b) Examples of hole-location dimension problems

The TRT found the horizontal member of Support CC-1-126-010-F33R was 3 inches lower at its centerline relative to the upper bolt-hole centerline than shown on the vendor-certified drawing. The as-built drawing had not been revised to reflect the actual installed condition in the plant. This support was located in the component cooling system, Room 247A, in the Fuel Handling Building. Other supports with similar hole-location violations found in the inspections were: CC-X-039-007-F43R, CC-1-126-011-F33R, and CC-1-126-012-F33R.

5. Spherical Bearing Gap:

(a) Applicable criterion

Brown & Root Procedure, QI-QAP 11.1-28, Revision 25 paragraph 3.7.3.1 states that "a sufficient number of spacers shall be used to prevent the spherical bearings from becoming dislodged," and "in no case shall the resulting gap be more than the thickness of one vendor-supplied spacer."

(b) Examples of spherical bearing gap deficiencies

- An excessive free gap existed between spherical bearing and washers on the sway strut assembly of support CC-1-126-015-F43R. Other supports with similar bearing gap anomalies found in TRT's inspections were: RC-1-052-016-C41K, RC-1-052-020-C41K, and MS-1-416-001-S33R. The frequency of this type of procedure violation in the TRT's limited inspection suggests that this problem is generic for Unit 1.

6. Spherical Bearing Contamination:

(a) Applicable criterion

QI-QAP-11.1-28 Revision 22, Paragraph 6.3.1 Note 2 states in part that "bearing internal and external surfaces shall be free of rust and foreign material, and bearing shall move freely within the housing."

(b) Examples of spherical bearing contamination

The TRT found paint contamination in the bearings of both snubber assemblies on component support SI-1-090-006-C41K that severely obstructed the bearing cavities and limited their movement. This Class 1 component support is located in the Containment Building of the Unit 1 safety injection system. A similar condition exists on support MS-1-416-002-S33R.

7. Snubber Adapter Plate Bolting - Lack of Full Thread Engagement:

(a) Applicable criteria

QI-QAP-11.1-28, Revision 22, Paragraph 6.1, states that "all bolts, studs, or threaded rods shall have full thread engagement in the nut."

ASME Sect. III, Div. 1, Subsection NF, Subarticle NF 4711 states that "the threads of all bolts or studs shall be engaged for the full length of thread in the nut."

QI-QAP-11.1-28, Revision 25, Attachment 29 permits less than full thread engagement in threaded plates. This allowance for less than full thread engagement is a potential violation of the ASME Code Sect. III, NF-4711; no code case was invoked to set aside this procedure. The requirement of NF-4711 that "the threads of all bolts or studs shall be engaged for the full length of thread in the nut" also implies that there be a full length of a threaded hole in plates, shapes, or bars where the required threaded hole length is the same as the bolt diameter. Further, there is no evidence that partial thread engagement at the snubber adapter plate connection has been given consideration in the design procedures for linear-type supports, nor does it appear that sufficient design margins have been introduced to allow for less than full-threaded connection. The TRT did not check "as-built" analyses to determine whether any such variations from the design norm had been considered in the "as-built" stress calculations.

What is in question is whether any calculations had been made to address this particular thread engagement condition for each size snubber being used in the plant.

(b) Examples of lack of full thread engagement

Snubber (shock arrester) adapter-plate bolt threads were insufficiently engaged in all four threaded holes of component support MS-1-416-002-S33R. The worst condition was 0.095" short, or more than 25% less than full thread engagement. Similar lack of full thread engagement deficiencies was found on NF supports SI-1-090-006-C41K and CT-1-013-012-S32K.

8. Threaded Rod Thread Engagement:

(a) Applicable criterion

QI-QAP-11.1-28, Revision 21, Paragraph 6.3.2.a. directs that "QC shall verify thread engagement if site [sight] holes are present in the strut body."

(b) Example of rod thread engagement deficiency

Sight holes were present in the strut body to verify threaded rod engagement. The rod was not visible through the sight hole for support RC-1-901-702-C82S.

