ORIGINAL

NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY & LICENSING BOARD

In the Matter of:	:	
	:	
HOUSTON LIGHTING & POWER COMPANY, ET AL.	:	
	:	DOCKET NOS. 50-498 OL
South Texas Nuclear Project Units 1 and 2	:	50-499 OL
	:	

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UNITED STATES OF AMERICA

BEFORE THE

NUCLEAR REGULATORY COMMISSION

In the Matter of:	X	
	X	
HOUSTON LIGHTING & POWER COMPANY, ET AL.	X	Docket Nos. 50-498 OL 50-499 OL
	X	
South Texas Nuclear Project Units 1 and 2	X	

Green Auditorium
South Texas College of Law
1303 San Jacinto Street
Houston, Texas

Tuesday
July 21, 1981

PURSUANT TO ADJOURNMENT, the above-entitled matter came on for further hearing at 9:00 a.m.

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C O N T E N T S

WITNESSES:	DIRECT	CROSS	REDIRECT	RECROSS	BOARD EXAM.
Gerald R. Murphy Gerald L. Fisher Charles M. Singleton Joseph F. Artuso Ralph R. Hernandez David G. Long (A Panel) Resumed					
By Judge Lamb					7025
By Judge Bechhoefer					7058
By Judge Lamb					7060
By Judge Bechhoefer					7075
By Judge Hill					7092
By Judge Lamb					
By Mr. Hudson			7114		
By Mr. Gay				7128	
By Mr. Sinkin				7159	
By Mr. Gutierrez				7191	
By Judge Bechhoefer					7223
By Mr. Sinkin				7233	
Albert D. Fraley, Jr. Gordon R. Purdy Robert A. Carvel					
By Mr. Hudson	7237				
By Mr. Gay		7242			

E X H I B I T S

For CEU	Identified	In Evidence
29	--	7276

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P R O C E E D I N G S

JUDGE BECHHOEFER: Good morning, ladies and gentlemen.

As a preliminary matter this morning we wanted to advise the parties that we are not going to rule on either of the CEU motions until a specific time comes up where we can judge the necessity for the type of information requested.

Are there any other preliminary matters before we begin the Board questioning of the Panel?

MR. SINKIN: Mr. Chairman, let me just be sure that I understand the ruling that you have just announced.

CEU asked that all persons who were not informants be identified. It seems to me that that might be useful and even necessary for the ultimate findings of fact, whether a particular occasion came up or not where a particular person needed to be identified.

It is hard to make a case in the abstract, but it is also hard to make a case that we need to know that in one Report A is C in another Report, because we don't know we need to know that unless we know who the people are in the first place. So it's kind of a catch 22.

JUDGE BECHHOEFER: What I thought was that

it would become more apparent through cross-examination of the Staff witnesses at the time whether the particular incident is even an important one and what the importance would be to the case.

MR. SINKIN: I see.

JUDGE BECHHOEFER: And that is why we would defer any ruling probably until that time comes up.

Overnight we decided to shift order, so Dr. Lamb will start questioning for the Board.

JUDGE LAMB: Good morning, gentlemen.

Whereupon,

GERALD R. MURPHY
GERALD L. FISHER
CHARLES M. SINGLETON
JOSEPH F. ARTUSO
RALPH R. HERNANDEZ
DAVID G. LONG

having been previously duly sworn, resumed the stand as witnesses herein, and were examined and testified further as follows:

BOARD EXAMINATION

BY JUDGE LAMB:

Q Mr. Artuso, looking at the root cause of the voids, could you clarify your judgment as to the extent to which those root causes should be found in the design or the construction, or both?

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BY WITNESS ARTUSO:

A. I would say the root cause of the voids at South Texas are twofold.

One is the design of the containment itself that has all of the congestion of rebar and plates.

The other was the failure to recognize that these were trouble spots before you started the construction, and before construction could alert design to make some changes so that the placement would be easier and capable of being performed without voids.

So in order to get a containment that is free of voids --

First of all, let me say this: I don't think there is any containment in the country that is free of voids, and I don't think that any procedure is capable of producing a containment completely free of voids. What you hope to do is set up a process whereby you can assure yourself that if they do occur you will know they are there and you can take remedial action, and one that would limit them to an absolute minimum.

In this case I would say that the construction procedures were faulty at the start. Now, I am a Monday morning quarterback, so I can say this. I don't know whether I would have said it if I had been involved in it from day one.

I think that now particular at South Texas there is a very comprehensive construction procedure. In my estimation I have never seen any better. With it, following it, I would feel very confident that we would minimize voids completely, or if voids did occur we would have th_ means of finding them and repairing any significant or critical voids.

Q Do you feel that the structural design should have been different as one mechanism for avoiding --

BY WITNESS ARTUSO:

A Very definitely. In fact, if I were a licensee I would look real hard at my containment right now, particularly one similar to STP. It is a bad situation for consolidation of concrete.

South Texas has done a lot to improve it. There is no doubt there is some other areas of improvement, but design should have recognized congestion, but then, again, you can never be completely foolproof. It is something that requires really the installation to be made, and maybe even looking at the pour before your placing it, and then deciding how difficult it is, because drawings alone many times won't tell you that. You have to physically look at the placement.

Q Mr. Murphy, do you agree with all of that, or do you have some areas of disagreement?

BY WITNESS MURPHY:

A. In general I agree with it, Judge Lamb. However, I must point out that this design is one that is used and has been used time and time again. It is a pre-stress containment, and it employs vertical and horizontal stiffening and embedments, as opposed to studs on some others, but essentially it is one that has been used in many other containments.

Q. Mr. Hernandez and Mr. Long, do you have some thoughts on it?

BY WITNESS HERNANDEZ:

A. I would like to point out that in the original concept for the containment liner we did originally have a studded liner concept.

This is -- I don't know if you are familiar with it. We still had the 3/8 inch carbon steel, but we had Nelson studs on the back of it to provide for anchorage or embedment of the liner.

An evaluation was performed by Brown & Root, and, subsequently, a recommendation came to HL&P, and we reviewed that recommendation, whereby we felt that the present configuration of the liner through a systems of vertical angles and horizontal stiffeners would provide better constructibility than the stud arrangement, because we were concerned with the amount of reinforcing that we

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would put into the containment shell wall and the dome that we would have inadvertently have a problem with knocking the Nelson studs, okay, and, therefore, losing the anchorage of the containment liner.

Now, I agree in hindsight there are steps we can do, and we have taken, to provide better accessibility, better constructibility, but I take issue -- I do not see the design, itself, conceptually being at fault. I think it is a basis of looking at it from a constructibility standpoint to insure that you have done all you can with respect to the design to enhance constructibility, the accessibility.

I don't have any concern whatsoever with regard to the design concept. We have made some changes. We have put the 8-inch stiffener at the top of the pour rather than the bottom of the pour. That is not a design change. That is a construction change, a constructibility change. And we feel that that is significant.

We increased the diameter of the weep holes, or the holes in the stiffeners, horizontal stiffeners. We feel that enhances the ability to see what is happening as the concrete comes under the horizontal stiffeners.

So my case in point is I don't think conceptionally-wise the design is at fault. I think it was probably a basis of not looking at detail or to the

extent of the detail to insure that we had accessibility, that we had constructibility, that we could move reinforcing as we have done at this point in time.

So, that is my opinion.

BY WITNESS LONG:

A And I agree with Mr. Hernandez in the fact that I think the basic resolution where we have moved the 8-inch stiffener to the top of the placement will enhance the integrity of the concrete pours greatly.

With the stiffener down at the bottom, in hindsight it could have presented some problems, but with the stiffener closer to the top portion of the pour it makes it readily available to the QC Inspectors, and also the Vibrator Hands to know what they are doing, to actually see the concrete at close distances, and how it goes into place.

And, basically, I think with this improvement we can pour very sound concrete.

Q Mr. Fisher, or Mr. Singleton, do you have any thoughts on that?

BY WITNESS FISHER:

A I would have just one thing to add: The problem is not just with the stiffener system, but with the congestion of reinforcing steel at certain locations primarily around areas of heavy penetrations, and in areas

of the vertical buttresses.

This reinforcing configuration turns out to be mostly a matter of fulfilling the design requirements, and there is very little that can be done about that directly. We have a design which encompasses the economical balance in the use of prestressing system and reinforcing steel.

We have also gone to a high-strength concrete, a 55 hundred pound concrete mix, in order to gain added strength in the concrete.

About the only thing else that could have been done would be to perhaps increase the wall thickness of the containment to something greater than four-feet nominal thickness. However, this is, to my knowledge, the thickest containment wall of any plant being built. There are many others four feet, but I don't know of any any thicker.

So, we are not dealing with, you know, an uncommon dimension in that regard.

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BY WITNESS SINGLETON:

A Judge Lamb, I'm not an engineer, so I can't really give you what I think about the design on it; but I do believe that the changes that had been made in the design, as far as the relocation of stiffeners and of the shear ties, horizontal shear ties and re-steel, from an inspection point, has made it easy as far as accessibility and visibility to get down and do the preplacement and the actual batch-in-place inspection.

Q Mr. Artuso, do you have any further thoughts as a result of those comments?

BY WITNESS ARTUSO:

A By my statements I don't mean to infer that the design was faulty from a safety standpoint at all.

Structurally, I have no question about it.

What I am saying about the design were probably details of the construction requirements, details of rebar congestion, those types of things that could have facilitated a little easier placing.

Q Mr. Murphy, was I correct in understanding that one or more of the voids actually penetrated substantially through the concrete part of the wall?

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BY WITNESS MURPHY:

A. That is correct, Judge Lamb. Underneath the penetrations for the main steam lines there was a path that water took.

We used water under pressure and it did not come out the other side the same velocity and the same quantity.

There was evidence of a water path. So we said that it did penetrate through.

In other words, this was a bleed water path that was underneath the penetration. We grouted this in the normal sense that we did the other repairs and with perseverance we got some grout to the other side.

That's what we talk about when we say that there was a -- the void went through the containment shell.

Q. I was trying to reconcile that with the point which has been made in several places in the testimony to the effect that the chances for voids in the center part of the wall would be much less or virtually non-existent.

I was trying to reconcile those, but if I understand it, it's because you had a penetration at that point?

2-3

BY WITNESS MURPHY:

A. That is correct, yes.

Q. How about at other penetrations? How could the presence or absence of a void of this type be detected at other penetrations, and were they detected?

BY WITNESS MURPHY:

A. There were more than one of these situations that I just described. I do not consider that a void of this nature -- These were generally behind a flange that was welded to the penetration on both sides of the containment, if you will.

I don't believe that this size of void was of any significance.

Q. Mr. Artuso, do you have some thoughts on that?

BY WITNESS ARTUSO:

A. Yes, I'd like to make a statement regarding the presence of voids underneath penetrations.

In placing concrete, as the level of the concrete rises to the penetration and then works around it as you are consolidating it, the concrete remains plastic for a while and the free water in the mix bleeds to the surface.

Air travels to the surface as you vibrate.

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So actually, as you vibrate more, you release more of these.

As you get away from this penetration, later you will find that there will be voids under every penetration. Every block-out will have voids.

The kind of voids that they encountered were in this case connected somewhat, but you will find many unconnected voids under every block-out; and this is very superficial voiding.

You just can't -- That's inherent in the kind of materia' and it's inherent in the type of construction.

BY WITNESS HERNANDEZ:

A. I'd like to add that these type of voids that we're talking about were beneath the penetration where you have some measure of bleed water which then evaporates and leaving a small void.

They have no structural significance. You have a penetration which has an anchorage which extends deep into the surrounding concrete, if it's a mechanical penetration.

If it's an electrical penetration, it's not seeing that type of loading in terms of pipe break or anything else like that; therefore, they are inconsequential with regard to the structural adequacy

2-5

of the containment or providing a leak-tight barrier.

It's just an evaporation of the bleed water.

Q. Thank you.

Mr. Murphy, on page 13, line 10, you mention, "As a contributing factor to void formation, the access visibility limitations."

I'm not clear on what you mean by that.

BY WITNESS MURPHY:

A. This was what was alluded to in the beginning portion of our testimony today, Judge Lamb, in that the access to the bottom of these placements where the eight-inch channel was originally located in relationship to the construction joint was much more difficult to get to than after we moved the eight-inch channel up --

Q. Excuse me. You mean, then, access for vibration?

BY WITNESS MURPHY:

A. For vibration and for inspection, for people to actually get down there.

In conjunction with the relocation of the construction joint relative to the channel, we also moved shear ties, in other words, bundled shear ties, to make freer access, if you will, for personnel to get down to the bottom of the placement.

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That's what is meant in this referece up here.

Q In looking for voids by the process that you used, by the tapping process, am I correct in understanding that this will only detect voids next to the liner, or will this detect voids farther into the wall?

BY WITNESS MURPHY:

A. The tapping in itself is not indicative of a void.

Tapping with additional information will define a void.

Now, if we -- in our analysis that we went through, we determined through many trial and errors, if you will, by drilling holes, that if we studied the geometry of the area when we got a hollow sound, and if that geometry was conducive to a void; namely, there was additional reinforcing steel there or there were horizontal members there, then we would drill.

Now, in addition to this drilling through the liner in Lift 15, we extended all of these holes that we drilled with a masonry bit approximately 16 to 18 inches into the concrete, and in no case did we find any, if you will, internal voids.

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Again, the method of placing the concrete by depositing it relatively in the center of the wall and moving it to both extremities, along with the confidence that you would have if there were no voids on the outside, would give you confidence that the existence of voids in the center did not exist.

Q How about in the rebar area? What would be the probability of void existence in the rebar area, and would the system which you used to find these --

BY WITNESS MURPHY:

A. The additional rebar that is in these is in the relatively same plane as the normal rebar, if you will.

So we're talking about the same depth into the containmen when we're talking about additional rebar.

Now, with the exception of the thickened portions of the shell around the equipment hatch and the personnel air lock, there are circumferential rings that penetrate in much further than the face steel in those cases; but generally, in the four-foot sections and around the brackets in Lift 15, there were additional bars, but they were put in the same layer, if you will, in the same relative position, as the

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normal steel was.

So the holes that we drilled in Lift 15 went through these areas, also, if we did not hit a piece of steel.

When we drilled past this steel, we were into the internal of the containment.

Q And so your conclusion that there are no voids in the central part anywhere except next to the line-up is based largely on the fact that in all of these holes that you drilled you didn't find any?

BY WITNESS MURPHY:

A That's right.

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Well, it's based on that fact and also just the nature of the placing process, if you will.

Q Does that seem reasonable to you, Mr. Artuso?

BY WITNESS ARTUSO:

A I would say generally the sounding system is a relatively crude system. It depends upon one's ear-drums. It depends upon the size of the void and the separations, and all that.

It is an indicator, however, and once you find areas that, for other reasons such as the congestions and block-outs that exist in that area, and it does sound hollow, then you probe it and you find or do not find a void, and you dig, you go deeper into the wall and you have no case that you ever find an internal void, and the method of placing that concrete gives you tremendous assurance that there is no significant voids whatsoever inside that wall.

Q If you did have voids in the rebar area, what would be the structural significance of that?

BY WITNESS ARTUSO:

A It would -- it depends upon the size of the void, of course. There is a -- the ultimate is all rebar be thoroughly imbedded in concrete.

Knowing that we cannot guarantee this a hundred percent, therefore the designers will use a

safety factor of two or three, so the safety factor is supposed to help take care of some of the deficiencies in the construction thereof.

I would say that there is, in the mass of concrete we have there, considering the exceedingly high strength of the concrete, way over the design, you could tolerate a lot of voids in that concrete without affecting your shear stresses or without increasing your shear stresses in your concrete.

That would be about the only significance I could see.

Q. Is there any way to detect voids within the wall, other than by drilling?

BY WITNESS ARTUSO:

A. The most conclusive way is drilling, of course.

We used our system of checking the soundness of walls in our verification program, used the sonic technique, where we pass the sound wave through the wall, and that is the most reliable nondestructive method that you can have.

In the containment structure with the steel liner, it's not very feasible. So the only method you have left then is the probing, and really it is the safest method.

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Q You mentioned the volume, on Page 14, the volume of voids as being a tenth of a percent of the total volume of concrete.

What's the implication of that statement?

BY WITNESS MURPHY:

A What page was that, Judge Lamb?

Q Page 14, Line 14.

BY WITNESS MURPHY:

A Line 14. What is the significance of the one-tenth of a percent?

Q Well, what I was wondering is what the statement was directed towards.

I was not sure that I understood the implication of the statement.

BY WITNESS MURPHY:

A Well, I think it was an attempt to put in perspective and give somebody a concept of the amount of voids that we estimated in relationship to the structure itself. That's the attempt that was made there.

Q Is that a valid measure of concrete quality?

BY WITNESS MURPHY:

A A valid measure of concrete quality?

Q What I was wondering is, does that represent definitive evidence that you have good quality concrete

construction?

BY WITNESS MURPHY:

A. No, not by itself, by any stretch of the imagination. This is including Lift 15, and that, we have testified previously, is a concern, and that does not mean that, you know, we've got good quality concrete because of just one percent. We had this area that it was woefully inadequate.

Q. All right. That's what -- I just wondered whether that was supposed to imply that.

BY WITNESS MURPHY:

A. No. It was made to give you some relative amount in relation to the whole. That's all.

Q. Mr. Artuso?

BY WITNESS ARTUSO:

A. I'd like to add something, if I may, Judge Lamb.

Actually, the one-tenth of percentage is very indicative. It indicates to me, knowing the size of the voids that were uncovered, that that's an exceptionally good structure.

If you can get one-tenth percent well distributed in your concrete, that's the containment I would like to have.

Q. The distribution, as I recall, you testified

earlier, when we were meeting in June, that the distribution is --

BY WITNESS ARTUSO:

A Is very significant, right. And this was fairly widely distributed, this one-tenth of percent. This is why I made my statement that that structure would have behaved as designed even if we hadn't filled any of those voids with the exception of Lift 15.

Q Mr. Murphy, on Page 15 you're talking about the number of holes which were drilled without finding voids, other than the ones that were found by your tapping process.

I'm wondering about your feeling with respect to the probability of striking voids, with your low percentage voids that you describe on Page 14, I'm wondering whether this represents an adequate sample to reach a conclusion of this type.

BY WITNESS MURPHY:

A I feel it does, Judge Lamb, because these holes were drilled after we did initially some exploratory hole drilling and some sounding and a study of the configuration in the area; in other words, anywhere that lent itself to a void we investigated, and then in addition to that, we went in areas that were not conducive to voids, if you will.

And so based on that analysis, I mean we just didn't go out and put 700 wherever we wanted to. We put them where voids would have existed.

Q Put them in what you considered to be the most likely location of voids?

BY WITNESS MURPHY:

A That's right. And if looking, again in retrospect, if you will, looking you can see areas in which it would be very difficult, without, you know, additional vibration, to get concrete in there. And these are the areas that we drilled holes in.

Q Mr. Hernandez?

BY WITNESS HERNANDEZ:

A I was going to make the same statement, that these were particular areas where we had already some information to say these were the most probable areas where we could anticipate having voids. These were the areas where we would be more concerned from a structural standpoint of having a void located there.

Therefore, we chose these areas and actually performed the drilling operation to investigate whether indeed we did have a void in the internal part of the containment. And again, the means is we identified through the drilling program that there was no evidence that this indeed was happening, even though we had a

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very high degree of reinforcing there, even though we had attachments to the bracket going towards the center of the containment internal -- the containment shell wall.

And I'd like to make the case also, completely at random we chose a bracket, okay, to perform a load test to verify both the void investigation and the void repair methodology, and we actually loaded that frame girder bracket to take its test load, and the performance of the bracket was in line with what was expected, it performed as anticipated.

Q. At the top of Page 17, Mr. Murphy, in the beginning of your answer to Question 23, you indicate that all the voids were completely filled.

How do you know that?

BY WITNESS MURPHY:

A. We had a verification drilling session, if you will, after we performed these -- this repair operation on Lift 15, and in addition to that, to investigate and develop the procedure that we used, we made several tests.

One of them was a composite concrete grout block in which we simulated the surfaces that we saw upon inspection, looking through the holes that were drilled in the liner, the roughened concrete as it would fall, and we just flowed grout over it, pumping

from the bottom with no pressure or anything else.

We took cores through this specimen, examined them and broke them, and failure was a compsite failure, if you will, through both.

In addition to that, we took a portion -- well, we took the imbedded items on the back of these polar crane brakets, simulated them on a mock-up, covered them with a plexiglass sheet and pressure grouted this configuration.

Now, this configuration had the studs and the vertical and horizontal stiffening members that were on the back of the bracket.

The holes that we cast into this mock-up were ones as we observed looking through the drilled holes again, and we grouted, and then we, after this was completed, we took core borings through this whole member and in no case did we find any area that there was not contact of the grout and the concrete.

Q On Page 18 you mention that the voids in the area that was uncovered were exactly the way you had predicted.

Were these predicted -- how, by tapping?

BY WITNESS MURPHY:

A Tapping and drilling.

Q Tapping and drilling?

BY WITNESS MURPHY:

A That's right.

Q And so you had mapped these ahead of time --

BY WITNESS MURPHY:

A That's right.

Q -- and then when you removed the plate you found that the voids were where you --

BY WITNESS MURPHY:

A Exactly where we had anticipated they would be, and the size that they would be.

Q You also indicate that the grout injection ports that had been placed through the liner were ideally located.

What constitutes an ideal location?

BY WITNESS MURPHY:

A Well, in these there was two ports, one at bottom, if you will, of a void area, and the other at the top of it, and these were as close to the top and as close to the bottom as one could hope to get.

Q The voids generally were filled from the bottom up?

BY WITNESS MURPHY:

A That's correct.

Q What is the situation relative to dead-ends in these voids, that is extending into the wall where you

couldn't vent the top, perhaps? Did this create a problem, or do you know?

BY WITNESS MURPHY:

A There was -- all of these voids were investigated with a fibroscope so that we knew what the configuration was.

In the polar crane brackets there was a configuation, the topmost imbedded item, we felt would have a problem venting because even although there was an air release port in the horizontal portion of this imbedment member the top of this port was covered with concrete from above, so we had to drill an angle hole up on the bracket through this vent hole, if you will, that was covered with concrete, and in that -- that's the case that we had to do something that you just described.

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BY JUDGE LAMB:

Q So that was considered in your program?

BY WITNESS MURPHY:

A Definitely. Yes. It was the -- all the voids had to have vents.

Q You mentioned something that you used to investigate the shape and size of the voids. What was that device?

A A fibroscope. Fibroptics.

Q Fibroptics?

BY WITNESS MURPHY:

A That's right.

Q On Page 20 in the answer to Question 29 you say that post-tensioning would cause observable structural failure in localized area if there were any significant voids.

What kind of failure would that be?

BY WITNESS MURPHY:

A It would either be tendon elongation, or in the local concrete failure --

Q Excuse me. You mean when you apply would tension, when you are tensioning that you are taking in more steel than you should, based on your stress --

BY WITNESS MURPHY:

A Yes.

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Q -- code?

BY WITNESS MURPHY:

A You could have some crushing of the concrete in a localized area. If there was not adequate concrete there it would have nothing to push against, or as you tension it it is resisted by the concrete. If you had no concrete there or not adequate you could have localized compressive stresses on the concrete causing it to crush. Okay? That is what we mean by failure.

Q Right. Thank you.

Mr. Artuso?

BY WITNESS ARTUSO:

A Judge Lamb, there are two classic paces of just this thing on containments. At Calvert Cliffs-Baltimore Gas & Electric plant this actually happened. When they prestressed the vertical tendons the end dams caved in because of the voids underneath the end anchorages.

At Turkey Point when they had the dome crushing they found voids, as well. There were two problems there. There was not a sequence of prestressing, but they also found voids, which probably contributed to the crushing effect.

So those were two cases which showed that you had to have structurally sound concrete in order for the system to work.

Q So we are not talking about failure of the structure, itself, but failure of --

BY WITNESS ARTUSO:

A Well, actually, in the --

Q -- in the vicinity of the --

BY WITNESS ARTUSO:

A It's a localized failure.

Q Yes.

BY WITNESS ARTUSO:

A It would be proper to say it would be a localized failure.

In the case that Mr. Artuso has said, if you have -- the point that you pull against on the post tensioning, it is called the trumpet plate. If you did not have concrete beneath or in back of that trumpet plate and you pulled against it you might see either a deformation of the trumpet plate as it move back into that void area, or you might have something of an anomaly with regard tothe stressing leveling of the post tensioning.

It is not a catastrophic failure of the containment, by any means, I mean. It is a localized failure.

BY WITNESS ARTUSO:

A Yes. These are construction failures that

had to be corrected.

BY WITNESS HERNANDEZ:

A. I would like to make the next point, though, in Mr. Murphy's testimony a continuation. The overall adequacy of the containment is checked through the performance of a structural integrity test, and that is a requirement of Reg Guide, I believe, 1.18, where you go back and actually demonstrate that the overall capacity of your containment is adequate for the design pressure, and the design pressure is even taken to 1.15 times the design pressure.

Q. This is what you are referring to farther on in the same question?

BY WITNESS HERNANDEZ:

A. Yes, sir. That's the structural integrity test.

Q. The pressure test is a 65 psi?

BY WITNESS HERNANDEZ:

A. Yes, sir.

Q. What is the end point of that test in the event of failure?

BY WITNESS HERNANDEZ:

A. Well, the point is if you cannot take the containment up to that design pressure, then you have a problem, because the NRC has placed a factor of 15 percent

increase over your design pressure.

Your design pressure you receive through the NSSS supplier and the performance of your own internal calaculations as to the pressure transient, the maximum pressure you will have under a design basic accident.

If you cannot achieve that, then I think you then have to go back to the drawing boards and evaluate what the extent is.

It is an acceptance test. It is a no-go type of performance test.

Q Well, how would that test identify the presence of voids?

BY WITNESS HERNANDEZ:

A If you could -- What that test would demonstrate is that if there were -- if you met that test satisfactorily, it is exceeding any type of condition that you will see as a design-basis accident, okay, with respect to the pressure.

Therefore, you know that your containment will perform to the design pressure, and, therefore, it will meet its expected design; it will provide its expected design adequacy.

Q That would show up as a massive failure of some type, that is a crack, a wall crack?

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BY WITNESS HERNANDEZ:

A. Well, it could show up as a wall crack, but in light of the testimony that we are addressing here, if we had, if you will, significant voids behind the liner they would be evident at that time.

Q. How would they become evident?

BY WITNESS HERNANDEZ:

A. You could have some type of unexpected crack pattern. You could have deformations beyond what you would expect in terms of the design.

The containment is provided with strain gauges.

Q. That was my next question. You have a lot of strain gauges located in this?

BY WITNESS HERNANDEZ:

A. Yes, sir. We provide strain gauges as required by Reg Guide 1.18 in Section 3, Division 2, ACI 359, and those strain gauges back to the Design Engineer to say that he can evaluate to determine whether the containment is behaving as anticipated in terms of its design.

