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UNITED STATES
NUCLEAR REGULATORY COMMISSION

IN THE MATTER OF: **DOCKET NO:**

MEETING BETWEEN TEXAS UTILITIES AND THE NUCLEAR REGULATORY COMMISSION REGARDING COMANCHE PEAK STEAM ELECTRIC STATION - PIPING AND SUPPORT DESIGN

LOCATION: GLEN ROSE, TEXAS **PAGES:** 1 - 136

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NATIONWIDE COVERAGE

MEETING BETWEEN TEXAS UTILITIES AND THE NUCLEAR REGULATORY COMMISSION REGARDING COMANCHE PEAK STEAM ELECTRIC STATION - PIPING AND SUPPORT DESIGN

Visitor's Center
Auditorium
CPN Power Plant
Texas Farm Route 201
Glen Rose, Texas

February 26, 1985

PURSUANT TO NOTICE, the above-entitled matter commenced at 8:45 a.m.

PRESENT:

VINCENT S. NOONAN	NRC/Comanche Peak Director
JOHN BECK	TUGCO
HOWARD LEVIN	TERA
FRANK A. DOUGHERTY	TERA
JOHN GUIBERT	TERA
W. J. HALL	TERA Consultant

HANSON LOEY	RLCA
R. L. CLOUD	RLCA
D. K. DAVIS	TERA
JACK REDDING	TUGCO
D. C. PURDY	Gibbs & Hill
MARK MANROE	TUGCO
L. F. FIKAR	TUGCO
JOHN FINNERAN	TUGCO
ROBERT C. IOTTI	Ebasco(RUGCO)
BILL HORIN	Bishop,Liberman,Cook, Purcell & Reynolds
DAVID H. WADE	TUGCO
DAVID C. MICHENER	TUGCO
DENNIS L. KELLEY	NRC/SRRI(O)
WARD F. SMITH	NRC/RRI(O)
R. E. CAMP	Iarpell
T. G. TYLER	Enerex/TUGCO CPRT
TOM GOSDIN	TUGCO
DICK RAMSEY	TUSI
DAVID FIORELLI	TUSI
J. MINICHIELLO	Cygna
DOYLE M. HUNNICUTT	NRC/Region IV
H. SHANNON PHILLIPS	NRC/Region IV
DARWIN P. HUNTER	NRC/Region IV
GEARY S. MIZUNO	NRC/OFLD

FRANK CHERNY	NRC/NRR
W. PAUL CHEN	ETGC
JOHN R. FAIR	NRC/IE
BERNARD F. SAFFELL	Battelle Columbus Lab.
GOUTAM BAGCHI	NRC/NRR/FOB
SPOTTSWOOD B. BURWELL	NRC/NRR/DL/LB#1
BARBARA BOLTZ	CASE
JERRY LEE ELLIS	CASE
JUANITA ELLIS	CASE
DAVID TERAO	NRC/DE/MEB
DONALD LANDERS	Teledyne
ROBERT BOSNAK	NRC/DE/MEB
JACK BOOTH	Dallas Times Herald
BOB MILLER	Fort Worth Star-Telegram
DAVID REAL	Dallas Morning News
NANCY H. WILLIAMS	Cygna

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PROCEEDINGS

8:45 a.m.

MR. NOONAN: Good morning, ladies and gentlemen.

My name is Vince Noonan from the NRC, Director of the Comanche Peak Project.

The meeting this morning is basically between the Applicant and the NRC to talk about the piping and support design for the Comanche Peak Steam Electric Station.

We have in the audience Ms. Juanita Ellis, who is the head of CASE and the Intervenor of record for this case.

I also invited the Cygna people to be observers here today, but -- oh, yes, back in the corner. We have one person from Cygna here today to be an observer.

The meeting is basically, though, between the Applicant and the NRC, for us to talk about the piping and pipe support problems, and also to reinforce with you the various technical concerns that we have regarding the Walsh-Doyle concerns that are being addressed by the Applicant.

This morning, I guess, after some brief introductions here, I would like to basically turn the

1-2

meeting over to you, John, and to have you talk to us about your plan on the piping and pipe support issues, and basically where you are at at this point in time and what you see to where you are going right now.

I have scheduled this meeting for basically two days. This morning and this afternoon's sessions will basically be for us to address concerns.

I am going to enter into the record a report that I received from Mr. Don Landers, who is the NRC consultant. It's a draft report. I would like to emphasize that. This report has not been reviewed by the Staff in any detail.

We have read it. We are in basic agreement with this report, but it has not been adopted by the Staff.

It is strictly here for us to address some of the concerns that the NRC has and basically this report kind of covers them all.

(Whereupon, the Draft Report of Teledyne Engineering Services, Donald F. Landers to Vincent S. Noonan, February 21, 1985, follows.)

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February 21, 1985
6216-7

DRAFT

Mr. Vincent S. Noonan, Director
Comanche Peak Project
U.S. Nuclear Regulatory Commission
7920 Norfolk Avenue
Bethesda, Maryland 20814

Subject: Preliminary Consulting Report on Comanche Peak Steam Electric Station - Piping and Support Design

Dear Mr. Noonan:

Attached is a copy of the subject report. Provided is a discussion on the Design Process in general as well as some detailed concerns (Concerns 1 through 5). In addition, there is discussion on four other specific items (Concern 6) which can be construed to be a result of the existing Design Process. All of the items in Concern 6 have been raised by others and I have merely provided my own opinion in these areas. There are currently a number of other issues that are still a concern to the staff (i.e., U-bolts, Richmond inserts, etc.). However, it is important to recognize that the majority of these concerns are interdependent and cannot be addressed as stand-alone issues. That is, the various outstanding issues (not only limited to those discussed in the attached report) must be addressed in combination so that the overall effect on the adequacy of piping and supports can be determined.

If you have any questions, please do not hesitate to contact me.

Very truly yours,

TELEDYNE ENGINEERING SERVICES

Donald F. Landers

Donald F. Landers
Executive Vice President

DFL:jej
attachment

In determining the acceptability of Design QA(1), two important issues need to be reviewed. The first is to determine whether a Design Process is in place and functioning.(2) The second is to determine whether the existing Design Process is structured so that, if followed, reasonable assurance exists that the licensing commitments for a plant are complied with.(3) The second issue above is the primary purpose of developing a process to control the design. Control is intended to channel the efforts of the design groups to the goal of fulfilling licensing commitments. This, in fact, may require some members of the design staff to do things differently than they are used to. Also it may require approaches, techniques, analyses, etc., which are significantly different than the last nuclear power plant project completed by the design agent simply because the licensing commitments are different. It is important to recognize that both issues must be acceptable or questions with respect to adequacy of the design may exist.

For example, a Design Process may be in place, supported by procedures, subject to meaningful audits and verification and yet be flawed because it does not address the licensing commitments. Similarly a Design Process which addresses the licensing commitments may be in place but it is not functioning properly and required audits and verifications are not being performed to demonstrate inadequate implementation and to provide corrective action.

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(1) Note that this terminology has been used in these proceedings. The author does not endorse its use in the context of the concern at Comanche Peak but will comply with current terminology.

(2) This is essentially a review of paper. For example, proper sign-offs exist, audits were performed appropriately, check lists were complete, etc.

(3) This is essentially a review of technical adequacy. For example, does the process assure implementation of a design that complies with applicable Regulatory Guides and Codes.

Two examples of the above situations were found by Cygna during the Independent Design Verification. The first is the issue related to mass participation. Under questioning during a January 10, 1985 meeting with the NRC, Cygna indicated that no procedure existed at Gibbs and Hill (G&H) to control this portion of the Design Process. Therefore, verification and QA audits using the process in place would not have indicated noncompliance with the licensing commitments for Comanche Peak. The second is the issue related to mass point spacing. Under questioning during the same January 10th meeting with the NRC, Cygna indicated that an acceptable procedure exists in the Design Process at G&H which addresses mass point spacing, however, in many cases this procedure was not followed. Design verification and QA audits failed to uncover the inadequate implementation of an existing procedure which was in place to provide a design that complied with the licensing commitments.

It would appear that until the Phase 4 effort by Cygna the issue related to technical review of the Design Process to determine whether it controlled design such that the licensing commitments were satisfied was not performed. This opinion is reinforced by the fact that, at this point in time, Cygna is revising their Phase 1, 2 and 3 conclusions related to Design QA.

Having established that Design QA has two sides, a paper trail side and a technical side, it is necessary to look at the process in existence for Comanche Peak for piping and supports.

Pipe supports and piping are so closely intertwined and technically interdependent that it is difficult to separate them. In designing a piping system the designer makes certain assumptions concerning individual support configurations. Also, a piping designer usually cannot make appropriate judgements on the adequacy of a piping system without

reviewing the piping layout with all of its supports.(4) This is particularly important when addressing an issue such as support stability since the interaction between the support and the pipe is usually critical in making this determintion. For example, for a pin-pin connection, the displacement of the piping at the support location due to operating conditions (thermal expansion) can result in a reduction in the ability of the support to carry a load along its axis. Also, the concern of the author with respect to support stability is directed towards anticipated water and/or steam hammer events which usually result in higher loads and displacements on the piping system than does a seismic event. To accomplish the kind of review discussed above it is necessary to have an established and functioning link between the group responsible for piping design and analysis and the group responsible for support design and analysis.

In the majority of cases a utility constructing a nuclear power plant contracts with a design firm (usually one of the major AE's) to provide design services in the areas of piping and pipe supports (along with a number of other areas not relevant to this discussion). The AE is responsible for the design process interface controls and procedures required to develop construction drawings for piping and pipe supports. The AE may elect to subcontract a portion or all of this work to a third party; however, responsibility for, and control of, the design of both piping and supports rests with the AE. This responsibility and control exists even when the third party uses its own Design QA Process and Procedures. The AE will review and approve the process and perform audits to determine acceptability of implementation. The above does not eliminate the requirement that the utility is ultimately responsible.

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(4) Your attention is called to Welding Research Council Bulletin 300, "Technical Discussion on Industry Practice," Section 1.7, page 26, December 1984.

In response to questions at four meetings with the NRC(5), TUGCO indicated that the process for initial design, including issue of initial construction drawings, consisted of the following.

(1) G&H performed preliminary free thermal expansion analysis and forwarded these to ITT Grinnell and/or NPSI.

(2) Deadweight supports were located by Grinnell and NPSI using the hanger spacing table established in ANSI B31.1. Potential locations and directions of seismic restraints were established by ITT Grinnell and NPSI. Guidelines for spacing these restraints were established by G&H and were based on frequency considerations.

(3) G&H then performed piping design and complete analysis, including location and selection of the type of pipe supports. This required the normal iterative process of layout, analysis, support location, modification of layout, analysis, etc. Eventually a design evolved that analytically complied with the licensing commitment.

(4) Support locations, types and load combination data were supplied to ITT Grinnell and NPSI.

(5) Support details (including selection of standard hardware) were developed and support analysis performed by ITT Grinnell and NPSI. Cases could arise where the location of a specific support for the specified loading was not acceptable (i.e., an adequate design could not be reasonably developed). In such cases the support contractor would inform G&H and another iteration in the piping analysis process would occur.

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(5) August 9, 1984, January 10, 1985, January 15, 1985 and January 17, 1985.

(6) Design and analysis was completed and supports were fabricated and shipped to the site. Review of the support details at G&H was not required at this time in the design process.

(7) Modifications to supports required by field conditions were made by field engineering (Texas Utilities responsibility) and a Component Modification Card (CMC) was executed.

(8) The CMC was forwarded to the responsible support design agent (ITT Grinnell or NPSI) for review and approval.

(9) A third pipe support group (PSE) was formed which was under the technical direction of TUGCO. This group functioned just as ITT Grinnel and NPSI did although the engineering and administrative procedures differed between the three organizations.

(10) Also in this time frame, ITT Grinnell and NPSI sent support designers and analysts to the site to perform design, analysis, modifications, and review of CMC's. These ITT Grinnell and NPSI personnel were administratively controlled by TUGCO but utilized their own procedures in performing their required tasks. For ITT Grinnell these procedures were the same as those for the home office. NPSI developed specific procedures to be used by their personnel at the site.

(11) Any of the three organizations who had concerns with a CMC informed the initiating field engineer of that concern in a Technical Services Design Review (TSDR) memo.

(12) At a point in time when the pipe was installed and Brown and Root (B&R) felt confident that the support as designed or

modified would be able to be installed, an as-built walkdown was performed by TUGCO personnel and a package forwarded to G&H for their review, reanalysis (as required), comments and/or acceptance. G&H comments or concerns with as-built condition were transmitted to TUGCO in a G&H memo.

(13) After piping reanalysis and determination of new loadings, the responsible support manufacturer would be supplied with the new loads by G&H to be used in their review, reanalysis, comments and/or acceptance, of the as-built support configuration. For cases where piping reanalysis was not required, the support designer would review, reanalyze, comment on and/or accept the as-built configuration.

(14) The documentation from G&H and the support design organizations was then forwarded to TUGCO who reviewed the documentation and stamped those supports which were accepted by the support design organizations "as-built certified."

(15) This process continued on an interative basis until all piping and supports were accepted.

(16) G&H in their review of as-built information was responsible for acceptance of the piping system (piping plus pipe supports) as complying with the licensing commitments.

As indicated, the Design Process at Comanche Peak was modified as the project evolved from design to design and construction. This is not unusual in the construction of a nuclear power plant, and a description of the current process exists in the Applicants Summary Disposition on Design QA.

The author has some concerns with the process described above and with some aspects of implementation of that process. These concerns do

not necessarily result in a conclusion that the process or implementation is sufficiently flawed to result in a design that is not in compliance with NRC safety criteria or the licensing commitments of TUGCO for Comanche Peak. The concerns are as follows:

Concern 1

The failure of the Design Process to require G&H to review designs (and modifications) of pipe supports prior to fabrication and installation can result in a situation that is of concern. Piping is not a "stand-alone" commodity.(6) A basic premise in designing a piping system includes (but is not limited to) the fact that support designs will reflect the assumptions made in the analysis of that piping. This is of particular concern to the author as it relates to anticipated steam and water hammer resulting from plant operating transients. Since G&H was not required to (and therefore did not) review support designs prior to their fabrication and installation they are always dealing with an installed or "ready for installation" situation. This could impact the judgement of a reviewing individual. One may be more willing to accept as installed situations rather than as designed situations. This is not to be construed as a judgement that this occurred at Comanche Peak nor is it to be construed as a judgement on the adequacy (safety significance) of the design that exists at Comanche Peak.

Again, my major concern is related to anticipated transients such as steam hammer resulting from a turbine trip or water hammer resulting from pump switching and rapidly closing check valves. With respect to seismic loading it is my current opinion (based on the data available to

(6) G&H agrees with this in footnote 13, page 17, of summary disposition.

me) that the existing supports will be adequate(7). This is based on the fact that the CPSES piping was designed using lower damping values than are currently permitted. Use of PVRC damping has resulted in reductions of peak accelerations of up to 50% with general reductions on the order of 35 to 40%. Further, test data indicates that piping systems with supports that are flexible, have gaps and pinned connections usually result in higher damping since a significant amount of energy is used up in deflecting the restraint, closing gaps and moving about the pinned connections.

Concern 2

The use of nomographs based on frequency to locate seismic restraints usually results in an excessive number of restraints. This approach was used at Comanche Peak and apparently resulted in excessive seismic restraints. This is verified, to a degree, by the fact that a majority of the seismic restraints are very lightly loaded. Lightly loaded restraints which are designed using a deflection criteria (i.e., 1/6-inch maximum) are usually very flexible. Flexible restraints have been a subject of concern at CPSES.

Concern 3

The stability question has resulted in a number of analyses and some modifications to supports. In one area, on the main steam system, bumpers were added to prevent rotation of the support about the pipe. Cygna has not accepted this design as sufficient to provide

(7) Those restraints which are pinned vertically and have bumpers for out-of-plane displacement control are an exception and are discussed in Concern 3.

stability.(8) TUGCO has performed seismic analysis with the supports in place and with the supports removed and the resulting stresses are acceptable in both cases. However, the supports are still in place and, according to Cygna, will not function. My concern is that the seismic analysis does not bound the real situation which could be that the support has become "tilted" or unstable and then a dynamic load is applied to the system. Does the tilted support provide restraint in a direction that was not intended? Once tilted does the support restrain thermal expansion? To assume that a support is acceptable because it is analytically not required may not "bound the problem" in every case. This would also apply to a support that was overstressed. To perform a piping analysis without the support in place and demonstrate acceptable stresses in the pipe and other supports is not always the worst case unless support failure is complete (or the support is physically removed) and does not impose a restraint on the system that was not accounted for.

Concern 4

A design process must provide a controlled communication between construction activities and design. TUGCO is right in pointing out that a Nonconformance Report (NCR) is not the only document for accomplishing this. Examples of other techniques used in the past are a Field Change Request (FCR) and a Drawing Change Notice (DCN). TUGCO used a Component Modification Card (CMC) to provide this interface. However, some concerns exist with the implementation of this interface. The design process underwent an evolution as plant construction activity increased. The following discussion addresses the process from its initial to its final stage as now understood.

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(8) January 10, 1985 Transcript, pp. 72 and 73.

In the initial stages (and for some time) CMC's on supports were generated by the Field Engineering Group (a subgroup of TUGCO Pipe Support Engineering - PSE) and were forwarded to the organization responsible for that support (ITTG and NPSI). The CMC was placed in the system file by ITTG or NPSI and would be worked on as the piping system required rework or as TUGCO requested.(9) This resulted in construction of the modification continuing without review by the responsible design organization. In some cases, as-built analyses performed by G&H could have included supports with outstanding CMC's although the appropriate CMC would be included in the as-built package. Based on the defined process, this would mean that the affected support would not have been approved by the appropriate design organization at that time. However, the support design organization was also involved in the as-built process and review of the support would have been accomplished as a part of that process. One could suggest that a method of controlling the number of outstanding CMC's on a given drawing (say 3 to 5), or controlling the time that a CMC can be outstanding, would force review, approval (or disapproval) and incorporation of the CMC into the drawing. This would reduce the turnaround time for approval and reduce the number of outstanding CMC's in a given as-built package.

Eventually, a site group was established under PSE which included ITTG and NPSI personnel. Under this organization CMC's were dispositioned by the PSE group on site. This shortened the communication link and should have resulted in more rapid turnaround of CMC review. However, no change to the process occurred (i.e., time limit on CMC or limit on outstanding number of CMC's on a given drawing) except that the field engineer, who authorized construction to make a change to a support, had available, on site, the complete design resources of ITTG, NPSi and PSE.

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(9) January 15, 1985 Transcript, pp. 30 and 31.

When ITTG, NPSI and PSE reviewed a CMC and found an unacceptable condition (i.e., stresses too high) they generated a handwritten memo(TSDR) noting the condition. This TSDR was sent to the field engineer responsible for generating the original CMC. The field engineer would reply back to the originator of the TSDR (on the original TSDR in a section set aside for a reply) noting the changes now recommended for the support can be found in the next revision of the CMC.(10) The support design organization was now responsible for reviewing the next revision of the appropriate CMC.