9. Snubber/Sway Strut Load Pin Locking Device:

(a) Applicable criterion

QI-QAP-11.1-28, Revision 22, Paragraph 6.3.1.1.b states that "the size of the cotter pins, when used, should be the maximum size the hole will accommodate and shall be fully opened."

(b) Example of locking device deficiency

Sway strut No. AF-1-001-014-S33R had a broken cotter pin.

10. Load Side of Pipe Clamp Halves Not Parallel:

(a) Applicable criterion

QI-QAP-11.1-28, Rev. 25, Sec. 3.7.3.1 states that "pipe clamp halves, in relation to attaching eyerod end, shall be parallel."

(b) Examples of halves not parallel

Clamp halves for pipe supports AF-1-001-001-S33R and AF-1-001-014-S33R were not parallel.

11. Pipe Clearances Outside of Allowable Tolerance:

(a) Applicable criterion

QI-QAP-11.1-28, Revision 19, Attachment 4, item 3.b states "where the design shows 0" on one side and 1/16" on the other, 0" must be maintained while 1/16" ± 1/32" is required on the other side."

(b) Examples of pipe clearance violations

Pipe support CC-1-126-013-F33R exhibited no clearance on top or bottom, while the hanger drawing called out 0" on the bottom and 1/16" on top. A similar problem existed for pipe support AF-1-001-702-S33R.

12. Pipe Clamp Locknut Loose:

(a) Applicable criterion

QI-QAP-11.1-28 Revision 21, Sect. 6.1 states that "unless otherwise shown on the drawing, fasteners will be tightened securely."

(b) Example of loose locknut

A pipe clamp locknut for pipe support AF-1-035-011-S33R was found loose (less than finger-tight).

13. Snubber/Sway Strut Misalignment:

(a) Applicable criterion

QI-QAP-11.1-28, Revision 18, Sect. 6.3.1.d states that "maximum sway strut misalignment shall not exceed 5° for ITT-Grinell and NPSI from the centerline of the sway strut."

(b) Examples of misalignment

Pipe support CC-1-126-014-F43R exhibited angularity that exceeded this requirement. A similar problem existed with pipe support RC-1-052-020-C41R.

14. Snubber Cold Set (AC) Dimension Did Not Match Drawing:

(a) Applicable criterion

QI-QAP-11.1-28, Revision 24, Sec. 3.8.3.5.b states that "deviation of more than ± 1/8" from the specified cold setting (AC dimension shown on the design drawing) is not permitted, unless authorized by a design change."

(b) Example of incorrect AC dimension

Pipe support CS-1-085-003-A42K deviated by approximately 1" from the cold set dimension shown on the design drawing.

15. Support Configuration Did Not Match Drawing:

(a) Applicable criterion

- QI-QAP-11.1-28, Revision 24, Attachment 2, Operation 3 lists the following inspection attribute: "support configuration complies with the design drawing."

(b) Examples of configuration problems

Pipe support snubber CT-1-005-004-S22K was installed end-to-end opposite from the orientation shown on the drawing. A similar problem existed with pipe support CT-1-013-010-S22K, where dimensional discrepancies existed on the support drawing that detailed the orientation of the snubber.

16. Component Type/Model No. Installed Did Not Match Drawing:

(a) Applicable criterion

QI-QAP-11.1-28, Revision 24, Sect. 3.2.1.1 states that "vendor-supplied NPT stamped component supports shall bear marking (i.e., name plate) traceable to the design drawing."

(b) Examples of component identification problems.

Model numbers of installed snubbers for pipe support SI-1-090-006-C41K did not match the model number on the design drawing. A similar problem existed with pipe support RC-1-052-020-C41R.