If you exceed the anticipated strain levels, then you have to go back and evaluate -- you are forced to go back and evaluate the condition that you have to say what is happening there? Has there been a design bust?

Has there been something that is happening that you had not contemplated in that manner?

So that is what would happen at that point in time.

Q So a strain gauge would represent one important method for determining the --

BY WITNESS HERNANDEZ:

A That is the method. It is very doubtful you will see some type of catastrophic failure in the containment.

Concrete has a capacity as one particular area. If it is overstressed, it will try to transfer that stress to an adjacent area. I believe it would be highly unlikely to get a catastrophic failure.

Q That's why I pursued that, because I wasn't clear on just how you would evaluate this.

BY WITNESS HERNANDEZ:

A It would be mainly through the meausrements of the -- as required by the Reg Guide.

Q Now, is this something you also do under crane loadings?

BY WITNESS HERNANDEZ:

A I didn't understand your question.

Q Well, you do this in a pressure test as you check out your strain gauges in --

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BY WITNESS HERNANDEZ:

A Yes, s' .

Q -- pressure testing.

BY WITNESS HERNANDEZ:

A Yes, sir.

Q Do you also do this in connection with your crane loadings?

BY WITNESS HERNANDEZ:

A We have already strain gauged a bracket. That is how we identified in the performance testing. To evaluate the repair of Lift 15 we chose a bracket at random. We then loaded that bracket.

The only way that we could identify short of a catastrophic failure of that bracket was to go back and provide strain gauges so that we would evaluate the movement of the bracket as we put the test load on that particular side of the bracket.

And, yes, we did evaluate those, and, yes, they were in line with the expected predictions. In fact, they were -- We had anticipated from a design standpoint higher strains than what we actually got with regard to the bracket that was actually tested by -- I might make the point it was tested by an independent testing laboratory.

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BY JUDGE BECHHOEFER:

Q I wanted to ask one question on this point concerning the structural integrity test.

Could a failure caused by a void or voids be the result of pressure applied over a period of time? Is there a function of time in that test?

BY WITNESS HERNANDEZ:

A No, sir. Well, the test is taken over a period of time. It's sequence with regard to going up to certain pressures. Okay?

I believe our intended manner of doing it, is doing this after the leak rate test. It is also another test required by the NRC to evaluate the containment capability of fissionable products. Okay? And we are going to do, I believe, the structural integrity test following the leak rate test.

You keep the pressure for a certain period of time, and I would have to look up that period of time, but it is done once from that standpoint.

The reason we do a structural integrity test is because you are performing an evaluation of the overall performance of your containment. You don't expect to have a design basic accident on a yearly duration. It is not that type of test where you are going back and saying, "Well, I can take this pressure 40 years, 40 times

in 40 years."

You go back and demonstrate the overall capability of the containment. There is no reason that I would believe that you would have to do this test every year. Once the contaiment has performed that in that manner, sufficient manner, nothing is going to happen that is going to alter that. The containment concrete is going to get stronger with time. You have an inspection testing, an in-service surveillance of the post-tensioning system that is going to monitor the performance of your post-tensioning.

There is nothing that would change, or that would require you to do this test in terms of every three, four, five years, that type of thing.

Q Would operation under normal pressures for an extended period --

BY WITNESS HERNANDEZ:

A Under normal pressure, I can't quote to you the pressure, but it is nowhere near 65 psi. 65 psi is the design accident temperate of pressure that has been increased by 15 percent.

I can't recall -- maybe someone here can give you the design, the actual operating pressure. It is, you know, it may be a negative pressure, that type of thing. It is no where near the design basic accident.

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BY WITNESS FISHER:

A Chairman Bechhoefer, the actual design operating pressure is very insignificant as compared to the accident pressure. And to add something perhaps to the answer to your general question about whether if we sustain the pressure in the containment would that make a difference, the phenomena of any lastic creeps that might occur over a long period of time would tend to relax the stresses, rather than amplify them, and, if anything, would improve the situation, rather than cause a deterioration.

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Q Mr. Artuso?

BY WITNESS ARTUSO:

A Judge Bechhoefer, your concern about over a period of time may be associated with this fatigue or cycling concern.

In concrete there isn't a fatigue problem. Concrete is not checked for fatigue; whereas, the steel components are, the prestressed strands are checked for fatigue properties and so are the reinforcing bars or connections are checked for fatigue properties.

So that concern -- Concrete is inherently not affected by that kind of cyclic type loading.

Now, I could see where a large void, if you had a large -- Let's assume that you had a large void behind the containment.

Under that pressure, if it were a critical void, you could get a rupture of the liner. So this is another means of knowing that you don't have any critical voids behind after you've run your structural integrity testing.

The system is well proven. For instance, the Three-Mile Island accident, there was a hydrogen explosion inside Unit 2.

All of the entries indicated no structural

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damage at all. So this is a well proven system.

BY JUDGE LAMB:

Q Mr. Artuso, you mention on page 23 of your testimony that the structural design and safety margin is well in excess of a hundred percent.

Can you explain why the safety margins are that high?

BY WITNESS ARTUSO:

A Yes. Design stresses as made by designers are of a certain magnitude.

Let's assume for a method of explanation that the designer needs 1500 psi concrete. The actual concrete strength, then, is designed for something like 4,000 psi.

So each material is actually designed and checked for a much higher strength than the designer needs for that component material.

In the case of the concrete at the South Texas Project, it was designed in the containment, say, 5,000 psi, and the other structures 4,000 psi.

We saw almost a doubling of those strengths in all of the testing that we did down there.

So that in addition gives you an additional safety factor.

Q I'm wondering if you could explain to us

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the basis on which that safety margin or safety factor is determined?

In particular, I'm wondering whether built in to that is any consideration of the types of voids and things that we have been talking about during your testimony?

BY WITNESS HERNANDEZ:

A. Judge Lamb, if I might answer that.

Q. Yes.

BY WITNESS HERNANDEZ:

A. With respect to the codes that we are required to design against, that is built in to the design allowables that are introduced into the codes.

You don't, as a general rule, or in the nuclear industry, with respect to the concrete and the steel portion of the structure, you do not design for its maximum creditable strength, its ultimate strength, its failure strength.

You design at some lower level, as determined by general industry. It's reviewed by the various bodies that have to to regulate that, the NRC and whatsoever; but you come back with a code allowable that is much less than where you have the ultimate capacity of the structure.

That is done because when you are constructing

5-4

anything, you have to make allowances for the potential for imperfection.

You may have -- All your reinforcing strength may be a yield strength of 60 ksi, kips per square inch. Okay.

Maybe you have a hundred pieces of rebar and maybe one is 59 that comes in. You build in that allowance with respect to the design.

The designer goes and designs on the basis, for the containment shell, 5,000 -- or is it 5500 -- 5,000 psi -- 5500, excuse me -- psi compressive strength.

Well, in the actual cylinders taken with regard to that concrete, they've proven to be much in excess of 5,500.

So you have in addition to that other factors built in with regard to the design, and when you add all these factors up, yes, you are -- as well as any containment or any nuclear powerplant structure, not necessarily just to South Texas, but to any within the United States, you are building in this over-design capability, okay, and that's done precisely for that reason, because you don't know what's going to be happening tomorrow with respect to something.

If what we're designing changes with

5-5

respect to the loading pattern changes or something to that, you want to have built in to the design some flexibility, some reserve, and you do that.

Let's take, for instance, a structure like a Category I structure, the fuel-handling building.

If we have a certain floor loading and then we decide to move equipment, after we've already poured the concrete and designed it, we may have that reserve margin to go put that additional weight on the floor, simply because we take and look and say we put this type of loading, and we've never seen it in the actual performance of the floor; but now we have this additional loading and we have that reserve capacity.

It's built in.

BY WITNESS ARTUSO:

A. I'd like to add one thing, Judge Lamb.

Probably the final acceptance test is that structural integrity test.

Let's assume the designer designed it for specific stresses throughout that structure, and all of those stresses were just met. No over design whatsoever.

Then, theoretically, it could not take an over-pressure, such as they do give it, as a proof test.

5-6

Any kind of loading test is always more than your design.

So if you can pass your proof test, then that means that anything you have in that structure has been accommodated, that you have achieved your design paramters.

Q. Would it be fair to state that you have a couple of bottom line tests after all the work and trying to find and solve a void problem, and those two would be in the pressure test and in the application of your prestressing to your concrete?

BY WITNESS ARTUSO:

A. Yes, both of them. Absolutely. In fact, as I say, there are containments with voids in them that have satisfactorily passed the structural integrity test, and that's because all these are over-designed.

Q. So in other words, whatever you may have missed, you stand a reasonable chance of picking up on those other two final tests?

BY WITNESS ARTUSO:

A. More than a reasonable test. Almost --

Q. Those are actual performance tests?

BY WITNESS ARTUSO:

A. Those are actual performance tests, yes, sir.

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BY WITNESS FISHER:

A. Judge Lamb, if I might add just a comment relative to the safety margin within the containment shell design.

Q. Yes.

BY WITNESS FISHER:

A. Mr. Hernandez pointed out the various safety margins that are available within the code allowable stresses and within the load combinations that we're obliged to design to.

But there's also another area of conservatism available, and that is in an area of designer option.

As an example of this, and perhaps to put the question of voids in the containment wall in a little better perspective, the design of the containment shell, that is, the general shell area itself, exclusive of areas of high concentrated stress where in general we've thickened the wall, the design only requires a wall thickness of three foot, six inches; whereas, we have actually provided a four-foot thick wall.

So in theory, at least, the design would permit a total void of six inches of thickness, to be a bit ludicrous about it; but there is that inherent margin within the general shell design.

5-8

Q Thank you.

On cadwelds, I'm not sure who -- Well, let me pose the question and see who should respond. Maybe Mr. Singleton.

On the reliability of these, based on data given in the testimony, this sounds like a highly reliable process.

How does the reliability of this compare, let's say, with the other things that go into the construction of this type of facility?

For example, piping fittings, electrical devices?

BY WITNESS MURPHY:

A. I could not properly address the examples you gave, piping fittings and electrical apparatus, but I would say that it is every bit as comparable as the reinforcing steel with which it's associated.

BY WITNESS ARTUSO:

A. I'd like to add one thing, Judge Lamb.

It's because of the fact that as we have developed more test data during the use of these cadwelds, that we found the cadwelds to be actually more foolproof than we originally anticipated, so that the Code Committees now are considering relaxing the testing requirements of them.

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We have found in our case -- I'll give you a specific example -- at Beaver Valley, that all of the welds that we rejected, all the cadwelds that we rejected due to visual examination were tested and every one of them passed the criteria.

So it's a very generous method of design.

BY WITNESS LONG:

A. Judge Lamb, if I might add, on page 31 in Mr. Singleton's response to Question 52, I'd like to note that of the 1200 cadwells tested today, only two splices have failed the tensile test.

So that's a good indication of our reliability on the cadwelding process.

Q. Thank you.

BY WITNESS SINGLETON:

A. Judge Lamb, Mr. Long took all of the fire out of my speech here, but that was what I was wanting to point out, also.

Out of curiosity, we took some cadweld splices that failed a visual observation, visual inspection, whether it be slag, porosity or void, and we pulled those cadwelds, and even the ones that failed a visual inspection passed the tensile test requirements.

So based on the 1200 specimens that we

5-10

have tested and other shots that we have pulled to satisfy our curiosity, the cadwelds have done very fine for us.

Q. Thank you.

On page 48, Mr. Murphy, line 31, you mention "full-scale, reinforced concrete models."

I'm not clear on what you mean by this.

BY WITNESS MURPHY:

A. I'm sorry, Judge Lamb, what --

Q. Page 43, line 31.

BY WITNESS MURPHY:

A. Yes, sir, 31.

Q. You talk of "full-scale, reinforced concrete models."

I'm not clear on what types of models. Is this of entire structures, you mean, or of sections of structures?

BY WITNESS MURPHY:

A. Portions or sections thereof, but not scaled-down sections.

BY WITNESS HERNANDEZ:

A. Judge Lamb, when Mr. Murphy was talking to you about the grout injection in response to your question on grout injection, what he was alluding to was a full-scale model made of the bracket area where

5-11

we did provide plexiglass on the exterior portion of it to review the adequacy of the grout injection method.

This is what we mean by full-scale model.

Q. I see. This is a full-scale mockup of --

BY WITNESS HERNANDEZ:

A. Of a specific section or portion, that's correct.

Q. Thank you.

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6-1

Q These additional strain gauges that you mention in your testimony, Mr. Hernandez, this is just to provide more details of testing with respect to what happens in the case of a pressure test, for example?

BY WITNESS HERNANDEZ:

A Yes, sir. It is a requirement of the regulatory guide and the specific section in Section 3, Division 2, or ACI 359. It's a requirement to place strain gauges to measure the actual deformation of the containment as -- certain areas as well as areas where you would anticipate having high stress concentrations, such as the equipment hatch, those manners.

Q Now, you say that you put in additional strain gauges to allow for containment prototype testing should the need ever occur.

BY WITNESS HERNANDEZ:

A Yes, sir. When we had -- when we first started out on South Texas, this was the design of -- the configuration of the South Texas containment utilizes post-tensioning in the form of -- vertical post-tensioning in the form of a "U" that goes from one side of the tendon gallery up over the top of the apex of the containment, down 180 degrees on the other side into the tendon gallery -- the other tendon gallery. It forms a "U" over the containment.

6-2

At the point in time that we first initiated the design, approximately '74 or '75, these were the newest types of containments. There were some predecessors of our design in terms of Trojan, Arkansas No. 1, and San Onofre, and it was felt that since at that point in time everyone looked to receiving an operating license in 1980, and this was the relative time frame of these other units, the requirment and Regulatory Guide 1.118 is that if you have a new type of containment, or a containment which has a configuration that has not been tested before as a prototype, you would be required to provide additional strain gauges over and above the standard amount, so that you could demonstrate the adequacy of this prototype containment.

Since then there are other containments that have already done this type of testing. A Trojan is already underway. Arkansas 1 will be finished fairly soon -- or I believe Arkansas 1 is finished.

San Onofre ought to be completed fairly soon. So we have excess strain gauges. That's what it amounts to.

Q. So this doesn't just pertain to the 65 p.s.i. test? This is a more extensive testing program?

BY WITNESS HERNANDEZ:

A. This is a more extensive program to demonstrate the adequacy of a prototype containment, a

6-3

containment that has a configuration different than what has been tested in the past.

BY WITNESS FISHER:

A. I think it might be said that it's a more extensive monitoring and analysis of the same structural integrity test.

Q. Mr. Artuso, do you agree with the general idea that the membrane was not necessary?

BY WITNESS ARTUSO:

A. The waterproofing membrane?

Q. Yes.

BY WITNESS ARTUSO:

A. Oh, yes. There's a lot of containments that are built without waterproofing membranes. It's just -- in some cases it's desirable, as I say, as damp-proofing.

Q. Yes. If the membrane that was installed had defects in it, would the presence of the membrane have any harmful effects beyond that which you would have if the membrane hadn't been present?

BY WITNESS ARTUSO:

A. No. No, the presence of the membrane, per se, would not be detrimental.

I might add, let's assume that you did have a gash in that membrane and it tore. If we're in a

6-4

building that didn't have a steel liner, you would -- if it tore and you had a water table that rose above that point and you had a crack in your wall, then you might see some leakage.

That's about the signficance of membrane waterproofing.

Q. Right, but the containment, you say some containments are built without the membrane entirely?

BY WITNESS ARTUSO:

A. Yes. Some are built without a membrane entirely. Some containments use a membrane to protect the concrete from any corrosive waters that may exist in that particular locality, but generally moisture for the concrete is beneficial, it ages it more.

Q. Mr. Long, what is a slick line?

BY WITNESS LONG:

A. A slick line is an attachment to a concrete pump whereby you can transport the particular concrete mixture to its desired location, desired pour.

JUDGE LAMB: Thank you. That's all I have.

BOARD EXAMINATION

BY JUDGE BECHHOEFER:

Q. On Page 10 there's a reference to the fact that voids were found in the containment shell walls of Unit 1 in October '78.

6-5

Is that the first time that any voids were found, or was that the first time that significant voids were found?

BY WITNESS MURPHY:

A. In the containment shell, is that what you're talking about?

Q. Yes.

BY WITNESS MURPHY:

A. I would say that's the first time significant voids; now, I cannot remember if there were some cosmetic repairs made to the exterior of the shell prior to then.

I would assume that there would be.

Q. But this was the first time that anything of significance of that sort?

BY WITNESS MURPHY:

A. That is correct.

Q. Now, you note on the next page that the voids were discovered by Brown & Root personnel.

Was this through the QA program, or QC program I should say, or was this the construction workers, or was it simultaneous, since a lot of the work is done together?

BY WITNESS MURPHY:

A. It was originally discovered by a laborer working the construction joint, who in turn reported it

6-6

to his foreman, who in turn reported it to QA. So to be specific, two people did not identify it at the same time. QC did not identify it first, which they wouldn't have had any cause to be there then. It would have been premature to their first inspection of a placement.

Q. Well, I understood QC people are there during concrete pours, are they not?

BY WITNESS MURPHY:

A. Yes. That is correct.

Q. But I take it you couldn't discover a void at that time.

BY WITNESS MURPHY:

A. No. This was -- these voids were discovered by a, if you will, a man laying on his belly reworking a joint.

Q. Perhaps your counsel could give you a copy of CEU Exhibit 4. I'd like to ask a question about that.

(Document handed to witness.)

I'd like to ask either Mr. Murphy or anyone else on the panel, have you ever seen this document?

(Witnesses review document.)

BY WITNESS MURPHY:

A. I do not recall seeing this specific document.

Q. What I was interested in is finding out what

6-7

was meant by the word "breakdown in QA," which concludes the first paragraph.

BY WITNESS MURPHY:

A. I could only surmise on that, Judge Bechhoefer, in that he, Mr. Jordan, was reporting this before a total picture of the problem was available, and this was his first assumption that if there was a void there it should have been found by QA.

BY WITNESS HERNANDEZ:

A. Judge Bechhoefer, if I might add -- could I take a look at that, Jerry?

On the requirements for HL&P to identify an item under the requirements of 10 CFR 50.55(e), we have chosen to interpret that to mean that we have only a definite period, a finite period to evaluate an item under the requirements of 10 CFR 50.55(e).

Sometimes they have been as short as 24 hours from the time that this thing has been identified to the field -- in the field, and made known to Houston engineering or Brown & Root engineering.

And I think I can -- I'm aware of this telecom, telephone communication, and I believe this was also the case that this Mr. Jordan was providing information based on the best information at the time, and I think at that time it was identified that these voids, or at least the

6-8

apparent voids, because they had, I believe, by this time chipped away in a localized area to determine that indeed there was a potential void, the significance not at that time known to the extent to be at all brackets, but to at least be identified at this one particular bracket where the chipping was performed, and the basis is that we have to call in the reportability, under 10 CFR 50.55(e), under some mechanism, a breakdown in QA, a construction defect, something that would represent a significant hazard, and it was determined at this point in time, based on available information, that it was a QA breakdown.

That's what was done at this point in time.

As later information came out through the investigation of the Lift 15 and Lift 8, I think it would be unfair to say it was purely a QA breakdown, QA/QC breakdown.

I think there were other contributing causes which we have since admitted to with regard to accessibility which would prevent -- or I think "prevent" is too harsh -- which would severely restrict the ability of a QC inspector to perform his job adequately.

There were other mitigating causes also in Lift 8, which we've touched on before, the equipment repair, the equipment breakdown, the long duration of the

6-9

pour, you know -- excuse me, on Lift 15.

Q Well, did any part of it arise out of a QA breakdown?

BY WITNESS HERNANDEZ:

A Well, we have QC as part of QA inspecting the pour.

Q Well, I was including QC.

BY WITNESS HERNANDEZ:

A Pardon?

Q I was not excluding QC. I was using QA broader.

BY WITNESS HERNANDEZ:

A Okay. We have QC on the specific pour to identify compliance with the specification and the construction procedures.

The specification, I believe, if I can paraphrase the wording, says that the pour shall be free of significant voids, or I don't know the exact wording, but we're trying not to build voids into the construction, practically free of voids.

Therefore, it's a QC inspector's responsibility to identify any situation that would represent a violation of those procedures. It was not done.

When we walked away from Lift 15, again it was the point that no one said there was a particular

6-10

problem with Lift 15 at that point in time.

Very shortly after the completion of the pour a laborer, when he was preparing, or cleaning up the construction joint on Lift 15, identified something that was amiss. He saw some type of separation of the concrete and the liner, and he immediately went to his foreman.

BY WITNESS MURPHY:

A. Judge Bechhoefer, I might add here that because a void is discovered does not mean that there is a breakdown in a QC function or QA activity.

As we've testified throughout the past several days, voids are a thing we have to live with. When we're talking about concrete we're talking about voids.

We will have them as long as we're placing concrete. We have means, we hope, to identify all of them and find out their cause, and if possible and if feasible to change whatever we've done to possibly eliminate that from happening again in that situation, but a perfect example of this is in our most recent containment placement in Unit 2 there was more than adequate inspection on this particular placement because of some adverse weather conditions that we ran into with the onset of the placement, but upon removal of the forms there was a void

6-11

discovered, evident, if you will, at the bottom side of the equipment hatch on the outside.

Now, all procedures were followed. There was no case in which there was evidence of any procedural violation occurring.

Pre-placement plans were gone over in detail. Post-placement meetings were held and there was nothing identified at that time.

There were engineers involved in this post-placement meeting and in the inspections during the placement, yet we ended up with a situation that we had a void.

It was discovered in the normal course of events in a post-placement inspection by QC at the appropriate time, and it's documented on an inspection repair card, and we will go about investigating and repairing this so that the adequacy of the structure is as good as was intended in design.

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7-1 ge

Q I take it you think the procedures you go through now are at least somewhat better than what happened on this Lift 15?

BY WITNESS HERNANDEZ:

A Yes. I certainly hope that with the revisions that have been made, numerous revisions since Lift 15, that every one of them has in some measure improved the placing practices and will eliminate some of the possibilities for these voids occurring.

Q All right. Well, I guess, back to Mr. Hernandez, I take it almost as an aside that the last paragraph is not completely accurate, either.

BY WITNESS HERNANDEZ:

A I would make that statement, that I don't believe the last paragraph is accurate with regard to the information contained.

Q I think you mentioned yesterday that one of the steps you would hope to take to avoid situations such as this is to have, I think you used the word -- well-qualified QC inspectors, or something along that line.

To the extent there was a QA breakdown or a QC breakdown here at all, would it have been caused by the qualifications or competence of the particular QC inspector?

7-2

BY WITNESS HERNANDEZ:

A. I think experience could play a factor in any type of pour like this. It's not just the qualifications.

Qualifications supply a measure of -- I'm speaking from my personal opinion.

Qualifications of a QC inspector provide one degree of measure of his ability to perform. I think that with all things, experience, having seen similar situations, having experienced similar situations, provides another degree of protection by having the QC inspector being able to witness an event going on in the field and mentally make a note to himself, is this significant or is this insignificant with regard to this.

Is this a procedural violation, and if so, does this procedural violation by itself contribute to an unacceptable performance of the activity going on, and I could pass to Chuck on that.

BY WITNESS SINGLETON:

A. Being the only true dyed-in-the-wool QC man here, I've been sitting kind of quiet, sitting back, and first of all, this gets my dander up.

I take exception to anything blaming it on QC.

7-3

In the true sense, if you want to define quality control in the true sense, then you could say yes, it's a breakdown in QC, because we didn't realize the sequence of events that were occurring that would lead up to the possibility of a void.

If you want to say QC is the last measure to ensure quality, our QC inspectors, I feel, we have some of the best.

They have the experience. They are qualified and certified per ASME III, Section III, Division II.

In addition to meeting those requirements, they receive on-the-job training. They receive written examinations and they are qualified personnel.

Sometimes there may be a particular -- the way the thing is erected, the way the thing is designed may prevent -- the inspector could be watching the concrete or watching the placement, but a particular sequence of events or the configuration of the pour may prevent him from realizing that a void is occurring in a localized area.

Any time you pull a form and it's a void, it's a surprise. We never expect to see any voids.

During a concrete placement, a sequence of events occurs that we believe that if we continue along

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this route, that a void is going to occur, then we stop and we take immediate actions to remedy the situation then.

We never expect a void. If during a placement, we realize we've got trouble, we stop. We get the people together and we find out what we've got to do to remedy the situation, to correct it, and we continue on.

We never let any pour go that we expect a void.

This particular Lift No. 15, a sequence of events, the duration of the pour which led to fatigue among construction and QC; we had a problem with visibility as far as it was late at night, with adequate lighting.

We had equipment breakdown and failure, but when those inspectors walked off that pour, and a review of their paperwork and an interview with them, they had no problems at the time.

When the void was found, we went back and reviewed the paperwork again. We went back and we asked the two inspectors again, "Did you have any problems with Lift 15? Do you think there's going to be any problems up there?"

And, again, they said, "No," so we got into

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the void investigation and realized the extent of the voids, and we went back to the inspectors and said, "Hey, look. Your paperwork said everything was fine and you say everything was fine, but we've got all these voids. What happened?"

Then they sit down and begin to tell us some of the problems they had.

One of the questions last night that came up, and I kept quiet, because the question was, "Was a construction foreman terminated as a result of Lift No. 15?"

The two QC inspectors responsible for the inspection of Lift No. 15, those two inspectors were disciplined because they failed to realize the sequence of events that were occurring.

They were not on top of this situation. They failed to grasp what was happening that led to the void problem, and those two inspectors were disciplined.

Q When inspectors are hired, they have to meet certain standards. Do the standards include any sort of certification in the exact type of inspection that they'll have to be performing?

I use the word "certification" sort of loosely, because it may be training or approval.

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BY WITNESS SINGLETON:

A. Would you repeat that question again?

Q. Are the people -- Are the inspectors who are employed by Brown & Root, I guess, are they certified in the particular type of inspection that they are going to perform?

BY WITNESS SINGLETON:

A. Yes, sir. If I could go through the sequence of events, we receive an application or a resume from a man.

We look at it and we make sure that he has the qualifications as required ASME Section III, Division II; he has the education and he has the minimum work time experience required.

If this man's experience is in preplacement inspection, then he is certified. He must have the education and experience in preplacement to be certified in preplacement.

If he has the education and experience in batching and placing only, then he is certified only in batching and placing; but he must have the experience in preplacement to be certified as a preplacement inspector; and he must have the experience in batch-in-place to be certified as a batch-in-place inspector.

One thing I would like to add on this

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qualifications. For example, if a man has a four-year degree in science or engineering, and he's a civil engineer, he can come out there and he can be hired by construction, by design engineering, and he can go to work the next day.