One area of concern with respect to QA control is that CMC's were handled by the site document control center and those individuals on the effected drawing distribution list received a copy of the CMC. Copies of the TSDR's were not controlled. There does not appear to be a definitive link between QA and design in the area of CMC's and absolutely none with the TSDR's. Therefore QA could only determine that changes to design were occurring if they performed audits (which they did) and reviewed both the CMC's and the TSDR's. This need not be a real area of concern in the initial design stages where construction was not underway, however, once a construction drawing is issued it is important that QA be aware of changes that are planned to that drawing. This is particularly important when those changes are already being built. QA can be effective in recognizing repetitive design changes and developing trends and then modifying their audit plan and schedule to focus on the affected areas. TUGCO (Chapman) states:(11)

> "Applicants have established a procedure, CP-QP-17.0, "Corrective Action," to review documented conditions adverse to quality for the purpose of providing corrective action to preclude repetition of significant conditions adverse to quality. This procedure provides for Quality Engineering Staff to review design changes documented on CMCs. The

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(10) January 15, 1985 Transcript, p. 46 and Motion for Summary Disposition, July 3, 1984, p. 53.

(11) Motion for Summary Disposition, July 3, 1984, p. 54.

results of these reviews are tracked using trend analysis techniques as an objective method of ascertaining the need for corrective action to preclude repetition of significant conditions adverse to quality. Periodic reports summarize the results of the reviews, including trends, and provide recommendations, where appropriate, for corrective action with respect to identified conditions which are considered to be significant.

This is appropriate, however without receiving copies of TSDR's it is not clear that trends of field engineering to propose inadequate changes to design are not explicitly covered unless one assumes that the revision to a CMC resulting from a TSDR defines that the reason for the revision was either a TSDR or a request by the reponsible design organization.

Concern 5

G&H had a Site Stress Analysis Group (SSAG) at CPSES that was administrated by TUGCO but reported to G&H. Mr. Ballard of G&H states:(12)

"SSAG was established to evaluate and approve proposed changes and modifications to pipe routing, pipe support locations and/or pipe support type, as requested by site engineering groups. The evaluations are made employing the latest as-designed piping stress analysis. SSAG provides revised design information to the applicable site organizations. All these activities are conducted

(12) Motion for Summary Disposition, July 3, 1984, p. 20.

> in accordance with CPSES Engineering Instruction CP-EI-4.6-9, Rev. 1, entitled "Performance Instruction for Piping Analysis by SSAG" and Gibbs & Hill Applied Mechanics procedures previously cited. These documents have been established to assure that the SSAG activities are accomplished in a manner commensurate with the original as-design analyses."

The concern here is related to the fact that SSAG performed their function "as requested by site engineering groups." It is understandable that a modification to a pipe routing of considerable magnitude would have been routed through the SSAG. It is assumed that this was accomplished through the use of CMC's as discussed for supports in Concern 4. However, a major modification to a support which could have an impact on pipe stresses may not be routed to the SSAG since the individual responsible for generating the CMC may not have considered (or recognized) the change would effect pipe stresses.

Concern 6

The following are discussions of those items which are specific in nature and yet tell us something about the design process.

6.1 Mass participation

This issue is addressed in introductory remarks (see page 2) and is important from a design process standpoint and a support/pipe adequacy standpoint. Based on the Cygna review it appears that the average mass participation of piping systems analyzed by G&H is in the order of 40%.[13] One could expect that a seismic analysis cut-off at

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(13) January 10, 1985 Transcript, p. 70.

33 Hz should normally result in 90% or greater of the total system mass. For piping stresses this would usually be acceptable. For supports however the contribution of rigid mode response could be important, particularly for supports located close to large concentrated masses or where the support is providing axial restraint. In these cases the total seismic load should include a rigid mode component equal to the floor ZPA times the weight of the supported component or segment of pipe. Based on normal expectations a mass participation of 40% is unacceptable. Further, the design process at G&H did not control this effect since a procedure was not available.

Reanalysis by G&H to include total mass participation will result in significant increase in some support loads. This efect when coupled with the low support stiffness (flexible restraints) could result in the need to modify supports (see Concern 2).

6.2 Support stability

In addition to the discussion under Concern 3 which addresses some specific restraints there are some generic concerns. Many of the restraints and supports at CPSES utilize box beams with either pinned struts or snubbers connecting the box to structure. This is not a common design for seismic Category I nuclear piping. Box beams themselves are not uncommon, however they are usually rigidly connected to the building structure using standard structural shapes. A second type of support that is of concern is the trapeze style support which is composed of a structural member supported off the building structure by pinned struts or snubbers and attached to the pipe by a U-bolt or trunnion. Again, this type of support is not a common design for seismic Category I nuclear piping in plants licensed to operate in the last 4 or 5 years. (Trapeze type supports with U-bolts can be found in non-seismic piping at nuclear plants and in other facilities such as process and fossil plants.) A third concern is related to support

application. That is, the use of struts or snubbers supporting a pipe from the bottom of the pipe to a floor or platform below the pipe. Since these supports are pinned they are unstable vertically as soon as horizontal displacement of the pipe occurs and system stability is provided only by the end conditions of the piping system or any horizontal restraints that exist. It has been pointed out that piping must be considered in conjunction with the existing supports and therefore the presence of pinned supports applied in the manner described above must be judged based on the overall support system.

6.3 As-built reconciliation

The as-built reconciliation process has two functions. The first, and most obvious, is to take dimensions, etc., of the actual as-built configuration of piping and supports and reconcile those with the as-designed documentation. The second is to have a qualified piping designer walk the system to develop an understanding of the overall geometry and to determine if the installation generally reflects the analysis. The importance of this second step is obvious, the overall configuration is there to see and one is not dealing with a number of different drawings trying to piece together a system.

The existing design process at CPSES required as-built information to be gathered by TUGCO technical services personnel and forwarded to G&H applied mechanics personnel. Already the ideal situation where the G&H analyst or members of the SSAG walked the system did not exist. However, this is not a fatal problem nor is it uncommon in the industry to have "others" gather as-built data. It merely makes the problem of system acceptance and analysis reconciliation more difficult.

The as-built reconciliation program was started at the time that the piping was installed and Brown & Root determined that the

supports not in place could be fabricated and installed as they were designed. The number of installed supports on a given stress problem varied from 20% to 80%[14] at the time G&H started reconciliation efforts. Having only 20% of the supports installed has two impacts, one that could be positive and one that could be negative. The positive impact is that with only 20% of the supports installed the G&H analyst should have had an early indication of what the support designs looked like and could have requested modification (if there was concern) prior to fabrication and installation of the remaining 80%. That is, the undefined pressure to accept constructed supports was significantly less than one could hypothesize for the situation where all of the supports were installed. The negative impact is that the piping analyst is not dealing with the complete as-built system and one can anticipate that a number of iterations will be required to complete the reconciliation process since modification to one of the remaining 80% of the supports could impact the total system including the installed 20% of the supports. Iterations such as this are not uncommon but sometimes tend to result in cursory reviews of already accepted situations.

One major concern with respect to as-built reconciliation is the situation where more than one piping system was supported by a frame, particularly frames which were pinned connected to building structure. G&H, though aware of the fact that the frame supported more than one system, dealt with the support as a single support on the piping system under consideration at that time.[15] The support designer was supplied with the loads on the frame for each piping system being supported and determined the structural adequacy of the frame. No one was apparently responsible for looking at the interaction effects inherent in a pinned frame supporting a number of pipes. It is my

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(14) January 15, 1984 Transcript, pp. 22 and 23.

(15) January 15, 1984 Transcript, pp. 23 and 24.

opinion that this is the responsibility of the piping designer and G&H accepts that responsibility.(16)

6.4 Support mass

Many of the support designs at CPSES result in considerable mass which is not acting at the outside diameter of the piping. It is common practice to add support mass to the piping analysis and this is usually done at the centerline of the pipe since it normally involves a clamp. In the case of a box beam rigidly connected to the building structure the mass is not applied to the pipe and therefore need not be considered. In the case of a box beam pinned to the building structure the mass acting 90 degrees to the direction of restraint should be applied to the pipe centerline.

A specific geometry that cannot have the mass applied to pipe centerline and be representative of the as-built condition is a support restraint that is pinned to the building structure and has a beam some distance from the pipe ℄ and the pipe O.D. The beam is attached to the pipe by welding a trunnion to the pipe and the beam.(17) The effect of the offset mass rigidly connected to the pipe results in forces and moments on the pipe which will not be represented properly by modelling the mass at the pipe centerline. TUGCO apparently accounted for this effect on the main steam system only.(18) However, there are some concerns with the approach used in that instance.

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(16) January 15, 1984 Transcript, pp. 11, 49 and 50.

(17) This would normally be called a trapeze restraint but if used as a horizontal restraint on a vertical pipe that could be a misleading statement since a trapeze support is normally considered to be a vertical support on a horizontal pipe.

(18) Applicants Motion for Summary Position Regarding Allegations Concerning Consideration of Force Distributions in Axial Restraints, dated July 9, 1984.

The concern with trunnion (stanchion) type restraints is the following:

(1) What are the stresses in the pipe wall due to the forces and moments generated as a result of the trunnion?

(2) What are the stresses in the trunnion?

(3) What are the loads on all of the support components (i.e., strut, base P, welds, etc.) and are they acceptable?

TUGCO has pointed out that the analytical techniques (response spectrum analysis) do not consider the relative phasing between axial and rotational motion. However for all supports (Figure 1 of summary disposition) the rotational motion is a result of the axial displacement of pipe. Therefore for a Type 2 restraint the axial loads in the strut or snubber resulting from axial pipe loads and moments generated due to the trunnions should be additive.

Also the applicant states the following on Page 7:

"In other words, that rotation cannot exceed the value which would occur if there were no rotation constraint."

I certainly agree with this and would suggest that this would require TUGCO to either limit the stresses in the trunnion or model the support as a three-pin restraint. That is a pin at the connection with building structure, a pin at the strut/snubber connection with the trunnion and a pin at the location of yielding in the trunnion (most likely at the pipe-trunnion weld). It is obvious that such a support (Type 2) would not provide any restraint in the direction of the pipe unless a significant pipe displacement had occurred.

Of greater concern is the water/steam hammer loading which can result in loadings higher than that for the earthquake. For the main steam system it is quite probable that an earthquake of the magnitude of the OBE would result in a turbine trip. A turbine trip generates dynamic loads in the main steam system due to the pressure wave generated by closing the turbine stop valves traveling down the pipe. The loads due to this condition should be combined with the earthquake loading. No evaluation has been presented to demonstrate the adequacy of these type supports for either water/steam hammer loading or a combination of seismic plus water/steam hammer loading.

With respect to lug type supports the same concerns expressed above exist. In attachment 1, Pipe Lug Elastic-Plastic Analysis[18] the applicant states:

> "As stresses exceed the yield strain, the stress-strain is no longer linear but changes with the increasing strain level. In a load-unload-reload loading pattern, it is observed that the new yield points occur at different stress levels. This behavior is called strain hardening."

Here again the applicant has ignored the dynamic load associated with steam/water hammer which does not follow the load-unload-reload pattern. Strains of the magnitude specified result in stresses which exceed the allowable requirements of NB, NC, ND-3600 or ANSI B31.1. It should be noted that in Paragraph 121.3.2.B of B31.1 the allowable stress in welds attaching lugs or trunnions to pipe is limited to 80 percent of the allowable for the remainder of the support. For NB, NC, ND-3600, the stresses in the pipe should comply with the requirements for piping as defined in Code Case N-318-2, N-391 and N-392.

DRAFT

RECOMMENDATIONS TO THE STAFF

Reviewing the items discussed above, as well as those identified by others, one finds a list of concerns related to supports, piping analysis and support-piping interface. Some of these are:

1. mass participation,
2. node point spacing,
3. support stiffness,
4. friction loads,
5. Richmond inserts,
6. U-bolts,
7. support mass,
8. axial restraints and
9. support stability.

Concern with one of the above items, or even two or three, may not necessarily result in an overall concern with respect to compliance with licensing commitments. However, when the list is viewed as a whole and when the interdependence of items is considered, a different perspective results. The interdependence of the above list is an important issue since the resolution of one issue may result in failure to comply in another area. The interdependence of mass participation and support stiffness has already been mentioned. The adequacy of Richmond inserts and U-bolts is a function of the applied load, and items 1, 2, 3, 4, 7 and 8 can have an effect on the applied load. Support stability is, to a degree, a separate issue only because it would exist even if the other eight items were resolved. However, the applied loads and therefore displacements (including rotations) of the piping system will have an impact on determining support stability.

Another concern when looking at the existing situation at CPSES and attempting to make a decision on the adequacy of the process is the

approach used by the applicant in addressing concerns, either in the form of Summary Dispositions or study-type analyses. In most of these cases the applicant has provided analyses which are well beyond that used in the normal design process. A typical example is that discussed in Concern 6.4 related to trunnions and lugs. Having performed these "state-of-the-art analyses" has not resolved the issue in some cases (i.e., trunnions and lugs, Richmond inserts and support stability).

With respect to the Design Process, any flaws appear to be limited to interfaces with the exception of G&H. The design process in place at ITTG, PSI and PSE was acceptable if external interfaces are not considered. The checking and verification of designs and analyses are commensurate with that generally utilized in the industry. The only exceptions to this that exist to my knowledge are those related to mass participation and node point spacing at G&H. In the first case the process did not address the issue (mass participation), in the second case checking and verifiction did not catch the failure to follow the procedure required by the process (node point spacing). It is not an essential requirement that each step in the computer modeling or interpretation of results be delineated in a procedure. For example, individuals experienced in piping dynamics should have recognized the mass participation and node point spacing problems without a procedure.

With respect to ITTG, NPSI and PSE, the fact that the list of items of concern contains five items that are support related requires evaluation. Many of the support designs for CPSES are not commonly found in commercial nuclear power plants. This is not in itself reason for concern but leads one to review the design and the supporting analysis critically since industry standards or experience cannot be totally relied on.

Based on the above a decision concerning the adequacy of the design at CPSES cannot be reached. It would be necessary to review a set of

n are representative of the as-built configuration, con-
ppriate load combinations, evaluate all components (piping
s) in accordance with the CPSES licensing commitments (and
ceptance criteria for those items such as support stability
ed by published Codes, standards or regulations). If the
ize were sufficient and included all those items of concern
then one could reach appropriate conclusions.

In addition to the above, any set of analyses performed should con-
to the following:

1. use as-built geometry and hardware representative of as-built pipe and supports,

2. include offset support and mass effects,

3. include appropriate mass participation,

4. use acceptable node point spacing,

5. include actual support stiffness,

6. use time-history analysis for steam/water hammer loading,

7. apply controls to the design process recommended in WRC Bulletin No. 300,

8. any new analysis shall be considered the analysis of record rather than a study, and

9. comply with current licensing commitments for CPSES with respect to acceptance criteria.

analyses which are representative of the as-built configuration, considered appropriate load combinations, evaluate all components (piping and supports) in accordance with the CPSES licensing commitments (and provide acceptance criteria for those items such as support stability not covered by published Codes, standards or regulations). If the sample size were sufficient and included all those items of concern listed, then one could reach appropriate conclusions.

In addition to the above, any set of analyses performed should conform to the following:

1. use as-built geometry and hardware representative of as-built pipe and supports,

2. include offset support and mass effects,

3. include appropriate mass participation,

4. use acceptable node point spacing,

5. include actual support stiffness,

6. use time-history analysis for steam/water hammer loading,

7. apply controls to the design process recommended in WRC Bulletin No. 300,

8. any new analysis shall be considered the analysis of record rather than a study, and

9. comply with current licensing commitments for CPSES with respect to acceptance criteria.

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In addition, we have some of the people that have been working on the summary disposition, and they will be bringing up concerns as this progresses.

Around 3:00 o'clock this afternoon, I would like to bring the meeting to a halt for today, and I plan to meet with the Staff and sit with them to address anything that we might have overlooked today and we will plan to bring up for tomorrow's sessions.

I might briefly talk about the summary dispositions that have been submitted by the Applicant and which the Staff is working on. I don't think it should come as any surprise to you that we are having some difficulty with these summary dispositions.

Now that you have brought in some independent authorities, and I understand Mr. Howard Levin here will be basically addressing these areas, I would encourage you to go back and revisit your summaries and look at them.

Not only does the Staff have some very strong technical concerns about the summaries, the way they have been presented, but also there's some what I would call discrepancies that need to be corrected. These are minor items, but they do raise questions in our minds on some of the things.

One other thing that I would like to

1-4

address at this point in time would be basically -- John would be basically talking about -- maybe briefly sometime today you could talk about the action plan that you would be submitting to us some time in the future.

I would like to make it clear that this action plan that we now expect from the Applicant would be a total action plan, in that it will cover all licensing issues, not just strictly the TRT issues.

I look at this action plan that should be submitted to the NRC are things that you say need to get done in order for this plant to get licensed and go down that licensing path, and TRT only being a subset of those things, we think.

After basically your discussion here this morning, Howard, I'm going to turn it over to Don Landers, who is our consultant, and who is the author of this consulting report.

I'll let basically Don talk about the report and some of the concerns that he has, and then we have Dave Terao and John Fair and Paul Chen here, also, who will be talking of concerns, I think.

I do not expect you to have answers for all these things. It's just the first time that we actually sat with you in this kind of meeting to talk

about this kind of thing.

I might make one comment. Basically, on these kind of things, I feel that any licensing proceeding, that mostly the Staff would have had these meetings many times with you, and we wouldn't be at a point where we have concerns this late in the date.

Hopefully, this meeting and, I'm sure, future meetings we will try to get the Staff concerns on the table and how you plan to resolve those.

With that, John, I will go ahead and turn it over to you, but I guess I would like to give a couple of these reports to you.

MR. BECK: Thank you very much.

Perhaps I should open by responding first to one of the issues you raised with regard to action plans for the future.

If I can put it into context, we have referred to our TRT responses as with a program plan, that in general provides the umbrella within which we have presented the methodology that we used to develop individual action plans, per se, that treat specific discipline concerns.

We have added, as you recognize, and we announced on February 7th, an additional issue to these considerations, although it is not a specific

1-6

TRT concern, and that is the question of design adequacy or design QA.

We announced at that time that Howard Levin would be serving as the issue team leader for that question, which is what brings us here today.

Our response over all that will be filed in April, as our schedule would have it today, will be an all-inclusive response.

It will treat all issues needed to be resolved to license Comanche Peak, TRT being a subset, albeit a major subset, of that particular question.

So the answer is a positive one, yes, we hear you and that's precisely what we'll do.

With regard to summary disposition documents that may be in front of the ASLB, that are in front of the ASLB today, obviously, as the development of our response to these particular concerns in the design adequacy area evolves, we will have to revisit positions that may have been taken in those documents, and that is in process today.

Today's meeting is going to be somewhat different from our perspective, certainly, than those that are scheduled from this Thursday and next week, in that we are merely in the early stages of developing a response to this question of design adequacy and in

1-7

particular as it applies to piping systems and piping supports.