17. Weld Data Card Missing QC Initials For Welds:

(a) Applicable criterion

QI-QAP-11.1-28, Rev. 25, Paragraph 3.5.3 Welder and Welding Material Verification states that "The QCI shall verify that the welder is qualified to make the weld utilizing the welder qualification matrix (attachment 16, typical), that the use of the WPS (Attachment 17, typical), and the type of filler material listed on the WFML [weld filler material log] are the same as those listed on the weld data card (WDC), and the welder's symbol has been recorded on the WFML."

(b) Example of deficient weld data card

Support number CC-1-126-013-F33R had some welds performed with no QC inspector initials or signature on the corresponding blocks of the weld data card for that support inspection package.

18. Identification of Materials and Parts:

(a) Applicable criteria

10 CFR 50 Appendix B, Criterion VIII states that "measures shall assure that identification of the item is maintained by heat number, part number, serial number or other appropriate means either on item or on records traceable to the item, as required throughout fabrication, erection, installation and use of the item."

QI-QAP-11.1-28, Revision 19, Sect. 3.1.2 states that "at installation inspection, the QC inspector shall verify the hanger number, the material type, grade and heat number ... using the information provided on the Material Identification Log."

(b) Examples of material identification deficiencies

A replacement part (sway strut eyerod) for pipe support CT-1-013-014-S32R had no apparent material identification either on the hardware or in the documentation package for the support. The Material Identification Log (MIL) did not list any identification traceable to the origin of the replacement part. A similar problem existed with pipe supports CC-1-126-012-F33R, CC-X-039-005-F43R, and AF-1-035-011-S33R.

B. Deficiencies with High Rate of Occurrence

The following pipe support inspections by the TRT were in addition to those already listed in the previous examples. Results of these ancillary inspections are summarized in Table 3.

The TRT identified six specific deficient items which need further evaluation to assess their generic implications. The TRT concern is that these items may have a high rate of occurrence throughout plant safety-related systems. The specific "frequently occurring" items and relevant inspection criteria were as follows:

(1) Strut and snubber load pin spherical bearing clearance with washers was excessive (Ref. QI-QAP-11.1-28, Sec. 3.7.3.1 Rev. 25).

(2) Strut and snubber load pin locking devices (cotter pins or snap lock rings) were damaged or missing (Ref. QI-QAP-11.1-28 Rev. 25, which did not specifically address load pin locking devices).

(3) Pipe clamp halves on load side were not parallel (Ref. QI-QAP-11.1-28, Sec. 3.7.3.1 Rev. 25).

(4) Bolts threaded into tapped holes of snubber adapter plates had less than full thread engagement (a "frequently occurring" deficiency; see related discussions on pipe supports, example 7 "Snubber Adapter Plate Bolting - Lack of Full Thread Engagement" within Part A of this section on as-built inspection).

(5) "Hilti Kwik" bolts (concrete expansion anchors) as installed did not meet minimum effective embedment criteria (Ref QI-QP-11.2-1, Sec. 3.5.1 Rev. 16).

(6) Locking devices for threaded fasteners were missing or of a non-approved type (see item 2 "Locking devices for threaded fasteners" on pipe support deficiencies within Part A of this section on as-built inspection).

Table 3 Summary of additional TRT inspections

Area: Room 77N, El 810'-6"
Unit 1, Safeguards Bldg

	Deficiency	No. of Supports Inspected	No. of Supports Deficient	% Deficient
Item 1.	Excessive Spherical Bearing Clearance	92	5	5.4%
Item 2.	Load Pin Locking Device Missing	92	14	15.2%
Item 3.	Pipe Clamp Halves Not Parallel	40	9	22.5
Item 4.	Snubber Adapter Plate Bolts With Less Than Full Thread Engagement	19	*13	to be determined

Area: Cable Spread Room 133, El 807'-0"
Unit 1, Auxiliary Bldg

	Deficiency	Bolts Inspected	Number Deficient	% Deficient
Item 5.	Hilti Kwik Bolt Does Not Meet Minimum Embedment**	24	3	12.5%

*Bolts had less than full thread engagement.