But if he's a degreed engineer in applied science or engineering, then he's got to have a minimum of three months' experience to go to work in QC.

So an engineer has got to be qualified and have more experience to work in QC than he does to be an area engineer out there.

Yes, they are certified only in areas of their expertise or their experience.

Q. Does not the Code, at least, have a waiver provision?

BY WITNESS SINGLETON:

A. All of our concrete people are certified strictly to ASME III, ASME Section III, Division II, and it's been Brown & Root's position not to allow any waiver of experience or education. It's strictly per the guidelines of the Code.

Q. Mr. Artuso?

BY WITNESS ARTUSO:

A. Judge Bechhoefer, in relation to that waiver provision, ANSI Standards had a certification standard

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for the certification of QC inspectors and others.

In that particular standard, there was a waiver provision.

The ASME Code, which is the Section III, Division II, that South Texas is working on, does not have that waiver condition.

Now, since the evolution of the ANSI Standard, the NRC has taken the position that they will not permit the waiver condition.

So now there is no waiver condition.

Q Turning to page 13, just carrying forward the discussion we were having about Lift 15, who were the site personnel who were referred to on line 22 who led you to discover some problems with Lift 8?

BY WITNESS LONG:

A Judge Bechhoefer, I was that site personnel referred to there. I was that person.

Q I see.

JUDGE BECHHOEFER: That's all the questions I have.

Judge Hill will resume, but let's take about a 15-minute break first.

(Recess taken.)

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JUDGE HILL: Back on the record.

My reckoning here indicates that this is the fourth day of hearing on this particular panel, and what the Board would like to do is go through and sort of summarize all of your statements in your prepared testimony and also the cross-examinations, and I'm going to be working directly off of the stated contentions on Page 3 of your testimony.

This will be in the nature of -- the lawyers will appreciate this -- of polling the jury, and I'm going to ask each of you individually, those of you who have had direct testimony on each of these contentions, and I will ask each of you a two-part question.

The first question will be a sort of "have you stopped beating your wife, answer yes or no" question, and the second one will be a request for a statement on your part, a summary statement on your part having to do with that particular contention.

So we'll start with Contention 1(2), and the people I wish to address this to specifically are Mr. Murphy, Mr. Artuso and Mr. Hernandez and Mr. Long.

And by the way, Mr. Fisher and Mr. Singleton, who did not have direct testimony on this, can respond if they wish.

Let me just state the question once, and then

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we'll get the response from each of you on this first question.

BOARD EXAMINATION

BY JUDGE HILL:

Q. Do extensive voids now exist in either of the containment building concrete walls as far as they are poured?

And I stress the word "extensive" in the context that it is listed here in the contention, and I think we'll have to define "extensive" as a void that would impair the structural integrity.

So let's start with Mr. Murphy.

BY WITNESS MURPHY:

A. Yes, Judge Hill. Now there are no voids, no extensive voids in either of the containment building.

Q. All right. Mr. Artuso?

BY WITNESS ARTUSO:

A. There are no voids, no extensive voids in the containment building, to the best of my knowledge.

Q. Yes. I should have added that, to the best -- to each of you, to the best of your knowledge.

Mr. Hernandez?

BY WITNESS HERNANDEZ:

A. Yes, Judge Hill, there were, in my opinion, extensive voids. By extensive I mean with regard to

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Left 15. Yes, to the best of my knowledge, those have been repaired and there are no existing significant, or there are no extensive voids at this time that have not been repaired.

Q And Mr. Long?

BY WITNESS LONG:

A To the best of my knowledge, there are no extensive voids that have not been repaired in the lifts in the containments.

Q All right. Now, let's move on to the second part of that question.

Would each of you state your degree of confidence, or the confidence that you feel that when both containment buildings are complete that the walls will be free of extensive voids, again used in the same context, that would impair the structural integrity of the containment building?

In other words, now I'm asking you to respond to what you expect. You have just responded to what exists today. Now I'd like your statement on what you think can be done in the next few months in completing these two buildings.

BY WITNESS MURPHY:

A Judge Hill, I have an extremely high level of confidence that future construction of the containments

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will not result in any extensive voids.

BY WITNESS ARTUSO:

A. Based on the studies that have been made and the repairs that have been performed, and the changes that have been made in construction procedures, I feel very confident that there will not be any additional significant extensive voids resulting from them.

However, the processes as are developed at South Texas do give sufficient, in fact in more detail than is normally found, the means of identifying any voids that may occur in future construction so they can be properly repaired and the structural integrity of the containments be maintained.

Q. Thank you.

Mr. Hernandez?

BY WITNESS HERNANDEZ:

A. At the time that the containment is intended to function, which is the structural integrity test, I am extremely confident, as Mr. Murphy is, that the containment will perform as a design function adequately, that there will not be at that point in time extensive voids in the containment shell.

I believe that we have at this point in time a system to produce quality concrete. I believe that we also recognize within HL&P that there always is the

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potential for an isolated void to occur.

We believe that we have the means for identifying that void, evaluating its significance and also repairing the subject void to bring the containment shell wall back into conformance.

BY WITNESS [illegible]NG:

A. Based on the current construction procedures in effect now at South Texas Project, and in conjunction with the, shall we say, the proof of the pudding that we sounded at Lift 7 on the Unit 2 shell, that gives me a sufficient level of confidence that I don't believe that there -- or I believe it not to be the fact that there will be any more voids.

In other words, I believe that our procedures are good enough where we will not have any more voids in the containment shell pours.

Q. Mr. Singleton, do you want to respond to that?

BY WITNESS SINGLETON:

A. My observation is I believe that with the changes that have been made to the procedures, the design changes that have been made, the additional training and emphasis on training with both construction and QC, the formulation of the pre-placement and post-placement plans, that we have greatly reduced the chances of internal voids occurring.

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However, I'd like to add I don't believe there's any way that you can refine a procedure to ensure that there will not ever be any voids. I don't think the problem is with the procedure. It's the problem that we ugilize human beings to implement the procedure, and when you do that there are too many factors that can come into play.

But I believe that we've got a good procedure and a good design and good people.

Q Mr. Fisher, do you wish to respond to that?

BY WITNESS FISHER:

A I can't really add anything other than to echo the confidence that's been stated so far.

Q All right.

Let's move on to Contention 1(3), and for the purposes of what we're doing here, it seemed reasonable to combine Contention 1(3) and Contention 1(6) and put them together in one, so I have two questions pertaining to those two contentions, and the people that have provided direct testimony are Mr. Murphy, Artuso, Singleton, Hernandez and Long.

The first question, to the best of your knowledge, have documents been lost or cadwelds been unverified?

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BY WITNESS MURPHY:

Q. I would like to clarify in my answer that there have been evidence in documentation that cadwelds have been lost.

However, I would like to state that all cadwelds that are required for the structural function are adequate for that, and that they will serve to meet design requirements.

Q. Mr. Artuso?

BY WITNESS ARTUSO:

A. Judge Hill, I had no specific part in trying to locate any missing documents or any means of trying to verify whether every cadweld is in place that was designed in place.

My testimony was primarily to the effect that of the capability of cadwelds, the means of determining whether a cadweld is satisfactory or not, those kinds of things.

Q. Okay. Mr. Singleton?

BY WITNESS SINGLETON:

A. On the first question, was a document lost, the document we're referring to FSQ 30, was never generated. A research of the cadweld inspection books indicated that the cadwelds had been inspected. They were located on the drawing. There was never any code or

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design requirement that this field document, the FSQ, be generated.

The field sketches are generated that in case of a tensile test failure to identify adjacent splices so we may go back and locate them and test them. There were no failures in any of the splices that utilized the same sleeve lot or powder lot material, so the cadweld document being lost had no effect on the quality of the cadweld at all.

The final acceptance of the cadweld is based on your visual inspection. In the case of cadwelds being verified or not being able to be verified, all the cadwelds in the structures had been inspected, and after a very comprehensive review by a special task force, then the vast majority of all the cadwelds were capable of being verified as to acceptance.

Q. All right.

Mr. Hernandez?

BY WITNESS HERNANDEZ:

A. I share Mr. Singleton's statement with regard to the cadwelds.

I believe that there may have been a documentation problem, but that the cadwelds that were performed on the South Texas Project were adequately inspected and tested, and in addition to that, through a

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personal review of the pour cards, of isolated pour cards, discussions with QC inspectors, it's been my judgment that the inspectors did indeed verify the location on the pour card that the cadwelds had been installed as stated in the design requirements.

Therefore, I have an extreme level of confidence that the cadwelds, as well as the reinforcing, are as they had intended to be per the design requirements.

BY WITNESS LONG:

A. I have no personal knowledge of any documents that have been lost, other than what was detected during the cadweld task force documentation review, which uncovered approximately 190 inspection reports, and of these 190 inspection reports that could not be located, 150 of these could be located to the appropriate concrete placement in which they were located.

And as indicated earlier, on the concrete pour card there is a section for the concrete pre-placement inspector to indicate his verification that all the cadwelds within that placement have been inspected as verified by the white line on the cadweld.

And as far as documents, as far as cadwelds being unverified, I'm not aware of any that have not been finally checked by quality control.

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Q All right. Several of you have anticipated my second question, and you have partially responded to it, so unfortunately I'll have to ask you this again.

The second question in this pair is, does the loss of the documentation, or the lack of verification, have a serious impact on the structural integrity of the structure involved?

Mr. Murphy?

BY WITNESS MURPHY:

A The fact that documentation is not there does not affect the structural integrity of the building. We have a high degree of confidence that the cadwelds were visually inspected. That is the end result and the criteria by which we accept the cadweld.

And based on the history of the apparatus, the cadwelds, and our inspection records, I feel that we have a high degree of confidence in them, and that the structural integrity is not at all jeopardized.

BY WITNESS ARTUSO:

A Judge Hill, based on my knowledge of the types of designs and construction of containments, knowing the types of excessive strength levels that are achieved in the materials, in the components, knowing that concrete although we have derighted it here about its voids, has an amazing property to transfer stresses and creep under

load to help transfer the stresses in any localized conditions so that you pick up the uniformity, continuity aspect of a design, I would say that a cadweld or two cadwelds that are missing in a continment mat, or in a containment structure would be like a spit in the ocean. You will never see it in the structural integrity test, which is a proof test, you will never notice the absence or a single or two bars.

BY WITNESS SINGLETON:

A. Speaking as a Quality Control person, if there is -- about documents being lost, inspection records being lost, if there is a procedure requirement that those inspection records be generated, and we are not capable of finding them, then as Quality Control I would be concerned that there is a procedure requirement for those records and we don't have the records.

I don't believe I am in a position to talk about whether the integrity of the structure -- I do believe if we have some cadwelds we are not capable of verifying the location or the inspection results, I believe based on our extensive tensile testing program that we have had, over 1200 specimens that have been tested, we have had five failures; three of them in the rebar, and only two in the splice itself. I would say that that would present itself as a high level of confidence in our cadweld

program that we have on the site.

Q Mr. Hernandez?

BY WITNESS HERNANDEZ:

A I would share the panel's previous answers to that comment. Despite the fact that we have had isolated documentation problems with the cadwelds, as a result of our own criteria for documentation of cadwelds, I remain convinced that we have provided adequate testing, inspection of the cadwelds into the overall design and construction of the safety-related structures, and more specifically the containment.

Again, stressing the fact that I am assured by the pour card itself that these have been witnessed, and that they have made a determination that all cadwelds called for in that specific pour have, indeed, been provided.

The testing that we have performed, the experience with cadwelds provides another additional degree of knowing that the performance of the cadweld system has been verified beyond any concern on my part. I can only state that it has a high level of performance, and it has a high degree of confidence.

BY WITNESS LONG:

A Being in Quality Assurance at the time, I would not feel that I had the engineering latitude to make

that kind of judgment. But as my experience as an Engineer, the test records do truly indicate that out of 1200 specimens we have two failures that indicates a high degree of confidence that we do have in the process, as stated by Mr. Singleton earlier.

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BY JUDGE HILL:

Q Okay. Let's move to Contention 1(4), and this will be addressed, again, to Mr. Murphy, Mr. Artuso, Mr. Singleton, Mr. Hernandez, and Mr. Long.

The first question: To the best of your knowledge, were any of the membrane seals damaged?

BY WITNESS MURPHY:

A To the best of my knowledge, there were no membrane seals that ended up under backfill that were damaged. In other words, that are on the containments now, that are damaged.

BY WITNESS ARTUSO:

A Judge, my participation and my testimony on this subject was not one of whether there were any damages, but what if there were damages. And I would just like to repeat that based on my knowledge of the soil condition, the water conditions, at the South Texas Project there was really no need for the membrane waterproofing, and the use of it or the lack of it will in no way affect the structural integrity of the containment structure.

BY WITNESS SINGLETON:

A As all the waterproofing membrane was applied at South Texas, it all was inspection by Quality Control. Any damage to the membrane at that time would have been immediately repaired.

After the membrane system was turned over to construction, and prior to backfill, any damaged membrane that was detected at that time was noted on a non-conformance report.

A review of all the non-conformance reports have indicated that all of the damaged areas were repaired, corrected, and that all conformance was closed out.

And, to the best of my knowledge, there have not been any waterproofing membrane where backfill has been placed against that was damaged at the time.

Q Mr. Hernandez?

BY WITNESS HERNANDEZ:

A Judge Hill, it would be my position that I do not have any personal knowledge of any instances where waterproofing membrane was left in a damaged condition.

I know that it is impossible to construct, to place the backfill without possibly rubbing against the waterproofing membrane, but I am familiar with cases where that was immediately identified and subsequently repaired.

The ease with which the waterproofing repair or waterproofing membrane was repaired also would provide me with the judgment that the waterproofing membrane, if damaged, was subsequently repaired through the normal QC Inspection Program that was performed, and that of any

consequence, any membrane should have been not repaired is of no consequence to the containment design in and by itself.

Q All right. Mr. Long?

BY WITNESS LONG:

A I do not have any first-hand knowledge of any waterproofing membrane seals being damaged, but I am aware of the several NCR's that Brown & Root has generated on the issue, and being the repairs are very simple to accomplish, it is very easy and it is no reason why the repairs should not have been made.

So since the repairs is easy and it takes relatively a short period of time, the NCR's were dispositioned that the repairs were to be made and backfill to proceed as usual.

So I am not aware of any that were damaged, but there are several cases documented on non-conformance reports.

Q All right. The second part of this question: What is the importance of the damaged membrane seals, assuming that they were damaged, what is the importance of the damaged membrane seals to the structural integrity of the Containment Building?

BY WITNESS MURPHY:

A As Mr. Artuso testified to, the necessity

for having this membrane on the containment is a redundant choice, and if the membrane was damaged or was not there there would be no affect on the structural integrity of the containment.

BY WITNESS ARTUSO:

A. I believe I included that answer in my previous answer. What I would like to do is just elaborate a minute.

Membrane waterproofing on concrete walls are not in the same sense as a roofing material that keep the rain out from your house. One hole in a roofing material will let the water pour in and ruin your furniture. One hole in a membrane may never get beyond the first inch of concrete.

BY WITNESS SINGLETON:

A. Judge Hill, I'm afraid I'm going to have to pass on the structural integrity on that one.

Q. Mr. Hernandez?

BY WITNESS HERNANDEZ:

A. If I were to have to make the assumption that there were damaged waterproofing membrane on the exterior side of the containment, it would be my judgment based on the fact that this is a redundant feature that there was no significance to the overall structural adequacy of the containment either at this point in time or during its

design life of 40 years.

BY WITNESS LONG:

A. Being in Quality Assurance at the time, I probably would not have that type of engineering latitude to make that kind of judgment.

But, nevertheless, if the seal was required, HL&P QA in their surveillance of the waterproofing membrane activity did insure, to the best of their ability, that the seal was in place.

Q. All right. Let's move to Contention 1(5). This will be addressed to Mr. Fisher, Mr. Artuso, Mr. Singleton, Mr. Hernandez, and Mr. Long.

To the best of your knowledge, are there any missing rebars in either of the Containment Building structures?

Mr. Fisher?

BY WITNESS FISHER:

A. To the best of my knowledge, there are no undocumented missing rebar in either of the containment structures, and I use the word "undocumented" deliberately because I am sure there have been cases where due to rebar congested or for other reasons there have been FREA's or FCR's requesting the omission or the shortening of, or the relocation of certain rebar for constructibility reasons. In these cases the requests are always evaluated

by Engineering against our design calculations, and judgements are made as to whether those exceptions can be taken.

In other cases, -- and I'm not quite sure whether they may have occurred in the containment shell or other places, but there have been NCR's written on occasion where reinforcing bars have inadvertently been omitted, and in those cases the NCR, again, is evaluated by Engineering and dispositioned to to either rework, replace the rebar by drilling and grouting, or by other means, or it is accepted as is, based on our evaluation of the design calculations for that particular instance.

Q. Mr. Artuso?

BY WITNESS ARTUSO:

A. My participation in this particular answer is not concerned with whether there are any bars. I made no study, or have no knowledge about missing rebars. My only statement is an opinion if occasional rebar were missing from a highly congested area, based on the over designs of containment structures, and the transfer of stresses under loading, an isolated rebar missing would have no appreciable affect whatsoever.

Q. Mr. Singleton?

BY WITNESS SINGLETON:

A. Any reinforcing steel missing or not capable

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of being installed for the design drawings would have been brought to the attention of Construction and Engineering. Quality Control inspects to approve design drawings and design change notices to these drawings, and would not have permitted any placement of concrete in an area that did not conform to these design requirements.

And, to the best of my knowledge, there is no missing rebar in the containment structure that was either not documented on design change.

Q Mr. Hernandez?

BY WITNESS HERNANDEZ:

A Based on review of the doucmentation contained in my testimony, it is my judgment that there are no cases I could identify, or which I am aware, or which Engineers that I work with are aware of, where there have been instances where reinforcing was omitted and not documented on the project, as documented by the project procedures on then a non-conformance report or FREA, field request for engineering action.

These documents, in turn, have been evaluated by Engineering, and an Engineering disposition has been either to accept the omission of rebar, if that was indeed the case, or to ship back and grout, or provide the rebar as installed. So, therefore, to the best of my ability I have no information as to missing reinforcing in the

containment.

BY WITNESS LONG:

A. I do not know of any missing rebar in either Containment 1 or 2, other than those that were documented on non-conformance reports or FREA's at the time.

Q. All right. The second part of this question, assuming there are missing rebars, does the lack of such rebar represent a serious degradation of the structurual integrity of the Containment Building?

Mr. Fisher?

BY WITNESS FISHER:

A. In the event that there were isolated bars inadvertently omitted, I feel very confident, 100 percent confident that there would be no resulting degradation of the containment design.

The conservatism that we have incorporated into our individual design, as well as the inherent conservatism prevailing the applicable design codes and regulations, would provide such a high degree of conservatism that mammoth amount of reinforcing steel would have to be omitted, essentially concentrated in one area for there to be any adverse affect whatever.

Q. Mr. Artuso?

BY WITNESS ARTUSO:

A. I believe I covered this somewhat in my

earlier response, but I would like to elaborate a little, in that through the concrete technology and engineering and construction industry it is recognized that there will be human error, and the Engineers compensate by this human error by always over-designing.

And this over-design, in effect, takes care of an occasional random misplacement or loss reinforcement. So I feel that, again, any isolated bars that are missing would have no structural affect on that containment.

Q Mr. Singleton?

BY WITNESS SINGLETON:

A As a Quality Control, if there were missing rebars I would be concerned, because it is construction's responsibility to install per the drawing, Engineering to insure that the as-built meets design requirements, and Quality Control to insure that the as-built has been installed for the design drawing.

I would be concerned as to why they were missing rebars, whether it was a failure of Quality Control to properly inspect, or interpretation of a design intent. I would be concerned along that viewpoint.

I will have to pass on the structural integrity.

BY WITNESS HERNANDEZ:

A If I were to assume that there were isolated

cases of missing reinforcement I was extremely confident, as Mr. Fisher is, that these instances of isolated missing reinforcement would not compromise the adequacy of the structure to perform as it has been designed. Therefore, I think it would be inconsequential.

BY WITNESS LONG:

A. As a Quality Assurance man, we in our performance of our surveillance activities checked each individual placement we involved ourselves in to the design drawing, and verified that the adequate number of reinforcing steel was in place, but as far as structural integrity I would have to pass on that, too, being Quality Assurance.

Q. Mr. Murphy, do you have any comment on this?

BY WITNESS MURPHY:

A. I concur with Mr. Fisher's statements, and the rest of the Panel, Judge Hill.

(Bench Conference.)

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JUDGE BECHHOEFER: Is there any redirect on this panel?

MR. HUDSON: Yes, Your Honor. We do have some limited redirect.

Do you want us to proceed at this time?

JUDGE BECHHOEFER: Right.

REDIRECT EXAMINATION

BY MR. HUDSON:

Q. Mr. Singleton, I'd like to direct your attention to CCANP Exhibit No. 32, please.

(Witness reviews document.)

BY WITNESS SINGLETON:

A. Okay, I have it.

Q. I believe this is a DDR, Deficiency & Disposition Report, No. S-202, which you authored; is that correct?

BY WITNESS SINGLETON:

A. That's correct.

Q. Could you explain for us what the problem was here in more detail than is provided in this summary statement, so that we have a full understanding of the problem?

BY WITNESS SINGLETON:

A. Yes, I can. Upon removal of the forms in this area, a void and honeycomb area was observed.

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At that time, a non-conformance re ort was -- or a deficiency and disposition report was initiated by myself, and was forwarded to engineering.

The procedure requirements at the time for the issuance of this DDR was that no activity could occur in this area before an approved disposition or resolution had been obtained from design engineering.

What had happened, construction went down into the area and began some chipping to remove the honeycomb and unsound concrete in that area, which violated the procedural requirement that no activity occur in that area, no additional work until an approved resolution was obtained.

And what construction did in their effort to get the work done, they went down there and started removing the unscund concrete.

Q Had construction initiated any placement of new concrete or grout to repair this structure?

BY WITNESS SINGLETON:

A No, they hadn't done that yet. They had gone down there to remove the unsound concrete and to do their exploratory chipping to define the limits of the void.

Q Thank you very much.

Would you now, Mr. Murphy, direct your

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attention to CEU Exhibit 21, please.

(Witness reviews document.)

BY WITNESS MURPHY:

A. I'm sorry, Mr. Hudson -- 21 --

(Pause.)

Q. I believe this exhibit has previously been identified as NCR S-C881; is that correct?

BY WITNESS MURPHY:

A. That's correct.

Q. The problem documented here deals with a procedural violation, again in the making of some concrete repairs on three containment shell lifts, Nos. 12, 13 and 14, and three internal walls, Wall 32, 22H and Wall 15; is that correct?

BY WITNESS MURPHY:

A. That is correct.

Q. Does the existence of the need for cosmetic repairs, as evidenced on the pour cards attached to this NCR, indicate to you the potential for the existence of significant voids against the liner opposite the areas where these cosmetic repairs were necessary?

BY WITNESS MURPHY:

A. No, absolutely. It would be expected that every lift there would be cosmetic repairs required at

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the construction joint, if you will; and they are, as simply stated, cosmetic repairs, and that's it.

Q These are not the types of surface indications which you would use as the basis for initiating a sounding program?

BY WITNESS MURPHY:

A Definitely not.

Q Mr. Singleton, would you take a look at that NCR, please.

(Witness examines document.)

Q Could you describe for me the nature of the problem that is documented by this NCR?

BY WITNESS SINGLETON:

A Yes. The requirement at the time was upon form removal the area engineer and the quality control inspector would do a visual examination of the form surface, and they would identify any type of repairs that was needed, be it cosmetic or structural.

The procedure requirement at the time was to document the evidence of this visual surface inspection.

The engineer would so denote on the back of the inspection -- or on the back of the pour card, as evidenced by the notation "cosmetic repair" was the type of repair that was required, and he would also

10-5

give the method of repair. For example, dry pack, grout.

What happened here, upon completion of the concrete pour, these concrete pour cards are forwarded to the QA vault.

It would have required the engineer to, upon the completion of the inspection, go to the QA vault and pull these pour cards and make the notation on the back.

During quality control's in-process inspection of the field activities, it was noted that the repair had begun on these walls, and the inspector, knowing the procedure requirements, went to the vault and looked at the back of the pour card to see if the evidence of the visual inspection had been documented on the back of the pour card.

It had not, so the inspector was following his procedures and doing his followup, and he so noted that the procedure requirement had not been done.

He had participated in the visual inspection of the walls himself, and that's why he knew that it had been done and it had tc be on the back of the pour card. So as a followup and another check of the procedure requirement, he went to the vault to check on it.

Q. Does this NCR evidence any error on the

10-6

part of the QA/QC inspector?

BY WITNESS SINGLETON:

A. No. I would say it's evidence that the QA/QC inspectors was doing his job.

He knew there was a procedure requirement that this happen upon the observation of the repairs being made.

He went to the vault to verify the compliance to this requirement, and so noted that the procedure requirement had not been adhered to; and he reported it, using the nonconformance report.

Q. Mr. Artuso, in your professional judgment, would the existence of cosmetic defects on the exterior face of a reactor containment building pour indicate a possibility of significant voids against the liner?

BY WITNESS ARTUSO:

A. First, I'd like to define what a cosmetic repair is. It's strictly a surface condition, and by nature of the type of condition, indicates that it's strictly cosmetic in nature, that it does not have any structural significance.

If you don't see a deep penetration, say, of a honeycomb section right at the surface of the concrete, you consider this a cosmetic condition, and it requires very little repair, if any. It's strictly

10-7

aesthetic, and it would not give you any concern that deeper in that concrete you had any voids.

Q. Would you advise a client to sound the lift if the only indication of deficiencies in the pour were these surface cosmetic effects that you've just described, the honeycombing on the surface of the pour?

BY WITNESS ARTUSO:

A. Absolutely not. This is to be expected that you will occasionally run into situations like that, that type of condition.

It doesn't indicate any severe condition that would warrant any more investigation.

Q. Mr. Singleton, at an earlier point in your testimony when we were discussing waterproofing membranes, you mentioned that you had looked at thousands of NCR's and, therefore, you could not recall a specific NCR that was shown to you.

Did all thousands of those NCR's relate to waterproofing membrane?

BY WITNESS SINGLETON:

A. I knew I was in trouble when I said that.

No, my intention was that I've looked at so many NCR's. All the NCR's generated on site that deal with civil activities, whether if they are generated

10-8

by engineering or HL&P or what, come through the civil QC Department, so we can be aware and on top of everything that's going on.

What I meant there, I've looked at so many NCR's and so many pieces of paper, that I could not recall the particular one that was noticed.

No, it was not my intention to indicate that thousands of NCR's had been on waterproofing membrane. Absolutely not.

Q. Mr. Murphy, at page 6574 of the transcript -- I realize you don't have it in front of you -- you were describing the documentation that was generated under current practices when a structural repair was required.