The meetings that will take place later will be very specific and will have formal presentation, if you will, of where we are in those particular action plan developments and execution.

We have communicated frequently with our TRT counterparts in that regard, so there is much more meat, if you will, from us.

Later on today, however, Howard will go into the methodology that will be used to deal with the design adequacy questions, and his presentation, although not very extensive, certainly will not limit our look in that regard. And he will illustrate that more clearly later on.

We are here today to listen, to absorb, and above all, to assure you and the Staff that are present, consultants that are present on your side of the table that our course is one to resolve the issues.

I know of none that aren't resolvable, and simply finding that common ground in which it can be achieved. That's our purpose, and we look forward very much to Mr. Landers' report to you, as you have described it, basically the Staff not having a position

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yet in that regard, but it is one towards which you are leaning; and we will certainly take that into complete consideration.

I want to reiterate, also, TUGCO's overall commitment to resolving these questions. That's the course we are clearly on, steadfastly on, and look forward to the exchange today.

Howard has the bulk of the presentation.

Before he starts, I would like to introduce John Guibert, who is in the audience. John is a member of the Senior Review Team in our TRT response effort, and serves with me on that Senior Review Team, which I chair.

Howard, would you take the podium.

MR. LEVIN: I have four viewgraphs and Vincent, you passed out copies. I will be using those in a moment.

As John has just indicated, TUGCO management recently made a commitment to consider the issue of the design adequacy.

This was presented at a recent Contention 5 briefing, along with other details of the Comanche Peak Response Team Program.

I was selected to coordinate the effort, along with other related issues under my responsibility

1-9

in the civil, structural, mechanical areas, primarily these issues falling into a construction QC area.

My goal and the goal of TUGCO is to provide a focus for resolution of these issues in areas that have evolved to have some common elements.

We are looking for an integrated assessment as opposed to -- you know, various efforts and initiatives that have been taken in the past, we are trying to put them under one umbrella and address them as a group.

I feel that the job we have before us is very important and will require competent resources. Accordingly, we are building a team, third-party consultants, that will assist in this endeavor.

In that regard, I would like to introduce some of the people that we have here today that like myself are here to listen to some of the concerns that would be expressed by the Staff.

To my right is Frank Dougherty. Frank will be playing a very key role in the management of the design adequacy effort.

I guess the best approach is just for people to indicate by raising their hands.

Doug Witt. Doug is going to play a key role in the management of the general area of piping

1-10

and supports, and he will be assisted by Paul Streeter, who will be assisting us in analytical help that we may need for this part of this program.

With us today, we have three consultants. One hasn't quite made it today. Dr. Bob Cloud, Dr. Bill Hall from the University of Illinois, and I understand that Sam Orr from Oak Ridge National Lab will be arriving shortly.

I expect these individuals to contribute both in the program development phase which should initiate immediately after this meeting, as well as other meetings that we have planned in the next couple of weeks, and I will get to that in a moment, as well as the execution later.

The specific roles of the individuals I just mentioned, other than assisting in the program development phase at this time, is undefined, but it will become clear as to what their responsibilities will be as our program evolves, and as we develop a schedule for the program.

Also here today, representing a third party, as John indicated, Mr. John Guibert is representing the CPRT Senior Review Team, and Mr. Don Davis, who has been a source of guidance for our entire CPRT effort and expect him to contribute to

1-11

our development.

I want to make it absolutely clear that we are here to listen and, hopefully, have an opportunity to ask questions that would tend to amplify the statement of the issue such that we have as complete an understanding as possible so that we can go back and define the plan.

John has indicated that we are shooting for early April to come back. We see this meeting as the first in a series. We plan similar meetings.

The next one we plan is the week of March 11th to generally discuss the issue of cable trays and supports. That meeting is being scheduled. It appears as though that will be sometime the week of March 11th, probably in San Francisco.

I guess I want to make two philosophical comments as to the nature of the initiatives that we believe will be developing.

Number one, I think they will have attributes that are very much consistent with those that the Staff, or at least the Contention 5 panel, was briefed on earlier this month.

The general philosophy, methodology, the types of initiatives will be very common to the other CPRT efforts, the action plans that we discussed at

L-12

that time.

We plan to develop initiatives that are sufficiently broad to identify and deal with the generic implications, both to similar hardware that may be in question and beyond that, other disciplines and other types of hardware as required.

In certain areas where weaknesses are identified, where potential deficiencies are identified, I think at the same time it will be comprehensive in those areas.

Our efforts will include a combination of initiatives, including confirmatory analysis, testing and review of existing material.

We don't plan to start from scratch. There have been a variety of efforts undertaken, and we believe to start with that, we will conduct a third-party review of that, verify its adequacy and use it if it is verified to be adequate, and as necessary, supplement.

I want to make it clear that there are no restrictions on our program. We will recommend practical solutions.

If this requires rework, then it will be recommended.

With those introductory comments, what I

1-13

would like to do in the formal presentation is describe just very briefly what we feel is the broad scope of the program, as well as our general methodology for dealing with issues.

Our methodology is non-specific. It is not dependent upon whether we are talking about piping issues, cable trays and supports or any other issue.

It's basically how we are going to go through dealing with these issues, sorting them out, getting them in the right hopper, and dealing with those hoppers.

MR. NOONAN: Before you start, I would like to identify some of the members of the NRC that I didn't properly do.

We also have here with us today Mr. Bob Bosnak, who is the Chief of the Mechanical Engineering Branch, and Mr. Frank Cherny, who is the Section Leader from that Branch.

Normally, these issues fall within the purview of that Branch.

I also have some members of my immediate Staff that are going to be involved in this: Mr. Goutam Bagchi, who will report directly to me on these issues, and Mr. Bernie Saffell, who is a consultant from Battelle, Columbus, working on these

issues.

In the audience today, we also have Geary Mizuno, who is from our legal staff.

Later on today, Mr. Larry Shelby will be coming down here around noontime. Larry will be also involved in this issue.

So we are kind of bringing all of the summary disposition issues under what has been called the TRT.

I don't necessarily call it that any more, because of the broader scope of what we're doing here; but it's basically under my direction.

MR. LEVIN: (Slide 1.) This is a very simple schematic of the scope of review as we understand it today.

(Whereupon, Slide 1 follows.)

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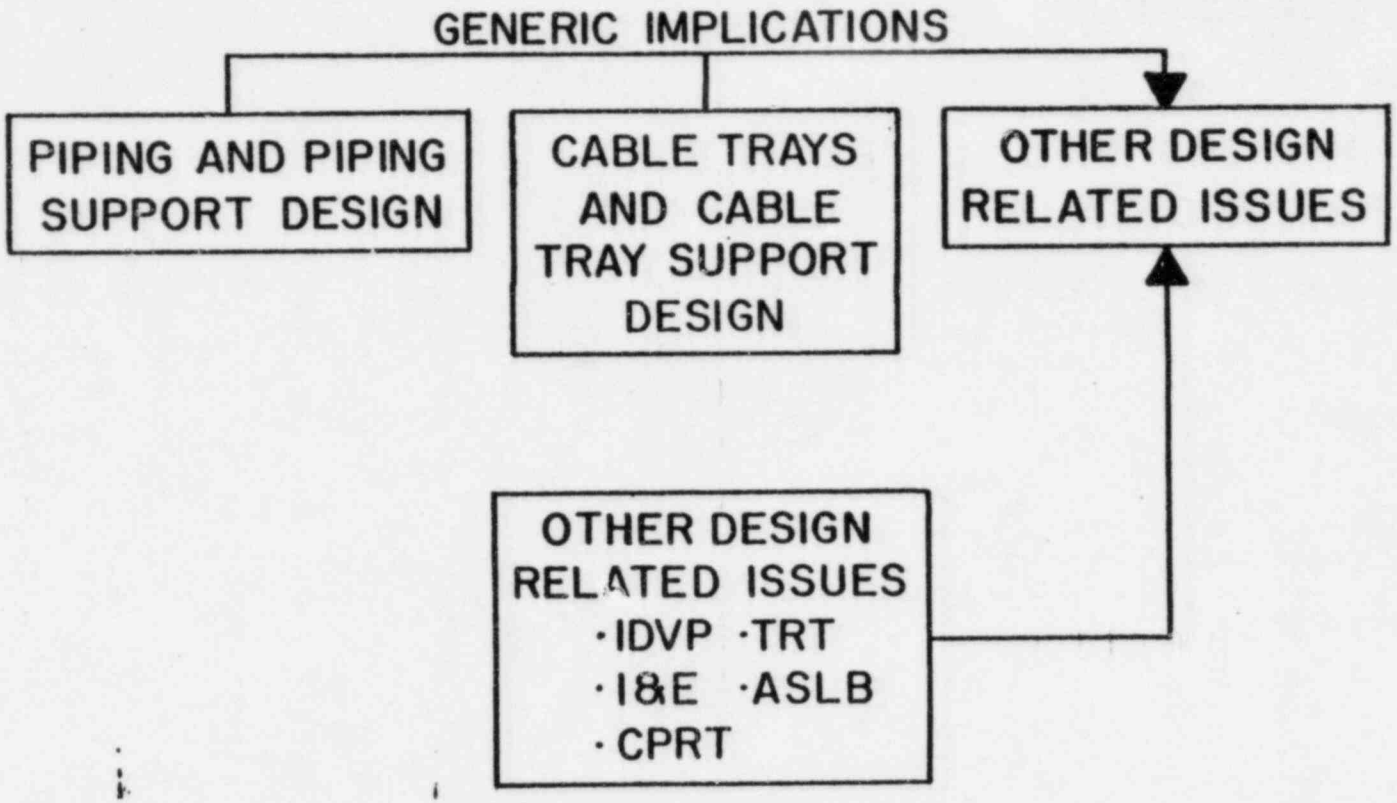
CPRT DESIGN ADEQUACY EVALUATION
SCOPE OF REVIEW



Slide 1

2-1

MR. LEVIN: Portrayed on the diagram are three principal boxes on the top, two of which we believe that through this meeting and the meeting I mentioned earlier, we will be in a position to identify the issues on the table, and be in a position to address very directly and in the context of the program plan that we'll submit in April: Those being piping and piping support design and cable trays and cable tray support design.

There's a third box that is unknown at this point. There are two sources of issues that could be reviewed in that box, the first being generic implications in terms of the implications to other areas that may arise out of the review in piping and cable tray area, as well as other design-related areas that could evolve from other programs, such as the IDVP that's been ongoing, TRT, the Board, as well as the inspection effort and CAT efforts and things of that nature, and lastly, the CPRP effort itself, which, although it's primarily focused in the construction QC area, there is a potential that design related issues could evolve out of that. And it's in this third box that we would attempt to deal with that.

MR. NOONAN: May I ask a question regarding this?

2-2

MR. LEVIN: Certainly.

MR. NOONAN: You say "TRT" here. Are you talking about reset to CAT, regional stuff, regional inspections? Is that all part of TRT, or how do you plan to look at those things?

MR. LEVIN: Region IV would fall under the I&E Category, but any source of concern that is relevant, that is viewed to have safety significance to the issues that we're talking about, would be included.

MR. NOONAN: That's sort of what you plan here with what you call "Other Design-Related Issues"?

MR. LEVIN: That's right, but by other, we mean that it's in areas other than piping and cable trays and supports.

Just at this point in time, Vince, I think we want to have an opportunity to take a step back, assimilate that information, understand what it may mean, and make a judgment as to what additional initiatives may be necessary to deal with design-related issues, other than those two areas that we know about.

We know that we are going to have to take a fairly comprehensive stance and look at those two

2-3

areas.

We are not in a position at this time to have identified anything else, but the program is being created such that we can deal with that. That's the objective.

But in terms of our April program plan, we will be able to adjust in detail the first two boxes and describe how we'll go about dealing with the third box.

I think that's something that's going to be evolved. The scope of that is going to track with the completion of our program, and I will anticipate that we -- and I wish that we will have an opportunity to discuss that with you as we go along when we contemplate changes in scope.

MR. NOONAN: Sometime within the next two days I would like to at least briefly talk about schedules and how you see future meetings coming about so I can plan out my schedule.

MR. LEVIN: Okay.

I have two slides that provide an overview of our over-all methodology for dealing with issues, issues such as the ones that we are going to hear today and others that we may hear in future meetings.

(Whereupon, Slides 2 and 3 follow.)

Slide 21

CPRT DESIGN ADEQUACY EVALUATION METHODOLOGY

(PRELIMINARY)

1. • IDENTIFICATION OF ISSUES
   - SOURCES
   - CATEGORIZATION
   - PRELIMINARY REVIEW OF HISTORY, DOCUMENTATION AND WALKDOWN

2. • DEFINITION OF ISSUES
   - DETAILED REVIEW OF AVAILABLE DOCUMENTATION
   - PRELIMINARY DETERMINATION OF SCOPE
   - STATEMENT OF TECHNICAL/PROGRAMMATIC ISSUE REQUIRING RESOLUTION

3. • DEVELOPMENT OF ACTION PLANS
   - TECHNICAL ISSUES: DIRECT OR INTEGRATED SOLUTION PATH
   - PROGRAMMATIC ISSUES: LOCAL OR GLOBAL APPLICABILITY
   - IDENTIFICATION OF POTENTIAL ROOT CAUSE
   - DEVELOPMENT OF INITIATIVES

Slide 3

CPRT DESIGN ADEQUACY EVALUATION METHODOLOGY (CONT'D)

- IMPLEMENTATION OF ACTION PLANS
  - TECHNICAL ISSUES: EVALUATION OF HARDWARE ADEQUACY VIA DOCUMENTATION EVALUATION, CONFIRMATORY ANALYSIS AND TESTING
  - PROGRAMMATIC ISSUES: EVALUATION OF PROGRAMS, EFFECTIVENESS OF IMPLEMENTATION AND SIGNIFICANCE TO HARDWARE
  - IDENTIFICATION OF LIMITING FACTORS, ROOT CAUSE AND GENERIC IMPLICATIONS
  - SCOPE EXPANSION AS NECESSARY

- CORRECTIVE ACTION/LICENSING EVALUATION
  - LICENSING COMMITMENTS EVALUATION
  - SAFETY SIGNIFICANCE EVALUATION
  - MODIFICATION OF HARDWARE OR LICENSING COMMITMENTS

- REPORTING/EXTERNAL INTERFACES
  - DESIGN ADEQUACY EVALUATION REPORT
  - STATUS MEETINGS

2-4

MR. LEVIN: There are six major elements to the program, and they are indicated by the major bullets on this slide as well as the next slide.

I'll be presenting an overview here, and then getting into as much detail as necessary in the following slide, which is a logic diagram for how we go through this process.

The process basically is a sorting process, leading to the definition of issues, the identification of initiatives, action plans for their resolution, implementation, and as I indicated, the possible modifications either to hardware or even licensing commitments, as necessary.

I want to make it clear that our focus in this effort is on the end product, and the adequacy of the design as represented on the drawings and the specs.

However, I need to amplify that by indicating that there will be a review of certain programmatic areas and the processes; and where there are weaknesses identified, I think we'll attempt to utilize that information in an effort to focus our efforts in terms of root-cause determiantion and our evaluation of generic implications.

However, the process is not an end unto

2-5

itself. I think we will learn from it to help complete our activity, which is to verify the quality of the end product, and also take lessons learned from that back and make recommendations as to how they should be folded into ongoing efforts in Unit 2, as well as the operations phase of Unit 1.

Now, if I can just go briefly into the six major categories. The first category is the "Identification of Issues," and as I indicated, this meeting is a source of that, as well as some of the sources identified in the previous slide.

As part of that effort, we will have to review the history through the documentation associated with the issues that are expressed, and in some cases walk down hardware to try to in a sense try to define these issues, categorize them, getting them into tangible boxes for ultimate definition of an action plan.

The second major emphasis is a definition of the issues. Here the review process would become more detailed in terms of looking at existing documentation.

We would hope at this point in time to get a preliminary determination of the scope that we're dealing with in terms of hardware and categories, such

2-6

that it would enable us to take an initial shot at the statement of the issue, the issue falling into one of two categories.

I want to make it clear that the hopper accepts issues that could fall into technical areas, as well as programmatic areas.

The methodology that I will describe will show how we deal with that and how ultimately, whether it's a programmatic action plan or a technical action plan, it ultimately gets down to the adequacy of the hardware.

The next step is the development of the action plan itself. In the two primary areas that I just mentioned, technical issues and programmatic issues, we contemplate things falling in each area into two boxes.

For technical issues, we believe that the initiatives will be directed at either a direct solution path or an integrated solution path.

What I mean by that is that based upon our very preliminary knowledge of what the issues are, certainly some of them have to be considered collectively, and the cumulative significance of these things needs to be weighed in a systematic way.

One example of that might be in the area

2-7

of stability. I'm aware that one of the issues on the table is the possible need to go back and reconcile the as-built condition with that which was assumed in the stress analysis.

One way of doing with that, as well as other issues, might be to consider that in a systematic way, either reconciling what has been done or in certain cases considering analyses of systems, factoring in whether the stability, mass participation or support stiffness into that evaluation.

That confirmatory evaluation, that analysis, so to speak, would be an integrated way of dealing with those issues.

Other problems, I think, would be amenable to a direct solution. They may be more isolated, and we may be able to just -- it may be most practical to address that issue by itself.

In the programmatic area, I believe the issues will fall into two basic groupings, both local and global.

Local, being things that might be limited to a certain group or a very small element of the design process; global, being an issue that could potentially be applicable across the board to all elements of the design process and the QA process.

2-8

An example of a local issue may be a concern of a very, very specific interface, possibly, between the architect/engineer and vendors that have been working for that architect/engineer.

On the other hand, an issue that may be broader could be one such as the availability of change paper to inspectors and things like that.

So a major part of this process is to get the issues that we hear from you, as well as some of the other sources, and get them into hoppers like that, and develop plans that can deal with them in these categories.

I made a few comments earlier about where root cause fits into the equation in terms of evaluating the adequacy of the end product.

That's a very important part of the action plans. Initiatives will be included which will get at that, but primarily focused to the areas I mentioned earlier.

MR. NOONAN: At this point in your plan, it seems to me that there ought to be -- Maybe you are already saying this and I'm just not hearing right.

There are certain designs that might not even be worth talking about. If you look at this design, you might even wonder why it's there in the

2-9

first place. If you question, say, "Maybe I don't need that support; maybe it should come out of there, you know, if it's not really needed," because a lot of times we tend to over-design plants and put in more supports than we actually need, as far as safety is concerned.

Maybe we should pull the support out, or maybe it's just as easy to modify it and make it something we can analyze, and we don't sit around for six months discussing how we should model it on a computer.

Would that be done here in this part?

MR. LEVIN: Well, in fact, I think you pre-empted my next area.

MR. NOONAN: Oh, I'm sorry.

MR. LEVIN: Yes, somewhat. But I wanted to get into that. I mentioned briefly earlier the types of initiatives that would be contemplated.

But I guess one thing that has to be clear is that our effort is primarily oriented to looking at the adequacy of the hardware, verifying conformance to commitments that have been made.

I think we all have to realize that there are many, many different ways of meeting a commitment.