**Taking into account the "allowed" slippage of the bolt for a distance of one nut thickness due to torquing (Ref. "Installation of 'Hilti' Drilled-In Bolts" 35-1195-CEI-20, Rev. 3, Para. 3.1.4.1) and the minimum specified embedment, the above Hilti bolts violated the "effective" embedment requirements.

The TRT undertook additional hardware inspections to ascertain the regularity with which these specific items may exist. All accessible pipe supports in Room 77N, at the 810-foot, 6-inch elevation of the Unit 1 Safeguards Building, were inspected for "frequently occurring" deficiencies 1, 2, 3 and 4 listed above. To assess the level of occurrence of "frequently occurring" deficiency 5, electrical support 'Hilti' baseplates located in the Cable Spread Room 133, at the 807-foot elevation of the Unit 1 Auxiliary Building, were inspected. For details on "frequently occurring" deficiency 6, see item A.2, "Locking Device for Threaded Fasteners," of the pipe support deficiencies, described above.

C. Electrical Raceway Support Inspections

The TRT inspected electrical conduit supports and cable tray hangers to the requirements of QI-QP-11.10-1, Inspection of Seismic Electrical Support and Restraint Systems; QI-QP-11.21-1, Requirements of Visual Weld Inspection; and other applicable instructions for conduit support and cable tray hanger inspections. All electrical raceway supports included in TRT inspections had been previously QC accepted. Table 4 summarizes the results of the TRT inspections not previously provided as part of our letter of September 18, 1984.

The TRT found the following discrepancies during its inspection of selected electrical conduit supports and cable tray hangers in Unit 1:

1. Undersize Welds:

(a) Applicable criterion

DCA 3464, Rev. 23, page 3 of 32, note 3 states in part that "welding requirements as shown on various details should be read as the minimum requirement."

(b) Examples of undersize welds

Three of four welds on conduit support C120-21-194-3 (cable spread room) were undersized. The required weld size was 1/4" at all weld joints, while the measured weld size was 7/32" to 5/32" for the full lengths of three out of the four welds.

Similarly, cable tray hanger CTH 5824 (Containment Building) had 12 undersize welds. The all-around welds on the six horizontal beams should be 1/4" in size, according to details L_1 and L_2 on Drawing FSE-00159, sheet 5824, 1 of 2. The measured size of these welds was 3/16" to 5/32" at each connection. Also, support IN-SA-7b exhibited undersize welds measuring 7/32" to 5/32" instead of the required 1/4".

Table 4 Summary of electrical raceway support inspection by the TRT unit 1

Support welds inspected	59
Supports inspected	5*
Supports with problems	3 (60%)
Types of problems	
Hardware-related, other than welding	6
Unauthorized configuration change	1
Weld-related types of problems (categories)	2
Welds requiring rework	41
Welds made in field but not recorded on drawing	80**
Beam stiffeners added but not recorded on drawing	40
Building/Area	Supports
Cable Spread Room	CTH 12646 C 130-21-250-3 C 120-21-194-3
Auxiliary Building	CTH 6742
Containment	CTH 5824

*All electrical supports inspected by the TRT had been previously inspected and accepted by QC.

**Full visual inspection was not performed by the TRT on these extra welds.

2. Misplaced Welds:

(a) Applicable criterion

QI-QP-11.10-1, Revision 29, Paragraph 3.5.2, Assembly Inspection, includes the requirement to inspect a support for configuration. Paragraph 3.6.2 of the same procedure requires that support welds receive visual inspection and that nonconforming welds be reported.

(b) Examples of misplaced welds

During inspection of Hanger CTH-6742, the TRT found that two structural welds were made in the wrong direction. The 3/16" shop welds which join MK-10 and MK-11 were made horizontally instead of vertically, as shown on drawing FSE-00159, sheet 6742. QC Inspection Report ME-I-0024909, dated February 16, 1984, accepted all inspectable attributes as satisfactory prior to the TRT inspection.

3. Unauthorized Configuration Changes:

(a) Applicable criterion

QI-QP-11.10-1, Inspection of Seismic Electrical Support and Restraint Systems, paragraph 3.5.2 includes the requirement for inspection of a support for configuration compliance.