I believe you stated that an NCR was normally written. Is this correct?

BY WITNESS MURPHY:

A. An IRC is written.

Q. What is an IRC, please?

BY WITNESS MURPHY:

A. Inspection repair card.

Q. What function does it serve; could you tell us a little more?

BY WITNESS MURPHY:

A. It serves to document the location and method of repair.

10-9

Q. This is the information that used to be written on the back of the pour card?

BY WITNESS MURPHY:

A. That's correct.

Q. And that requirement that Mr. Singleton just described for noting on the back of the pour card the need for repairs and the method has been deleted and replaced by the form --

BY WITNESS MURPHY:

A. An inspection repair card.

Q. -- IRC?

BY WITNESS MURPHY:

A. That's correct.

Q. Thank you very much.

Mr. Artuso, in discussion with Judge Lamb earlier about the root causes of the voiding at South Texas, you mentioned both the role of the design and the construction practices in causing the voids.

I was concerned that there may have been some suggestion left that you thought that there were further steps that HL&P or Brown & Root could take to reduce the possibility of voiding.

Is that the case? Do you think that there are further changes that we could make to our design or to our construction practice that would reduce the

10-10

possibility of voiding?

BY WITNESS ARTUSO:

A. Based on my knowledge of your new construction practices and procedures, I believe that they are superior.

I can't, per se, offer any additional suggestions as to how you can improve them.

Now, I would assume that these are living documents and there will be times when situations will arise where you can see areas for improvement for specific cases.

This is normal. This is something that should be strived for, but based on what I see here, based on this method of checking for surface defects, I think South Texas Project is superior to most other plants in their attack of the problem.

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BY MR. HUDSON:

Q You mentioned that -- What about the design? Do you think there are any changes that we could make in our design that would --

BY WITNESS ARTUSO:

A The design features I am speaking of are not the stress analysis type. The design features I spoke about earlier were the locations and congestions of rebar and plates embedded in the placements.

I think you have done, or you designers have done everything they can by adjusting lift heights and bundling reinforcing, steps of that sort to minimize the possibility of unconsolidated concrete. I can offer no more improvement than that.

Q You mentioned earlier back in the beginning of your answer to my first question to you that with your knowledge of the current procedures. What is your knowledge? Have you reviewed CCP-25, the current concrete construction procedure?

BY WITNESS ARTUSO:

A Yes. I have reviewed your new construction procedure CCP-25.

MR. HUDSON: Your Honor, that is all of the cross-examination, redirect, recross -- redirect, I guess, right now.

I was wondering if we could suggest breaking for lunch now so that I could have an opportunity to review my notes. The length of time that this panel has gone on, I've got a full legal pad scribbling that I need to run through, and when we come back I may have a few more questions, but I don't think it would be more than ten minutes worth, perhaps.

JUDGE BECHHOEFER: The Board thinks that is a good procedure, so we will break for an hour and 15 minutes for lunch.

MR. HUDSON: Thank you very much.

(Whereupon, at 12:02 p.m., a recess was taken until 1:30 p.m., the same day.)

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AFTERNOON SESSION

1:27 P.M.

JUDGE BECHHOEFER: Back on the record.

MR. HUDSON: We have no further redirect at this time.

Before going into recross, however, I would like to bring up a procedural matter. We would suggest that the Board try and schedule two late sessions out of the next three days, so that we can get on all of the witnesses, all of the HL&P witnesses, with the exception of the Operation's Panel, and Mr. Williams, perhaps. In other words, the witnesses we said we would produce this week.

We did not expect this Panel to go as long as they have, and we are concerned that we won't get finished unless we do that, and I know it takes some time to set things up with the court reporter, so we wanted to suggest it now, that we think it would be appropriate maybe tonight and Thursday night to go late and get in some extra hearing time.

We offer that for your consideration.

MR. GAY: Mr. Chairman, I don't know what the cross-examination is from the other parties in this proceeding, but you may have noticed what I have indicated this morning, I do not have much cross for the next

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several panels, and I don't envision a problem that the Applicant is addressing at this moment. I see the schedule that has been outlined by the Board, going to 6:00 every evening, that we will more than finish in time this week.

JUDGE BECHHOEFER: Does the Staff have any comment?

(No response.)

JUDGE BECHHOEFER: Mr. Sinkin, do you have any comment?

MR. SINKIN: Mr. Chairman, I am not really certain that evening sessions are necessary. Our cross is fairly limited, also. The only panel I think I have any substantial cross on will be the welding panel.

MR. GUTIERREZ: With the exception of tonight, the Staff thinks it might be a good idea to tentatively schedule some late sessions either Wednesday or Thursday. If things move along in the interim it might not be necessary, but we do agree with the Applicant, that it will be helpful and desirable if the scheduled panels could be completed this week.

JUDGE BECHHOEFER: We will take this under advisement. Tonight we won't go late, but we will see where we get on other evenings, or other days.

I had one further message. The reporter has

asked if possible that the witnesses should not talk together. I guess the message applied to lawyers and the Board as well. So to the extent you can, wait until the preceding person has stopped before you start talking.

Mr. Gay, do you have recross?

MR. GAY: I have three, maybe four different matters to discuss with you.

RECROSS-EXAMINATION

BY MR. GAY:

Q Mr. Singleton, I would like to deal with you first. In discussion with Judge Bechhoefer this morning you indicated that with reference to Lift 15 there were two QC Inspectors who were disciplined.

Let me ask you first how many QC Inspectors were involved with Lift 15?

BY WITNESS SINGLETON:

A The inspection on the concrete placement?

Q Yes.

BY WITNESS SINGLETON:

A Two.

Q That was a rather substantial period of time that Lift 15 pour was in progress. Were there two inspectors there simultaneously, or did their periods of inspection overlap?

1-6

BY WITNESS SINGLETON:

A. Let me clarify that. There were more than two inspectors utilized in the inspection of Lift 15, because these inspectors were relieved periodically for lunch breaks, or whatever type breaks are required.

During the placement of the concrete in the area of the polar crane brackets where the majority, or in the area where voiding occurred, there were two inspectors involved in that, and they were the two.

Q. Could you tell us what discipline was involved for those two inspectors?

BY WITNESS SINGLETON:

A. Yes. Each one received a three-day suspension without pay.

I would like to add that it was a three-day suspension without pay, based on a four-day work week, and I was a Lead Inspector at that time. I was not involved in the decision to discipline the Inspectors.

Q. You were not involved?

BY WITNESS SINGLETON:

A. I was not involved in that decision.

Q. Are you generally aware of the reasons for that decision?

BY WITNESS SINGLEOTN:

A. To the best of my knowledge, to sum it up,

1-7

the reason that they were suspended, because based on a failure of the Inspectors to grasp exactly what was occurring at that time, based on their failure to see that there was a problem that was occurring, particularly in the area of the polar crane brackets where the voiding occurred, basically to sum it up, they failed to grasp realm of what activity was going on at the time.

Their inspection reports revealed that everything was fine. We asked them on three separate occasions if they had any problems with the pour, and they indicated that they did not; when the extent of the voiding was discovered they sat back down again and they asked them again if they had any problems and then they came forward at that time and said, "Well, we may have had a problem here, or there," because their paperwork indicated they didn't have any problems it was decided -- they were not able to grasp what was going on at the time, and take appropriate measures to remedy the situation.

Q Now, you say that they were not able to grasp what was going on. Let me see if I can clarify that a little bit.

Are you saying that they were aware of the problem, and didn't report it, or that they were simply unaware and should have been?

1-8

BY WITNESS SINGLETON:

A. I guess they were not able to add two and two together to realize that the sequence of events that was happening right there could lead to the potential presence of a void. Not that they didn't report it, they just didn't -- they wasn't able to add up everything that was happening.

I might add that when this area was poured it was very late at night and there was several factors that were taken into consideration as far as personnel fatigue. It was nighttime. It was dark. Maybe there had been inadequate lighting. But all of these factors contributed to that.

Q. What should the Inspectors have done, Mr. Singleton, had they been able to, as you say, put two and two together? What would have been the natural course for them to follow?

BY WITNESS SINGLETON:

A. Based on what I would do is how I am going to respond to it, because I don't know -- In an area when they are placing concrete and they realize that maybe their visibility is limited, or there is not enough lights, or the method that they were placing it and consolidating it there is a doubt whether it is adequate enough, then you would stop and you would get Engineering involved, and

say, okay, this is what is happening. I think we need more lights up here. I think the way we are placing it and the way we are consolidating it is not quite adequate and that we've got the potential for a void, and you as an Engineer, what do you recommend that we do to relieve this situation?

The Engineer could have made several recommendations, and we would have gone based on what the Engineer's recommendation would have been.

Q Should the QC Inspectors have issued a stop workorder at any point during that pour?

BY WITNESS SINGLETON:

A Was the question could they have?

Q Should they have?

BY WITNESS SINGLETON:

A Should they have? I'm talking hindsight now. If they had realized, like I just mentioned, the events that were leading up that would develop into sequence of events that we would have possibly had a potential for a void area, yes, I believe they probably should have stopped the pour and until we had taken steps to remedy the situation got Engineering involved and got their recommendation from it. Hindsight, that's what should have been done, probably.

Now, you would have to be up there. You would

1-10

have to be up there from 8:00 or 9:00 o'clock in the morning until 4:00 or 5:00 o'clock the next morning. You would have had to have seen what was going on. You could not just sit here and say, yes, that's what they should have done. You would have to get involved in it, and see what was going on up there.

Q Do you recall, Mr. Singleton, how many pump failures occurred during the period of time that Lift 15 was being placed?

BY WITNESS SINGLETON:

A An exact number, no. I want to say three, four. We had things like hydraulic hoses would break, or the connection on the hydraulic hose would break.

I believe they had a problem with one of the butterfly valves in one of the pumps. Three or four.

Q Mr. Singleton, I have a memo to C. W. Vincent from T. B. Schreeder, Jr., dated November 1978, that talks about the Lift 15 problem. And within that memo it cites the discipline of the two Inspectors.

But also attached to that is some description of the pump failure, and I just wanted to show you that to refresh your memory.

JUDGE BECHHOEFER: Is this a document we have, or --

MR. GAY: I don't think so, Your Honor. I

11-11

just want to refresh his memory.

(Document hadned to witness.)

BY MR. GAY:

Q. Have you had a chance to review that?

BY WITNESS SINGLETON:

A. Yes. I briefly scanned over it.

JUDGE BECHHOEFER: Does that refresh your memory?

BY MR. GAY:

Q. Does that refresh your memory regarding that particular incident?

BY WITNESS SINGLETON:

A. Yes. It does.

Q. I believe that the notations there reflect that there were five different pump failures. Does that seem correct.

BY WITNESS SINGLETON:

A. To the best of my knowledge. Like I said, three or four. Mr. Spooner was one of the Inspectors involved during that placement, yes, sir.

Q. Can you tell me --

BY WITNESS SINGLETON:

A. And he was there the complete time. So if he says there were five failures, there is no reason to doubt that.

11-12

Q. Can you tell me when the first pump failure occurred; at what time?

BY WITNESS SINGLETON:

A. According to Mr. Spooner, 10:10 a.m.

Q. Do you recall when the last failure was reported?

BY WITNESS SINGLETON:

A. Again, according to Mr. Spooner's note here --

MR. HUDSON: Your Honor, we are going to have to object to this questioning and answering. It is apparent that the witness does not know this. He is simply reciting from a document that has not been introduced and is not in the record, that no one here has seen, except he and the witness.

If we want the document in for the truth of the matters stated, then let's have a motion to put it in and we will argue. But to just have the witness read that off, I don't think it is credible testimony and is not really the testimony of this witness.

MR. GAY: Mr. Chairman, I asked the witness if it refreshed his memory, and he said "yes." My last question was do you recall, and he started to answer. I think the objection was not well taken.

MR. HUDSON: I believe in his answers he said,

"According to Mr. Spooner," and then he says something. It is obvious that he does not recall it. He is simply reading from the document.

MR. GUTIERREZ: Mr. Chairman?

JUDGE BECHHOEFER: Let me ask the witness. Maybe we can clarify it.

Do you recall these things, or are you just reading it from the document?

WITNESS SINGLETON: Judge Bechhoefer, I am strictly reading from the document.

JUDGE BECHHOEFER: This is not your independent recollection?

WITNESS SINGLETON: No, sir. This is not from my recollection at all.

JUDGE BECHHOEFER: I will sustain the objection then.

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12-1

BY MR. GAY:

Q. Mr. Singleton, do you recall how many pump failures occurred, from your personal knowledge?

BY WITNESS SINGLETON:

A. I think I previously answered that three to four, to my personal knowledge, and that's strictly a guess.

In all honesty, in November 6, '78, you know, I'd been on a lot of placements and the figure doesn't stick out. There to four is what I recalled.

Q. Do you recall from your personal knowledge when the first failure occurred on the Lift 15 placement?

BY WITNESS SINGLETON:

A. That's kind of hard to do now after having read what Mr. Spooner said here, you know.

In all honesty, Mr. Gay, if I had not read Mr. Spooner's thing here, I could not tell you when the first pump failure occurred.

It's not that I'm trying to forget or anything, it just -- from November the 6th, '78, to the present, there's been so many pours and I just can't recall. I'm sorry.

Q. Well, Mr. Singleton, let's assume for a moment that there were anywhere from three to five pump failures over the course of that placement, and going

12-2

back to the hindsight, quarterbacking situation of whether or not there should have been a stop work order issued, in light of those placements do you think that one of those inspectors should have stopped the placement of concrete on Lift 15?

BY WITNESS SINGLETON:

A. Well, the --

MR. HUDSON: I object to that, Your Honor. It's been asked and answered.

JUDGE BECHHOEFER: Yes, I think that has. That's the same question you asked a few minutes ago, was it not?

MR. GAY: Well, there's a slight modification. I'm particularly citing the pump failures and not any other incident involved in consideration, so I think my earlier question was more of a generic question. In this I rely solely upon the pump failure.

MR. HUDSON: Is the question now that if the only thing that had gone wrong was the pump failure should the placement have been stopped?

MR. GAY: That is the only consideration that I am assuming.

MR. HUDSON: Okay. Well, I'd like to have the question restated, because the way I heard the original question was in light of the pump failures,

12-3

which did not exclude anything else.

BY MR. GAY:

Q Mr. Singleton, I'll rephrase it for you.

If a QC inspector is aware of a series of pump failures, and that's his only consideration, the pour has gone on for quite some length of time, would that be a sufficient justification, or should it be a sufficient justification for in and of itself stopping the placement of that concrete?

BY WITNESS SINGLETON:

A. I don't believe so, Mr. Gay. I think you'd have to look at each individual instance.

For example, when a pump goes down, pump breaks, the first thing you should do is get with construction and say, okay, what's the problem now, what do you plan on doing, are you going to put another one in or are you going to repair this one; and if you're going to repair this one, how long do you estimate that it's going to take.

Your first consideration would be, for me, would be to make sure that a cold joint in the concrete does not occur.

There's a lot of things that's taken into consideration there; how long the concrete has been sitting there, the amount of retarder, the ambient

12-4

conditions as far as is it cool, in direct sunlight, any wind, or what like that.

You'd have to take a look at each instance of pump failure as it occurred and how long it was going to take to repair the pump, and go based on that.

If they said, no, it's going to take us four to five hours, then you've got to come up with something. You've got to come up with a back-up pump or another way of placing the concrete.

To have just a pump breaking down four to five times during a pour, I would not say that was justification for an inspector to stop a placement.

Q. Do you know, Mr. Singleton, whether the QC inspectors involved in evaluating this particular placement in Lift 15 carried on that kind of dialogue with construction?

Did they go to them and ask them about the problems that were occurring, particularly the pump failures?

BY WITNESS SINGLETON:

A. Mr. Gay, I was there approximately maybe half the length of the pour, and we do carry -- this is normal for us to carry on this type of dialogue because we're in constant radio contact with construction, that we need to know what step they're going to do next so that we can

be prepared.

I know this happened during my presence. After I left the placement, I don't have any recollection, I don't have any knowledge that this type of dialogue took place, but it's a typical type dialogue that takes place every day on each pour, the communication with construction.

We question, and construction, they let us know what's going on, because we've got to work together. We've got to know what we're going to do.

Q I asked you a question a moment ago, Mr. Singleton, about the reasons for the discipline of the QC inspectors.

One of the things mentioned in the memo that I showed you I think refers to those QC inspectors' failure to report to their supervisors.

Would you agree with that as a grounds for discipline of those QC inspectors?

MR. GUTIERREZ: Mr. Chairman, the Staff would object. The question is meaningless, absent an explanation of what that document says and an identification of that document. I didn't follow the question. It presupposes something is in the record that he's referring to.

MR. GAY: I don't think it presupposes

12-6

anything, Mr. Chairman.

What I was asking Mr. Singleton was the failure to report to QC supervisors the incidents that were occurring at Lift 15 a grounds for the disciplinary action that was taken against them.

I think that question can stand apart from any reference to the memo.

MR. GUTIERREZ: Well, maybe I was mistaken. I thought Mr. Gay referred to the memo.

MR. GAY: Oh, I did. I asked him if he agreed with that, and essentially that's --

MR. GUTIERREZ: Well, you see, that's the problem, the Staff has never seen the memo and therefore didn't understand the question.

JUDGE BECHHOEFER: I take it you've rephrased the question.

MR. GAY: I've rephrased the question.

WITNESS SINGLETON: What's the question?

BY MR. GAY:

Q I'm asking you, from your personal recollection, whether or not the failure of the QC inspectors involved, the two that were disciplined, was a reason for the discipline that they failed to report the events that were occurring at Lift 15 to their immediate supervisors.

12-7

BY WITNESS SINGLETON:

A Well, let's see. Memo from Tom Shreeder to Mr. Vincent, Mr. Schreeder was to cite QC supervisor, Mr. Vincent, I believe at the time was project QA manager.

Now, I wasn't involved in the decision to do this, but I believe your question is was the failure of the inspectors to report to their supervision exactly what went wrong out there, or to report --

Q Well, let me see if I can explain this a little bit.

A while ago you mentioned that there were two or three instances that these QC personnel were asked questions and they failed to give explanations as to what went wrong.

Now, I'm just trying to get some explanation first of all, if there was any consideration in disciplining them based upon the fact that they did not immediately, during the progress of that pour, go to their supervisors and explain what was going on, or if there was a subsequent consideration in disciplining that they refused to acknowledge under cross-examination by their supervisors what went wrong.

BY WITNESS SINGLETON:

A Mr. Gay, I'm going to bring up again that I wasn't involved in the decision to discipline these

12-8

people.

Q. Well, I understand that, Mr. Singleton.

BY WITNESS SINGLETON:

A. In my opinion, was that justification enough to give them disciplinary action; is that the question?

Q. No, I'm just asking if the failure to report to supervisors was a consideration for the disciplinary action, and if so, what that involved; was it a failure to report immediately on the site, or was it a failure to respond under cross-examination?

I mean, you did --

JUDGE BECHHOEFER: Well, let's have him answer the first question first, and if he knows, then maybe you can go on. If he doesn't, it will cut it off.

WITNESS SINGLETON: Not involved in the decision to discipline these people, but the best of my knowledge, I do believe it was a consideration, it was considered in the decision to discipline them.

BY MR. GAY:

Q. Now that you've said that, do you say that because it would have been logical for those QC inspectors to inform their supervisors of the events that were occurring at Lift 15 placement, or was it because they failed to communicate to their supervisors at some subsequent period of time?

12-9

BY WITNESS SINGLETON:

A. It was a combination of both. If they experienced problems in Lift 15, then it would have been their responsibility to seek assistance from their supervisor to help remedy the situation, and also immediately following the placement the inspectors were asked several times, two to three times, did you have any problems and they indicated that they did not, so I think both of those things were taken into consideration for them to be disciplined.

Q. I have a broader question about the question of supervision, Mr. Singleton.

Do you think the failure of the QC inspectors at Lift 15 could have been in any way attributable to a failure of supervision of QC?

BY WITNESS SINGLETON:

A. No.

Q. No?

BY WITNESS SINGLETON:

A. No.

Q. So could we assume from that that you would not accept any personal blame as a QC supervisor for the events that occurred at Lift 15 placement?

BY WITNESS SINGLETON:

A. I wouldn't accept any blame at all. I would

12-10

be concerned as a QC supervisor, again, that we had the requirements to inspect for the procedures and when we run into problems to seek the help from our own supervision, from engineers and everything, and if our inspectors had failed to do this I would be concerned as, you know, this is something they should be doing, and why didn't they seek assistance from their supervision or why they didn't get with engineering or what, I would be concerned with the root problem of why it did not occur.

Q. Prior to Lift 15 placement, Mr. Singleton, were QC inspectors trained as to what to do under a series of events as occurred at Lift 15?

BY WITNESS SINGLETON:

A. As a series of events that were unique to Lift 15 or that if you ran into a problem during a placement, this is what you did.

Q. Well, I had in mind the series of events regarding the pump failures and the high congestion of rebar, and those type of events.

BY WITNESS SINGLETON:

A. Yes, we have been. We have been in the course of our training and our qualification training, our periodic retraining, our what we call safety and training sessions which are held weekly, we deal with

12-11

how to handle problems.

As part of our testing we were given situations, for example, you're on a concrete placement, the form tie breaks, the foreman wants to do this, the engineer wants to do this, what do you as an inspector do? This has been part of our test, of our questio s, and it was done to handle situations like this.

We have, not procedures, but we have instructions on how to handle auditors, how to handle NRC when they come on a pour, you know.

Yes, we have been trained to handle situations like that. We've had sessions, we've had questions, we've had tests.

Q Could you inform us as to the two individuals that were disciplined? What were the names of the two individuals?

BY WITNESS SINGLETON:

A Jerry Souther, S-o-u-t-h-e-r, and Charlie Spooner, S-p-o-o-n-e-r.

Q And that's the same Mr. Spooner that -- whose notes you were referring to a moment ago?

BY WITNESS SINGLETON:

A That's correct.

Q I think you identified him at the time as a --

12-12

you say he was a lead QC inspector?

BY WITNESS SINGLETON:

A. No, sir. Both of them were Level II batching and placing inspectors.

Q. Okay. This question can go to any member of the panel that perhaps would know the information.

Who was the seniormost individual knowledgeable of the events that were occurring at Lift 15 at the time that they were occurring?

In other words, who was the Brown & Root individual on the jobsite that was aware of what was occurring at Lift 15?

Mr. Murphy, do you happen to know that?

BY WITNESS SINGLETON:

A. Present on the jobsite during the pour?

Q. Yes. Someone who was aware of the events that were occurring, the seniormost person in Brown & Root.

MR. HUDSON: Could we have a clarification; is that in QC or in construction?

JUDGE BECHHOEFER: I was just about to ask that.

BY MR. GAY:

Q. Well, let's take it first with QC, Mr. Singleton, do you know the answer with regard to QC?

12-13

BY WITNESS SINGLETON:

A. Well, when the placement started, the senior-most QC man that would have been knowledgeable of the activities that were going on would have been the civil QC supervisor, Mr. Allen Hammons.

Q. Was he aware of the progress of Lift 15?

BY WITNESS SINGLETON:

A. He was aware of the progress of Lift 15.

Q. And he was aware of the pump failures? Would he been aware of that?

BY WITNESS SINGLETON:

A. He would have been aware of the pump failures by communication with -- his communication with the lead inspectors, his communication on the radio and everything, his monitoring of the radio as far as the progress of the pour.

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13-1

Q. Who was the senior-most construction person at the site aware of mistakes or the sequence of events that were occurring on Lift 15?

BY WITNESS SINGLETON:

A. I guess the senior-most construction man that would have been familiar with the activities would have been the general civil superintendent.

I think that was Mr. Jim Salvetti at the time.

Q. Now, were either Mr. Salvetti or Mr. Hammons disciplined for failing to take this information up the ladder and discuss it with either engineering or someone else in construction during the progress of this pour?

Do you know, Mr. Murphy?

BY WITNESS MURPHY:

A. No, I do not, Mr. Gay.

BY WITNESS SINGLETON:

A. The pump failures as they occurred, as I am looking at Mr. Spooner's memo here, the pump failures here would not have been -- strictly QC now -- would not have been a reason to go to higher management of a concern on the progress of the pour.

Broke down for 30 minutes; broke down for an hour; broke down for 45 minutes.

13-2

Our main concern would have been the prevention of a cold joint occurring in the concrete and would not have been a concern for taking it to higher management at that time.

When most of this activity occurred, as far as placement of concrete around the polar crane brackets and at the top, it occurred very early in the morning, 3:00, 4:00 o'clock, 5:00, from 3:00 to 6:00 in the morning.

Mr. Hammons would have left approximately 6:00 or 7:00 o'clock that night. I don't know how long Mr. Salvetti was out there.

The concrete superintendent, concrete general foreman, they were all preser.

Q Mr. Artuso, do you agree with the comments that Mr. Singleton just made that the series of pump failures showed no reason for construction personnel to take this matter of the ladder and discuss a possible solution?

BY WITNESS ARTUSO:

A This is generally a procedural affair for a given site, and for a QC person to identify a problem, if he can on his level readily resolve a problem, then you handle it on that level; if it is a problem that is beyond the scope of his responsibilities, then it would

13-3

go up the ladder.

Let's look at this particular situation, for example.

There's an old axiom that you cannot inspect quality into the product. It's the constructor or the construction people's primary responsibility to get that placed without a cold joint, without any honeycomb.

The inspector there is to verify that they are doing that. It's the inspector's responsibility to identify if they don't find it.

Now, to timely call a cessation of that pour would be almost primarily an economic situation.

If he has enough intelligence and experience that he can fall back on and say this is going to be a real time-consuming and expensive repair, we had better stop it now, he can suggest that.

His counterpart in construction should have that responsibility of actually performing the stop.

Q There's one thing that I recall you mentioning when we were in San Antonio, Mr. Artuso, and that is in your Monday morning quarterbacking situation as TMI, you might have suggested to them that they simply, upon reaching a particular point in the pour,

13-4

have just turned on the hoses and washed that concrete out.

I'm not asking you whether or not that should have been done at South Texas Project. What I am asking you is from the knowledge that you have of the events that took place during Lift 15, should the personnel there have gotten together and decided, "We've got to take some action, or we need to discuss this with upper management"?

BY WITNESS ARTUSO:

A. Here again, it's a matter of time. Upper management -- It may be too late to go to upper management.

This is a decision that has to be made quickly. If you had an experienced senior-type person on the job, his responsibilities should be well-defined as to whether he stops the pour if he contemplates a problem.

Had I been there and I received reports that there were continual breakdowns and I was the inspector, just a Level 2 inspector looking at it, I could foreseeably do the same thing he did.

I didn't see any specific cause.