We are not seeking to optimize the piping

2-10

design here, but just to verify that in fact it meets the Code requirements and other commitments that have been made.

If it is practical to do that and that is a solution path, I guess my direct answer to your question is yes, from the standpoint of adequacy, but not from the standpoint of optimizing the system.

We want to just verify that we've met commitments and Code requirements.

At this point I have an open mind as to what paths would be required. It's clear to me from just my, at this point, superficial knowledge of the issues, that that may be the most practical solution, either eliminating certain pieces of hardware or modifying certain pieces of hardware, as opposed to taking analytical or testing investigations that could take a significant amount of time and resources.

So we are just going to have to weigh those things. I guess at this point I can't be any more specific.

MR. NOONAN: I was more or less wondering where that appears in your plan. Where would that decision path be made?

MR. LEVIN: That decision path would be made in the next-to-the-last bullet where we talk about

2-11

corrective action, and that bullet or that area of the program we are going to be asking ourselves the question have commitments been made.

If they have, I think it's obvious what happens there. If they haven't, we need to deal with the significance of that. Depending upon the level of significance, I think there's two possibilities: It would be modification or there may even be some licensing commitments that are modified.

Those are basically the alternatives that I think exist.

MR. BECK: One modification to hardware would be eliminating it. Does that answer your --

MR. NOONAN: Yes.

MR. LEVIN: Getting back into the top of the slide, as far as our implementation plan, I believe that the initiatives that we will define in our action plans will fall into three categories: That of evaluation of documentation that may already exist and our third-party verification of that information; confirmatory analyses by third parties; and testing by third parties.

In the programmatic area, our efforts would include evaluation of the programs, the effectiveness of their implementation, but most importantly,

2-12

the significance to hardware; and all of these things focusing towards trying to get the issue down to its lowest common denominator, identifying those limited factors that allow us to understand the boundaries of the issue, the root cause and its generic implications, because it's through an understanding and evaluation of those items that we are going to be sure that we fully bounded the scope of these concerns.

I think most importantly, we are undoubtedly going to get to a point where our initial action plan will have to be modified.

Part of the initial process in going through this, putting these issues into these hoppers, involves making hypotheses as to what the problems could potentially be, based upon our experience, and initiating actions which will be oriented at confirming or not confirming those hypotheses.

In certain cases we may be right and the path will go directly through an action plan to completion.

In other cases, I think you are going to see a series of decision paths and possibly even new action plans that would evolve in process as you learn, as you decide where the design adequacy effort takes you.

2-13

We know for a fact that that's going to occur in Box Three that I described earlier, you know, that are as yet undefined.

With that, I just want to indicate that we will, much the same as the other CPRT efforts, be issuing a report that documents our process, as well as our conclusions, and I anticipate, Vince, that at the point that we are ready to sit down and discuss our program, we'll have a meeting, and that it will be appropriate, particularly if changes in scope are contemplated along the way, that we'll get together and have similar meetings as we are having here today.

With that, I have a diagram --

MR. NOONAN: Maybe on that one point.

MR. LEVIN: Yes, sure.

MR. NOONAN: I know we are going to need some meetings. There's no question in my mind. Today you hear the NRC talk.

I'd like to see some time in the future you hear the Cygna people talk. I'd like to see a meeting between the Applicant and Cygna, and NRC will be observers; we'll sit back and listen.

Recently, I talked to Ms. Ellis about making Mr. Walsh and Mr. Doyle available to us. Maybe we don't learn anything new and maybe we do, but I

2-14

think it's worth it so that when you get back and you are ready to make your corrective action, at least you've heard from all the parties involved.

MR. LEVIN: Yes. The important thing is that will confirm the boundaries of what's on the table. I agree.

MR. BAGCHI: May I ask one clarification?

MR. LEVIN: Sure.

MR. BAGCHI: I am Goutam Bagchi of the NRC Staff.

You laid out here a very methodical and deliberate process of identifying the problems and making sure that you have a problem before you go over to the corrective action plan.

But haven't we spent enough time in discussing technical issues for so long that some issues ought to jump out at you and make their presence known?

And I would like to understand how you are addressing those issues.

MR. LEVIN: I think the answer is obviously yes, Goutam. What we have developed here and what we have portrayed, if we could put this up. It might be good for the Staff to maybe take it back and look at it and we could discuss it in more detail, if necessary.

2-15

tomorrow.

MR. BAGCHI: I think a significant amount of discussion has taken place and --

MR. LEVIN: Absolutely, and this methodology was developed to deal with issues that fall in those categories, Goutam, where it's obvious that there's an issue there, and you might go directly to a solution. Okay?

The action plan could simply be that we are not going to try to analyze this thing to death, and the action plan itself is go back and deal with this physically right away.

That's a possibility.

Others, I think, are going to require study before the initiatives can be defined in an action plan.

So -- But I think what we are defining here is something that can deal with that and allow the issue to get to the right location and ensure the process that will develop the plan that's appropriate for that specific issue.

MR. BECK: If I can just add to that, some issues are going to track very rapidly down to the corrective action treatment, but we want to be sure that we have a methodology in place that's going to

3-1

identify all relevant questions that may not be on the table yet.

We don't want to do this but one time and we want to be darn certain that this exercise is a comprehensive one that doesn't leave anything unanswered.

So that's why we're taking very careful pains in what may seem to be, with regard to some of the specific technical questions that are on the table, superfluous activity.

It's structured so that there's nothing left unanswered as far as the safe design and construction and operation at Comanche Peak. It's been perhaps excruciatingly boring at this juncture, but we want to have everybody assured that that's the case.

You are right. Some of them go very quickly to the bottom line.

MR. LEVIN: I think my colleagues have made me aware of an example, in our existing CPRT efforts, that falls into that category.

That was the issue having to do with the improper shortening of the steam generator upper lateral support bolts, okay?

There we had a situation where there was

3-2

concern over adequate engagement of a bolt into a drilled and tacked plate, which was embedded in the cubicle wall.

We had to check the program of inspection to verify the engagement lengths. It was determined that the lengths in several cases were not adequate, and the path chosen was to go back and bring the condition in conformance with that shown in the drawings, very directly.

But there was a couple of initial steps, even there. I mean, that required an inspection, but the approach was make the installation in conformance with the design, not analyze it away.

It made sense to do that, and I think there will be other examples of that.

By the way, that issue was reported as a 50.55(e).

MR. BOSNAK: Howard, I would like to advise everybody here at this point, it might be of some use to you, because we dealt with similar problems, not necessarily in the technical issues, but similar kinds of things with other utilities.

I would hope in your approach to the resolution that you would not have any particular mindset as to how you want to go about doing this.

3-3

In other words, I think in some cases that we have dealt with, people have felt that it would be a loss of face to make a hardware fix where that would really be the appropriate way out.

After many months of discussions about analytical solutions, the analytical solution was found to be acceptable; but still, all I'm trying to say is don't have a mindset, if you will, when you approach the solution of the problems.

MR. NOONAN: One other comment at this point in time.

As you go down this path and as you decide to do certain things, if you feel it necessary to sit with the Staff and receive their concurrence on certain things you want to do, particularly like criteria, you know, do it.

I don't have to be there. John Beck doesn't have to be there for you and the Staff to sit down and talk and get the Staff's acceptance so we don't have to wait until the very end and then we find out that we don't like some of your program or there's something we're not happy with. Get that early on.

MR. LEVIN: Hopefully, Vince, we'll be able to do 90 percent of that in our formulation of our plan; but as we go through this, undoubtedly, issues

3-4

like that will come up and we'll have to talk. Yeah.

I think we can go into a lot of detail on this diagram. It's more detailed than I previously discussed on the previous two slides.

(Whereupon, Slide 4 follows.)

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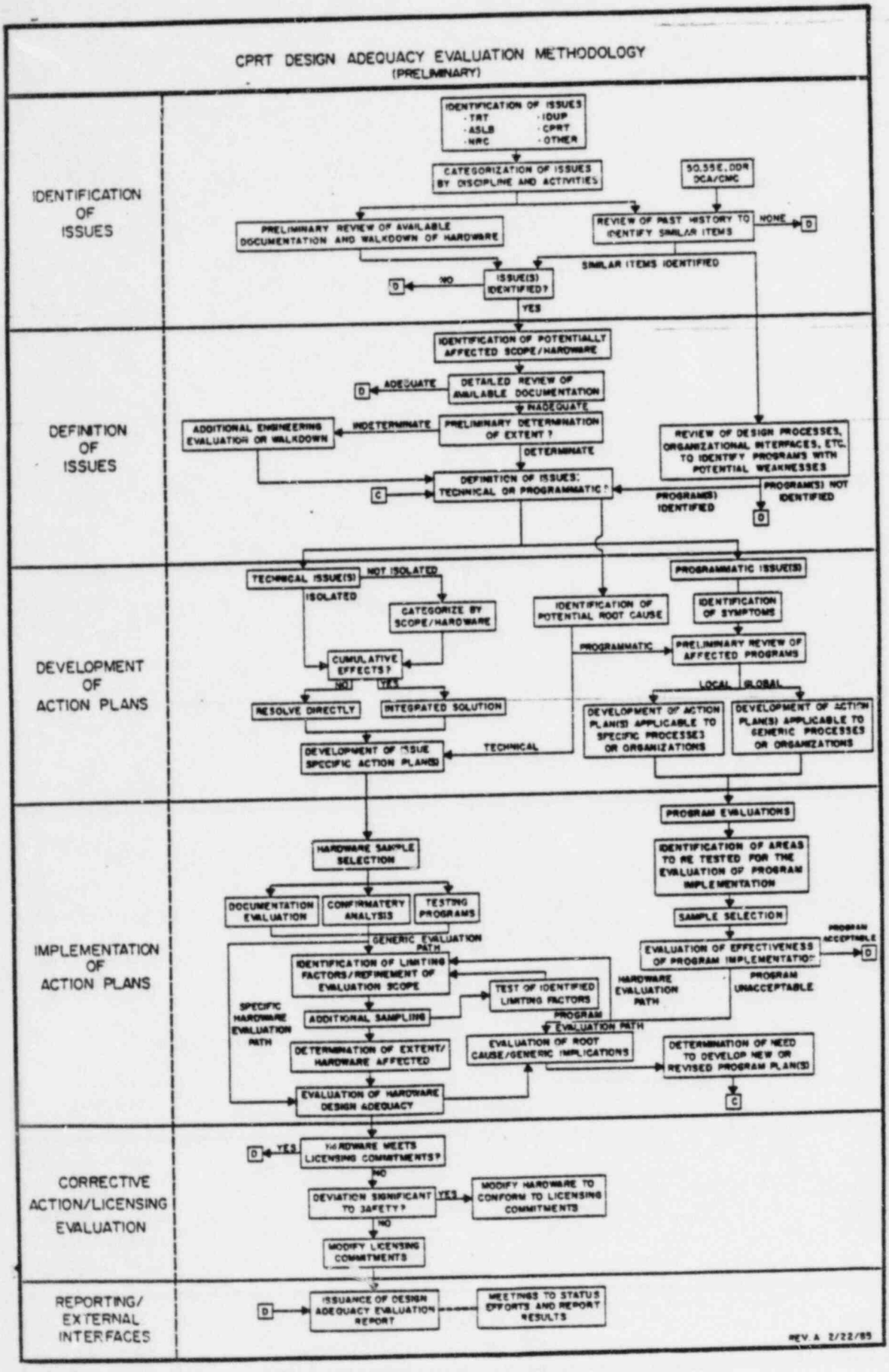
Slide 4


CPRT DESIGN ADEQUACY EVALUATION METHODOLOGY
(PRELIMINARY)
IDENTIFICATION OF ISSUES
DEFINITION OF ISSUES
DEVELOPMENT OF ACTION PLANS
IMPLEMENTATION OF ACTION PLANS
CORRECTIVE ACTION/LICENSING EVALUATION
REPORTING/ EXTERNAL INTERFACES
IDENTIFICATION OF ISSUES · TAT · IDVP · ASLB · CPRT · NRC · OTHER
CATEGORIZATION OF ISSUES BY DISCIPLINE AND ACTIVITIES
50.55E, DDR DCA/CMC
PRELIMINARY REVIEW OF AVAILABLE DOCUMENTATION AND WALKDOWN OF HARDWARE
REVIEW OF PAST HISTORY TO IDENTIFY SIMILAR ITEMS
NONE
SIMILAR ITEMS IDENTIFIED
ISSUE(S) IDENTIFIED?
NO
YES
IDENTIFICATION OF POTENTIALLY AFFECTED SCOPE/HARDWARE
DETAILED REVIEW OF AVAILABLE DOCUMENTATION
ADEQUATE
INADEQUATE
PRELIMINARY DETERMINATION OF EXTENT?
INDETERMINATE
ADDITIONAL ENGINEERING EVALUATION OR WALKDOWN
DETERMINATE
REVIEW OF DESIGN PROCESSES, ORGANIZATIONAL INTERFACES, ETC. TO IDENTIFY PROGRAMS WITH POTENTIAL WEAKNESSES
DEFINITION OF ISSUES: TECHNICAL OR PROGRAMMATIC?
PROGRAM(S) IDENTIFIED
PROGRAM(S) NOT IDENTIFIED
TECHNICAL ISSUE(S)
NOT ISOLATED
ISOLATED
CATEGORIZE BY SCOPE/HARDWARE
CUMULATIVE EFFECTS?
NO
YES
RESOLVE DIRECTLY
INTEGRATED SOLUTION
DEVELOPMENT OF ISSUE SPECIFIC ACTION PLAN(S)
TECHNICAL
IDENTIFICATION OF POTENTIAL ROOT CAUSE
PROGRAMMATIC ISSUE(S)
IDENTIFICATION OF SYMPTOMS
PROGRAMMATIC
PRELIMINARY REVIEW OF AFFECTED PROGRAMS
LOCAL
GLOBAL
DEVELOPMENT OF ACTION PLAN(S) APPLICABLE TO SPECIFIC PROCESSES OR ORGANIZATIONS
DEVELOPMENT OF ACTION PLAN(S) APPLICABLE TO GENERIC PROCESSES OR ORGANIZATIONS
PROGRAM EVALUATIONS
IDENTIFICATION OF AREAS TO BE TESTED FOR THE EVALUATION OF PROGRAM IMPLEMENTATION
SAMPLE SELECTION
EVALUATION OF EFFECTIVENESS OF PROGRAM IMPLEMENTATION
PROGRAM ACCEPTABLE
PROGRAM UNACCEPTABLE
HARDWARE EVALUATION PATH
HARDWARE SAMPLE SELECTION
DOCUMENTATION EVALUATION
CONFIRMATORY ANALYSIS
TESTING PROGRAMS
GENERIC EVALUATION PATH
IDENTIFICATION OF LIMITING FACTORS/REFINEMENT OF EVALUATION SCOPE
TEST OF IDENTIFIED LIMITING FACTORS
SPECIFIC HARDWARE EVALUATION PATH
ADDITIONAL SAMPLING
PROGRAM EVALUATION PATH
DETERMINATION OF EXTENT/ HARDWARE AFFECTED
EVALUATION OF ROOT CAUSE/GENERIC IMPLICATIONS
DETERMINATION OF NEED TO DEVELOP NEW OR REVISED PROGRAM PLAN(S)
EVALUATION OF HARDWARE DESIGN ADEQUACY
HARDWARE MEETS LICENSING COMMITMENTS?
YES
NO
DEVIATION SIGNIFICANT TO SAFETY?
YES
NO
MODIFY HARDWARE TO CONFORM TO LICENSING COMMITMENTS
MODIFY LICENSING COMMITMENTS
ISSUANCE OF DESIGN ADEQUACY EVALUATION REPORT
MEETINGS TO STATUS EFFORTS AND REPORT RESULTS
REV. A 2/22/85

3-5

MR. LEVIN: It might be appropriate to address this tomorrow or a later date, but fundamentally, it shows you the flow.

As Goutam appropriately pointed out, I believe it deals with issues that, you know, have a range of levels of significance, as well as can deal with issues that have had different histories, and get them into the right solution path.

I think it may be appropriate to discuss this possibly in early April, along with the rest of our plan.

I want to make it very clear that this is very preliminary. It's something that is as recent as the Rev. date; it's draft indicates the 22nd.

I believe that it will evolve and mature, and I expect to have a lot of help in that regard from my colleagues and consultants that are here today.

MR. NOONAN: I think what I would like to do maybe is offer that tomorrow morning we make this a part of the agenda.

I will ask the Staff to take a look at it between now and tomorrow and give us some comments back to you. They won't be very detailed, but at least give you a flavor of what we see on the plan.

MR. LEVIN: Vince, right now, at least as

3-6

far as my presentation goes, I'm ready to listen.

I guess that we can go about this in any way that you desire. Would you prefer that we, in terms of clarification as your speakers go along, or would you prefer us to hold it until the end, or in process?

MR. NOONAN: I just want to do this like a normal meeting, whatever we have to do; but let's get it done.

If that's it, I would basically like to start out with Mr. Landers here, talking about the report that he submitted to us.

This is just a brief thing here. You know, Staff has actually been working on this since sometime last May, I think, the time frame.

When I came on board the Comanche Peak Project in October, I wasn't even aware that we had four people looking at piping and pipe support design.

Sometime later we decided to bring this into what we call the Comanche Peak Project. It was kind of being handled separately from the project.

So now we basically have the people here now working with the Comanche Peak Project.

It should be no surprise to you that we do have concerns. If we didn't have them, we would have answered your summary dispositions a long time ago.

3-7

We need to get those things resolved.

Some of the things that Mr. Bagchi raised to you is maybe of frustration, because Goutam is on this project a very short time, too, and we are wondering, you know, why are we sitting here two years late talking about piping and pipe support design. It should have been done a long time ago and finished.

With that, I think we'll go ahead and let Don start and talk about the report and then the rest of the people can join in.

MR. LANDERS: To begin, as you can see, the report was submitted February 21st. It is draft.

The Staff really has not had time to sit down and review it and to comment on it. So I would assume that I will be getting questions from them today, also.

Secondly, I found out last night I was going to talk about it today.

Basically, the first six pages are a discussion of design process, design QA, as I see them in a global sense within the industry, and then the design process, as I understand it -- I want to make that clear. This report is as I understand things.

The design process that's described here is

3-8

the one that I understand and the one that resulted from a number of meetings that we had with the Applicant, and their responses to those meetings.

The first issue, I think, is Design QA, which I don't like as a title, but, however, Design QA, I think, has two important parts.

One of those parts is a documentation part, and that is that we have all the documents together and we have procedures that describe what we are going to do. Then we have results of audits and all of the paperwork in place.

So I think the second one, and really the most important one, is that that process in fact controls the design so that the licensing commitments are being fulfilled.

It's really that one that I'm looking at. I really am not chasing the paper trail too much, except where I think it might have an impact on controlling the process and doing it adequately.

Right away, two examples jump out and those, of course, were those found by Cygna with respect to mass participation and mass point spacing.

In the first case, there was no procedure according to Cygna at Gibbs & Hill that defined mass participation.