(b) Examples of configuration change

The TRT found that cable tray hanger CTH 5824 (Containment Building) had been fabricated to include 40 more stiffeners and 80 more welds than required or shown on drawing FSE-00159, sheet 5824, 2 of 2, Detail L_2. Inspection Report ME-1-0006155 verified final QC inspection and acceptance on January 3, 1984.

Further, cable tray hanger CTH-6742 (Auxiliary Building), Clip, MK-12, should be 6" x 6" x 3/4" angle stock in accordance with FSE-00159, sheet 6742. The actual flange thickness of MK-12 was 3/8".

4. Hilti Anchor Bolt Installation Deficiencies:

(a) Applicable criterion

QI-QP-11.2-1, Concrete Anchor Bolt Installation, provided requirements for proper installation and inspection of Hilti anchor bolts.

(b) Examples of Hilti bolt deficiencies

CTH-6742 (Auxiliary Building) anchor bolt torque was not verified (paragraph 3.5 of the procedure). Hilti bolts were not marked in accordance with attachment 1 of the procedure, nor was the length of these bolts verifiable (paragraph 3.2).

CTH-5824 (Containment Building) base plate bolt holes had violated minimum edge distance--edge distance cannot be less than 1 7/8" (Attachment 2 of the procedure). Actual distance was 1 5/8" to 1 3/8" from the nearest plate edge. This condition affected five of the eight Hilti anchor bolt holes in the base plates for this hanger.

One Hilti bolt was skewed to more than 15 degrees. Maximum allowable skew was 6 degrees without corrective bevel washers (paragraph 3.1.2).

The Hilti bolt torque on this hanger CTH 6741 (Auxiliary Building) was not documented as being verified by QC (paragraph 3.5).

5. Undersize Nuts:

There was inconsistency in the application of nuts for SA-325 bolts in that both standard and heavy hex nuts were used. No stipulation was found which would permit the use of standard (non-heavy) hex nuts. This condition is a potential violation of the Material Specification ASTM A325 (ASTM, Part 4-1974) paragraph 1.5, which provides that "heavy hex structural bolts and heavy hex nuts shall be furnished unless other dimensional requirements are stipulated...." B&R Drawing No. FSE-000159, sheet 5824, 2 of 2, required the use of ASTM A325 bolts for cable tray hanger number CTH-5824.

D. Summary of Pipe Support and Electrical Raceway Support Inspections

The as-built verification effort conducted by the TRT provides evidence of faulty construction by craft personnel, installed hardware that does not match as-built drawings, and ineffective QA and QC inspections. Despite the small size of the TRT's sample, there appears to be a large number of deficiencies. The potential also exists that these deficiencies are not represented correctly in the final stress analysis.

5 DOCUMENT CONTROL

The TRT evaluated the CPSES document control system to determine if it was effective and if it ensured consistent quality of documents for construction practices and records. The results of this review showed the following problems.

A. The TRT found that there was a potential for document control center (DCC) field distribution centers (satellites) to issue deficient document packages to craft personnel. Typical problems identified were: packages were not thoroughly examined; procedures and guidelines were not specific or were not followed; and documents controlling operation of the centers existed in the form of guidelines and charts rather than as controlled procedures.

B. The TRT found that many problems indicative of inadequate drawing control existed at CPSES from September 1981 to April 1984. These problems had been identified prior to the TRT's evaluation by both TUEC and NRC Region IV audits and reviews.

Prior to placing the satellites in operation (a phased effort between February and August 1983), DCC distributed drawings, component modification cards (CMCs), and design change authorizations (DCAs) to file custodians, welding engineering, the pipe fabrication shop, QC, and the hanger task force. Document control through this system proved to be ineffective.