But on the other hand, if I were an engineer there who had more experience, who had seen

13-5

much more construction and who could detect that there was a possibility of voids, then it would be my responsibility to stop the pour, for one reason, and that is to save my employer the time and cost of repairing that.

Q Mr. Artuso, do you have an opinion as to whether or not there ought to be a procedural step involved in the process of a concrete pour where an engineer is contacted upon a certain sequence of events, or reaching a certain point in time?

BY WITNESS ARTUSO:

A I would say that any procedure should have a stop-work requirement in there. If you see that there is no question whatsoever at certain levels of work being performed that is not in compliance with the specifications, you should have the procedures established so that it can be stopped, much like -- Let's simplify it.

The Level 2 inspector has to see to it that concrete of only a certain temperature, of only a certain slump, goes into the placement.

If a truck comes up and it doesn't have that slump and temperature, he can reject it.

That is his primary responsibility. That is his so-called stop-work limitation, whereas the

13-6

construction engineer or a senior-type construction fellow on that project, if he knows, and in this case I assume from all of the discussions, it was not readily known about the honeycomb formations.

If he knew that there were honeycomb formations, he would have been very wise to have stopped the pour.

Q Do you have an opinion that there was a lack of experience of the personnel involved in Lift 15 placement that contributed to the problems there?

BY WITNESS ARTUSO:

A I would say that -- again, you know, second guessing is easy, and Monday-morning quarterbacking is easy.

Knowing what developed there, I would have said that there should have been some concern on the part of the Level 2 inspector that there were honeycombs being formed.

He should have known that much. Now, whether he -- I don't think he necessarily could be given the responsibility of stopping the pour, but he certainly should have had the responsibility of reporting those possibilities, so that then the next day they could have investigated it and determined whether corrective action was required.

13-7

Q. Mr. Murphy, earlier this morning Judge Lamb asked you questions about penetrations through the wall.

I think you responded by citing one that occurred under the steam line.

Was there also a penetration that went through the wall in the Lift 8 at I guess it would be the personnel air lock, personnel air hatch?

BY WITNESS MURPHY:

A. Yeah, the personnel air lock is in Lift 8, or a portion of it is in Lift 8.

Q. Was there a penetration that went through the wall in that area?

BY WITNESS MURPHY:

A. The personnel air lock went through the wall.

Q. I mean, was there a void in or around that air lock that went through the wall?

BY WITNESS MURPHY:

A. I think there was a -- There is one there, as I said earlier. There was three or four of these situations in the containment that we came across.

Without going back and specifically looking at drawings, I couldn't say for certain, but I would say that that could have been a likely spot.

13-8

Q. Do you recall a consulting engineer by the name of John King?

BY WITNESS MURPHY:

A. Yes, I most certainly do.

Q. Did he deal with the void problem at Lift 8?

BY WITNESS MURPHY:

A. Yes. As a matter of fact, Mr. King was involved from the onset in the development of the repair procedures and the methods that were used to investigate and repair all of these.

As I stated in previous testimony, I think, Mr. King was the primary developer of the material that we ended up using to repair this.

It was the cementatious non-shrink grout.

Q. With regard to the --

BY WITNESS MURPHY:

A. It was a cementatious cement grout.

Q. This is a clarifying question regarding the waterproofing membrane.

Can someone tell me where that waterproofing membrane begins and what is covered by the waterproofing membrane?

I guess what I'm asking is what level --

BY WITNESS MURPHY:

A. The waterproofing membrane begins at the

13-9

bottom and ends at approximately Elevation 28.

Now, I say the bottom. The bottom varies throughout the plant, depending upon the structure that we're talking about.

We pour a mud slab, if you will, which is a construction working surface; and on that -- this is a horizontal surface, and there's a layer of waterproofing membrane applied there.

Over that there is a seal slab, if you will, to protect that while the reinforcing steel and additional work is being done above it.

Then when you get into a vertical surface, the waterproofing membrane is applied from that point up to elevation, approximately 28.

Q Is Elevation 28 below ground?

BY WITNESS MURPHY:

A It's grade.

BY WITNESS SINGLETON:

A It's grade.

MR. GAY: I pass the witness.

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14-1 ged

JUDGE BECHHOEFER: Did he say he was through?

MR. SINKIN: He passed the witness.

RECROSS-EXAMINATION

BY MR. SINKIN:

Q. Mr. Singleton, you said that you were present for Lift 15 for about half the pour; is that correct?

BY WITNESS SINGLETON:

A. That's correct.

Q. Which half would that have been?

BY WITNESS SINGLETON:

A. Approximately 10:00, 11:00 o'clock at night; it would have been the first portion of it.

Q. I heard you say 10:00, 11:00 o'clock at night. That was when you left or arrived?

BY WITNESS SINGLETON:

A. I left.

Q. You left?

BY WITNESS SINGLETON:

A. I left at approximately 11:00 o'clock, 10:00 to 1_:00, somewhere along in there.

Q. In what function, in what capacity were you there? Why were you there?

BY WITNESS SINGLETON:

A. I was a lead inspector, I believe for Unit 1,

lead inspector for Unit 1.

Q. As lead inspector for Unit 1, then, were you essentially a supervisor of Mr. Spooner and Mr. Souther? Did they work under you?

BY WITNESS SINGLETON:

A. They worked for the -- We had lead inspectors for preplacement activities, and we had a lead inspector that was over batching and placing concrete activities.

In the absence of the QC supervisor, civil supervisor, and in the absence of the Level 2 batching and placing inspector, then I would have been supervising those two inspectors.

Q. During the time you were at Lift 15, were the other two persons there, the Level 2 --

BY WITNESS SINGLETON:

A. I believe the Level 2 batch and placing inspector left at approximately 5:30.

He lived quite a distance from the site, was in a van pool, and had no way of getting home. So he left approximately at 5:30.

I believe Mr. Hammons left probably about 6:30 or 7:00.

Q. Who was -- I'm sorry. It seems to me that earlier you had described Mr. Sooner and Mr. Souther

14-3

as Level 2 batching and placement inspectors.

BY WITNESS SINGLETON:

A. That's correct.

Q. But there's a Level 2 supervising --

BY WITNESS SINGLETON:

A. There's a lead inspector over batch and placing.

Q. And who would that have been?

BY WITNESS SINGLETON:

A. I would say at the time I believe it was a man by the name of Jerry Lacey.

Q. And he was the one that didn't have a ride home and left at around 5:30?

BY WITNESS SINGLETON:

A. Yes.

Q. And as far as Mr. Spooner and Mr. Souther, were they there for the full 20 hours with just breaks for meals?

BY WITNESS SINGLETON:

A. I don't know if Mr. Spooner and Mr. Souther began the pour. Again, I wasn't supervising their activities at the time.

They were not there the -- They were relieved periodically. I don't know if they were there the full 20 hours, not counting relief.

14-4

I do know they were there from approximately 5:30 p.m. to the duration of the pour.

Q. Mr. Artuso, when you were discussing the stopping of work, it seemed to me that what you were saying was the primary authority for stopping work under these kind of conditions should rest with a construction engineer who was either watching what was going on or at least was continually aware of what was going on.

Is that your feeling of how the authority should be arranged?

BY WITNESS ARTUSO:

A. Actually, I guess regulatory requirements really govern who performs the stop-work function, and they require QC to have stop-work authority; they require construction to have stop-work authority.

The primary goal is not to allow any shoddy construction stay in the structure.

So I believe that in this particular case a wise construction engineer, knowing that there were voids, or should have -- maybe -- again, let me say I am not sure how I would have behaved under those circumstances.

Certainly, if you know there are major voids, you should have stopped and washed out all the concrete and started from scratch.

14-5

I even envision a scenario where the next day you would probably be fired, because they would say, "Why did you ruin all that good concrete? There's no voids there."

So it's a very delicate situation. It takes someone with considerable experience to make that judgment and put it on the line.

Q Mr. Singleton, did you have the feeling -- well, let me ask a first question.

Were you involved at all in questioning Mr. Spooner and Mr. Souther as to whether there were any problems on the pour?

Were you personally involved in that questioning on any of the occasions on which the questioning took place?

BY WITNESS SINGLETON:

A I was standing there when the supervisor, Mr. Hammons, asked Mr. Spooner or Mr. Souther if they had any problems with the pour. Probably twice -- two of the three times they were asked, I was there.

Q Was it your impression that they didn't want to say and they were embarrassed or for some other reason did not want to say they had had problems; or was it that they did not recognize that they had problems?

15-6

BY WITNESS SINGLETON:

A. I think that they believed that under the conditions that existed out there, as far as the duration of the pour, the lighting, the accessibility, that they believed that construction had done the best job that they could.

I honestly believe that they didn't think that there were any voids in there, because any inspector, if they had thought that voids were occurring, then it would have been the proper thing to stop, remedy the situation; and if you could remedy the situation, continue; and if you couldn't, then make a decision.

But I honestly believe that they thought that construction had done the best job that they could under conditions, and I don't believe that they thought that there were any voids there.

Q. Who decided on the three-day no-pay discipline?

BY WITNESS SINGLETON:

A. I guess the over-all responsibility of it and the approval of it would have rested with Mr. Schreider.

I don't know if it was Mr. Hammons' suggestion and Mr. Schreider agreed with it. Knowing Mr. Schreider, I would say it was his suggestion.

15-7

Q. You think it was Mr. Schreider's suggestion because he was particularly tough or....

BY WITNESS SINGLETON:

A. I know how to answer you in construction language, but I'm trying to say something that I can say.

Q. Would you describe him with three initials? I mean, what are you saying about Mr. Schreider?

BY WITNESS SINGLETON:

A. He was tough.

Q. He was tough. Okay.

Did you feel that the three-day, no-pay discipline was warranted under the circumstances?

BY WITNESS SINGLETON:

A. I believe some disciplinary action was probably warranted, whether it was sitting them down and, you know, chewing them out and getting on their case and finding out what the problem was, or maybe putting a letter to the file where you had a discussion with them and your opinion that it was a failure on their part to perform their duties.

My own personal opinion is that I think the three days was a little extreme.

Q. You talked about concern that a cold joint would form. Could you just describe briefly for me

15-8

what a cold joint would be?

BY WITNESS SINGLETON:

A. I'm going to let Mr. Murphy give you the technical or the engineering definition of that.

BY WITNESS MURPHY:

A. A cold joint as applied to in this situation would be a construction joint that was not prepared.

In other words, one in which you could not penetrate with a vibrator, a running vibrator, when you placed subsequent layers of concrete on it or by itself.

Q. In other words, a vibrator wouldn't move through it?

BY WITNESS MURPHY:

A. That's correct.

BY WITNESS SINGLETON:

A. That was one of the tests of a cold joint is a vibrator when it's operating will penetrate in its own weight.

That's one of the things that when a pump goes down or you have a problem like that, that's something that you continuously monitor.

You may do it, depending on, again, the ambient conditions and stuff; you may do it every 15 or 20

15-9

minutes, go around and check for a cold joint situation.

When you see one developing, that's whe you get into it and get with the engineers and say, "Okay, this is what we've got. Now what are you going to do?"

Q To your knowledge, was there ever a pour at South Texas where QC stopped the pour in the middle of it?

BY WITNESS SINGLETON:

A I didn't hear the last. Stopped --

Q Stopped the pour in midstream, in the middle of the pour?

BY WITNESS SINGLETON:

A Yes, sir, there was. I did it once or twice myself.

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15-10

Q Was there ever one on the complex concrete pours?

BY WITNESS SINGLETON:

A You could call this one complex. It was the base mat for fuel handling building in Unit 1. I believe it was approximately twenty-four or twenty-five hundred cubic yards, a very congested pour.

Q Why did you stop it?

MR. HUDSON: Objection. Your Honor, we are getting far afield here, I think, and using a lot of time.

That's not relevant to the testimony of the witness. It's not relevant to the containment building or any of the contentions.

I think we're just exploring things for curiosity's sake.

This is redirect. It's not direct examination. If he had wanted to inquire into these areas, he could have done it earlier.

He didn't use all his time last night. Why didn't he ask these questions then.

JUDGE BECHHOEFER: Let me ask you, where are you going on this line?

MR. SINKIN: I was starting with the fact that Mr. Singleton was asked, "Should QC have stopped

15-11

this pour?"

His opinion was, "Perhaps they should have."

What I'm trying to elicit from him -- He has just told me that he actually stopped a pour once.

What I'm trying to elicit from him is the criteria for when a pour is stopped by QC and whether there have been instances where they have been stopped by QC, and if so, why were they stopped.

I think it's the same general area that's being explored about stop-work authority.

MR. HUDSON: Your Honor, we question, with that explanation, is any of that relevant to the issues before the Board, the contentions, and I don't see that they are.

MR. SINKIN: Well, there's one about technical competence, I believe.

JUDGE BECHHOEFER: I think we will sustain that objection. It's getting pretty far afield.

BY MR. SINKIN:

Q Mr. Long, when you were asked earlier by Mr. Gutierrez, I believe, why there was no tap test used prior to the Lift 15 breakdown and all the subsequent events, you said that procedures were thought to be sufficient at that time.

15-12

Were you aware of voiding in concrete at South Texas prior to Lift 15?

BY WITNESS LONG:

A. Would you specify which structure you are talking about, or the plant in general?

Q. Were you aware of voids that occurred in the fuel handling building, the containment base mat, the secondary shield wall?

BY WITNESS LONG:

A. I was aware of the FH-1 S-2 spent fuel pool slab, Elevation 21-11; it had some voiding on the underside of that slab prior to Lift 15.

Q. Did that voiding in any way raise in your mind a concern that there might be future voiding and that perhaps some special measures should be taken?

BY WITNESS LONG:

A. This was a very unique slab, and I think Mr. Murphy could probably tell you a little bit about the configuration of the rebar on that particular slab.

Q. Well, I'm not really asking that question.

I was asking if, in your mind, the occurrence of those voids raised a more generic concern.

I think I'm hearing you say not really, because --

15-13

BY WITNESS LONG:

A. It was very unique in the fact that it had bundle No. 11's, which do not occur at any other place, to my knowledge, in the plant, and did not have a steel liner, as the containment shell does.

Q. At what elevation in the containment building does the steel liner start?

BY WITNESS HERNANDEZ:

A. Mr. Sinkin, I'm not altogether sure. I believe it might be as minus 11.3.

Q. And let me get the relationship between the bottom of the steel liner at minus 11.3, where you think it is, and the -- I guess it would be the mud seal that's the lowest possible --

BY WITNESS HERNANDEZ:

A. It's 18 feet below that.

Q. The mud seal is 18 feet below the edge of the steel liner?

BY WITNESS HERNANDEZ:

A. That's in general. I'm talking about -- What we have is we have a two-foot internal fill slab on top of the three-eighths-inch carbon steel liner.

Then beneath that we have an 18-foot thick concrete mat; and below that, you would have the waterproofing membrane.

13-14

It wouldn't be its lowest point, because on the outside circumference of the containment mat we have a lower area which is called the tendon gallery.

Q. Mr. Singleton, you testified that when you were the lead inspector for Power Block Unit 2, that Mr. Swayze was the lead inspector for Unit 1, the power block for Unit 1; is that correct?

BY WITNESS SINGLETON:

A. That's correct. We changed up several times and switched things around, but at the time I was testifying about, that's correct.

Q. To your knowledge, was Mr. Swayze the first QC hired for this plant?

BY WITNESS SINGLETON:

A. No, he wasn't.

Q. Do you know who was?

BY WITNESS SINGLETON:

A. I believe there were two or --

MR. GUTIERREZ: Mr. Chairman, the Staff has to object to that question, just on the basis of relevancy.

(Bench conference.)

JUDGE BECHHOEFER: Why is that relevant?

I think the Staff's objection is well taken there, unless you can give me some explanation.

15-15

MR. SINKIN: I was basically laying some foundation questions about his knowledge about Mr. Swayze's background at the project, and I was going to ask him to characterize Mr. Swayze's work.

JUDGE BECHHOEFER: How does that relate to this panel's testimony? It doesn't have anything to do with Mr. Swayze's work, I don't think.

MR. SINKIN: Well, you have a lead inspector in charge of an entire power block unit, and my questions are going to the characteristics of that inspector's work, whether he did good work, poor work, whether Mr. Singleton had confidence in that work, just like we've explored his opinions of the work of Mr. Souther and others.

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15-1

MR. HUDSON: Your Honor, can we be heard on the Staff's objection?

JUDGE BECHHOEFER: Well, if you're going to support it, you can't be, because we're going to uphold it, but if you're against it --

MR. HUDSON: I'll withdraw.

JUDGE BECHHOEFER: It isn't relevant to either to the -- any questions asked by the Board or the Staff, as far as we can determine.

BY MR. SINKIN:

Q Mr. Singleton, earlier you were questioned by Mr. Gutierrez about Roger Forte, and I believe you said that he was a lead inspector for Units 1 and 2 and at the same time you were QC supervisor. Is that correct, or were you changing positions in the midst of that?

BY WITNESS SINGLETON:

A We're in a transition period here. I was lead inspector for Fuel Handling 1 and 2. Mr. Forte was lead inspector for Reactor 1 and 2.

And then in March '79 I assumed the position of the civil QC supervisor, which at that time prior to that I worked with Mr. Forte. As of March '79 I supervised Mr. Forte's activities.

Q Are you familiar with a memorandum that

15-2

Mr. Forte wrote about the cleanliness of a particular pour and your role in okaying that pour?

BY WITNESS SINGLETON:

A. I've almost got it memorized. I could say I was familiar with it.

Q. Earlier you answered some questions regarding that, and you said that you were not involved in the disciplining of Mr. Forte, I remember, and that you were not involved in the decision and then you went on and named who had.

Did you agree with that decision? Did you feel that Mr. Forte should have been placed on probation?

BY WITNESS SINGLETON:

A. Yes, I did.

Q. Were you disciplined in any way for the topic of that memorandum?

BY WITNESS SINGLETON:

A. No, I wasn't.

Q. Was there any --

JUDGE BECHHOEFER: Where is this line of questioning going?

MR. SINKIN: That's the last question right there, Your Honor.

BY MR. SINKIN:

Q. Mr. Hernandez, was there any tap test ever

15-3

done on any lift prior to finding the Lift 15 problem at any time?

BY WITNESS HERNANDEZ:

A. No, not to my knowledge.

Q. You stated that you felt there would be a problem in doing it generally because you would end up drilling a lot of holes in the liner where there was just a small separation.

BY WITNESS HERNANDEZ:

A. That was one of my reasons.

Q. One of your reasons. If you could take that a step further, what is the actual problem? Are you saying that you're weakening the liner by drilling the holes?

BY WITNESS HERNANDEZ:

A. No, sir, you're not weakening the liner by drilling the holes.

I just see no reason to indiscriminately drill into -- except into the steel liner, on the basis of a sounding approach as a result of the tap test.

I don't believe that the tap test, in and by itself, can be used as a means of providing conclusive evidence as to whether there exists a void on the other side of the carbon steel liner. I just don't believe that. I believe that you have to have specific

15-4

information regarding that pour, you have to evaluate where that is relative to the structural features of the liner.

I think that you have to go back and review what happened with respect to the characteristics of the pour and with all that information then yes, as an engineer, I can go back and evaluate a specific area as to the merits of an area that has been marked out relative to the tap test.

But my position is that if tomorrow someone draws some area on the containment liner, in and by itself I would not go out and drill in through the containment liner on that basis alone. I would not agree.

Q. The voids in Lift 8 around the stiffener, were they above or below the stiffener, do you recall?

BY WITNESS HERNANDEZ:

A. I'm not sure; with respect to what we found in the Lift 8 investigation, and Jerry can correct me, the only time that we found voids were beneath the eight-inch stiffeners, or let's say the channels, and the eight-inch steel plate stiffeners where we had an unusual amount or what we have characterized as a heavily reinforced congested area, but the voids were beneath the eight-inch channel.

Q. They were beneath. Judge Lamb was asking a

15-5

series of questions about the strain meters, or the strain gauges, I guess they're called.

Would I be correct that in Containment Building No. 1 that Carlson stress and strain meters were installed? Is that correct?

BY WITNESS HERNANDEZ:

A. I believe that's the name given to that type of strain gauge, Carlson strain gauge.

Q. Carlson strain gauge. Is that the same strain gauge as installed in Unit 2?

BY WITNESS HERNANDEZ:

A. I believe it -- I would have to go back and look. I don't know if we have installed strain gauges. I believe Reg. Guide 1.[illegible] is with respect to the first unit. I don't believe we actually installed strain gauges in Unit 2. I'd have to go back and check on that.

I think it's doubtful that we did. I don't think that there's a regulatory requirement, but I'd have to check the document.

Q. Well, let me be sure I understand. What specifically is the strain gauge designed to measure?

BY WITNESS HERNANDEZ:

A. The strain gauge is designed to measure -- let me start from the beginning.

When you have the containment you have

15-6

certain documents which state that you will place a strain gauge at certain stress locations. Okay.

You build your containment, and in the process of building the containment you locate the strain gauge as required.

You get to the point that the strain -- that the containment has been completed. You're in the process of performing the structural integrity test, which is the actual "go/no go" test for the containment.

Q Excuse me. Is that the pressure test now you're talking about?

BY WITNESS HERNANDEZ:

A Yes, sir. It's a pressure test.

You take the pressure up to 1.15 times your accident pressure that's been determined on the job.

You have digital analyzer with leads to these various strain gauges. As you take up the pressure you'll be able to read out the strains with respect to how the containment is expanding, okay, or how it's moving differentially, circumferentially and radially.

You then take that information and you analyze it against what you had predicted in terms of design strains that you would see as a result of the post-tensioning and the SIT.

Q Then can you explain to me why you would want

15-7

to do that kind of test on Unit 1 but not want to do it on Unit 2?

BY WITNESS HERNANDEZ:

A. Because you have the same type of containment. You're verifying the adequacy of the containment design.

Unit 1, okay -- I should say Unit 2 is a replica of Unit 1. You're actually going back and baselining the containment configuration. It's a replication.

MR. SINKIN: Pass the witness, Your Honor.

JUDGE BECHHOEFER: Oh, good. I was just going to inquire when we could take a break. We'd like to take a break.

We'll take a 15-minute break.

(A short recess was taken.)

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JUDGE BECHHOEFER: Back on the record.

Before we go to the Staff, Dr. Lamb has a couple of questions based on the last series of questions.

WITNESS HERNANDEZ: Excuse me, Judge Bechhoefer. I would like to make a correction of the statement I made with respect to a response to Mr. Sinkin. I don't see him here, but I checked --

With respect to the structural integrity test, I am in error. We do perform a structural integrity test both on Unit 1 and Unit 2.

However, the Unit 1 containment does contain all the strain gauges that are required as if the containment were to be considered a proto type. It does contain the strain gauges.

Whereas, on the structural integrity test performed for Unit 2 per the Reg Guide requirements, we are going to make a gross deflection check of the containment, and we will also perform the visual examination of the containment consistent with what we are doing on the Unit 1 containment for crack patterns, et cetera.

That's a correction.

MR. SINKIN: Does that mean there are no strain gauges in Unit 2, though?

WITNESS HERNANDEZ: There are no strain

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gauges in Unit 2 embedded in the concrete. They are provided in Unit 1.

BOARD EXAMINATION

BY JUDGE LAMB:

Q. My question was related to that then. We talked about the use of strain gauges this morning in connection with the 65 psi test.

BY WITNESS HERNANDEZ:

A. Yes, sir.

Q. That can't be done in Unit 2?

BY WITNESS HERNANDEZ:

A. The pressure test, sir?

Q. Yes.

BY WITNESS HERNANDEZ:

A. Yes.

Q. You do have strain gauges in it for that?

BY WITNESS HERNANDEZ:

A. No, sir. We do not have -- The requirement is that we will strain -- The requirement is to strain gauge the Unit 1 containment.

We have provided additional strain gauges in the Unit 1 containment, as I stated before in this morning's testimony, to consider it as a potential prototype, because --

Q. Those are the ones you referred to on Page 57

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of your testimony?

BY WITNESS HERNANDEZ:

A Yes, sir.

Q Now in Unit 2?

BY WITNESS HERNANDEZ:

A In Unit 2 we will perform the same type of test. We will do a leak rate test to test the leak tightness of the containment membrane, the liner, and then we will also take the containment up to its structural integrity test.

We will also perform a visual examination of the containment and monitor any gross deformations of the containment.

The requirement is that on the Unit 1 containment we will go back and be required to review the actual strain gauge measurements against predicted strains in the containment. If those indeed are acceptable, then you are allowed to go back to the Unit 2 containment and say the Unit 2 containment will be performed on a structural integrity test without the strain gauges. There is no requirement for the Unit 2 containment to be strain gauged. But there is a requirement for the licensee to perform the structural integrity test.

Q So you would not in Unit 2 be able to

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determine the presence of voids, for example?

BY WITNESS HERNANDEZ:

A. Yes. We would.

Q. You would?

BY WITNESS HERNANDEZ:

A. The pressure test is a pressure test. It -- The strain gauges do not tell you if the liner is going to deform to an unacceptable amount.

The strain gauges are placed in the concrete itself. They are providing information relative to the strain or movement of the concrete itself at different points in the concrete. Okay?

Whereas, when you take the pressure test up, you are putting the pressure inside the containment. If you had a localized area where you did not identify a void, and you had a void in back of the liner, and you pressure tested the 65 psi, this would exceed the yield value of the liner, because it would not have support because of an absence of concrete if you had a void. And you would see a permanent set or deformation in the liner, okay, at that point in time, or any type of voids that were on the -- let me clarify that -- any voids that were adjacent to the liner surface.

The pressure is an internal pressure. It is like a tin can, pressurizing a tin can. Okay? If you

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over pressurize it, you are going to deform the tin can. That is why there is a jacket, or the containment shell around the containment liner. The containment liner in and of itself is not a structural member. It provides a leak-type membrane. That's its only function.

Therefore, if we had portions where the concrete was not placed back of the liner, and we did take the pressure test up, you would be able to tell if you had gross deformation of the liner. It would be an acceptance/rejection test of the liner, itself, and it is an acceptance/rejection test of the overall performance of the containment as its ability to constrain that pressure.

Q All right. But there is something that will be determined only by a visible change and a permanent visible change in the character of the liner?

BY WITNESS HERNANDEZ.

A That's correct.

Q You would not -- do not have the capability to do that with strain gauges in Unit 2?

BY WITNESS HERNANDEZ:

A There are no strain gauges on the liner. My point is that you are not going to be able to tell, other than a permanent deformation either on Unit 1 or Unit 2 with respect to the liner.

Q On Unit 1 in your testimony on Page 57 you

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say that HL&P requested the incorporation of additional strain gauges. This is in addition to what strain gauges? This is more strain gauges.

BY WITNESS HERNANDEZ:

A. Those are more strain gauges than the requirement for Reg Guide 1.18. When we consider the containment as a prototype, or the potential for having it considered as a prototype, what we did is we met the criteria of the Reg Guide by providing additional strain gauges that were required when you consider the containment as a prototype.