3-9

In the second case, there was a procedure at Gibbs & Hill that addressed mass point spacing.

So what we have really is a paper trail problem and a technical problem, the paper trail problem being the fact that there was a procedure in place, the procedure wasn't followed, and in fact the verification process did not pick that up, the mass point spacing.

With respect to mass participation, no procedure. However, I would expect individuals experienced in dynamic analysis of piping to recognize that there was a problem in doing that.

So I wouldn't really expect that one would require a procedure for that kind of thing.

However, it's apparent that in this case that probably was required.

Another issue that I think is important to me, and I think, in listening to the short presentation from Howard, that you are going to address, and that is that I don't think you can separate pipe supports and piping, that in fact they constitute a system. To look at one separate from the other is almost impossible.

I think all of the issues that at least are on the table today are interrelated; most of them,

as I see them, are very closely interrelated, and to try and separate them is difficult, and I think up to now that's what's happened.

We've answered this issue, or tried to, and then we've answered this issue, and in answering the second one, it had impact on the first one, and we have to go back and look at the first one.

I just don't think you can do that. I don't think you can do that in a normal design process.

You have to be able to look -- A piping designer has to be able to look at the final product and say, "Yes, that's what I had in mind when I first sat down and started my piping design and my analysis."

Perhaps if we could get to the concerns, and the fact that I have a concern does not necessarily mean that I can make a judgment with respect to the adequacy or inadequacy, and I'm sure I say that.

I think one of the major concerns I had in the beginning is that there was no review of the initial pipe support designs by the piping analysts, and that's a concern to me because of the close relationship of those two items.

I don't know for a fact whether that ended up creating some of the issues that currently exist,

and as I go through other concerns later on, in fact it may not have.

Another concern I have, since I've been involved, when we are talking about the issues, we are always talking about seismic and its relationship to the issues.

I have a gut feeling that I don't have any problem with that plan with respect to piping and supports when one talks about seismic events.

I have a real problem when we want to talk about steam and water hammer and normal operating events, and I don't have anyone addressing those issues, as we go through trying to resolve the outstanding issues.

So I would like very much, as we talk about these things, to not forget the normal operating water and steam hammer transients that are going to be imposed on the system.

I think that with very few exceptions, to show adequacy of the piping and supports for the seismic event at Comanche Peak will be relatively simple to do; but I think we have to show it just as you proposed here, in a programmatic way and in a combined way, rather than looking at individual issues.

A concern, too, is really more of a

statement with respect to locating seismic restraints using nomographs. We get into a situation of having more supports than we need, and if we are going to use a deflection criteria, those supports are going to be very flexible; and I think that's where the flexibility of supports came about.

However, that doesn't lead one to a conclusion that there's a problem, and probably 90 percent of the people in the room are aware that that's why we have flexible restraints.

Stability certainly has been a problem that people have talked about and tried to develop definitions of, and depending upon whose report you read you get a new definition, and I'm not going to try to define stability.

However, I would suggest that where we have concerns with stability and we can demonstrate by analysis that we don't need that support which is unstable, then I would suggest that support be removed from the plant, because if we can't define its stability, then we don't know where it is at a given point in time with respect to plant operation and, therefore, we don't know what type of restraint it is imposing on the piping system.

So where we show analytically we don't

need the restraint, then I think that it's my opinion that the restraint should be removed.

Concern four is probably the first area of design process that I really was supposed to be involved in, and I see nothing wrong with the use of Component Modification Card or in fact whatever TUGCO wanted to call it.

Different utilities use different techniques: Field change requests, drawing change notices, whatever.

So the label, "Component Modification Card," is not a problem to me.

One of the problems I do have with that is not with the use of Component Modification Card, but perhaps with the fact that they weren't reacted to very quickly in the initial process of the design, that at least based on meetings and comments from the Applicant and his agents, that CMC's would be filed and would be worked on when the system was looked at.

I think that that may have resulted in designs being installed that were not at the time approved by the hanger supplier, and then later on there is, I think, always some -- I won't say that.

As we look at the design process, we can recognize that the process changed over the life of

the construction, and that certainly is appropriate and happens all the time.

In fact, the change in the process which resulted in bringing engineering to the site was a good change and an appropriate change and the kind of thing that the industry has learned they have to do.

So that with respect to supports, the site group was established under PSE, and it included ITT, Grinnel and NPSI personnel, so that CMC's we would hope would have been dispositioned and had a shorter route to take in being dispositioned and being commented on.

However, we don't see any real change to the process with respect to shortening that turn-around time and establishing some controls on how long those things stay out there without being approved.

One area I have with respect to the QA control of CMC's was that, as I understand it again, CMC's were handled by Site Document Control as this process developed and as the engineering people from hanger supplies were moved to the site, and individuals who were on the affected drawing distribution list received a copy of CMC's, as I understand it, if they received drawings.

However, one of the ways in responding to

a CMC by the hanger supplier was a memo, and that was a TSDR, and at this point I've forgotten what a TSDR is.

MR. DAVIS: Technical Services Design Review.

MR. LANDERS: Technical Services Design Review.

The Technical Services Design Review was not controlled as the CMC was, and the field engineer would make a change with a CMC. A TSDR would be written by ITT, Grinnel saying, "Gee, that's no good. That's not what we want. We need something else."

There was a space in the TSDR for the field engineer to say, "Okay, understand, and look at the next revision of the CMC that comes out."

Now, with respect to the design, the process was covered and the loop was closed. The CMC was sent, the TSDR was sent back, it was responded to, and the hanger supplier responsible for that support knew that another CMC was going to be coming in.

My concern was and is that there was no QA hook in there with respect to the field engineer making changes to supports and perhaps trending of the fact that, "Hey, this field engineer is making changes

and we're having problems with everything that this guy is doing."

So with respect to QA's hook into TSDR's, I don't think that that existed, at least as far as I understand the process.

MR. LEVIN: Don, I have a question in that regard.

You say that the TSDR's were not controlled. Okay. I understand the ramifications of that statement.

Was there any evidence that QA --

MR. LANDERS: They were not controlled with respect to QA being automatically receivers of TSDR's, as I understand it.

MR. LEVIN: Okay, but was there any evidence at all that -- I mean, would it have taken a cognizant QA type to know to go look for --

MR. LANDERS: As I point out here, in performing an audit, QA could very easily have pulled out TSDR's. Theywere available. There's nothing wrong with that.

In performing the audits, QA could have gone in, seen CMC's and seen TSDR's. The trail was there.

The only concern that I have is that they

were not automatically on the list, so that this big issue that's been raised about trending -- you know, we had a QA program that developed trending.

Well, in one case here the QA program that looked at trends really couldn't look at it, if we had a field engineer, again, making recommendations that were always being rejected.

MR. LEVIN: But as far as that QA individual, he would -- I mean, presumably, the CMC's and information on a particular line were kept in a central file. He would have had to go to that file, and then he could be sure that he had a complete set of drawings, CMC's and TSDR's?

MR. LANDERS: I'm not sure about the TSDR's.

MR. LEVIN: Okay.

MR. LANDERS: That's my point. He would have the drawing and have the CMC. He may not have the TSDR.

What I don't know is if the CMC says, "Revision 2 in accordance with TSDR No. 7." I don't know that and I haven't had an opportunity to resource it to follow that trail.

If that's the case, then fine, that's beautiful.

MR. LEVIN: Okay. That's a trail that we'll certainly investigate.

MR. LANDERS: Yes.

MR. DAVIS: And you don't know whether there was a secondary close-out by the support designers to check to see if their initial comments had been --

MR. LANDERS: Well, sure, because the CMC is going to come back as a revision. We get CMC No. So-and-So, Rev. 0. And I look at it and I don't like it, so I write a TSDR.

I get a reply back that tells me, "Okay, look for Revision 1 of the CMC."

So I'm sitting there waiting for Revision 1 to come in.

So in the engineering sense, the loop is there. It is there.

My concern was with respect to that field engineer out there doing things that we weren't following and trending, other than in an engineering sense.

Concern five talks about the Site Stress Analysis Group that Gibbs & Hill had, and that group was available and was involved when requested by site engineering to be involved, and I would have

expected or I would have guessed that they were involved whenever there was a modification to pipe routing or modification to piping systems or modification, say, to a different type of branch connection.

However, it doesn't appear that they were very involved in the modifications of the supports, and again, that is because the process as set up dealt with modifications to supports being dealt with by the supports supplier, and the support manufacturer, and that interface between piping and support not really as strong as I think it should be.

So modification to support would not go through the Site Stress Analysis Group, would not, therefore, get reviewed by Gibbs & Hill, as I see the process.

MR. LEVIN: So Don, the function of the SSAG is parallel to the original function of the Gibbs & Hill New York Office in that they are primarily reacting to changes in location, types of supports; is that correct?

MR. LANDERS: No, that's my point. I don't think the Site Stress Analysis Group was getting involved in support modifications, as I feel they should have been.

MR. LEVIN: But when their system got

tweaked to do an evaluation, was it because somebody was -- it's a relocation or -- You are saying they didn't get involved in the details of the specific support designs.

MR. LANDERS: Yeah. If I went out and, for example, changed a pipe plant to a box beam with some other modification, I wouldn't go to SSAG, because that had no impact on the piping.

MR. LEVIN: Okay.

MR. LANDERS: And I think it may have been better if that loop was there, that in fact, if I modified a support, the piping people approved it, as well as the support people.

I think that would have been a better way to do it.

Then under Concern 6 are a number of specific issues, four really, that I think tell us something about the design process.

Mass participation we've talked about. Support stability, I think, we've talked about, and that is that where we have supports that people feel they don't need and they are in this stability category that we probably should go out to that plant and take them out.

One of the concerns that I have, when we

look at the stability issue is, again, we can't take a support and look at a support, particularly with respect to stability.

The interaction between where that pipe is moving, where the building is moving and what's happened to the support are so interrelated that you just can't take a support out and address its stability alone.

Just as I talk about here in Page 15, when you look at a piping system that is supported in an area with pin supports from the bottom, I mean, you immediately say, "That's unstable."

However, if I look and I find some horizontal restraints, then in a system sense, it's not unstable.

So we have to be very careful when we talk about stability with respect to pulling a support out.

We have to look at stability and the system together.

With respect to as-built reconciliation, it's my understanding that when that process began, that Gibbs & Hill would be given a system in which the number of installed supports on a given problem could vary from 20 percent to 80 percent.

The other 80 or 20 percent would determine to be able to be installed as designed.

I think that's good and I think it's bad. I think it's good with respect to 20 percent, because it gave Gibbs & Hill an opportunity to review these support designs that were out there with respect to the impact on their piping, and to be able to say whether or not they had a problem with that.

So I don't think beginning reconciliation with 20 percent is bad. In fact, I think that there is an impact to that that's good; it's positive.

The negative impact to that is that it may require more iterations, but that's not unusual for nuclear power plant construction and reconciliation. It's an iterative process. We know that.

So only having 20 percent of the supports installed, I think, may be a positive for the design process, because I think we can say there that in fact at that point Gibbs & Hill had an opportunity to look at these when a whole lot of them weren't installed; and, therefore, that kind of hidden pressure to accept stuff as installed may not have been as severe as people have made it out to be.

The only real major concern that I have with respect to a detailed item on as-built

reconciliation is that situation where we have more than one piping system supported off a frame, and it's my understanding, based on meeting with the Applicant and answers that I was given, that in performing the analysis of the piping system and, therefore, accepting the system, that Gibbs & Hill did do the analysis of each system, assuming individual supports.

Loads were then put together on the support and the support frame was reviewed by the support manufacturer; but again, no one was looking at this interaction effect.

We've got six piping systems on a frame. Certainly, the support manufacturer has all the loads from those six piping systems, and he can look at the structure adequacy.

The analyst is dealing with them as individual supports, and that doesn't look at the interaction effects.

So I think that wherever you've got these gang supports, that we have that problem to take care of.

Support mass, this is a situation in which we're talking about massive supports that are not box beams around the pipe, but are offset from the pipe, either with a stanchion or some other thing.

It's my opinion that that mass ought to be modeled in the piping system as offset. Certainly, large masses with respect to being around the pipe ought to be included in the analysis of the centerline of the pipe, which is the only place we can put them, because all we have are centerline models.

But where we have these large offsets, I think it's critical these large offsets be modeled in as an offset; and I think we have some problems with respect to that.

I don't think that it was done, except for the main steam system, and at this point I have some problems with the way that the Applicant is attempting to validate some of the things that exist in the main steam system. I won't go into detail on that.

Again, when we're talking about offset mass, my immediate concern is the steam and water hammer.

Certainly, I'm concerned about seismic, but I anticipate that the loads you are going to be developing due to turbine trip on the main steam are going to be far more severe than what we're going to get due to seismic event on the main steam.

So when we look at this offset mass, we

really should be concentrating on steam and water hammer and operating loads.

Basically, my recommendations to the Staff are that there's a whole lot of issues, and on Page 20 I just list some of them, none of which I generated myself. They've all been generated by other people.

If we only had one of those issues up there, we probably wouldn't be here meeting. I mean, we could resolve it very easily.

And even if we had two or three of them, we could resolve them very easily.

My concern is that when you look at this list as a whole -- and again, I don't have all the issues here that are related to supports and piping -- that you recognize they are interdependent. You really can't answer one of them without answering the other one.

You can't answer a Richmond insert question without knowing what the loads are on the Richmond insert, and you don't know what the loads are until you get mass participation, node point spacing, support stiffness, everything else put together.

So I cannot reach any conclusions on what's going on out there in respect to the piping and supports, and I think that the only way that I can

reach some conclusions is to have the Applicant take a sample and go back and do some analysis of some systems, using the guidelines on Page 21 and 22, basically on Page 22.

You've got to have as-built configuration. We ought to consider the appropriate load combinations.

We should evaluate all components, piping and supports, in accordance with the licensing commitments first; and provide acceptance criteria for those items that are not covered by Code standards or regulations.

Support stability is one. I can't find anything anywhere that addresses support stability. So we need to develop criteria that's acceptable for that.

MR. LEVIN: Don, in that vein, I agree, but that's a difficult issue. It appears to me that there are quite a few differences -- well, different definitions, I should say, and it strikes me that eventually we are going to have to come to grips collectively as to what is the safety significant attribute to be dealing with and, you know, orient our initiatives towards that.

I certainly concur in your observation that that needs to be done in a system context versus

an individual support with a free-ended pipe attached to it. That, you know, is not going to get us anywhere.

I hope that maybe as we go on further today, we can maybe even arrive at what we believe are safety significant attributes relative to stability questions to strive far, because it's apparent to me, and maybe it's just my understanding, for example, of Cygna's recent letter, that it may not be consistent with what I heard you saying.

I don't know. You are probably in a better position -- I don't know if you've read their letter.

MR. LANDERS: Last night.

MR. LEVIN: Okay. -- to judge whether or not --

MR. LANDERS: I'm in no better position than you are.

MR. LEVIN: Well, it wasn't clear to me whether or not they were advocating looking at it as a system or as individual supports or whatever, and I think that's something we all need to talk about and decide.

MR. LANDERS: Yeah. Well, I agree with that, but what I would like -- what I first would like to see is the results of this with respect to licensing

commitment. I think that's one issue that the Applicant needs to address.

I think then we can address the safety significance. Now, we can't address support stability with respect to licensing commitments, because I don't know what we can say about that, because there are no licensing commitments. There's no Code, no criteria.

But at least those issues that there are commitments, there are Codes, there are standards, we ought to see how we sit with respect to those.

Then we ought to see if in fact we may be outside some of those standards, what's the safety significance of that.

But I think we need to do it quite precisely. We have to get rid of the term "study." We need to be able to review analyses that are analyses of record, that have been verified, that the Applicant says, "Here it is. I'm through with it. It's done. This is it."

So that when the Staff reviews that and has a concern, then that it's not, "Well, that's a study."

So, you know, we can't, I don't think, do that any more. We need to take a serious look at what we're doing, do it very methodically, very precisely,

do it with respect to the way one would normally design a nuclear power plant piping system, which is to preclude at this point, in my opinion, the use of non-linear, inelastic analysis, for example.

That's not how we would design a nuclear power plant. Let's go in and do the kind of analysis we would do with respect to designing that plant and see where we sit, and then we can make some judgments.

But if we have to deal with non-linear, inelastic analysis, then I don't know what judgments we could make.

MR. LEVIN: Well, let me ask you this, Don.

At certain points we are going to get to a situation where we have a certain physical situation that we are going to want to model, and there are limitations in the context of the type of analytical approach that you just talked about that we can make.

We can make a -- There's limits to the amount of boundary conditions and assumptions that we can make. So you have to oftentimes make judgments, you know.

Is it closer to append; is it closer to fix? You know, how do you want to represent it? Okay.

And then there are certain non-linearities,

both geometric and material. So the question -- What I hear you saying is let's not spend a lot of time maybe entertaining a Ph.D. dissertation on something.

But what I'm saying is there are some circumstances that may not be amenable. Do I hear you advocating some other approach?

MR. LANDERS: No. No. What I'm suggesting to you is let's not, in designing nuclear power plants, we don't worry about things like gaps on the pins, so let's not worry about those.

MR. LEVIN: Yeah.

MR. LANDERS: We can sit and talk about considering stiffness. I think because of the issue here, you have to look at stiffness.

Were it not as big an issue to people as it was, I would be amenable to saying you could use rigid supports; but I think based on where we sit today with that issue, we have to look at flexibility of supports.

If you are talking about the fact that we've got to now do a detailed analysis of a small area, fine; but in an over-all sense, I don't think we should be doing that, at least to get to the point.where we can initially look at what we have.

I can't do that, because every time I look

at something, one of the issues that's still outstanding has an impact on this, and so I can't reach a judgment on that.

So if I could just have one system in which all the issues are addressed and the Applicant has said, "This is how I'm going to address them," then one can look at that.

That's really what I'm saying, and I think that certainly with the people that you have on the CPRT, that you know what the industry approach to issues are, and we can deal with those.

I'm certainly not one that's going to ask you to do analysis that is outside of common industry practice.

I think that's what's been done and I think that's what the problem is. I think we ought to stay within the industry practice as much as we can.

Now, when we get to a situation that we don't meet the criteria doing that, the criteria always allows us to do something different; but I would like to begin with knowing what doesn't meet the criteria and why, and why we're going to plastic analysis, for example, which the criteria allows us to do.

But I don't know that at this point, and

I think it's important for all of us to know why we went....

MR. LEVIN: Don, you mentioned two things that I thought were illustrative of -- For example, mass participation and mass point spacing, two issues that demonstrated maybe two different types of problems, one where there may have been a failure to define the requirement, and in another case, failure to verify conformance with the requirement.

Are there other examples of that that you would like to kind of point us to that you found in your review, or anybody on the Staff, that kind of fall into those categories, because I think they are illustrative.

MR. LANDERS: I think I need to state that failure to have the people responsible for piping to review support designs prior to installation, to me, is a concern.

It's not a concern that would say that in doing that you automatically are going to have a problem. No, I don't agree that that's the case.

However, I don't agree that not having a procedure for mass participation, you are automatically going to have a problem, because I would expect people to understand that, and I wouldn't expect to see a

procedure on that.