In an attempt to correct identified problems, DCC satellites were created to distribute drawings to field personnel, rather than use the file custodians. However, between August 1983 and April 1984, recurring problems with document control were identified. Examples of the types of document control problems that existed between August 1983 and April 1984 were as follows:

1. Drawings released to the field were not current.
2. Drawing and specification changes were not current.
3. Design documentation packages were incomplete.
4. DCC did not provide the satellites with up-to-date drawings, CMCs, DCAs and document revisions.
5. Drawings hanging from an open rack, which had no checkout control, were available to craft and QC personnel.
6. Design change logs were inaccurate.
7. Design documents were not always properly accounted for in DCC.
8. Current and superseded copies of design documents were filed together.
9. Satellite distribution lists were inaccurate.
10. There were discrepancies between drawings contained in the satellites and those in DCC.

11. Some drawings were missing from the satellite files.

12. Telephone requests for design documents resulted in the issuance of documents that bypassed the controlled distribution system.

In April 1984, top management took a direct interest in recurring document control problems. Their efforts appear to have been successful. For instance, in April 1984 satellites 306 and 307 had error rates of 30% and 10%, respectively; but by July 1984, these error rates had fallen to less than 1% for both satellites. The TRT has found that TUEC document control after July 1984 was adequate; however, the effects of document control inadequacies prior to July 1984 have yet to be fully analyzed by TUEC.

C. Deficiency reporting procedure CP-EP-16.3 appeared to relate only to craft and engineering personnel and was not directed to noncraft and nonengineering personnel who may have had knowledge of reportable items. Procedure CP-EP-16.3 indicated that the applicable manager was responsible for documenting and reporting Deficiency and Disposition Reports (DDRs); but there were no checks or balances to ensure that a manager or a designated substitute would process a DDR.

D. TUEC did not consider the CYGNA audit findings regarding the DCC as appropriate for formal reporting to the NRC pursuant to 10 CFR 50.55(e), as required by procedure CP-EP-16.3, "Control of Reportable Deficiencies."

E. The TRT found that the DCC issued a controlled copy stamp to the QC department to expedite the flow of hanger packages to the Authorized Nuclear Inspector. Methods for this kind of issuance and control of such stamps were not described in TUEC's procedures.

6 TRAINING/QUALIFICATION

The TRT identified numerous weaknesses during its review of the ASME and non-ASME training, certification, and qualification of QC and DCC personnel. TUEC's training and certification program lacked the programmatic controls to ensure that the requirements in 10 CFR 50, Appendix B were achieved and maintained. The items identified by the TRT include those listed below, in addition to the items previously provided in our letter of September 18, 1984.

A. Twenty percent of the training records reviewed contained no verification of education or work experience.

B. The results of Level I certification tests were used for some Level II certifications rather than the results of a Level II test.

C. After failing a certification test, a candidate could take the identical test again.

D. Certifications were not always signed or dated.

E. White-out was used on certification tests.

F. Seven inspectors had questionable qualifications.

G. There was no limit or control on the number of times an examination could be retaken.

H. No guidelines were provided for the use of waivers for on-the-job training.

I. In some cases recertification was accomplished by a simple "yes" from a supervisor.

J. There was no formal orientation training for DCC personnel prior to August 1983.

K. The responsibility for administration of the non-ASME training program was not clearly assigned to a single individual or group.

L. Non-ASME personnel capabilities were loosely defined by levels (I, II, III).

M. There were numerous additional problems in non-ASME certification testing, such as: no requirement for additional training between a failed test and the retest; no time limitation between a failed test and a retest; two different scoring methods to grade a test and a retest; no guidelines on how a test question should be disqualified; no program for periodically establishing new tests except when procedures changed; and no details on how the administration of tests should be monitored.

N. The exemption provision in ANSI N45.2.6, which allowed substitution of previous experience or demonstrated capability, was the normal method for qualifying inspection personnel rather than the exceptional method.

7 VALVE INSTALLATION

The TRT found that installation of certain butt-welded valves in three systems required removal of the valve bonnets and internals prior to welding to protect temperature-sensitive parts. The three systems involved were the spent fuel cooling and cleaning system, the boron recycle system, and the chemical and volume control system. This installation process was poorly controlled in that disassembled parts were piled in uncontrolled areas, resulting in lost, damaged, or interchanged parts. This practice created the potential for interchanging valve bonnets and internal parts having different pressure and temperature ratings.