As I stated before, when we first started out on the construction of the containment we did not know if these other units that were preceding us, which were similar in configuration, would be completed on time with respect to their construction schedule. Therefore, we did not want to have the situation whereby we were now, because our production had proceeded at a rapid rate where we were the first containment to undergo the SIT as the configuration we have.

Therefore, to alleviate this concern we required that we consider ourselves and potentially prototype and that we provide the additional strain gauges required by the Reg Guide as a consideration of a prototype containment, so that we wouldn't get down and

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be in the position of just before going to -- get in the position of going and performing the SIT, and having to argue with the NRC, or any regulatory body, gentlemen, you didn't put additional strain gauges and we are considering you a prototype. We didn't want to be in that argument.

It was far more economical for us to just include those strain gauges and provide some additional pieces of information.

Q What I am having trouble with you say "additional strain gauges." That suggests that in connection with prototype testing you installed strain gauges in addition to strain gauges which you would have installed if you were not going to make the prototype test.

BY WITNESS HERNANDEZ:

A That's correct. That's on Unit 1.

Q So then there is a base group of strain gauges installed in Unit 1 --

BY WITNESS HERNANDEZ:

A Yes, sir.

Q -- regardless of the possibility of prototype tests?

BY WITNESS HERNANDEZ:

A Exactly.

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Q But those are not in Unit 2?

BY WITNESS HERNANDEZ:

A Those are not in Unit 2.

Q Yes, Mr. Artuso.

BY WITNESS ARTUSO:

A I would just like to add that in concrete technology, the proof testing of concrete members, is primarily one of measuring deflections. And you measure deflections against the calculated deflections that you would get under the loadings, under the stresses that you would get.

The logic for containment SIT testing is very much the same. You load test the containment, and you measure how much it deflects. And if it meets within the calculated deflections, then it is considered acceptable.

Now, let's assume that you had tremendous voids in there, you may get a permanent deflection, or you may get unusually large deflections. This would mean then that, the SIT test would tell you that that containment is not acceptable.

Q Right, but that will -- You will only be able to do that, if I understand what I am being told, you will only be able to do that on containment 1?

6-9

BY WITNESS ARTUSO:

A. No. You don't need strain gauges to measure overall deflections. You can do it by other means.

Q. Okay.

BY WITNESS ARTUSO:

A. I had mentioned on Unit 2 that we would take gross deflections. We will monitor the deflection of the containment on Unit 2. We just won't have strain gauges inside the containment shell wall that are actually providing data as to how the concrete is moving, at the outside face, the middle face, and the inside face.

BY JUDGE BECHHOEFER:

Q. If you were going to use the test to detect voids, would your information be as useful after you did the Unit 2 as after you did the Unit 1 test?

BY WITNESS HERNANDEZ:

A. Yes, sir. That's --

Q. In terms of detection of voids.

BY WITNESS HERNANDEZ:

A. Yes, sir. That's what I am trying to say. When you pressure test, you have a containment that is filled with a pressure. That pressure is an internal pressure and it is pushing out radially. It is trying to press against the containment liner. The point is, if we have any internal voids, or if we have voids that are

6-10

on the inside face of the containment liner, on the inside face of the containment liner you will see a deformation of the liner. That is one way of telling.

The other way is if you go back and you see something unusual happening with regard to the Unit 2 containment because deformations and deflections are not in line with predicted values that you have already calculated both from Unit 1 and predicted on the basis of calculations for Unit 1 and Unit 2 you will readily be able to ascertain there is a problem.

You will also have, as the containment swells up, the concrete is going to crack. You are going to form a crack pattern. If you see any cracks over and above a certain size or thickness, then those are grounds for concern, also. Those are written into specification.

So it is not just that the strain gauges by themselves are going to tell you whether the containment is acceptable or not. It is going to tell you Unit 1 is acceptable, and it is going to tell you that the configuration of thatcontainment whether it is Unit 1, whether it is Unit 2, or whether it be a Unit 3 or Unit 4 is an acceptable configuration that it will perform as it has been designed.

Q But strictly in terms of void, the strain gauges really have no affect at all, whether they are

there or not, strictly in terms of voids?

BY WITNESS HERNANDEZ:

A. Strictly in terms of voids they are not going to tell you that there is a problem, but the instrument that is going to tell you a problem is when you take the pressure up and perform the SIT, all the strain gauges are telling you is as the containment swells this is the strain. That is all of the information that that is telling you.

JUDGE BECHHOEFER: Mr. Gutierrez, recross?

MR. GUTIERREZ: Yes. Thank you, Mr. Chairman.

RECROSS-EXAMINATION

BY MR. GUTIERREZ:

Q. First, Mr. Hernandez, I understood you say in answer to a question by Dr. Lamb that HL&P thought the use of horizontal stiffeners would be a better design relative to constructibility than using Nelson studs. I have two questions in that regard.

First, briefly could you explain what a Nelson stud is, and, secondly, could you give HL&P's thinking behind choosing the horizontal stiffener design over the Nelson stud design?

BY MR. HERNANDEZ:

A. Yes, sir, if I can describe a Nelson stud. It's a piece of -- It is like a metal rod, which is

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welded on to the back of the containment liner. It has a little button at the end of it. It is a proprietary type arrangement. It's specific purpose is to provide anchorage into the concrete through the capacity of the extended piece of rod.

When we evaluated Brown & Root's recommendation at that point in time we were concerned with regard to the fact that the Nelson studs, as they were typically going to be welded on to the containment liner -- you have some type of configuration, a diamond pattern -- in other words, the Nelson studs would be at all corners of a diamond. We call that a diamond pattern. Or you could have a square pattern, or something of that nature.

And the concern that we had was they would have to be placed on the containment liner prior to its erection, from a constructibility standpoint. You have a transportation problem when you have the circular ring of the liner, and it is laying down on a truck being shipped out. You have a very high tendency to break off some of the Nelson studs attached to it. And this was a concern with regard to replacing of the Nelson studs.

It was just something we felt that even once we got the liner in place that we would be looking at damage to the studs when we were placing the reinforcing

6-13

next to the containment liner, that we would inadvertently damage some of the stud, and probably have a very hard or have a very high degree of difficulty in replacing those studs.

Second, we were aware that the configuration of the, the revised configuration of the containment liner, with the horizontal channels and the vertical angle stiffeners was a design that had been accepted through the Bechtel topical report submitted to the NRC. That Bechtel topical report was used as a basis for our review with regard for reviewing for constructibility, as well as for insuring that the configuration met the design intent.

Those were some of the outstanding reasons.

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Q Okay, thank you.

Just to be clear and to close this, once the liner plate is erected and the pour has been prepped -- you are ready for the pour -- is there any difference in ease of inspection and accessibility for inspectors, if you are using Nelson studs versus the horizontal stiffeners?

BY WITNESS HERNANDEZ:

A I think you would not -- With the Nelson stud you would not have the problem that you have a horizontal surface, in terms of the eight-inch channel which could -- which we found to restrict the visibility of the concrete beneath it, as the concrete is coming up.

But on the same standpoint, with the Nelson studs, if you are taking a vibrator -- this is just my personal opinion.

If you are taking a vibrator and you are using a very heavy vibrator, a three-inch diameter vibrator, and you are going very close to the reinforcing, you may have a tendency to knock off some of the studs.

It's a give-and-take proposition with regard to the design of the vertical stiffening system versus a studded system.

Q Okay, thank you.

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BY WITNESS FISHER:

A. Might I add just a comment, Mr. Gutierrez?

Q. Yes, Mr. Fisher.

BY WITNESS FISHER:

A. One consideration in using the stiffened liner in lieu of a liner with studs was simply a matter of constructability from another aspect, and that is that the liner with the stiffeners is self-supporting as an interior form; whereas a liner with studs would require supports from the interior of the containment in terms of large ring girders, bracing and so forth during placing of the concrete.

This type of apparatus has a tendency to get in the way of work going on inside the containment, and so it's a constructability consideration, as well as the other factors that Mr. Hernandez mentioned.

Q. Thank you, Mr. Fisher.

Mr. Artuso, in response to a question from Dr. Lamb, I understood you to say that voids are always present under penetrations; and I'm asking you did you mean that, or is it more correct to say that the potential for voids are particularly present under penetrations?

BY WITNESS ARTUSO:

A. Well, here again, we'll have to get into

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a definition of what is a void.

A void would be entrapped air pocket, let's say, and you can name the size.

I would say categorically that under any horizontal plane, bleed water and air will rise and become entrapped under there.

So all penetrations, all flat areas, have a certain number of voids.

Q. Okay. Let me ask you this: Relative to significant voids, which we've gone into great deal in the past, is it your testimony that significant voids are always present under penetrations, or that the potential for significant voids are particularly present under penetration?

BY WITNESS ARTUSO:

A. I would say that insignificant voids are always present under penetrations; significant voids only if it's not placed properly.

Q. Mr. Murphy, I'd like to ask you the question: What are you doing, Brown & Root doing, now different from what you were doing prior to Lift 15 to counteract the potential for the occurrence of significant voiding underneath penetration?

BY WITNESS MURPHY:

A. The major change is that there has been

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in blockouts over a given dimension, which I cannot recall exact, but I think it's something like 18 inches, there will be a vibrator port, if you will, through the middle of the blockout, in which a vibrator can be lowered through that and concrete placed through that port, also.

That is the major change, then until now.

Q. And by "blockout," do you mean -- I have the mental picture of actually what I described as a mini-form, I guess, and you are --

BY WITNESS MURPHY:

A. You are correct.

Q. -- actually making a special placement for the penetration areas?

BY WITNESS MURPHY:

A. That's correct.

Q. Now, Mr. Hernandez, during the Board questioning, a number of tests were discussed, and I jotted down the names of tests when they came up.

I jotted down four. It's my understanding that to date none of these tests have occurred, but that all of them at the appropriate time will be performed.

Let me just run down this list and you tell me if I'm correct.

The structural integrity test?

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BY WITNESS HERNANDEZ:

A. That is correct.

Q. Leak rate test?

BY WITNESS HERNANDEZ:

A. That is correct.

Q. Post-tensioning test?

BY WITNESS HERNANDEZ:

A. Yes, sir.

Q. And pressure loading test?

BY WITNESS HERNANDEZ:

A. Well, the pressure loading test is the structural integrity test.

Q. Right.

BY WITNESS HERNANDEZ:

A. But you are correct; those have not been achieved at this point in time.

They are acceptance tests in the future upon completion of the construction of the Unit 1 and Unit 2 containments.

Q. Mr. Artuso, we've had extensive testimony relative to the unimportance of the membrane seal, and you said that in some cases it is desirable. You cited to protect concrete from corrosive waters.

My question is, is such water present around the South Texas Project?

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BY WITNESS ARTUSO:

A. That was one of the first questions I asked when I was consulted on this matter.

Concrete is effected by sulfates in water and soil, and I was told that the tests indicate that there are no sulfates present at any of the prescribed magnitude that would require protection for the concrete against sulfate effect.

Q. Who was it that told you that?

BY WITNESS ARTUSO:

A. The engineers.

Q. Brown & Root?

BY WITNESS ARTUSO:

A. Brown & Root.

Q. Did you, yourself, perform any independent tests to assure that was the case?

BY WITNESS ARTUSO:

A. No, I did not.

Q. Mr. Hernandez, do you have any knowledge relative to the --

BY WITNESS HERNANDEZ:

A. I have no knowledge of the contents of the water being high in sulfates.

Q. Does any member of the panel?

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BY WITNESS MURPHY:

A. The sulfate concentrations of the groundwaters at South Texas are below, well below, any concentrations that would need to be addressed.

In addition to that, if they were there, the mix design and the water/cement ratio and the type of cement that is being used would also accommodate much higher concentrations of sulfate than we experienced.

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Q. I believe it was Mr. Long -- I could be mistaken. One of the panel members said that the voiding on Lift 15 was originally discovered by a laborer working on a construction joint.

Was that -- Was it Mr. Long or Mr. Murphy?

BY WITNESS MURPHY:

A. That was I, Mr. Gutierrez.

Q. Now, am I correct in saying that that would have been in preparation for Lift 16, the next lift? Is that what that laborer was doing?

BY WITNESS MURPHY:

A. As I recall, and as I got information regarding this situation, the general superintendent, Mr. Salvetti, made an inspection of that construction joint upon his arrival the next morning, shortly after the placement had been completed.

He noticed that the slick lines had been discharged on top of the construction joint, if you will, at the completion of the placement; and that he had told the foreman to have the laborers clean that up and dress it up as a construction joint.

So it was much prior to the preparation of the next placement. It was the completion of this one, and they were removing hardened but green concrete in this operation.

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Q. So as I understand you, that would also be prior to final QC sign-off on Lift 15; post-placement inspections had not occurred at that time?

BY WITNESS MURPHY:

A. No. This was hours after the placement.

Q. I see. That might be unclear.

Is your answer that this laborer discovered the voiding that gave rise to the investigation prior to the final QC post-placement inspections on Lift 15?

BY WITNESS MURPHY:

A. Yes.

Q. Okay.

You also stated that the most recent pour found some voiding, even though, to your knowledge, all the new procedures were implemented and properly carried out. Is that what you said earlier?

BY WITNESS MURPHY:

A. That is correct.

Q. Could you elaborate a little bit as to where the placement was and the extent of the voiding?

BY WITNESS MURPHY:

A. The placement? It was CS2W9, which is the ninth lift in the Unit 2 containment shell.

The placement in question encompassed the bottom portion of the equipment hatch.

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The preplacement plan provided for the use and the placement of grout underneath this area, underneath this penetration.

The plan required that there be several locations underneath here in which a grout lance, if you will, would be fed to the liner from the outside of the containment.

If you will, this is a very congested area, and these lances had to be threaded, if you will, where a clear path existed.

In conjunction with these ports that were cut in the forms for inspection -- or to facilitate these lances there were inspection ports that were also provided in there.

The placement proceeded. I might add at this point that this is after we had some inclement weather and there was a two-hour delay because of rain and the removal of subsequent water that had resulted from the rain.

The placement proceeded, and up underneath this equipment hatch, approximately at 7:00 o'clock, there was an inspection port and a grout port.

The lance was used to inject grout underneath the penetration, and it was withdrawn as the grout moved forward.

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Just prior to the grout reaching the front end or the outside of the containment, the inspection ports were closed and this grout lance, which is probably eight or ten feet long -- probably ten feet long at this point -- was pulled out prematurely.

Subsequent placement, because of the congestion and what have you, did not permit subsequent lifts to flow into this area.

In the normal course of a post inspection after the placement was finished, there was an indication on the outside of the equipment hatch on a circumferential flange that was attached to the equipment hatch, there was an opening that you could put your fist in.

Subsequent to this, it was investigated and found that it was of approximately three feet from possibly 6:30 to 8:00 o'clock, if you will on a clock, and extending approximately seven to ten inches below or away from the equipment hatch sleeve, if you will; and it went into the shell approximately two, two-and-a-half feet.

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18-1

The area was very visible and you could evaluate the condition of the surrounding concrete and grout, and it was an error in judgment, I guess, that the lance was pulled out when it was.

Q. Now, what you're saying is this is the only void that was found since new procedures were -- have been implemented?

BY WITNESS MURPHY:

A. I doubt that very seriously. I cannot tell you that for sure. I know that there was a rock pocket found in one of the set of previously approved pours, if you will.

Q. Is what you're saying then that this is the only void of significance that's been found subsequent?

I'm wondering. My initial question was for you to elaborate on the voiding you were referring to this morning following the implementation of these new procedures.

BY WITNESS MURPHY:

A. This is the one, and this is what I was alluding to then, that no matter what we do to the procedures, we are never going to get to the point that we will assure ourselves of eliminating every void.

BY WITNESS HERNANDEZ:

A. Mr. Gutierrez, I might add, from an

18-2

engineering standpoint, I think Brown & Root has evaluated this specific void located around the equipment hatch in this localized area, and we have also done the same.

We do not consider the void in and by itself to be significant from a structural standpoint, but your question did go back and say, have you identified any voids. Yes, we have.

We have also instituted, per procedure, the program to evaluate the void, to go back and chip out the concrete to determine the extent of the void, and have done so.

And on that basis, engineering has evaluated or is in the process of evaluating the void, but from our standpoint we find the void as not being significant in nature.

I might add at the time that this occurred to ensure that we had a proper indication of what was happening, as soon as the form was removed at that particular point, we sent the construction manager, we sent the engineering manager, we sent the site civil engineer from HL&P, and I think a couple of other people all at the same time to personally witness the extent of the void at that point in time.

It was their judgment, as well as our

18-3

engineering judgment, once we got the photographs and the actual extent of the void, this was not structurally significant.

Q I guess what's troubling me is in your new procedures, absent visual inspection for surface voids, how are you guaranteeing that you're going to detect internal voids?

What procedure do you have to see that those are picked up?

BY WITNESS HERNANDEZ:

A. Mr. Gutierrez, I guess my point again is that if you're talking about any type of wall system, and there you're talking about, I assume, an internal void in some inner space between the exterior face and the interior face, whether there's a carbon steel there or not.

Is that the extent of your question?

Q. Between the external face and the liner.

BY MR. HERNANDEZ:

A. Okay. So your question --

Q. That doesn't show itself on the surface.

BY MR. HERNANDEZ:

A. Your question only relates to the containment, then?

Q. Yes.

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18-4

BY WITNESS HERNANDEZ:

A. Okay. We are placing the concrete in the middle portion of the containment shell. I guess a picture would be worth a thousand words, but we have the -- the concrete is being placed in the middle portion of that containment shell wall.

If there's going to be any type of problem it's not going to be in the internal portion of the containment shell wall. It's going to be as the concrete has a tendency to flow through the reinforcement to get to the interior face or to the -- to the interior face where the liner is, or to the exterior shell.

Q. Well, therein lies the problem, it seems. You've got a procedure to check if it flows to the exterior face and a void occurs. That's through visual inspection.

If the other problem occurs, namely it flows to the interior face, the liner, how do you pick up voids that occur there?

BY WITNESS MURPHY:

A. There have been changes made to the procedure in which the application of grout in congested areas is being used more frequently.

The practice of injecting grout next to the liner and having it flow to the exterior of the containment in these areas will eliminate a concern there.

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In the other areas we have moved the prime cause of voids to a much more visible and accessible position, and there is -- then with those two things in mind, and then barring any problems with the placement, if you will, pump breakdowns and the like, and the industry practice of using inspection during the placement, the concerns are not justified.

BY WITNESS HERNANDEZ:

A. I'd like to add, Mr. Gutierrez, also that before, and this is something that we can't over-stress, is that we had highly reinforced congestion. We admit to that.

We also admit to the point that this reinforcing congestion severely restricted the ability of both the concrete hand who was placing the vibrator and the QC inspector from getting to the point of accessibility where he could inspect the pour, or where he could be down there actually ensuring the adequacy of the concrete placement.

We have made changes with regard to the reinforcing configuration so that we have provided a much larger degree of accessibility for the inspectors, and again, we have made changes in the configuration, we have made changes with regard to visibility, lights, we have made changes with regard to the time the pour will

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start. If we can't get our act together by a certain drop-dead time, the pour is not going on during that day and will have to be shut down until the next day or the next time that they can make the pour.

For all of these reasons we don't feel that there is a rational reason to go back and tap the external surface of the containment liner for each individual pour.

Q Just let me close this line with one question that continues to trouble me.

I hear what you're saying, that your new procedures, from an engineering point of view, satisfy you that voids will not occur, significant voids will not occur.

In the same breath I hear you saying relative to Lift 7 in order to verify that your new procedures worked that you performed a sounding test to satisfy yourselves of that.

Now, I'm sitting here thinking, well, if you thought it was a good idea for Lift 7, why do you also say in the future it's not only redundant but could add problems or create problems?

BY WITNESS HERNANDEZ:

A Because, Mr. Gutierrez, you're relying on a tapping of the containment liner. It's an audible mechanism whereby if my ears are better than somebody

18-7

else's ears, where I say I think that sound sounded a little bit more distinct or hollow sound than the gentleman next to me, I would be going back and marking the containment liner.

Q Well, now, Lift 7 you did sounding, right?

BY WITNESS HERNANDEZ:

A Yes, sir.

Q As contrasted to tapping?

BY WITNESS HERNANDEZ:

A Yes, sir.

Q Let me ask you this question. In light of that, do you think it's a desirable feature to -- as a post-placement QC check to sound lifts for voids?

BY WITNESS HERNANDEZ:

A I would rather place the -- and again I can't state this too strongly -- I would rather have my QC in the middle of the pour during the inspection than having to provide a false sense of satisfaction against tapping.

I would rather have QC in the pour witnessing the pour. I would rather have construction adequately trained and performing against a construction procedure and I would rather have a site engineer available to witness the pour to ensure if anything does occur unusual that it's taken care of.

I believe that that's the proper method for

18-8

ensuring the adequacy of the pour, not in and by itself tapping.

Q Let me ask you this, relative to the Lift 9 and the void Mr. Murphy described.

If the void went the other way, toward the liner, as opposed to toward the surface, how would that have been picked up? How would it have been detected?

BY WITNESS HERNANDEZ:

A It was adjacent to the liner, and it was on the exterior surface.

Q I'm saying now if it had gone the other way, in other words, if it had flowed to the interior, or the void was created in the interior, how would that have been picked up, assuming all procedures, all new procedures were implemented?

BY WITNESS HERNANDEZ:

A Well, that is a very unlikely occurrence. The pre-placement plan required that grout lances be placed through the thickness of the shell up against the liner, the carbon steel liner, and this is the point that the placement began.

In other words, grout was ejected against the liner and it was witnessed through inspection ports as it flowed to the outside of the containment.

So the method of placing, it was visually

18-9

watched and inspected.

We had provided inspection ports to witness that. I guess it's hard to visualize, but this lance is in a horizontal plane. There is enough visibility to see that the lance has been placed against the liner.

The grout is ejected from the lance and is slowly withdrawn back from, away from the containment liner.

At this particular point, at the time as the lance was withdrawn, because of the height of the inspection pour, there was a concern that the grout was going to come through the inspection port.

Therefore, that inspection port was closed and you could not witness what was occurring in the last six to eight inches as you withdrew the lance to ensure that grout was actually being filled in that exterior portion against the wooden form.

Q. It's my understanding from Mr. Murphy's testimony that the void wasn't six or eight inches but three feet by two and a half feet.

BY WITNESS HERNANDEZ:

A. I'm talking with respect to depth.

BY WITNESS MURPHY:

A. The inspection port was closed. The inspection port and the point at which the grout lance was injected

were not coincident. They were somewhat removed.

The grout was at a lower elevation than the injection port, and consequently would have come out the inspection port had it remained open.

BY WITNESS HERNANDEZ:

A. Mr. Gutierrez, when I said six to seven inches, or I believe six to seven inches, my -- in depth, what I meant is if you have the center line of the equipment hatch and you move radially from the theoretical center line of the equipment hatch, you'll have the outside ring of the equipment hatch.

My six to seven inches was moving along that radial line away from the equipment hatch. If you want to take it in terms of depth, that's what I meant with respect to.

Q. If it's any comfort, I understand it now.

BY WITNESS HERNANDEZ:

A. All right.

Q. Mr. Singleton, relative to Lift 15, after Mr. Hammons left at approximately six and the Level II batching-placement inspector left at approximately 5:30, who were Mr. Souther and Mr. Spooner's supervisor at that point?

BY WITNESS SINGLETON:

A. I would have been their supervisor at that

18-11

point.

Q And were you their supervisor from, I guess, somewhere right after 6:00 o'clock to 11:00 p.m., when you left?

BY WITNESS SINGLETON:

A That's correct.

Q During that time why didn't you perceive any problems with the pour?

BY WITNESS SINGLETON:

A During that time we didn't have any problems with the pour other than the pump failure.

At the beginning of the pour we had what we considered to be -- not at the beginning of the pour, as it got dark we perceived the problem to be with adequate lighting, where we got with construction and indicated we needed additional lighting, and which they complied with it.

The time element that you're talking about where the problems occurred in and around the polar crane brackets was after 11:00, close, you know, to 4:00, 4:00 to 6:00, 3:00 to 6:00 o'clock in the morning.

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19-1 ge

Q. Well, it's my understanding that the principal reasons for the voiding on Lift 15 have been cited as the pump failure and the duration of this pour, the unusual duration.

As I look at this, you say the pump failure had already occurred, and by this time the pour had been going on for some almost 13 or 14 hours.

Were you subject to any disciplinary action as a result of the subsequent discovery of voids on Lift 15?

BY WITNESS SINGLETON:

A. Why would I have been subject to disciplinary action?

No, I wasn't.

I didn't mean to answer the question with a question.

BY WITNESS HERNANDEZ:

A. Mr. Gutierrez, we've also cited other contributing factors beyond the pump breakdown in our testimony.

That is of significance to us as the engineers, okay, but we've also cited the other aspects, the undeniably long duration of the pour, the limited accessibility, the rebar congestion with respect to the containment bracket area, the extent

19-2

of the bracket, the portion of the bracket that extends into the shell wall itself, added to the congestion in the area.

So, therefore, I don't want to leave you with the impression that it was only the pump breakdown that brought about this event.

BY WITNESS SINGLETON:

A. If I could expand a little bit further on that, the pump breakdown contributed to the pour lasting as long as it did.

The fact that the pumps broke down, in itself, did not say, "Okay. The pumps broke down. That's why you had a void."

That's why I got my hair a little bit up on my neck just then.

Q. From 6:00 to 11:00, did you bring any of the concerns that Mr. Hernandez just listed to anyone's attention, engineering's attention, construction's attention?

BY WITNESS SINGLETON:

A. From 6:00 to 11:00, like I said, the only concerns that the inspectors brought to me, or even talked to me about any problems they had at all during that time period was inadequate lighting, which we took immediate steps with the electrical superintendent

19-3

and the concrete superintendent to remedy that situation.

The inspectors did not indicate that they had any problems at all during that placement.

Q And then after you left at 11:00, who was the inspectors' immediate supervisor?

BY WITNESS SINGLETON:

A Prior to my leaving -- At the time that I left, everything was, you could say, was going smooth. There was no problems.

I talked to the inspectors. They had no problems.

When I left, it would have been -- I don't remember, it was either Mr. Souther or Mr. Spooner, would have been in charge of the pour.

They had instructions that if any problems did occur, they had our telephone numbers where they could contact us and let us know that they had a problem, and we could come back out there.

We had other QC inspectors there monitoring the concrete testing agency at the time.

Q Is what you are saying, then, that after 11:00, there were no QC supervisors present during the pour? Is that what you are saying?

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19-4

BY WITNESS SINGLETON:

A. There was not a concrete -- a civil QC supervisor present or a lead inspector present. That's correct.

Q. Before you left at 11:00 did you ascertain how long the two inspectors, Souther and Spooner, had been on duty?

BY WITNESS SINGLETON:

A. Would you repeat that last part, please?

Q. Did you ascertain or ask them or find out through any other means how long these two inspectors had been on duty before you left at 11:00?