MR. LEVIN: By a "procedure," do you mean an implementing document?

MR. LANDERS: Yes.

MR. LEVIN: Because, certainly, there was an FSAR commitment in that regard.

MR. LANDERS: Yes.

MR. LEVIN: You mean something that describes how you implement that?

MR. LANDERS: Yeah, a procedure in the design process that says if we do this, we are going to comply with the licensing commitments.

So the lack of review of support designs prior to fabrication and installation, and as I understand it, in fact, of the initial designs, some of them from ITT, Grinnel were box beams.

It was my understanding originally when I got involved that that was not the case, that everybody came out with pipe clamps and they were all modified out here.

That's not true, that in fact original designs -- and the Applicant sent me copies of drawings from ITT, Grinnel were box beams with pin struts or snubbers.

To me, that's an unusual design. I have

seen, quote, trapeze, end of quote, style designs in non-Category I piping in nuclear power plants. I've seen it in petrochemical plants and fossil units. I don't see it a lot in Category I seismic.

I don't see a lot of box beams, pin box beams supports. So those are unusual, and if I were a piping person and I saw that, I would say, "Hey, what's going on and why, and has everybody considered everything here?"

But again, that's hindsight. If box beams like that weren't used, then I wouldn't expect the analyst to make much of a comment.

So I'm not sure that that problem is any worse than the mass participation problem with respect to the fact that I'm not convinced that we need a procedure in place to have people worry about mass participation.

You know, if one could define all of the situations that created the concerns, then we would know what to do. The concerns are there, and I'm not exactly sure why all of them are there, other than I think I make a statement in here that the support designs are unusual to a lot of us.

We can't rely on judgment. We can't rely on some industry practice. You know, "Yeah, that's

worked before. I'm used to seeing that," and, therefore, we become very critical about those things and become concerned about whether they are going to work or not.

That may be the biggest single issue, but I can't tell you why that happened.

MR. LEVIN: Don, you indicated in another area with respect to steam and water hammer concerns that -- you cited some examples. For example, offset mass and how that may be exacerbated by those transients versus the seismic event.

I guess I'm interested in -- not knowing, but were those events considered in the analyses at all, or is your concern in how they were treated, or is it just simply the fact that when it was treated, offset mass wasn't --

MR. LANDERS: No, I keep hearing that they were considered in the analysis. I am not suggesting that they weren't considered in the original design.

I have never seen, I have never reviewed any analysis.

MR. LEVIN: Okay.

MR. LANDERS: And I don't want to, you know, really, at this point.

However, when we have been addressing these

single issues, we have always looked at the seismic impact on the single issues, and I am much more concerned about operating transients.

I don't know how those were done and I don't know if one-year elastic time-history analysis was used.

MR. LEVIN: You are just, I guess, observing that given the physical arrangement for some of these supports, that that would tend to be a more difficult situation under those terms versus seismic.

I would tend to agree with you because of the nature of dynamic loading.

MR. LANDERS: The loads are much higher.

MR. LEVIN: Higher and just much --

MR. LANDERS: And to a degree, any direction, and one would anticipate more pipe displacement.

MR. LEVIN: So our starting point is a little bit earlier down the line. You really haven't looked at the details of that.

You are just observing the physical --

MR. LANDERS: Just observing the physical and reading the response to questions from everybody who is raising issues, I keep hearing people talking

about the seismic problem. You know, at this point, I'm not that concerned about the seismic problem at Comanche Peak.

MR. LEVIN: One other thing: I concur in your recommendation as far as -- we want to create an integrator, and that may be an analysis that considers properly mass participation, mass point spacing, actual stiffness, and those things are straightforward, whether you are talking about a more typical type of analysis as compared to a more sophisticated non-linear one as you've discussed.

But I'm still interested in discussing, particularly with regard to stability, whether or not you believe that -- I think because we are trying to integrate so many things, we need to have some means of doing that. I concur that we want to do that as simple a model as possible.

Can we -- I'm saying this in part out of ignorance of all the configurations in the pie. Will we be able, using those methods, to include that as one of the variables into that equation?

I suspect -- The reason I say that is I suspect that we'll have to make certain assumptions, and we'll have to balance out maybe the uncertainties with those assumptions versus the positive benefits of

being able to find an integrator. Okay.

MR. LANDERS: Well, I think in some cases you can, I think, include that support in the analysis, and after you are through with the analysis, we can look at the stability question.

MR. LEVIN: And verify that it behaved as you --

MR. LANDERS: I think there are others, when you looked at the details you would say, "No, I can't. I've got to either do something to that support or --"

MR. LEVIN: So that means -- For those, and that's the subset that I'm focusing on, if it appears that you can't do it within this model that's going to integrate numerous variables, you have a choice of developing a detailed model.

And your recommendation is do that locally. Don't develop -- Don't send in 271 stress problems that are non-linear dynamic analysis.

MR. LANDERS: Yeah, we have other options.

MR. LEVIN: Yeah. Okay, I'm getting to those.

The other options might be testing or modification.

MR. LANDERS: And a fourth option: Do you

need it?

MR. LEVIN: Okay. That's something you could verify with a simple model.

MR. LANDERS: My gut feeling is that there's a lot of supports out there you don't need, and hopefully, those would be those supports that have stability questions.

Do you need it or don't you need it? There are a couple of supports that are stability questions in the main steam that bumpers were put in that Cygna's not happy with. Analysis has been done that says remove them -- I mean, you don't need them.

My concern is remove them. If we don't know whether they are stable or not, if we don't know where they are going to be, let's get them out of there.

MR. LEVIN: Your concern is that they may interfere with normal operations?

MR. LANDERS: Normal operations, absolutely. I mean, everything may be fine. It may get a turbine trip that may cock the restraint. Now what do I have during normal operations?

So let's get the support out, and that question disappears.

So where those issues are real issues and

we can't get agreement with respect to stability, I think in a lot of cases you don't need the support and maybe you can get rid of it.

Maybe you do need it, and so now we've got to discuss the technical approach.

I would hope we don't have to get into large detailed analysis of a small portion of the piping system in order to defend the stability design of a given support.

It would seem to me like the cost and the time associated with that would far exceed the....

MR. LEVIN: I just, you know, independently, Don, have come to the same conclusion, that we're going to have to entertain, at least at first, a sampling program for getting into the systems and looking at hardware.

It strikes me that there's two ways to do that. One might be to take a very statistically pure approach and truly randomly sample through small bore or large bore runs.

Another approach may be to try to bias it according to engineering attributes, possibly attributes that are biased towards known or suspected stability problems or lines that you might think are more susceptible to a mass participation

problem, or some set. We could develop those attributes based upon a list of variables.

Do you have any thoughts on that? I think there's benefits to both ways. I believe that we'll be able to, from an engineering -- We could probably get -- One analysis gives us a feeling for how representative the systems are, how they would respond in a representative sense.

Another one would give us a feeling for a lower bound response.

MR. LANDERS: I quickly learn, sitting on this side of the table, the best thing to do is to respond to the Applicant's submittal.

(Laughter.)

MR. LANDERS: I didn't know that a month ago.

I think that the Applicant should decide the approach and the Staff should review that, and they should comment and approve or disapprove.

I think that's really a situation that you people should address. You understand the issues as well as the Staff does.

MR. LEVIN: Those are two choices. We've got to pick one.

MR. NOONAN: Mr. Beck, I wonder if we could

take a break.

MR. BECK: Why don't we break for 15 minutes at least?

(Recess taken.)

MR. NOONAN: I guess we can go ahead and continue here after the break.

I'd like to basically start down with John Fair, talking about some of the concerns that he has.

John has been working on the responses to the summary dispositions. He has been doing this for some time now.

He has some technical concerns. I think we'd like to go ahead and get those on the table.

John.

MR. FAIR: Yes. I'll go through the motions one by one which I am reviewing and still have open technical concerns with.

The first one I'll go through is the friction forces. In order to lead in, some of the people recently involved in this project, I'll give a little discussion on exactly what argument the Applicants have put forth in this motion.

The concern is that some of the piping design -- pipe support design organizations made an

assumption in the analysis of pipe supports for the case of friction force calculations, which is the pipe sliding across the support, putting a force on the support in a direction that the support generally isn't intended to take a force.

This assumption was to neglect these forces for pipe motions that were less than one-sixteenth of an inch, the Applicants figuring that one-sixteenth of an inch is a very small amount of movement and such forces would be negligible.

Now, there was two main arguments in your motion.

The first was that these friction forces would be a fairly insignificant load, coupled with the fact that you did have ASME Code provisions that allowed you to bump up stress allowables for primary plus secondary type loading conditions.

Now, in order to address this first argument, we asked you to summarize the results of some of your analysis, and you chose a sample of six pipe supports for analysis, just looking at the friction forces alone.

When you did this analysis with just the friction forces, it turned out that on a couple of cases the results of your analysis showed that these

forces were fairly significant; i.e., greater than 50 percent of the normal allowables.

Therefore, the first part of your argument was not supported by the results of your own analysis.

Now, the second part of the argument was that considering these friction forces, you were still able to meet applicable Code allowables, when they were included in the analysis.

However, the Intervenor CASE pointed out on one particular support there was an error in that support calculation in which the Applicants agreed with, and resubmitted another calculation.

In resubmitting this second calculation, the Applicants changed an assumption used to analyze the stresses in the fillet weld-to-baseplate joint.

This assumption was that the contact point between an I-beam and a baseplate where there was a fillet weld on the upper and lower flanges of the I-beam.

The assumption was that there was full contact bearing between these two elements and, therefore, on the compressive side of the I-beam under bending load, you could assume that all the loads were taken out in compression between the I-beam and the baseplate and you did not have to analyze this

stress in the fillet weld.

I can find nothing to support this assumption in the ASME or the AISE Codes; and, therefore, I have no basis to accept that calculation.

If I don't accept that calculation, as the Intervenors pointed out, this will result in an over-stress in the fillet weld; and, therefore, you have not even proven for this sample of six pipe supports that you can meet applicable allowables.

As a side issue to this, the Intervenors made some arguments as to what the appropriate Codes and standards were for doing this analysis.

One of the issues had to do with whether Reg. Guide 124 was applicable. Now, Reg. Guide 124 simply imposes some conditions on Subsection NF of the ASME Code, which does not allow you to use in general some of the higher allowables unless you take a look at some specific cases; and one of these has to do with shear stresses.

You have come back and made an argument that what you were analyzing was a Class II -- or a Class III support, not a Class I, which the Reg. Guide is applicable to.

However, putting aside the legal arguments of whether the Reg. Guide is applicable to this specific

support, the technical bases in the Reg. Guide are equally applicable whether it's a Class I, II or III support.

So I have the following question, and that is: What are the Applicants' design criteria for all three pipe design groups, regarding the use of provisions of NF 3231.1 of the ASME Code?

And I'd like to hear a discussion of what the Applicants view are the applicable limitations from Reg. Guide 1.124, which are incorporated in the design criteria, and how they are applied to ASME Class I, II and III support designs.

And if it's the Applicants' position that Reg. Guide 124 does not apply to Class II and III supports, what do the Applicants feel applies to those supports.

MR. NOONAN: If I can interrupt at this point just for a minute.

To me, this is an example where we have a lack of communication between the Applicant and the Staff, where John has pointed out where you seem to have deviated from the Code, and there seems to be no agreement on what criteria was going to be used.

I think, Howard, in your work, this is important that this thing is resolved early on. Let's

make sure that we have a set of criteria that we agree to to cover these various issues before you get into a plan and you start doing analysis and so forth.

I think what John's saying here, I think this is something that could have been done a long time ago, could have been agreed to, but it didn't seem to happen.

I'd like to know how to fix that kind of a problem.

MR. LEVIN: I think, Vince, that listening to what John has to say, that our starting point may be a little bit different.

The general issue here is the impact of these friction forces on support qualification, and I think I'd like to approach that issue with an open mind, looking at the merits of the design basis that exists, but not necessarily -- approach it independently as opposed to historically.

That's the way I'd like to enter the problem. I'd like to be aware of it, yes, there is some concern. In fact, address your question, John, your last question, is how I would start.

We would be addressing the adequacy of the design criteria, the verification that it's been met, but focus towards the significance of friction forces,

as opposed to -- I think we may have to review some of the evaluations that have been done historically, verify them, use portions where we can verify them, supplement them, in some cases ignore pieces that we can't utilize.

So I don't know. I'm going to find it difficult, I guess, to respond to the details here, just because we weren't involved, John, you know, in terms of what the positions in past communications were.

I guess the people I have here aren't the right audience for that. I think we could -- it could be more beneficial to us if we kind of address the issue, the general concern of friction forces, how you think it may impact design, and generally what we ought to look at, like the accuracy of the criteria, the implementation of the criteria.

I'm not going to gain much at this point, at least at our level of knowledge, to go through the detailed evolution in terms of communication between you and the Texas Utilities people that may have transpired over the last year or something.

MR. NOONAN: I think what John is trying to do here is basically give you an example. He posed it as a question, but that would be a question we would

normally send to any other Applicant if we were doing this.

We would give that question to you on a piece of paper and we would send it down here, and there would be a meeting and we would resolve the differences of opinion, if there were any. You know, we would come to some agreement as to what the answer to that was.

My point is that hasn't happened yet. I want to make that happen now.

But he's posing the question to you. I don't think we fully expect you to answer it or get into detail.

MR. LEVIN: Yeah. We couldn't attempt to.

MR. NOONAN: Clearly, what he's given you, he's given you a question that says, "Here's something for you to consider. Here's a question that needed to be asked and never was asked, and now here it is."

If you do things that maybe makes the question go away, that's fine, too; but whatever it is, you ought to at least recognize that here's the kind of problems John had in going through these summaries.

MR. LEVIN: But our view of it and the way we approach it is going to be much the same as yours

was.

MR. FAIR: Let me stop you right here. Let me get two things.

First, on asking these questions, we haven't had a formal meeting in quite some time on the summary disposition motion, because we were getting prepared to file for several months.

In the intervening time, the Intervenors have filed their responses and brought up some issues, and we've had additional time to review other things that are going on in different areas.

So that's point number one.

Point number two, what I was trying to bring out on this example, the friction forces motion, was that your arguments that you put forth in that motion, whether or not I think a sixteenth-of-an-inch motion that you neglected to analyze for is a safety concern or not, the arguments that you put forth are not supported by the facts.

MR. LEVIN: And my point is that we are going to look at the merits of those arguments independently.

We are not an advocate of those arguments. We are an independent party much the same as you took a look at them, John, and where we find them to be

inadequate, we'll have to do other things.

So I guess we're not in a position to defend those things one way or another. We'll take a look at the merits, just as you did.

MR. NOONAN: Okay. John, go ahead.

MR. FAIR: Do you want me to continue with asking questions that I think are relevant?

MR. NOONAN: I think you can bring out things you had problems with, things of substance that need to be discussed.

MR. FAIR: Okay. The second one I had was one I mentioned in the introduction, and that was that two of the supports, when you evaluated them for friction factors by themselves, and I understand your argument that friction does not occur alone, that you have to have a thermal force to create it.

However, we were looking for the significance of the actual force from friction.

I would like to know the basis of why you can still say that the forces are insignificant, based on the results of two supports showing that these stresses or loads were as much as 50 percent of the normal allowables.

And the third issue is I would like an explanation, if there is any, for assuming uniform

bearing between the baseplate and the I-beam in the analysis of that one particular support at the fillet weld.

MR. NOONAN: If I can kind of reflect a little bit here, in the summary areas, if we were to do this the way -- you know, if we were to file our answers to your summaries, basically what we would do is be filing these kinds of things.

They go up to the Board, and then you guys come back with another answer. That's why I think meetings like this are important, to sit here and ask these questions and get answers or get action to look into it, whatever has to be done, rather than just paper route. It never works very well. The open meetings tend to work much better.

MR. FAIR: The second issue has to do with damping factors. This issue originated based on some concern that maybe OBE loads were higher than SSE loads, and was looked at by the original SIT Team in the review at the site.

The SIT Team had, when they wrote their report, had referred to a couple of damping parameters of two and four percent for a particular piping system, which were pointed out not to be in accordance with our Reg. Guide requirements for damping.

In addressing this, the Applicants have sent in an analysis, part of the analysis of that particular problem, which is stress problem 141, along with the appropriate spectra and some evidence in the computer sheets of what damping was used.

However, what was sent in was not the analysis run which raised the concern in the first place; therefore, at this point in time I am unable to conclude whether or not the damping mentioned in the original SIT Report was used or whether correct damping factors were used.

My understanding is that the Applicants have been looking at this, have been gathering together all the documents associated with this particular stress problem, and will eventually show us a detailed history of this stress problem analysis.

MR. LEVIN: John, whose scope is this stress problem in?

MR. FAIR: I believe this is a Westinghouse problem.

MR. LEVIN: Westinghouse.

MR. CLOUD: John, do you know what the system was?

MR. FAIR: No, I can't recall what that was.

MR. CHEN: Let me tell you what that is.

MR. FAIR: We don't have a handy reference to that system.

MR. LEVIN: Okay, that number and Westinghouse is sufficient, I think.

MR. IOTTI: Howard, it is a three-inch line attached to the -- in stress program 141.

MR. LEVIN: Okay.

MR. FAIR: The next issue has to do with the section property values to the tube steel sections.

This issue, I'll call it, was brought up in a twofold fashion in the hearings.

One issue involved the actual section properties, that is, moments of inertia and things like that produced in the tables for these particular tube steel sections.

An adjacent issue was also brought up by the fact that these tube steel sections have a corner radius associated with them, and because of this corner radius, there is some limited area in which to deposit a weld on some of the welded joints.

Now, the second issue was addressed by a member of the SIT Team after the hearings, and his response was filed in an affidavit.

So when I was reviewing this particular

motion, I was going on the assumption that this issue had been resolved, had been submitted to the Board, and I was reviewing only the property values themselves.

And the motion had not even addressed the issue of weld throat thickness.

However, fairly recently, in reviewing some of the things that were going on by Cygna, I came across a question from Cygna to the Applicants asking about weld throat area.

Apparently, based on this response from the Applicants to Cygna, their criteria for calculating weld throat area had changed from the time that Mr. Tapia had done his initial review.

Therefore, this area now has not been resolved by the NRC, since we did not review this change in criteria.

My question on this area now would be I'd like to see the design criteria used by all pipe support groups at Comanche Peak in evaluating weld throat area for flare bevel welds.

I'd like to also see all revisions of all design criteria for all three pipe design groups at Comanche Peak that are still the basis for the design.

For any criteria which is picked up from

later editions of AWS or any other Code, I'd like to know like an explanation of the basis as why this criteria is applicable at Comanche Peak.

MR. NOONAN: Howard, do you plan to go back and revisit all the criteria? Is that part of that? I mean, just go back and revisit all the criteria and look at it from that standpoint, what was used, what was -- or do you know?

MR. LEVIN: Well, I hesitate when you use the word "all," but --

MR. NOONAN: That's probably not the right word, but go back and review criteria?