8 ONSITE FABRICATION

The TRT findings regarding onsite fabrication shop activities indicated that:

A. The scrap and salvage pile in the fabrication (fab) shop laydown yard was not identified and did not have restricted access.

B. Material requisitions prepared in the fab shop did not comply with the applicable procedure.

C. The fab shop foremen were not familiar with procedures that controlled the work under their responsibility.

D. Fabrication and installation procedures did not include information to ensure that B&R-fabricated threads conformed to design specifications or to an applicable standard.

E. Indeterminate bulk materials that accumulated as a result of site cleanup operations were mingled with controlled safety and nonsafety material in the fab shop laydown yard.

F. Site surveillance of material storage was not documented.

G. Work in the fab shop was performed in response to memos and sketches instead of hanger packages, travelers, and controlled drawings.

9 HOUSEKEEPING AND SYSTEM CLEANLINESS

TRT inspections at CPSES indicated that the facility was well maintained. However, two issues were identified that indicate housekeeping and system cleanliness deficiencies.

A. The TRT reviewed the August 6, 1984, draft of flush procedure FP-55-08. The purpose of this procedure was to verify the cleanliness of Unit 1 reactor coolant loops, including the reactor vessel, by means of hand-wiping, visual inspection, and swipe testing. Tests to determine surface chloride and fluoride contamination were performed by TUEC systems test engineers and Westinghouse representatives. The TRT notes, however, that FP-55-08 required only two swipe tests of the reactor vessel—one on the side and one on the bottom. This limited number of swipe tests may not provide adequate assurance that the vessel had been properly cleaned.

B. In rooms 67, 72, and 74 of the Unit 2 Safeguards Building, the TRT observed that not all snubbers were wrapped with protective covering when welding was being done in close proximity to them. This practice was a violation of B&R procedure CP-CPM-14.1, which required protection of installed equipment during welding. This condition was immediately corrected when the TRT reported it to TUEC QA management, and an inspection was performed by TUEC to correct similar conditions in other areas as well.

10 NONCONFORMANCE REPORTS (NCRs)

There were several weaknesses in the NCR and deficiency identification reporting systems. The TRT found that:

A. The TUEC procedure for preparation and processing of NCRs did not contain explicit instructions for handling voided NCRs.

B. NCRs were used as a tracking document to record removal of a part from equipment on a permanent equipment transfer rather than for reporting a nonconforming condition; such usage of the NCR was not defined in procedures.

C. There was an inconsistency between paragraphs 2.1 and 3.2.1 in procedure CP-QP-16.0. Paragraph 2.1 required all site employees to report nonconformances to their supervisor or to the site QA supervisor, while paragraph 3.2.1 required persons other than QA or QC personnel to submit a draft NCR to the Paper Flow Group.

D. The NCR form had no form number or revision date to indicate that the form was being adequately controlled.

E. There were two versions of the TUEC NCR form, one with and one without a space for the Authorized Nuclear Inspection (ANI) review.

F. The NCR form had no space to identify the cause of the nonconformance and the steps taken to prevent its recurrence.

G. The NCR form had no provision for quality assurance review.

H. The TRT found approximately 40 different forms (other than NCRs) for recording deficiencies. Many of these forms and reports were not considered in trending nonconforming conditions.

11 MATERIALS

The as-built review effort by the TRT included a material traceability check on 33 of the same pipe supports that the TRT had field inspected. The material traceability was adequate for those 33 pipe supports, with the exception of four material identification discrepancies, as noted in section 4 on as-built inspections.

In another case, TUEC failed to maintain material traceability for safety-related material and numerous hardware components. This QA breakdown was identified in an ASME Code survey in October 1981 yet was not reported to the NRC in accordance with the requirements of 10 CFR 50.55(e).