BY WITNESS SINGLETON:

A. I believe Mr. Souther and Mr. Spooner had came onto the pour approximately a little after 5:30 or right at 5:30.

Q. And your source for that information is your memory?

BY WITNESS SINGLETON:

A. Memory.

Q. One other comment relative to Lift 15 you made I'd like to ask you about.

You stated that construction did the best they could under the conditions. I believe that was your testimony.

19-5

My question is, is that the QC inspector's job, to make such a judgment? Is that what you're out there for, to determine whether construction put forth its best effort?

BY WITNESS SINGLETON:

A. I believe my comment was based on the observation of what I thought Mr. Souther or Mr. Spooner, if they had had any problems, and I was reading off of a memo that Mr. Gay had given me; and it was my observations that I felt that the inspectors believed that under the conditions that existed, as far as duration of the pour, the accessibility, the visibility, they believed that construction had done the best job that they could.

Q. But isn't the role of the QC inspector not to determine whether construction did the best job they could, but whether construction followed the specifications and procedures?

BY WITNESS SINGLETON:

A. The role of the QC inspector is that construction requires with the requirements of the specifications and the procedure.

Q. Just a few more questions.

Mr. Murphy, did you state that in the review of the voiding problem following Lift 15 that

19-6

approximately three or four voids underneath penetrations went all the way through the containment? Did I understand that correctly?

Of the voids you discovered, you found about three or four of them that had actually gone through --

BY WITNESS MURPHY:

A. As I recall, that's the approximate number, yes.

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19-7

Q Mr. Artuso, do you have any basis for telling us what percentage of containments within the nuclear industry are built with membranes?

BY WITNESS ARTUSO:

A I don't know what percentage are built with membranes. I said some are and some are not.

I don't have any idea.

Q Do you have any knowledge relative to the percentage of containment built with membranes when those containments are built in areas where there's a high groundwater table?

BY WITNESS ARTUSO:

A Seabrook is built with membrane. There it's a -- one of the primary reasons is to protect the concrete from seawater attack.

The other reason is they have some deep pits where they want to provide greater assurance that there is no leakage of water.

Q With that exception or with that -- Is that the only plant you know that was built with a membrane, and also was built on an area where there was a high groundwater table?

My question was whether you know what percentage of plants?

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19-8

BY WITNESS ARTUSO:

A. No, I don't know the percent. I was trying to recall of all the plants I've been associated with which had and which had not membranes; and many of them were in high water level. Most of the ones in Florida were, and I can't recall which ones of those had waterproofing membrane.

MR. GUTIERREZ: Thank you.

That's all, Mr. Chairman.

(Bench conference.)

BOARD EXAMINATION

BY JUDGE BECHHOEFER:

Q. I want to go back just briefly to this area of lighting in connection with Lift 15 pour.

First, on page 13, I guess, Mr. Murphy indicated that visibility limitations, and I think you said included lighting, were one of the factors that caused the voids in that Lift 15; is that not correct?

BY WITNESS MURPHY:

A. That's correct, Judge Bechhoefer. Part of the visibility limitations were attributable to insufficient lighting, but also because of congestion and just the access for visibility.

Q. Now, I believe Mr. Singleton mentioned, and I'll ask you this, if the people involved in the pour

19-9

had reported to your inspectors that there were lighting problems, and I think you stated that they did that and they were corrected.

Were they corrected adequately or was enough done in this area? Either one of you can answer that.

BY WITNESS MURPHY:

A. Well, probably not as much as could have been done, because we've ended up with some voids there.

Now, whether it was done soon enough, I guess, is the question.

BY WITNESS HERNANDEZ:

A. Judge Bechhoefer, at that point in time -- My understanding is that at that point in time when they requested additional lighting, you had to get these portable lamps.

They are high intensity lamps, but you had to physically move them from where they were located on the plant site, and then place them on the top of the containment where this pour or the top of Lift 15 where this placement was occurring.

In addition to that, concrete is a gray color. At night, even with lighting, you run into difficulty with shadows and everything else like that.

Now you are in this area of a high degree of rebar congestion and you are tired and everything

19-10

else like that.

It only amplifies the situation of the problems that we had there.

Even with this lighting there, you've got the contrast of bright lights, dark shadows obscuring some of the portions of where you are working in.

You can't have continuous floodlights on every square inch of that pour.

So I don't think that even if we had provided the lights at 2:00 or 3:00 o'clock in the morning, that's a little late.

Q Should complex pours be undertaken --

BY WITNESS HERNANDEZ:

A We have changed that.

Q -- pardon?

BY WITNESS HERNANDEZ:

A We have changed that with regard to -- I think that will be discussed in the next panel as part of the restart program as to the steps that have been initiated as a result of looking at specifically this pour and saying it's obvious that we need to take steps to correct deficiencies that we had built into the system through inadequate provision of lighting.

In other words, if there was going to be the potential that this was going to go into the evening

19-11

or into the dusk, the lighting already should be up there, so that you are not having to go back and say, "I don't have adequate lights. I'll go run around and get them."

You are supposed to make that provision already in the pre-pour planning so that they are accessible. You are supposed to have a duration of the pour that's reasonable so that it can be performed in one continuous operation without the complete physical exhaustion of all the participants in the pour.

There should be rotation of inspectors, if indeed something is happening at that point in time.

I think that's something the restart panel could address probably in more detail than we can right now, but we have taken steps with regard to that.

Q. I was going to ask whether there are standards for lighting in situations like that, any standards in terms of degree of illumination required, or --

BY WITNESS HERNANDEZ:

A. No.

Q. -- don't the standards get that specific?

BY WITNESS HERNANDEZ:

A. We do not have that type of standards in terms of illumination, foot candles or anything like

19-12

that.

It's from the standpoint of do we have enough visibility through illumination to see what we're supposed to see in that specific pour.

It's a judgment factor with regard to that.

Q It may be addressed more by the next panel, but there was a reference to Procedure CCP-25.

Is that the procedure under which you would try to anticipate problems of this sort?

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19-13

BY WITNESS HERNANDEZ:

A Yes, sir. That's the modified construction procedure.

Q Mr. Singleton?

BY WITNESS SINGLETON:

A Let me tell you about the light situation on that pour.

At approximately 5:30 or 6:30, the two inspectors, particularly Mr. Souther, said, "We're going to need some more lights up here."

Prior to that pour we had what we considered to be adequate lighting. It's hard to check out what's adequate lighting in the daylight.

So as it got darker, we decided that we needed additional lights.

I got with the concrete general foreman, Roy Pardon, and I said, "Roy, we're going to have to get some more lights up there."

He said, "Okay. I'll get with the general electrical superintendent, and we'll get the lights up there."

About 15 minutes later, Roy came back and said, "Hey, I got with the electrical man, but I'm having a little bit of trouble getting the lights up there. He doesn't want to seemingly get up there as

19-14

quick as he should. Can you help me out?"

I said, "Yeah, I can help you out."

I got on the radio, and I called Jerry Souther. I said, "Jerry, if you don't have the lights that you need up there within 30 minutes, let me know and we'll stop the pour until we get the lights."

You say those magic words and it brought a flurry of activity real quick, and the general electrical superintendent got up there and got the lights up there.

I got back with Jerry and I said, "Okay, have you got everything you need? Got your lights? Got any more problems?"

He indicated no more problems.

Q. But I take it that even additional lighting would have been desirable in view of -- through hindsight?

BY WITNESS SINGLETON:

A. Through hindsight. We had the lighting up there, and in addition, the inspectors had a hand-held flashlight; but again, the lights, the shadows, the darkness, the glare, a hand-held flashlight can only show you one small area.

In hindsight, yes. Now we've got it that it's got to be adequate lighting, just, you know, not

19-15

say, okay, you can use adequate lighting and a flashlight.

It's got to be enough lighting that you can see the bottom of the joint. It can be clear, almost like it's got to be daylight inside those forms.

That's the way it is, and that's one of the considerations in CCP-25, and that's one of the considerations on the preplacement plan, that adequate lighting is available; a backup power source is available in case your primary power source goes out; and we have those considerations built in to the procedure now.

(Bench conference.)

JUDGE BECHHOEFER: That's all the questions the Board has.

Do you have any re-redirect, I guess it is, or further followup questions?

MR. HUDSON: Could I hold up just a second?

(Counsel conferring.)

MR. HUDSON: I don't believe we do.

JUDGE BECHHOEFER: Do any of the other parties have followup questions?

MR. GAY: Mr. Chairman, I have a bit of a

19-16

special request.

This memo that took place between Mr. Vincent and Mr. Schreeder seems to be more important to me now after the discussion that's gone on, and I would like to get it into the record.

I was not apprised of its existence until this morning and, therefore, did not have an opportunity to show it to Counsel ahead of time and get the copies.

Mr. Singleton is going to be up late in the week, and what I would like to do is to take five minutes with Mr. Singleton at that time just to offer this memo into the record.

I will have it available to all the parties in the morning, and Counsel for the Applicant can have an opportunity to evaluate it and have Mr. Singleton review it or check its accuracy before that time.

But rather than my wasting time on hypothetical questions at the moment, or to get this material into the record, or trying to prove it up with just one copy, I would like to make that special request, having five minutes to do that later on in the week.

MR. HUDSON: Your Honor, he showed the memo to Mr. Singleton earlier, but I don't recall that Mr. Singleton was either the author or addressee or

19-17

recipient of the memo.

I'm not sure he even asked him if Mr. Singleton had ever seen the memo before.

He just used it to refresh the witness' recollection.

I don't see how this document could come in through Mr. Singleton.

There's nobody on the panel that I've heard of that will attest to the accuracy of the memo.

(Bench conference.)

MR. GAY: Mr. Chairman, it's my recollection that Mr. Singleton testified that he sat through several conversations where Mr. Spooner was asked about Lift 15 and about the events that transpired there.

I think that the important thing about this memo are some of the notes from Mr. Spooner regarding his recollection of what happened there, and I think that Mr. Singleton has testified that he is generally aware of those comments that were made.

I think that he has an opportunity to testify about that to prove that up.

MR. GUTIERREZ: Mr. Chairman, if the Staff could be heard.

Before we get into this document's admissibility or whether Mr. Singleton can sponsor it,

19-18

why don't we ask Counsel to at least reproduce it so we all can read it.

I don't have any idea what he's talking about in the document. Then we can at least discuss it intelligently.

MR. GAY: That would be fine, Your Honor.

JUDGE BECHHOEFER: Let's do that.

I can't rule on a hypothetical. It's difficult.

Other than that, did any party have any further questions, based on the --

MR. SINKIN: Just one, Your Honor.

FURTHER RECROSS-EXAMINATION

BY MR. SINKIN:

Q A very interesting description was being given of the gray concrete and the white light and the dark shadows and all of that.

I'm wondering if there's been any general consideration of whether concrete pours should be done at night at all?

BY WITNESS HERNANDEZ:

A. Mr. Sinkin, with regard to concrete pours at night, they can be done if there is provided adequate illumination to ensure that you can see the bottom of the pour.

19-19

If you cannot see the bottom of the pour, then I don't think as a general rule of thumb that you have provided adequate illumination.

Q Does that mean the answer to my question is --

BY WITNESS HERNANDEZ:

A. I would not restrict pours with regard to -- If I had a specific -- If I as a construction engineer, changing hats, and I wanted to make a pour at night for some unusual reason, I would not restrict myself to the fact that it was being done at night.

I would go back and provide the proper characteristics that would allow me to make the pour and make the pour correctly.

So I would have no restriction on the fact that if a pour is being placed at, say, 7:00 o'clock at night to 9:00 o'clock and it's getting from dusk to dark, I don't have a particular concern about that, as long as the proper steps are taken to ensure the illumination of the pour.

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BY MR. SINKIN:

Q. I am not sure I got a direct answer. Let me just ask one more time.

Based on this experience with Lift 15, and your other experiences with nighttime pours, has there been any general reconsideration of whether nighttime pours should be discouraged as a policy?

BY WITNESS HERNANDEZ:

A. As a policy, not to my knowledge, have nighttime pours been discouraged in and by themselves.

There has been consideration of starting the pour if you have a pour that is going to require an unusual amount of time, 1200 cubic yards, you would want to start that by no later than 9:00 o'clock, if my memory serves me correctly,on the restart program.

If you haven't gotten it together by that time, a certain time early in the morning to allow the most time with regard to daylight, then you junk the pour. You don't go through with it.

BY WITNESS ARTUSO:

A. I would like to make a comment, Mr. Sinkin, to your question. There are some nuclear power plants that only place concrete, or most of the concrete is placed at night because there are certain advantages of placing concrete at night.

Q Would that be the drying versus the not drying?

BY WITNESS ARTUSO:

A The workability lasts longer; right.

JUDGE BECHOEFFER: Does the Staff have any further questions?

MR. GUTIERREZ: No, Mr. Chairman, we have no further questions.

JUDGE BECHHOEFER: This panel may be excused.

(Witnesses excused.)

JUDGE BECHHOEFER: I would like to comment that the Board will ask Mr. Singleton the questions it outlined at the next time Mr. Singleton is here, concerning the card games. We issued a memo. Well, we anticipate asking those questions at the time that Mr. Singleton is back with the next panel.

We will take just a short break.

(Whereupon, a short recess was taken.)

MR. HUDSON: Your Honor, at this time the Applicant would like to call Mr. Fraley, Mr. Purdy, and Mr. Carvel to the stand, and I believe they are currently on the stand.

20-3

Whereupon,

ALBERT D. FRALEY, JR.
GORDON R. PURDY
ROBERT A. CARVEL

were called as witnesses and, having been first duly cautioned to tell t e truth, the whole truth and nothing but the truth, were examined and testified upon their oaths as follows:

DIRECT EXAMINATION

BY MR. HUDSON:

Q I would ask each of you gentlemen to give your name, employer, and current position, please?

BY WITNESS FRALEY:

A My name is Albert Fraley. I am Assistant Project Manager, Construction, South Texas Project, Brown & Root.

BY WITNESS PURDY:

A My name is Grodon Purdy. I am the Manager of Quality Engineering at South Texas Project for Brown & Root.

BY WITNESS CARVEL:

A My name is Robert Carvel. I am the Project Quality Assurance Supervisor, Civil Structural, for Houston Lighting & Power at the South Texas Project site.

Q Do each of you gentlemen have in front of you a document entitled Testimony On Behalf Of Houston

20-4

Lighting & Power Company, Et Al, of Mr. Alb ert D. Franley, Jr., Mr. Gordon R. Purdy, Mr. Robert A. CArvel On The Concrete Restart Program?

BY WITNESS FRALEY:

A. Yes, sir.

BY WITNESS PURDY:

A. Yes, sir.

BY WITNESS CARVEL:

A. Yes, sir.

Q. Is your testimony in this proceeding that portion of the document which I just identified, which is preceded by your initials?

BY WITNESS FRALEY:

A. Yes, sir.

BY WITNESS PURDY:

A. Yes, sir.

BY WITNESS CARVEL:

A. Yes, sir.

Q. Mr. Fraley, do you have any changes in your testimony?

BY WITNESS FRALEY:

A. Yes, sir. I have one I think it is on Page 4. That needs to read, line eight needs to read "...McPherson, Kansas. Starting in 1964, I became a carpenter, reinforcing ironworker, and foreman for four

projects."

JUDGE BECHHOEFER: Do you want to repeat that?

WITNESS FRALEY: Yes, sir.

JUDGE BECHHOEFER: Is that on the second line?

WITNESS FRALEY: On the seventh and eighth lines. "I became a carpenter, reinforcing ironworker, and foreman for four projects."

BY MR. HUDSON:

Q As I understand the change, you are just inserting the words "reinforcing ironworker" in that sentence as it now reads?

BY WITNESS FRALEY:

A Yes, sir.

On Page 5, Line 12, "...all aspects of the construction of the diesel generator..." and that should be "turbine generator." The word "diesel" should be changed to "turbine."

Line 23, "...directly in charge of all building..." instead of "civil construction at STP."

Page 7, Line 22, "...until certain aspects of the site QC concrete program were resolved," instead of "control."

Page 16, Line 31, there is the word "statements," "making the seven initial complex statements," that should be "placements."

20-6

Line 44, "QC requirements were required," instead of "offered."

On Page 18, Line 32, "yearly" should be "tri-annual."

Those are all of the corrections that I have.

Q. Mr. Purdy, do you have any changes in your testimony?

BY WITNESS PURDY:

A. Yes, sir. One.

On Page 5, Line 36, "Prior to joining Brown & Root, I spent 19..." Slice twenty-one.

Q. Mr. Carvel, do you have any changes?

BY WITNESS CARVEL:

A. Yes. Just one.

On Page 19, Line 48, "Our staff now has 30 man-years nuclear experience..." At the time this testimony was filed the "34" was a correct number, but because of personnel changes since that time the correct figure today is 30.

Q. With these changes is the testimony reflected in the document entitled "Testimony On Behalf Of Houston Lighting & Power Company, Et Al, Of Mr. Albert D. Fraley, Jr., Mr. Gordon R. Purdy, Mr. Robert A. Carvel On The Concrete Restart Program" true and correct to the best of your knowledge, information, and belief?

20-7

BY WITNESS FRALEY:

A. Yes, sir.

BY WITNESS PURDY:

A. Yes, sir.

BY WITNESS CARVEL:

A. Yes, sir.

MR. HUDSON: Your Honor, we would move the admission of this testimony into evidence as if read.

MR. GAY: No objection.

MR. SINKIN: No objection.

MR. GUTIERREZ: No objection.

JUDGE BECHHOEFER: Without objection, the testimony will be entered into evidence and bound into the record as if read.

(See attached pages)

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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of:	§	
	§	
HOUSTON LIGHTING & POWER COMPANY, ET AL.	§	Docket Nos. 50-498OL 50-499OL
	§	
(South Texas Project, Units 1 & 2)	§	
	§	

TESTIMONY ON BEHALF OF HOUSTON LIGHTING & POWER COMPANY, ET AL.

OF

MR. ALBERT D. FRALEY, JR.
MR. GORDON R. PURDY
MR. ROBERT A. CARVEL

ON

THE CONCRETE RESTART PROGRAM

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of:	§	
	§	
HOUSTON LIGHTING & POWER COMPANY, ET AL.	§	Docket Nos. 50-498OL 50-499OL
	§	
(South Texas Project, Units 1 & 2)	§	
	§	

TESTIMONY OF ALBERT D. FRALEY, JR.
GORDON R. PURDY, AND ROBERT A. CARVEL
ON THE CONCRETE RESTART PROGRAM

Q. 1 Please state your names.

A. 1 Albert D. Fraley, Jr., (ADF),Gordon R. Purdy (GRP) and Robert A. Carvel (RAC).

Q. 2 By whom are you employed?

A. 2 (ADF, GRP): Brown & Root, Inc. (B&R).

(RAC): Houston Lighting & Power Company (HL&P).

Q. 3 Describe your current position and responsibilities.

A. 3 (ADF): I am Assistant Project Manager, Construction for B&R at the South Texas Project (STP). I am responsible for managing the Construction Engineering group, cost, scheduling, planning and all other construction activities at the STP Site, where I report to B&R Construction Manager.

(GRP): I am the Quality Engineering (QE) Manager for the B&R Power Group. I am responsible for the management and direction of QE personnel at the STP site where I report to the B&R Project QA Manager for STP.

(RAC): I am the Project QA Supervisor - Civil/ Structural for HL&P at the STP Site. My group provides programmatic and technical direction in the formulation and implementation of B&R's QA/QC program for Civil/Structural activities. We conduct implementation reviews to ensure compliance with project quality requirements. We follow up on nonconformance reports (NCR's) to ensure timely and effective corrective action, and we review all dispositioned NCR's for technical and QA/QC adequacy and feasibility. We also review and approve the QA/QC programs of potential suppliers and sub-contractors and we serve as the contact group for NRC personnel inspecting civil/structural activities.

Q. 4 Please summarize your professional qualifications and experience.

A. 4 (ADF): I have nineteen years of experience working for B&R in various areas of construction in nuclear and fossil power plants and other heavy industry projects. I started, in 1962, as an apprentice carpenter and carpenter's helper in three construction projects: the International Paper Company paper mill in Evadale, Texas; the U.S.I. Chemicals plant in

Deer Park, Texas; and the McPherson fossil power plant in McPherson, Kansas. Starting in 1964, I became a carpenter reinforcing iron worker, and foreman for four projects: the Giddings Power Station Unit #2 (fossil fired) in Bastrop, Texas; the Pan American Petroleum Company petroleum and sulphur plant in Edgewood, Texas; the Premier Fertilizers fertilizer plant in Pasadena, Texas; and the Elmendorf Power Plant (fossil fired) in San Antonio, Texas. In the Giddings and Elmendorf projects I also worked as a "rod-buster" (a person engaged in erecting reinforcing steel in concrete structures) and also worked in concrete placements. Starting in 1965, I worked in the construction of the Nekgosa-Edwards Paper Company paper mill in Ashdown, Arkansas. In that job I was responsible for supervising the placement of concrete, the erection of rebar, and the carpentry work in the ground floor and all the offsite structures of the mill. In 1966, I was put in charge of all carpentry work, form design and temporary construction at the Gulf States Utilities Company's Willis Power Plant, Unit #1 (fossil fired), Willis, Texas. In 1967, I was appointed General Foreman in charge of all civil construction activities relating to the machine room building and all the offsite structures, including all architectural work, excavation, structural steel erection, reinforcing steel, concrete carpentry work, and painting, at the Boise Southern Paper Mill in De Ridder, Louisiana.

In February, 1970, I was made Assistant Building Superintendent for construction of the Carolina Power & Light Co.'s Brunswick Units 1 and 2 nuclear power plants in Southport, North Carolina. At Brunswick, I was originally in charge of all aspects of the construction of the ~~diesel~~ turbine generator buildings and all offsite work, as well as all the switchyard, bridges, and railroad trestle construction. While at Brunswick, I was promoted in 1974 to Building Superintendent in charge of all civil construction on the project. I began working in the STP project as Building Superintendent in September 1975, being directly in charge of all ~~civil~~ building construction at STP. In 1979, I was promoted to Area Manager in charge of all construction (electrical, mechanical and civil) in the Reactor Containment Buildings for Units 1 and 2 at STP. In 1980, I was promoted to Project General Superintendent and placed in charge of all construction on the site. On March 1, 1981, I was appointed to my current position as Assistant Project Manager, Construction.

(GRP): Prior to joining B&R, I spent ~~twenty-one~~ nineteen years working in the nuclear power industry, eighteen of which were spent in the United States Naval Nuclear Power Program. I worked primarily in the area of construction, operation and maintenance of nuclear power plants. I also spent approximately one year with Bechtel Power Corporation as a mechanical Quality Control (QC) Engineer.

(RAC): I received a B.S. degree in Civil Engineering from Cornell University in 1973. Before joining HL&P in June 1980, I had worked for Stone & Webster Engineering Corporation for approximately seven years. During this period, I spent five years in various civil quality control positions at four nuclear power plants and one petrochemcial plant. For the last year before joining HL&P, I was responsible for supervising all Quality Engineering activities for the Civil/Structural and Mechanical disciplines at the River Bend Nuclear Power Plant.

Q. 5 What is the purpose of your testimony?

A. 5 (ADF, GRP, RAC): The purpose of our testimony is to describe the program that has been implemented to resume complex concrete placements at STP and the respective roles of each of our organizations in the program.

Q. 6 Please summarize your recent involvement with the placement of concrete at STP.

A. 6 (ADF): In August 1980, I was assigned, together with John Ruud of B&R QA, as coordinator of the complex concrete restart activities at STP, an assignment which I have carried out to date and in which I expect to continue until normal complex concrete placement operations are resumed.

(GRP): In May 1980 I was assigned the responsibility of QE Manager for STP. As such, I am directly responsible for the Civil QE Discipline and its participation in both the concrete restart program and the normal concrete placement activities.

(RAC): I have had responsibility for HL&P's QA program for concrete activities since June 1980.

Q. 7 Mr. Fraley and Mr. Carvel, when was concrete construction stopped at STP and why?

A. 7 (ADF, RAC): On December 21, 1979, a meeting was held between HL&P officers and the Director of Region IV of the NRC. At the meeting, the Director informed HL&P of noncompliances identified relative to concrete placement activities. On that same date, HL&P verbally instructed B&R not to place any safety related concrete until certain aspects of the site QC ~~control~~ concrete program were resolved.

Q. 8 Once work was stopped, what actions were taken by HL&P and B&R to respond to the problems cited by the NRC that led to the decision to stop work?

A. 8 (ADF, RAC): On December 28, 1979, as described in the testimony of Mr. Oprea and Mr. Frazar, HL&P proposed to the NRC a "Nine Point Action Plan" to address the problems identified by the NRC. With the presentation of this plan, HL&P asked, and obtained authorization from NRC, to resume placement of safety-related non-complex concrete at STP. Such work was resumed on December 31, 1979. Complex safety-related placements were to remain suspended until authorization to proceed with them was given by HL&P.

Q. 9 What is the difference between complex and noncomplex concrete placements?

A. 9 (ADF, RAC): The decision to classify a placement as "complex" is arrived at jointly by Construction Engineering, Construction Supervision and QA. Factors involved in the decision are the rebar density and configuration; the quantity and size of embedments; and the pour volume, geometry and location. All placements in the Reactor Containment Building shell walls are classified as complex.

Q. 10 Was action taken to implement the items in the Nine Point Action Plan relating to concrete placements?

A. 10 (ADF, RAC): Yes. On January 25, and February 28, 1980, HL&P wrote to the Director of I&E's Region IV describing the actions taken by B&R and HL&P to respond to the items in the Nine Point Action Plan. As stated in those letters, the Nine Point Action Plan was fully implemented as of the end of February 1980.

Q. 11 Were complex concrete placements restarted once the response to the Nine Point Action Plan was completed?

A. 11 (ADF, RAC): No. On April 30, 1980, the I&E Director issued an Order to Show Cause requiring HL&P to show cause why safety-related construction activities at STP, including complex concrete placements, should not be stopped and/or remain stopped until certain actions were taken. In its response of July 28, 1980 to the Order to Show Cause, HL&P committed to taking a number of steps, beyond those already implemented in the area of complex concrete placements. These commitments included:

1. Revision and reissuance of concrete placement procedures.

2. Training of personnel in the revised procedures.

3. Review by Construction, Engineering and QA management of the results of the Concrete Special Task Force investigation of the Unit 1 Reactor Containment Building for impact on existing procedures and methods; and performance of modifications in these procedures and methods as necessary.

4. Assignment of a complex pour coordinator from B&R Construction to oversee complex concrete placement operations until such time as Construction management determined that performance was satisfactory.