MR. LEVIN: But certainly those issues that are -- For example, section property values for tube steel sections, you know, I envision that going into the hopper and the first step, identifying the best we can what the criteria is.

In this case, John believes it's important to know how it has evolved as well, so we will be sensitive to that.

So there's an identification. We're going to do an evaluation of the adequacy, much the same as, I think, he's seeking to do, and then verify its implementation.

That's the general three-step process that

we would undertake for any issue.

So I think that we most definitely would be asking the same questions.

MR. NOONAN: I just visualize that it seems to me that we could sit one whole day and just talk criteria. We could, in getting an agreement on what the criteria is, and do we agree with that, et cetera, asking these kinds of questions again, if we have problems, and coming to some kind of resolution.

MR. LEVIN: Yeah, but our first step as an independent party is much the same as yours, okay, what was it, and we kind of have to get there.

And then take a step back and look at it, its adequacy, its conformance with commitments, as well as how it interrelates with other criteria, its consistency with other criteria.

Yeah, and we'll make those judgments. That's part of our evaluation. At that step in time, depending upon our input and input that may come from your staff, there may be changes.

The project may -- or if it's unclear, they may tend to clarify it. But I think it will come from our third-party review, questions that are out on the table, because it's apparent to me there's a couple of issues.

One is in many cases, what is the criteria. Tell me what it is.

And the other thing is, is it adequate.

I hear a little bit of both in a couple of issues that I've heard John express here.

MR. BOSNAK: Howard, when you start with that, be sure you go back to the FSAR licensing commitments, and what your basic design specification called for.

You should have material if there were changes made, and how those changes, whatever revisions there are, still meets the licensing commitments.

MR. FAIR: There was one followup question that I had on this issue, which we had discussed in some of the meeting transcripts, but I was unable, after going back and reviewing them, to get a very clear picture in my mind as to the status, and that had to do with the fact that on many of these tube steel sections that were analyzed to the higher properties, and the Welded Steel Tube Institute -- using Welded Steel Tube Institute values, you went back and re-evaluated them to the eighth addition section property values, which were somewhat lower.

The question is: What is the exact status of this re-evaluation effort and how is it recorded in

the actual support evaluations?

Just for clarity, since you evaluated everything except for the small-bore Class II and III supports in this effort, I'd like to know exactly what the definition in the context of this motion is of Class II and III small-bore supports? What pipe size does that constitute?

The next issue I would like to cover is generic stiffness. As it stands right now, the Applicants are doing an additional study to support the motion.

I have seen the criteria presented for selecting systems for this study and I have no further comments on that criteria.

I'd like to know what the status of this re-analysis effort is, when it's going to be completed.

MR. LEVIN: John, just to make a philosophical point of how we would deal with a study like that, I think we would start with it and evaluate its merits and the degree to which it addresses the issue at hand ourselves, and determine what, if any, other initiatives would be required to address this issue, both as a specific issue and in the context of some of the points that Don Landers was making in terms of adding other variables to the equation.

My understanding is yes, in effect the same as yours, that there was a study, that if it's not complete, it's very near completion, and I guess the way you fellows should look at it, it's kind of input into our process, and we'll be conducting an evaluation of that.

If there's anything, any further steps, they will be defined.

MR. FAIR: Well, I guess my question on the results of this study, what are you going to use the results for and is it incorporated with other studies, such as the missing mass concern of Cygna's?

Are they all in the same analysis and is that now the analysis of record for those particular systems?

The other question I had is a request for additional data. In support of this motion, there was an argument that the generic stiffness calculations did not need to include localized effects, such as baseplates.

In order to support that, you did some tests in the field to measure actual support stiffnesse and compare them to your calculated values.

Apparently, there was a problem with some of the supports on the first set of test measurements

and, therefore, you went back and retested those supports.

I would like to see the actual test data for both the initial test and the retest of those supports, and the actual calculations for the support stiffness that you compared these tested values to.

The next issue has to do with U-bolts that were intended to be one-way restraints which could act as two-way restraints.

At the last meeting we had here at the site, I stated I went out and took a sample of some of these supports that were in the motion to measure gaps in the direction that the support wasn't intended to be in, and that these gaps were not uniform and did not meet that one-sixteenth of an inch that was stated in the motion.

Because of this, the Applicants re-analyzed these systems and included a thermal run on some of them that were not included in the first motion.

Now, the reason the thermal run was not included in the first motion was the assumption that there was a gap in there that exceeded the thermal motion.

It appeared to me from reviewing the results of this analysis that there was a U-bolt in

that analysis where the new generated loads may have exceeded even the new set of load-rated allowables developed by the Applicants by test.

It was not clear to me, because this particular U-bolt did not appear in the original Table 1 of the motion.

Also, in the submittal, it had stated that the re-analysis had shown all piping stresses met the Code allowables.

However, it was silent with respect to all the supports associated with those piping systems.

Therefore, I need some clarification as to whether all associated supports were reviewed and determined acceptable, and I'd like to see all support analyses associated with those three piping systems that were re-analyzed, all support analyses.

Also, as a result of some Staff questions, some of the test data was resubmitted on the four-inch and twenty-four-inch U-bolt load deflection tests in the normal direction, or direction of intended restraining U-bolt.

It appears from reviewing the data in Figure B-1 that this does not correspond with the actual deflection given in Table B-1.

I'd like an explanation whether there is a

discrepancy and whether -- which data is correct.

MR. NOONAN: Howard, do you have any idea when John says "the analyses," how many there are at this point in time? Do you have any idea at all?

MR. LEVIN: Are you talking about piping problems or what?

MR. FAIR: If you are referring specifically to the first set of questions, there were three examples of piping analyses performed with these U-bolts.

There's a limited number of these U-bolts at the facility. In order to support their motion, they did it by a sampling basis.

The sampling basis was intended to include the U-bolts that existed at points where the piping motion was the largest.

MR. NOONAN: I'm looking for volume, John. How many are you talking about?

MR. FAIR: Three piping analyses.

MR. NOONAN: All right.

MR. LEVIN: That was the sampling, John.

MR. FAIR: That was the sampling.

MR. LEVIN: Okay.

MR. FAIR: The final motion which I will discuss is on the Richmond inserts.

In the motion on the Richmond inserts, there were several pieces to it.

One of the pieces was to go out and test some of these inserts for their capacity.

They involved shear tension and shear tension interaction.

Some of the tests performed in the March 30th, 1983 -- that were in the March 30th, 1983, test report, Tests Nos. 7 and 8, it appears that there were very large shear deflections at load levels which would equal the design load.

I'd like an explanation of why these large shear deflections occurred.

This was discussed in CASE's response to your motion.

MR. LEVIN: John, did these seem to stand out from other tests? You mentioned seven and eight, and I don't know how many -- I'm not knowledgeable as to how many tests were done.

MR. FAIR: There were a number of tests and these particular tests did stand out as rather large shear deflections at design loads, shear deflections in the order of four-tenths to a half of an inch.

MR. LEVIN: So let's see, you are

interested in understanding what that could be attributed to?

MR. FAIR: That's correct.

Another issue raised by the Intervenor had to do with how these bolts are actually installed in the field.

I'd like to know very clearly what the field installation criteria for angularity of Richmond inserts is at Comanche Peak.

I'd also like to see the calculations for Support CC1-028-024-S33R that was provided by CASE in Attachment N of their response to the motion.

Another part of this particular motion, there was an issue on torsional loads creating some bending loads on these A-36 threaded rods.

In order to evaluate this, the Applicants selected a sample where the bending torsional loads were the most significant.

I'd like a more detailed discussion of exactly how these supports were selected and what exactly was looked at in order to pull these supports out for evaluation.

MR. LEVIN: John, just for our benefit, what is the configuration and how are they applying these torsional loads to the threaded rod?

MR. FAIR: This was one of the major issues that had to do with how do you evaluate the Richmond insert tube steel connection --

MR. LEVIN: Oh, it's a tube steel connection

MR. FAIR: -- for torsional load cases.

MR. LEVIN: Okay.

MR. FAIR: As it turns out, there apparently is a problem with the bending being reproduced into the bolts where you have offset conditions from the centerline of the tube steel.

Another issue involving the Richmond inserts and tube steel connections had to do with how do you model the connection, whether it's a fixed or pin model.

There was some confusion in the original affidavit in one particular section as to what exactly was being discussed in terms of fixed versus pin connection, as to whether that was the bending moment along the axis where the tube steel and the bolt belong or whether it was some other bending moment.

There was a response by the Applicants which essentially changed a discussion in part of the affidavit to change this discussion from talking about bending to torsion.

In the context of that section, I still

have problems that the whole thing made sense when it's talking about just torsion, and this discussion is in Pages, I believe, 35 to 39 of the affidavit.

I would like a discussion of the relevance of the evaluations performed in Table G, Page 38 of the affidavit, if this entire discussion is indeed talking about torsion.

Also, since the discussion in where it was up to the analyst to model as fixed or pin, happened to be the torsional load case, I don't think sufficient basis exists in the motion to justify that that assumption may not lead to a problem with stresses or flexibilities in any of these supports.

Therefore, I'd like to have some further basis to justify that the assumption of fixed would not result in any problems for these frames where the torsional moment was judged to be fixed by the analyst.

A final major issue of discussion on the Richmond inserts has to do with how do you handle this bending that's induced into the bolt.

It's already been discussed that this bending is not normally considered by AISE or Subsection NF and, therefore, there is no direct criteria from these sections.

The Applicants have developed their own

allowable interaction formula and have provided some evaluations to justify it based on evaluation procedures that could be used in Subsection NB of the Code for components.

I'd like the following issues to be discussed relative to the Applicants' evaluation of this bolt allowable bending:

Number one, any uncertainties in the assumptions used in proportioning the moment to the bolt that were presented in the affidavit on Page 26, and this was simply a method of providing a simplified analysis procedure by assuming certain percentage of the load went into bolt bending.

The tolerances, or as we call them, the bolt-hole gaps, whether that has any effect whatsoever on these induced bending loads.

And, also, any criteria used by the Applicants for allowances of bolt angularity; that is, deviation from perpendicular.

MR. LEVIN: John, I think that your discussion, because of how well it was organized, will be of value to us as we review the transcript, after we get more knowledgeable on the details, and I think that's exactly what we'll do.

I hope that as we get a better physical

understanding for this hardware criteria, we'll be taking a look at your presentation and possibly even getting back with you, you know, to help amplify when it means more to us.

I guess one question I had is: Are these six areas the general focus of the message that you would like to give us that we should concentrate on? Are there any others, I guess, is my question?

MR. FAIR: Well, the message I'm giving you is the areas that I'm having difficulty accepting the Applicants' motions as they stand.

MR. LEVIN: Okay.

MR. NOONAN: I think what we are trying to do here is basically give you a flavor for some of the problems Staff is having with the motions.

I recognize there's probably no need to go into all this kind of detail as far as you are concerned right now, because you can't answer the questions; but at least you can maybe hear the kinds of things that John is having problems with when he tries to respond to the motions.

Those are typical for other Staff members, those kinds of things are typical for other Staff members.

John is basically finished right now. I

do have a couple of more Staff members that need to talk, but I've got a logistic problem here.

I guess if it's okay I'd like to maybe break at this point and reconvene about 1:00. I need to make some phone calls back, and I also need to talk to a couple of the Staff before we come back at 1:00 o'clock.

If I could do that, I'd like to do that and come back at 1:00 o'clock and proceed on.

MR. BECK: Okay.

MR. LEVIN: Vince, I just want to make one last statement, that the look that I plan to take on these issues is going to be broader than -- Many of these questions are very specific questions.

We have to start with a broader focus than that. I think John has got us to the right address, and how we find out which room to go into.

MR. NOONAN: Maybe some of John's questions will even go away after you get going. I don't know the answer to that.

Maybe you'll do something that resolves his question, and he doesn't have the question any more.

I guess I just wanted you to hear what sort of problems the summaries are and, again, these

are typical.

We will go ahead and come back at 1:00 o'clock.

(Whereupon, at 11:30 a.m., the meeting was recessed, to reconvene at 1:00 p.m., the same day.)

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AFTERNOON SESSION

1:15 P.M.

MR. NOONAN: I guess we can go ahead back on the record for right now.

We just returned from the lunch break.

This morning you heard from two people. One is Don Landers, who is a consultant to us, and then also John Fair.

The purpose of having John basically give you the kind of detailed questions we have, you'll notice his questions are very detailed, very specific. It was basically to give you a sample of some of the problems that the Staff in general has with the summaries.

Howard, I know you can't respond to that, and I don't really expect you to, but those are the kinds of questions.

I guess you need to go back and look at all those summaries. You personally have to look at them. You have to see them, and I would guess that you probably have as many, if not more, questions on your own, you generally, just looking at them.

But that was the kind of thing basically on the Staff review of the kind of things we do, looking at the review, being prepared to respond to

the summaries.

I felt those kinds of questions ought to be answered in these kinds of meetings, rather than have us respond to your things formally and add to the paper trail.

It's on the record. We can send this to Judge Bloch and the Board, which I will do when we are finished here.

But it's on the record and basically these are the types of things you hear from the Staff.

This afternoon we are not going to basically go into that kind of level of detail. I think what we want to do here is to cover other areas that have really been enveloped in Don Landers' report, about the stability questions and so forth.

I'd like to have Dave and Paul Chen basically address concerns that they have in this area, but they won't go into the kind of specifics you heard this morning.

It will be basically things -- at least so you can identify the kinds of concerns the Staff has at this point in time.

One thing that was said to me when we met right after we left here, and I think it needs to be re-said again: The Staff feels very strongly that

the third party that you have over there right now ought to hear all the parties, including the NRC, including Cygna, including Mrs. Ellis and CASE and the Walsh-Doyle people. Sit down with them, talk to them, listen to them, hear what their concerns are.

So then when you come back with the planning, you have talked to everybody; you've had a look at all the concerns.

Like I said, maybe you don't hear anything new, but at least you've talked to people and you can talk to them personally and hear their questions.

I guess with that I'm going to go ahead and let -- Dave, are you going to be the one that goes next?

MR. TERAO: Yes.

MR. NOONAN: Let Dave go ahead and talk about some of the concerns he has on the pipe support stability.

What I'll do here, I think we'll probably talk for at least a couple of hours. I plan to break about that point in time.

Some of the NRC Staff wants to walk out to the site, out to the containment. They have some things they want to look at. So they are going to do that by themselves, a small group.

Then tomorrow morning I'll come back. I want to talk about the slides you gave us today a little bit, and if there's any other concerns the Staff wants to bring forth at that point in time, we'll hear them in the morning.

I guess I don't see this thing going much past noon tomorrow, the way we're set up right now.

MR. LEVIN: As part of Dave's presentation, Vince, for the benefit of my colleagues here who may not be familiar with all the physical geometries, Dave, if you could kind of give us an intro as you introduce the subjects, particularly with regard to stability, it would help people visualize things better.

So I would appreciate that, if you could, just a short description of the --

MR. TERAO: Well, before I even get into the stability issue, I just want to reiterate the situation the Staff is in and try to put into perspective why we are having this meeting and why we are discussing these concerns with piping and pipe support designs.

Today, what you heard with John Fair's affidavits -- or John Fair's comments on summary disposition motions, the Staff had quite a few question

comments, concerns about the summary disposition motions. That's what we are discussing today.

It doesn't necessarily imply that those are all of the Staff's concerns. In other words, it's only indicative that we've looked at the summary disposition motions, and we do have some questions with those alone.

Of course, the Staff is also aware of the four phases that Cygna is working on and in many ways shares the concerns that Cygna has expressed in their recent letters, and also with the efforts that the Staff has done in the TRT scope that you'll be discussing later this week and next week, too.

So when you put all of these different efforts together, it sort of spells the picture about our concerns with the piping and pipe support designs. So I just want to make that clear, so that when I get into some of these pipe support stability issues, these are really some of the issues that we've identifie from the supports that have been identified by Messrs. Walsh and Doyle, and from just some of our own field experience in walking through the plant, and may not necessarily represent all of the unstable supports.

I really had two summary disposition motion

that I -- in my scope of responsibility.

One of them was the AWS and ASME weld design. That, I believe, is the only summary disposition motion formally filed by the Staff.

I won't go into any detail on that, because it is on the record now. I would just suggest that you read our comments in there. It's there in the record.

With respect to stability, this was one area where the Staff had some of our major concerns. Don Landers talked this morning, and I thought gave a very good overview of the Staff concerns.

I could go into some of the details. I don't know that it's necessary to go into all the details.

The one point I do want to mention is that Cygna recently filed their letter, a February 19, 1985, letter, stating their position on stability.

One thing that I would like to at least clarify is that there seemed to be a very high percentage of supports identified in that letter with respect to being potentially unstable.

I do want to clarify for the record that we have to understand the Cygna definition was a very broad definition, and by broad I mean that it's not

your classical definition of stability. In fact, it's quite a lengthy definition of stability.

I don't want to state at this time whether or not we agree with the definition. In many ways it does reflect what the Staff has been talking about with Cygna and with the Applicant until now.

The one area that I felt Cygna did a good job in was at least -- the dividing of the types of instabilities into system instability and pipe support instability.

That's one area that hopefully will clarify the record. There was a lot of misunderstandings in the hearings when we were discussing the stability issues.

With respect to system stability, I think what I would like to say at this point is comment more on what was filed by the Applicants in their motion for summary disposition regarding system stability.

That was one area where we really didn't agree with the Applicant with respect to analyses, piping stress analyses being able to predict system instability.

We still believe that it's not analytically feasible to predict instability in the piping system, but it is common industry practice and it is, let's say,

more feasible to ascertain whether a system is stable by actually reviewing the pipe configuration and the support drawings; and because of the complex pipe supports at Comanche Peak, because it's difficult to review a piping configuration in the field, we felt that there is some need to look again more closely at system instability by using not only the pipe support people, but also the piping people.

In other words, possibly reviewing out in the field both the pipe support designs and also the isometrics to be sure that you have a stable system.

Also, Don Landers' comments this morning about reviewing these systems, not only for seismic, but also for normal loadings, such as water and steam hammer.

With respect to pipe support instability, we had several concerns that have been expressed already at meetings with Texas Utilities. We had meetings August 8th and 9th, August 23rd, where we expressed some of our concerns with the specific unstable pipe support designs.

I'm not sure exactly how you are going to go back, whether or not you are going to review the record for our comments there; but at this point Staff

still has concerns about what was filed with the summary disposition motion and in addition to what Cygna has identified in their recent letter.

MR. LEVIN: Dave, just to respond to that, our plan is to review them.

I think one of the first steps in this process is in fact to get all the issues on the table and identify where they overlap.

I think various parties are essentially questioning the same issue. In our attempt to identify them all and get them all in the right box, I think that's going to be part of the effort.

So I believe that some of the filings, as well as meeting minutes, will provide database.

MR. TERAO: Going on to another sub-issue of stability, I think I'd like to comment on some of the modifications that we've seen to some of these supports.

I think we've expressed the concern before that many of these support designs, some of the original designs tend to be very unconventional or unique, and the modifications that we've seen to alleviate some of the potential unstable design, we also find to be questionable.

In other words, we found that in many cases

the modifications themselves did not use what I would call standard industry practice, but maybe they were adding more steel that we don't completely agree with.

For example, the stability bumpers that were identified by Cygna was one of those modifications.

The use of the cinched U-bolts on a boxed frame was another such modification.

So in many cases these modifications may or may not have cured, let's say, the unstable concerns, but it's very difficult to tell. Because they are so unique, it's difficult to predict exactly how these modifications are even going to perform.

Now, Cygna, also, in their definition of instability, broke it down into a force requirement and a geometric requirement.

I admit it was a very complicated definition. I think what I'd like to do is at least present the Staff's understanding of what Cygna meant by a force requirement and geometric requirement.

By the force requirement, I believe the Staff would tend to believe that the support can be unstable if the load path is not predictable or calculatable. In other words, if there are elements within the support design, there are hardware elements whose ability to resist that load is uncertain, I

believe that is how I am interpreting Cygna's definition of force requirements.

For example, the twisting -- the ability for a U-bolt to resist a twisting motion, or if you were to use any materials that had questionable yield or tensile properties at temperature.

The geometric requirement that was discussed by Cygna, we are interpreting it to mean actually a fundamental performance requirement of the support; in other words, whether or not that support is even going to perform as intended, whether or not a support will slip, whether or not it can move.

Those are what I consider to be performance requirements.

I just want to put that out. I think these are areas that should be looked at in a little more detail.

To give you some more examples of the modifications where the Staff is finding it's not conclusively acceptable or where it's still questionable the supports that were in the motion for summary disposition identified those box frames with single struts and snubbers which were modified using three different techniques.

One was to add index lugs and the second was

to add more struts to prevent the frame from rotating around the pipe.

Since our August 23rd meeting, we did have a submittal by the Applicant, I believe it was a September 24th, 1984, submittal, where the Applicant provided us with 44 different double-strutted supports.

In reviewing those supports, we did find other effects in tnere that raised questions, such as some of these supports have gaps on the sides of the -- between the pipe and the frame itself.

In other words, it was not a zero clearance gap on all four sides. Two of the sides had zero clearance and two of the sides did have gaps.

Those supports would then exhibit the same type of potential instability that Cygna identified where the support can then rotate in the axis perpendicular to the pipe axis itself. It can actually cock itself.

Another question that has never really been satisfactorily addressed is whether or not there is adequate friction within these box frames to prevent these box frame supports from sliding along the axis of the pipe.

Again, we felt this was a unique design. Instead of using standard pipe clamps where the friction

is at least controlled from a bolt torque, when you have a solid frame around the pipe, it's dependent upon the welding technique to develop that friction, and it can't be controlled once it's welded up.

MR. LEVIN: Dave, you are referring to these frames with zero clamps?

MR. TERAO: Right.

MR. LEVIN: And the potential for not really obtaining it due to the way it's fabricated?

MR. TERAO: Yes. Obviously, there's friction there. The question really is how much friction is there.

In other words, even in a zero clearance frame, it's still uncertain whether or not there was a tolerance allowed to have a sixteenth-inch gap or not.

But even if you had completely a zero inch frame, whether or not there's enough friction in there to prevent the frame from either moving along the length of the pipe.

In the Applicants' submittal, it did address it for struts, for double struts, and provided an argument why double struts cannot physically move very far along the length of the pipe; but there was nothing addressing the use of, say, double snubbers.

With respect to the modification using

the index lugs, at one of the meetings -- I don't recall if it was the 8th and 9th of August or on the 23rd -- we asked the Applicant whether or not there is a potential for the support to disengage from the lugs themselves.

I don't believe that's ever been addressed.

MR. LEVIN: That would be along the longitudinal axis?

MR. TERAO: That's correct.

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MR. TERAO: With respect to the stability bumpers, I also want to reiterate Don Landers' concern this morning that if those stability bumpers were not needed that they probably should be removed, if that support is not needed.

Also, in the September 24th, 1984, submittal to the Staff, there was an Exhibit F-10 where a triple-strutted box frame, Support No. CC-1-019-006-A43R, was identified. And that support is located on a vertical pipe riser, and it's resting on a structural steel member, apparently for stability purposes.

Now, the design, itself, has a potential for the frame to impact that structural steel member during any outer plane dynamic displacements. And we would like you to address that type of design.

Again, it's our concern with the modification to a support that might introduce more problems than the original design itself.

What we'd like you to be aware of is in your review of any other supports at Comanche Peak, which could have any similar problems of either impacting itself, or impacting the pipe, or impacting any other piping components, such as the insulation, during outer plane dynamic displacements, we would like you to identify any of those piping supports.

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Also, in your September 24th submittal there was some main steam supports identified which were described as trapeze-type, utilizing a U-bolt pipe attachment with a clearance gap, but no support drawings were given. We don't know exactly which supports those were.

But what we need, really, is the basis for the summary disposition motion concluding that snugging the U-bolt during the U-bolt torquing program will eliminate any concern for instability.

It sounded to the Staff to be the same support that Cygna had identified, but we aren't really sure.

And, finally, and I believe Don Landers mentioned this this morning, in order to prepare an adequate design of piping systems and piping supports, the final as-built condition of a support must be carefully examined, specifically with respect to the factors that affect the functionality of the support.

We recognize that an as-built check was done, but it appeared to be more in line with checking orientation and support locations, and assuring that the support design is in conformance with what is installed.

In light of all the factors that we have

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discussed, we think that an as-built check should be performed to carefully examine and review these support designs by all the design groups involved, not only the pipe support people, but piping people.

MR. LEVIN: And you make that recommendation from an engineering point of view, to understanding its behaviour?

MR. TERAO: Yes.

MR. LEVIN: As opposed to -- I want to make sure I understand.

There's not a question as to the as-built that was done to dimensional types of issues. It's functional that you're recommending.

MR. TERAO: That's correct.

MR. LEVIN: Okay.

MR. TERAO: And going back to Don Landers' comment about the interface between the piping and pipe support design, because of the issues that are in front of us right now, we really would recommend that piping-type people actually look at some of these supports out in the field, along with the isometric, and review the system as a whole to assure that the pipe support design cannot be impacted, cannot impact the piping integrity.

And, of course, in that type of review the

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supports should all be reviewed for any potential instability concerns.

That, basically, completes my broad overview of the stability issue. If you have any specific questions, I could answer those now.

MR. LEVIN: Well, you've indicated examples, Dave, particularly some original designs as well as modifications, modifications which may have exacerbated the situation.

I'm curious, some of those modifications included cinching U-bolts, and I'm curious as to your views, you know, under what, you know, other circumstances where that is a piece of a solution to the stability problem, what things that you may have -- you know, I understand that there may be significant information on the record that try to deal with that, but what pieces of it in particular you may have had difficulties with, if there's any further focus you can give us in that area.

MR. TERAO: The actual cinching of the U-bolt falls under Paul Chen's review.

MR. LEVIN: If he's going to address that, fine.

MR. TERAO: So, actually, we still have, I won't say -- Well, I think I'll just leave it at

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that point. I think Paul Chen will address a cinching of the U-bolts.

MR. NOONAN: Okay. Any other questions?

MR. LEVIN: No.

MR. NOONAN: Okay.

MR. LEVIN: Thank you, Dave.

MR. NOONAN: Paul Chen is a consultant we have on board also to look at these issues. And with that I'll just go ahead and let Paul start his part of it.

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MR. CHEN: Before I begin, I would just like to make a few comments. I heard several times this morning a question of what a definition of what these problems are, the Walsh-Doyle concerns.

I think for you to really understand what these concerns are you have to go all the way back to the depositions that were filed by Messrs. Walsh and Doyle. You've got to go back through the ASLB record. You've got to read the proposed findings that were submitted by CASE, by Staff. You've got to go back and read the Board's memorandum and orders on QA and design.

And you've got to read all the CASE and NRC comments that have been submitted on these summary dispositions.

I think reference to the four boxes of information that I carry around, which have been mentioned a few times, that's no understatement.

MR. NOONAN: It's actually six, isn't it?

MR. CHEN: It's close to that now.

I think some of the things you've got to bear in this group program that you're coming up with --

MR. NOONAN: Paul, speak up a little louder.

MR. CHEN: Okay.

-- is to be aware of some of the Board's

concerns about QA design in general. You've got to make sure that your procedures are adequate, I think, to satisfy all of your commitments in the FSAR, commitments regarding general design criteria in Appendix B to 10 CFR, ASME Codes, other Codes and standards and Reg. Guides.

I have gone through or reviewed four summary dispositions and come up with a bunch of concerns. I'm not going to go through a detailed listing of all these concerns. I'm going to pick a few areas and concentrate on those for you.

The kinds of questions I think I'm going to be asking here would be indicative of the kinds of things which will be needed to really resolve all the issues that are in these summary dispositions.

And I think you should also be sensitive to the kinds of questions I'm asking in your program that you are going to propose.

Let me start off with the one of cinching of U-bolts. If you go back and look at CASE's proposed findings of facts, I think you will see there a listing of concerns which were not addressed in Applicants' motion for summary disposition. And I'll cite some of these concerns.

For example, CASE was concerned that

cinched-down U-bolts were not in compliance with the requirements of INE Bulletin 7902, and PAC Guidelines Section 2.

There was a concern that cinched-down U-bolts were not in compliance with NF 3137, 3272.1, and 2271.3 of Appendix 17.

Local deflections and extra-long U-bolts and U-bolt cross-pieces, especially where the cross-pieces are made of flexible plates or flanges, or white flange members, were not addressed.

Yielding at the U-bolt pipe interface due to point load contact was not also addressed.

Effects due to multiple cinched-down U-bolts were not also addressed.

And the next one I'm going to cite I think has been mentioned before, but this is the effects due to support masses, which are offset from the pipe centerline and rely on friction to prevent the rotation of the pipe was also not considered.

Regarding the inspection program to determine the range of torque in installed U-bolts, I think that is an ongoing thing at this point. I'm not going to say very much about it, except to point out that if such inspections are carried out in the future you should be sensitive to requirements of Appendix B.

Let me address my concern regarding the analysis, which is submitted for cinching down of U-bolt An attempt was made to justify the analytical model, and I have some problems with the analytical model, because somewhere in the summary disposition it was point out that -- or rather in the affidavit it was pointed out that the local stresses were attenuated within one meridian element of the model, and I would not consider that the model would be wide enough to determine what the local stresses are, given that they were attenuated within one element.

There was some discussion or explanation to try to correlate the tests and analytical results, and I think the correlations were not very good in some places. I would like to point out that the test configuration had a PL over 4 bending moment in the pipe walls, and the analysis did not have that, the effects of that moment. So, you really can't make the comparison.

The analysis for the slick condition -- this is addressing the question of whether ot not there was a sufficient friction between the U-bolt and the pipe so as to prevent rotation, I do not think considers the most critical loading condition.

I think the thermal, plus pressure, plus

push load I think was considered, but I can think of other configurations in which that would not be the governing case, particularly if you've got a cinched U-bolt on a cold line which attaches to a hot line, you get movements of hot line, and if the element is not a rigid strut, but it is limber, you can actually get a less severe condition than was analyzed.

It was observed during the normal vibration simulation tests that some pumping had taken place, and this was not addressed in the analysis. In fact, I'm not exactly sure what this pumping is. The test report does not really describe it fully.

I have a concern regarding the axial walking during the vibration tests and potential interferences on binding in clevises.

Elastic plastic analysis was performed at a maximum stress intensity of 40.5 ksi, yet the analysis shows that there were more severe cases; some to 3.4 and some to 4.2 ksi. But the analysis was done to show the amount of yielding that would occur would be highly localized. But you've got higher stress intensities which were not looked at.

The calculation of stress intensities ignored the radial stresses on the inside and outside surface of the pipe, and circumferential shearing

stresses on the outside of the pipe. I don't know what effect these will have on the overall results of the analyses.

Some assessments were made of stresses in the pipe walls. They were taken by -- These assessments were based on assuming that the pipe stresses were up to the Code allowable, and then ratioed down by some factors for elbows.

My concern would be with cinched U-bolts at elbows, or other piping products or components where you do have the high stresses.

We had raised some questions in August. I think we were given some explanations as to our question in the September 24th submittal. Most of these questions relate to relaxation of A-36 material.

A lot of the arguments on the cinching down of U-bolts is based on these relaxation arguments. Yet, to quote from the September 24th submittal, "Scant, if any, data is available for SA-36 material." I'm not sure what the impact of that will be on your conclusion

That's just to give you an idea of the kinds of concerns we have as to the cinching down of U-bolts.

Do you have any questions on this area, or do you want me to go on to the next?

MR. LEVIN: No.

MR. CHEN: Okay. I'l take the course distribution in axial restraints. I have a concern here basically that the proposed criteria of treating rotations of these kinds of axial restraints as being secondary. I don't believe that that argument has been justified thoroughly.

Basically, I think the loads and these axial restraints increase by a factor of two or three, and then if you propose an allowable of three times the old allowable, we don't have a problem. But if you do not accept the proposed new allowable of three times the old allowable, then you will have a problem.

In fact, I notice that the feedwater line, when the results of that was given, the loads I think jump up by a factor of around forty or so percent. So, based on the old allowable you would have a problem. And this would be a line that would be involved in the kinds of plant transients, I think, that Don was talking about this morning.

I mention this one just in passing, but if you add the total number of various kinds of supports, this is Type I, II and III that are mentioned in various parts of the affidavit, and compare them against numbers in all of the places, you'll find that things don't add

up always.

Now, I mention this, because throughout these summary dispositions or responses to questions regarding these summary dispositions, I get responses like, "Some was done inadvertently." And this occurs over and over.

I was a little bit concerned about this, when I saw this affidavit, because what I was seeing was a little bit different from what I understood was going to happen after the SIT inspections in 1982. I thought some acceptable method had been proposed then to take care of this problem, and the arguments that were being put forward here were not in accordance with my understanding of what was going to happen in 1982.

Let me go on to differential displacements of large-frame wall-to-wall, floor-to-ceiling pipe supports.

Again, I can identify some of CASE's concerns which were not addressed in summary disposition One of CASE's concerns, for example, is that wall-to-floor, and wall-to-ceiling supports are more critical for thermal and seismic conditions than the other kinds of supports.

Time dependent displacements, including those deadloads which are added after the supports

were installed, could be a problem. That although the displacements that are calculated are very small, these could give rise to very large stresses.

Treating seismic, thermal, and treating effects separately is incorrect. All of these effects should be combined, the cumulative effects should be addressed.

CASE is also concerned that treating wall-to-floor, floor-to-ceiling, the wall-to-ceiling supports as they are usually treated in buildings, that is as building supports, could be a problem. And this was not done here.

Local stresses and displacements, I guess there are a few topics here. Zero clearance box frames. I will try to put this in perspective.

Calculations have been performed to determine forces and stress for differential growths on the order of one times ten to the minus three.

Free play in the supports, I think, was not considered. The validity of doing linear elastic analyses based on this kind of displacements, I think, were not looked at.

I think we pointed out some problems regarding the ability of the analyses for supports SI-1-325-002, S-32-R, and CC-1-020-001, E-33-K to bound

stresses in zero clearance box frames was raised during the August meetings.

There were a number of questions raised here also regarding the use of formulae out of Roark & Young, considering that those were meant for thin-walled vessels and the pipes that we are looking at are the thick-walled vessels; that is, the R over T ratios were less than ten.

Formulae for stresses were taken from, again, Roark & Young. Code calculations based on these formulae. But if we look at the formulae in Roark & Young you will notice that the longitudinal bending stresses, the formulae for longitudinal bending stresses were not given. And I have a problem with that, because I don't see how you can perform a Code calculation if those stresses are not accounted for.

Similar kinds of comments could be made in regard to the second support information CC-1-020-001-A33K. Those comments also extend to the analyses for stresses in use in other piping systems.

I think that is sufficient to give you a flavor of the kinds of concerns I have.

MR. NOONAN: Are you finished?

MR. CHEN: Yes.

MR. NOONAN: I guess we are done a little

bit early. This is kind of the picture as we see it at this point in time.

I guess what I would like to do, if I could just talk a little bit about tomorrow. I'd like to come back and talk about your program plan, and give you at least some preliminary feedback on that. And if the Staff comes back with any others things tonight, then I'll bring those up to you.

I guess the next meeting, John, is yours.

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12mor

MR. BECK: Well, I will close out our presence here by saying we certainly appreciate the input that we got from all the folks that had a presentation to make today.

A lot of it, of course, is in the record from previous meetings. Howard and the other third party folks have been on notice from day one that the entire record is part of the issues they have to deal with, and certainly they will be. Insofar as that has been supplemented with some of the understandings we got today, that's appreciated, clearly.

I'd just like to reiterate, as I started out this morning, that this commitment which was formalized on February 7th in our presentation to the Contention Five Panel is a comprehensive one, and one that is going to be executed completely.

I also indicated earlier that we would be revisiting the summary disposition motions in light of the information that has come forth as a result of the efforts that the third-party folks are going through, and I'm sure that you'll be hearing from us in that regard when that revisitation is complete, which it isn't or I would have said so before now.

Beyond that, I look forward to tomorrow's input to Howard's outline of methodology, and the

13mor

opportunity to present later on this week and next the results of activitites that have taken place on the other technical issues.

MR. NOONAN: Okay. Let me kind of touch on this a little bit here.

Thursday we have the electrical meeting. Next week we have the --

MR. BECK: QA/QC.

MR. NOONAN: QA/QC to structures, testing and mechanical.

I guess from my point of view we'll be listening to you talk.

MR. BECK: Yes.

MR. NOONAN: And tell us where you are at. And the Staff will give you feedback on what they hear at that meeting.

A lot of the Staff have not heard what the Contention Five Panel heard, and I need to bring them up to speed, because they are the one to make the final decision as to acceptability of any program.

MR. BECK: I understand. We'll have comprehensive presentations on each of those days, and I would anticipate the days will be long and in full detail, so bring your mattress pads. We look forward to it.

14mor

MR. NOONAN: We'll make this record available to the Board, and I'll make it available to al' the parties as soon as they can get a copy of it.

With that, I don't guess I have anything more to say today.

Excuse me. I forgot. This is a public meeting, and I do wish to offer Mrs. Ellis a chance to comment, if she wishes to comment at this point in time.

MRS. ELLIS: I think I'd just like to wait until tomorrow at the end of the session.

MR. NOONAN: Okay. Thank you.

Also, the Cygna people, tomorrow if you wish to comment you may do so.

Any other members of the public involved can make comments at the same time.

If there are no further questions, I'll go ahead and adjourn it for today.

(Whereupon, at 2:10 p.m., the meeting in the above-entitled matter was adjourned, to reconvene at 8:30 a.m., Wednesday, February 27, 1985.)

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 BETWEEN TEXAS UTILITIES AND THE NUCLEAR REGULATORY COMMISSION REGARDING COMANCHE PEAK STEAM ELECTRIC STATION - PIPING AND SUPPORT DESIGN

DOCKET NO.:

PLACE: GLEN ROSE, TEXAS

DATE: TUESDAY, FEBRUARY 26, 1985

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

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