5. Assignment of a complex pour coordinator from B&R QA to oversee concrete placement inspection activity until QA management determined that B&R QC performance was satisfactory.

6. Verification of the availability of qualified Pittsburgh Testing Laboratory concrete testing personnel.

7. Reconfirmation of the qualification and certification of QC inspection personnel.

8. Review of the concrete supplier's quality program to assure there were no unresolved quality program deficiencies.

9. Reverification of the availability of adequate concrete placement equipment and personnel.

10. Resumption of complex concrete placement on a limited basis.

11. Review of the quality of the placement and documentation of the work for conformance with requirements.

12. After the processes described in the above items had been completed, expansion of the complex concrete placement program into other areas as additional B&R personnel were qualified.

Q. 13 What actions were taken to implement the July 28, 1980, commitments?

A 13 (ADF, RAC): B&R had primary responsibility for developing the complex concrete restart program embodied in these commitments. Some of the actions included in the July 28, 1980 response (such as the revision of the concrete placement procedures) were well under way at the time the formal commitment to the NRC was made. In addition to rewriting the concrete construction procedures, HL&P and B&R took a number of other steps to insure that future complex concrete placements would be conducted fully in accordance with those commitments and with the revised procedures. First of all, a Complex Restart Review Committee, which Mr. Fraley chairs, was organized to oversee the restart program. In addition, the Project instituted a simulated complex concrete pour program; reevaluated the Construction organization so that people with strong backgrounds in relevant areas would be assigned to those areas; instituted a zero defect program; conducted the training program on the revised concrete procedures in such a way as to assure consistent

interpretation of the procedure by the various affected organizations; gave QC Inspectors the authority to stop work if there are any doubts that the work meets acceptance criteria; and established individual personnel qualification and training files, as well as reviewing the qualifications of subcontractor personnel. Most importantly, we devised a demonstration program of seven complex placements to test out the new procedure and to confirm that complex placements can be resumed at STP.

(RAC): In addition to participating in the procedure revision process itself, HL&P reviewed the final product to assure that it complied with all commitments and addressed all areas of concern. We also provided programmatic direction to B&R personnel engaged in the revision effort.

Q. 14 Please describe the process by which the concrete placement procedures were revised and reissued.

A. 14 (ADF, RAC): The reevaluation and rewriting of the STP concrete procedures was a multidisciplinary undertaking by B&R and HL&P. In April 1980, at the direction of the B&R Project General Manager, Construction Engineering established a detailed plan for the rewrite effort. Under the plan, Construction Engineering reviewed the existing concrete procedures in the light of significant input from the construction crafts, and proposed a number of changes to the procedures, which changes were then reviewed and commented upon by QA/QC personnel, including Quality Engineers. B&R and HL&P Construction Engineers

then prepared a redraft of the procedures, which was reviewed by the Design Engineers, as well as the Training Department. After final meetings by Construction, QC and Design Engineering, final revisions were agreed upon and the new procedures were approved by all affected B&R disciplines and HL&P Construction and QA.

(GRP): The Civil QE and QC disciplines have been intimately involved in the formulation and implementation of the complex concrete restart program from the time the task was initially defined. During development of the new procedure covering all aspects of concrete activities, QE assured the proper translation of engineering design requirements into the procedure including all applicable inspection acceptance and rejection criteria. QE and QC working together assured that the inspection requirements were clearly identified in the new procedure, that the requirements conveyed clear direction for field implementation and that the required quality inspection reports provided objective evidence of all activities which required quality documentation.

QE actively participated in the extensive training program prior to the implementation of the new concrete procedure. This included participating in the training presentations to Construction and Engineering, performing training for field QC inspection personnel, participating in the pre-planning phase of the simulated dry-runs and participating in the pre-planning

and performance of the trial placements conducted on non-complex concrete placements.

Q. 15 What areas were given special attention in your review?

A. 15 (ADF, RAC): We focused our attention on the following areas in the procedures: providing greater continuity and clarity; eliminating references to codes and standards outside the procedures; improving documentation flow; eliminating conflicting directives where they existed; providing additional information where required; more clearly defining hold points; clarifying responsibility assignments; and increasing input from affected craft, QC, and engineering personnel.

Q. 16 Have craft personnel been trained in the revised procedure?

A. 16 (ADF): The procedure reexamination and revision effort resulted in a comprehensive single procedure, Concrete Construction Procedure CCP-25, which was approved in July 1980. It replaced and incorporated Concrete Construction Procedures CCP-3, 4, 6, 8, 11, 12 and 19. Training on CCP-25 began in July 1980. Training was in three phases: classroom instruction, videotaped instruction on the basics of the procedures, and controlled "hands on" field training administered to affected personnel in QC and Engineering and to Construction personnel working on concrete, rebar and carpentry. Individual training files have been establi ed for concrete consolidation personnel

documenting that all training steps have been met for each individual. In addition, as provided in the new procedure, B&R has established a 90-day cycle for retraining all concrete consolidation personnel.

(GRP): QE actively participated in the extensive training program prior to the implementation of the new concrete procedure. This included participating in the training presentations to Construction and Engineering, performing training for field QC inspection personnel, participating in the pre-planning phase of the simulated dry-runs and participating in the pre-planning and performance of the trial placements conducted on non-complex concrete placements.

(RAC): HL&P has monitored B&R's retraining to assure that changes were adequately explained to QC Inspectors and the accept/reject criteria were fully understood. In addition, we have monitored the generic B&R quarterly refresher training sessions.

Q. 17 Panel, how do the new concrete procedures address the problem areas found to exist in its predecessors?

A. 17 (Panel): Lack of clarity problems have been solved by simplifying words, definitions, forms and document flow where possible, and by giving great weight to the input from construction craft personnel and their supervisors, who will be the people utilizing the procedure in the field. The need to refer to other sources has been eliminated by placing all

required information in the procedure so that it "stands alone" without need for outside reference material. Documentation flow problems have been dealt with by combining all concrete procedures into one. The lack of sufficient information as to what the procedure requires has been remedied by spelling out "inspection checklists" that tell construction personnel what they are responsible for at each inspection checkpoint. Inspection hold points at which QC review and verification are to take place have been more clearly defined. Further, the new procedures expand and clarify the QC Inspectors' stop work authority. The procedures also outline what to do in the event that interpretation questions arise due to conflicting requirements in drawings, specifications and procedures.

Q. 18 Mr. Fraley, please describe how the seven initial complex concrete placements in the restart program were selected.

A. 18 (ADF): The seven initial complex concrete placements were chosen so that they would provide as broad a spectrum of complex placements as possible. The placements chosen represented each of the main types of complex placements, and contained every obstacle to placing concrete that is likely to be encountered. Four of them were placements featuring high rebar congestion, a large number of embedments, difficult placement configurations, and the need for uncommon placement techniques. Another of the placements had highly congested

rebar, a wall and a slab being placed together monolithically, and a requirement for the use of grout in conjunction with concrete to reach areas for which there was difficulty assuring that concrete could flow uniformly. Another placement was a typical shell wall placement, and also required the use of grout. The last placement was a typical dome pour, utilizing a large amount of grout together with concrete, and requiring pumping over 130 feet vertically and then over 400 feet horizontally.

Q. 19 Mr. Fraley and Mr. Carvel, what actions were taken in preparation for making these seven initial complex placements?

A. 19 (ADF): In addition to those undertaken to implement the commitments made in response to the Order to Show Cause, the following actions were taken in preparation for making the seven initial complex ~~placements~~ placements in the concrete restart program. The Review Committee for ~~Safety~~ Related Complex Pours, which includes Mr. Carvel and me, conducted a review of past complex placements, identifying potential areas of improvement and making appropriate recommendations. Construction and QC personnel were trained in the use of the new concrete procedures, and quarterly refresher courses on procedures and QC requirements were ~~offered~~ required. Finally, nine non-complex placements were made following the procedures applicable to complex ones in order to simulate complex placement conditions. Our

evaluation of these pours showed them to be entirely satisfactory.

(RAC:) Prior to initiating the restart program, B&R conducted nine non-complex pours as if they were complex in order to familiarize all personnel with the procedural and documentation requirements for safety-related complex pours. HL&P QA personnel attended the pre and post-placement meetings and had personnel present for the entire duration of all of these pours. All documentation relating to these pours was reviewed and found in compliance with the new procedures.

With regard to implementing the restart program, HL&P QA personnel participated in all pre- and post-placement meetings for the safety-related, complex pours. A minimum of two HL&P QC Inspectors and one HL&P QA Specialist were present on each pour to monitor the performance of the B&R and PTL Inspectors. The documentation for these pours has been reviewed for compliance with Project requirements.

We also conducted an implementation review in conjunction with the first restart program placement. The implementation review was an in-depth examination of the pour to verify adherence to procedures, specifications, codes, standards and licensing commitments and to assess the effectiveness of the implementation. Our review indicated that all aspects of the performance and

documentation of this first restart pour were accomplished in strict accordance with Project procedures.

Q. 20 Were there any further conditions set by the NRC to its authorization of the seven initial complex placements?

A. 20 (ADF, RAC): Yes. On October 2, 1980, HL&P requested NRC's clearance to perform the seven initial complex placements. The NRC requested that certain actions be taken prior to commencing the placement of complex concrete. They included establishing management systems and special procedures to control the work on the seven placements; training personnel in those procedures and ensuring that adequate staffing existed to perform and to manage the placement activities; completing corrective action for previously identified deficiencies relating to concrete placements; utilizing concrete correlation testing in lieu of taking samples at the pump line discharge; and completing the ~~yearly~~ tri-annual inspection and evaluation by the National Bureau of Standards Cement and Concrete Reference Laboratory of the concrete testing facilities maintained at the STP site by Pittsburgh Testing Laboratory.

Q. 21 Were all of these conditions satisfied?

A. 21 (ADF, RAC): Yes. The NRC acknowledged on January 13, 1981 that all conditions had been satisfied and released the seven complex placements for performance.

Q. 22 Mr. Carvel, have there been any changes in the HL&P QA program for Civil/Structural activities which accompanied the formulation of the restart program?

A. 22 (RAC): Yes. We have become more involved in the planning and analysis of complex pours as reflected by our participation in the pre- and post-placement meetings. HL&P also increased its involvement through the creation of a QC arm which provides Inspectors in addition to those from QA.

Notwithstanding our increased involvement in complex pours, HL&P QA has generally decreased its participation in the day-to-day aspects of B&R's QA/QC program and redirected its attention to spotting problems as they develop. We now monitor the programmatic aspects of the B&R program, rather than the daily results of the program. A Project Trending Program was developed by HL&P to aid in identifying recurring nonconformances so that root causes may be addressed. This program is independent of the B&R NCR trending program.

This additional effort by HL&P QA has been made possible by a significant expansion in the number of professional personnel on the staff. There are six professionals at present and we are still recruiting for an additional two places. We also have increased significantly the total years of nuclear experience of our staff through hiring experienced, highly qualified individuals. Our staff now has 30 ~~34~~ man-years nuclear experience as compared to 13 man-years prior to November 1979.

A formal training program has been established for the HL&P QA staff. The training needs of each individual are assessed yearly and quarterly by the supervisors and specific training is assigned as it becomes available. Each person receives the technical training required for his or her specialty and general QA and STP program training. The technical training is provided primarily by specialized institutes to which we send selected individuals.

Q. 23 Please describe the results of the complex placements made since the NRC's release.

A. 23 (ADF,RAC): The seven complex placements have now been completed, all successfully and in accordance with the Concrete Restart Program and applicable procedures. While some minor problems were experienced during the course of two of the placements, they were of the usual type encountered during complex concrete placements (for instance, plugged slick lines, an insignificant rock pocket observed upon form removal, vibrator breakdown), they were resolved expeditiously, and the quality of the placements was maintained. The satisfactory completion of these placements demonstrates the adequacy and effectiveness of the procedures controlling the complex concrete work and the adequacy of the training of the personnel performing the work.

Q. 24 Is a "rock pocket" the same as a void?

A. 24 (ADF, RAC) No. A "void" is an area within the placement that was never filled with concrete. A void

indicates that some condition or set of conditions prevented the concrete from reaching that specific location. In contrast, a "rock pocket" is an area that was filled with concrete initially but solidified without the mortar binding the aggregate.

Q. 25 Does the occurrence of this rock pocket indicate a programmatic problem?

A. 25 (GRP, RAC) No. The area involved was small and while B&R attempts to prevent all such occurrences, it is not unusual to occasionally have a rock pocket appear when forms are removed. We doubt that there is anything QC could have checked to prevent this rock pocket from occurring. It is important to remember that concrete placement is not an exact science. Even the best procedures, followed exactly, will not always produce perfect concrete.

Q. 26 Mr. Fraley, is there a plan for further complex concrete construction at STP?

A. 26 (ADF): Yes. B&R has formulated a plan for fourteen (14) additional complex placements in the reactor containments buildings. HL&P concurred in the plan and submitted it for NRC approval. On April 16, 1981, the NRC approved the placement of all but three dome placements on Unit 1 and requested additional information on the three remaining placements.

Q. 27 Panel, are you confident that the current concrete program will enable B&R and HL&P to continue producing high quality concrete?

A. 27 (Panel): Yes, most definitely. As evidenced by the Task Force investigation, the concrete placed prior to the I&E Investigation 79-19 was high quality concrete. Since then, we have strengthened the program. The new procedures work well, are understood by the implementing personnel and have produced high quality concrete during the limited restart program. We suspect that further improvements can and will be made as we gain more experience. The key point is that HL&P & B&R have in place good concrete procedures and a QA/QC program that will detect any deficiencies, assure that they are corrected and take appropriate action to prevent or minimize recurrence.

T.Hudson:11:02:C

BY MR. HUDSON:

Q. Mr. Fraley, on April 16th, 1981, you received permission to perform 11 additional complex safety-related placements under the Concrete Restart Program.

What is the current status of those 11 placements?

BY WITNESS FRALEY:

A. We have made two of those in Phase 2.

Q. Mr. Carvel, as I recall, there were three dome placements for which you requested permission to make as part of the restart program, but were not authorized on April 16th, 1981. What is the status of those dome placements for Unit 1 at this time?

BY WITNESS CARVEL:

A. We have received verbal authorization from the NRC to proceed with those pours, but we have not received the follow-up written notification.

Of course, we will not proceed until we have received that written notification.

MR. HUDSON: Your Honor, with those two updating questions, that concludes our direct examination.

JUDGE BECHHOEFER: Mr. Gay.

CROSS-EXAMINATION

BY MR. GAY:

Q. Mr. Purdy, am I correct in understanding that

20-9

QE is more related to QA than to Design Engineering?

BY WITNESS PURDY:

A. Yes, sir.

Q. And am I correct in assuming that what QE is charged with doing is to insure that the code and standards are written in clear, concise, succinct English?

BY WITNESS PURDY:

A. Among other things, yes.

Q. What other things does QE do?

BY WITNESS PURDY:

A. Quality Engineering's responsibility is to insure the translation and incorporation of all of the STP quality commitments into our program, whether these are the applicable quality assurance commitments established by Regulatory Guide, by reference to codes, by reference to standards.

Also, those particular commitments or design criteria, the design engineering is specified and which would require a Quality Control verification to assure adequacy of the construction to satisfy the design base.

Q. Mr. Purdy, at several points in this proceeding to date there has been testimony that part of the problem with QA was a implementation, and also part of the problem with QA to date was a lack of understanding

of the QA requirements.

Was it your responsibility within QE to insure that the QA standards were clearly written so that they could be understood by the people charged with interpreting and enacting those standards?

BY WITNESS PURDY:

A. Are you referring to misinterpretation or unclear guidance to Quality Control personnel specifically?

Q. If there is a particular word or phrase that is not understood by QA, is there some fault that lies with QE as a result of that?

BY WITNESS PURDY:

A. I think in order to satisfy your question, I believe, it is necessary to understand that Quality Engineering in its current form was implemented on the South Texas Project after the Order to Show Cause.

Q. Okay.

BY WITNESS PURDY:

A. Today, yes, definitely that would be the case. That is, it should not be construed to mean that a form of Quality Engineering was not on the project previously.

There had been for quite a period of time, and I am not sure of the exact date or how long, a group

20-11

that was called Quality Control Engineering, the Quality Control Engineers worked with the actual disciplines through the Superintendent, and, yes, part of their function at the time wa to try to insure the field had the proper tools they needed to do their job, whether that was software or hardware.

And there was a group in Houston whose responsibility was to interface with that particular organization and with Project QA to expend every effort to insure that those requirements were understood.

Q. How many persons are in QE at the moment?

BY WITNESS PURDY:

A. I have 49 people on my staff.

Out of that 49 there are approximately 12 who are more documentation coordination or clerically oriented than they are technically oriented.

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21-1

Q. What do the other 37 individuals do? Are they divided into any divisions?

BY WITNESS PURDY:

A. They're divided into disciplines. The quality engineering disciplines are established obviously by expertise, technical expertise, but they are divided into a civil discipline, a mechanical discipline, a nondestructive examination discipline, a procurement or materials discipline, and the electrical discipline.

And I have in addition to that a group which is called procurement quality engineering, and procurement quality engineering consists of one of each of those discipline personnel.

Q. Would I be correct in assuming that it is the civil discipline of those 37 individuals that is responsible for dealing with concrete?

BY WITNESS PURDY:

A. Yes.

Q. How many persons are in that particular discipline?

BY WITNESS PURDY:

A. I have seven personnel currently in the civil discipline, and one assistant manager who sits over the civil/electrical disciplines.

21-2

Q. Mr. Purdy, much of the testimony this panel is giving concerns new criteria or new procedures for concrete placement.

Was your group, the civil division of your group in QE charged with the responsibility of actually writing those particular standards?

BY WITNESS PURDY:

A. The civil quality engineering group participated in the development of the new concrete procedures, and in fact were responsible for writing the inspection portion of those procedures.

Q. That is, you originated the inspection part or you shared ideas and you were responsible for just going back and putting it on paper?

BY WITNESS PURDY:

A. The development of the new concrete procedure was a very complex, well thought out, well planned activity.

I'm not sure it's so easy to just see it, you know, in that type of language. A great deal of time was expended and it was the intent in the development of the concrete procedure to start first of all with those individuals in the field that had to implement the program.

That started with the soliciting of comments

21-3

from field QC personnel, from field construction personnel, the crafts, area engineering personnel, in trying to establish where their problems actually existed, where they lay, and then to develop a comprehensive procedure which would lay that out in a format which could be clearly understood by all interfacing parties.

That's probably a very simple statement for a very massive effort.

Q. I understand that there were a lot of persons involved in the effort and a lot of sharing of ideas, but is it fair to say that the words that finally appeared on paper are a product of this particular division that you supervised?

Let me ask it another way. In terms of the final clarity of the language, the understandability that's communicated, the precise definitions that are communicated to the laborers, is your division responsible for the selection of the words, the communication of ideas that originated in the field?

BY WITNESS PURDY:

A. My organization was responsible to assure that the quality assurance department personnel clearly understood the requirements, the sequences and the activities associated with it, and not necessarily the actual construction.

21-4

BY WITNESS CARVEL:

A. I'd like to add there that the interfaces between the construction people, be they craft people or supervisors, the interfaces between those people and quality control were also explicitly outlined in that construction procedure, and Mr. Purdy's organization was instrumental in seeing that that kind of information got into the procedures as well.

BY WITNESS FRALEY:

A. I'd like to add one thing there on the procedures. Construction engineering was charged to do the leg work and to sponsor the meeting set-up and chair the meeting set-up and to put all of the information together, which included information from construction, information from construction engineering, information from Houston engineering and also QE and QA, and all of this information was put together by Mr. Jim Akinson and Jim Dunning, which are senior civil engineers on the project, and all of this went together and meshed properly to make our new CCP 25.

Q. Mr. Fraley, what were those two names again?

BY WITNESS FRALEY:

A. I beg your pardon?

Q. The two names that you mentioned.

/ / /

21-5

BY WITNESS FRALEY:

A. Jim Dunning and Jim Akinson, senior civil engineers.

Q. Now, I'm going to skip over your qualifications and credentials and let someone else talk to you about that.

I'd like for you to turn to Page 7. In Answer No. 8, Mr. Fraley and Mr. Carvel, you mention the nine-point action plan.

Were either of you involved in the origination of that plan?

BY WITNESS CARVEL:

A. As stated elsewhere in the testimony, I started working at the South Texas Project on June 25th, 1980, so I was not directly involved in that nine-point action plan at all.

Q. Mr. Fraley?

BY WITNESS FRALEY:

A. No. I might add that we did have some construction input on the project as to where that we had talked about problems.

Q. Mr. Fraley, are you generally aware of Brown & Root's involvement in the creation of that plan?

BY WITNESS FRALEY:

A. No, sir, I'm not.

21-6

Q Mr. Purdy, are you?

BY WITNESS PURDY:

A Yes, sir, I am.

The nine-point action plan, several of the items on there, and you'll have to bear with me, I'm not sure I remember what all the items are, but several of the items on that action plan directly involve quality activities.

In that particular instance Brown & Root presented some proposed immediate action to that plan, which was reviewed by the licensee, HL&P, and was ultimately discussed until we had every degree of confidence that we were in fact addressing the concerns at the time, prior to submitting them to the Commission as a nine-point action plan.

Q That's exactly what I wanted to get to. It's your understanding that Brown & Root originated the plan and submitted it to HL&P for approval?

BY WITNESS PURDY:

A Most of the items on there, and there are several items on there that deal -- if I'm not mistaken, or as I recall, dealt with some management actions that I did not personally participate in, but to the best of my knowledge, yes, Brown & Root did actively participate in the development of those actions.

21-7

Q At the bottom of the page you're asked a question about the difference between complex and non-complex concrete placements, and your answer is given at the top of Page 8.

The first sentence of your answer states that the decision to classify a placement as complex is arrived at jointly by construction engineering, which is you, Mr. Purdy, construction supervision and QA.

Can any one of the three of you tell me how this decision making process is arrived at? How do you sit and make a joint decision?

BY WITNESS FRALEY:

A. Yes. First of all, we sit and identify a problem, potential problems that we see in a placement.

The next thing is -- that's the first step. Another thing is there's some standard criterias that are set out, which are spelled out in this statement, and that's the configuration, the complexity of the pours.

Really the only judgment call that we have is the degree of difficulty in placing the concrete. The other things are pretty well cut.

Now, there's some density of rebar, where it's located, the uncommon practices that you may have to perform to get the concrete into the final location, the quantity and the size of imbeds, the massiveness of it.

21-8

Q. You spoke of standard criteria. Is that the same as the three factors that you list in the second sentence in Response No. 9?

BY WITNESS FRALEY:

A. I'm not sure that I understand your question.

Q. Well, in responding how the decision was made, you said first that you identify problems and then you proceed with a standard criteria for evaluating that.

I'm just asking you if the standard criteria that you're using is one and the same, the factors that you're referring to in the second sentence.

BY WITNESS FRALEY:

A. No, not necessarily. We can identify it. It's very easy to identify massiveness in concrete placement. It's very easy to identify a configuration. It's easy to identify the things that we've put down here, but when a QC supervisor or a construction engineer or a constructor questions the capabilities of placing concrete, then that's the discussions that you sit down and you talk about.

We've also got the flexibility to classify a placement as noncomplex but also identify a complex area or areas in that placement, which we exercise.

Q. Back to this joint decision making, is this a case where Brown & Root identifies the problem and then

21-9

submits it to HL&P for approval, or was --

BY WITNESS FRALEY:

A. No, sir. This is a case where we sit down and if anyone has a problem, then we identify that problem on the pre-placement plan, and that problem may classify that pour as complex, it probably would.

Those things are determined jointly, but keep in mind that QC has the ultimate decision there to make. What I'm saying is if there's a gray area that the constructor doesn't really feel is that difficult, then the QC makes that decision. They have the final decision on rating a pour.

BY WITNESS CARVEL:

A. I think it's important, before we move off the topic, to state that any one of those three groups who consider that placement complex would ultimately lead to that placement being classified complex.

In other words, if construction engineering says that they think it should be complex and the other two organizations don't think so or aren't sure, then it is automatically classified complex.

Q. Just to summarize your response in Answer No. 9, I understand that there was an occasion when these three groups sat down and attempted to go through every concrete placement at the plant that was to be made in

21-10

the future and to classify that as either complex or non-complex, and then at some subsequent occasion there will be a pre-placement plan that's arrived at for the complex pours; am I correct?

BY WITNESS FRALEY:

A. Okay. Let me answer that question, or that statement.

Q. All right.

BY WITNESS FRALEY:

A. We've got a two-week schedule that we look at. We've also got a 90-day schedule. When a pour shows up on the two-week schedule it's required that it shows up classified what pour it is, and that sets our priorities towards our job by looking at these pours.

When it comes aboard, or when we see it on two-week placement, it has been classified at that time.

Q. Are you saying that this decision making process is an ongoing thing, or was there a classification complex versus noncomplex that was made at some point in the past?

BY WITNESS FRALEY:

A. It's an in-process, everyday thing.

Q. All right.

BY WITNESS FRALEY:

A. But I'm saying that it is required a minimum

of two weeks prior to making that pour.

Q Who is involved in that decision? You mentioned the groups, but who are the specific individuals involved?

MR. GUTIERREZ: Mr. Chairman, the Staff would object to that, unless there's going to be a showing that the Applicant is somehow misclassifying pours as non-complex when they should be complex.

I don't see the relevancy of going into such great depth as to how the decision is made.

JUDGE BECHHOEFER: Mr. Gay, what are you driving at?

MR. GAY: I was questioning the direct testimony, Your Honor. I think it's clearly relevant. We're just trying to get at the decision making process and who made it.

I'm not going to challenge the decision on any one pour. I don't have the ability to do that, but I think that we need to have an understanding of HL&P and Brown & Root's decision making process in this particular event.

MR. GUTIERREZ: The Staff isn't saying that it's not addressed in the direct testimony. It is addressed in the direct testimony relative to the stop work order, and in a way the stop work order went to

21-12

complex concrete pours, and the question was, well, what's the difference.

Beyond that, I don't see the relevance of this line of questioning, unless there's going to be a showing that somehow the Applicant is mischaracterizing these pours.

(Board conference.)

MR. SINKIN: Mr. Chairman, if CCANP could wade in with one word, in defining the purpose of this testimony on Page 6 the panel says the purpose of the testimony is to describe the program that has been implemented to resume complex concrete placement at STP and the respective roles of each of our organizations in the program.

I think what Mr. Gay is asking is what are those roles, who's playing them.

JUDGE BECHHOEFER: At this time we'll overrule the objection. We'll see how far this line goes and where it's driving at, but it is mentioned in the direct testimony.

BY MR. GAY:

Q The question, gentlemen, was what individuals are involved in the decision making process? What I'm trying to get at is are you the individuals involved, or is it someone higher than you, or is it someone subordinate

21-13

to you who is making these decisions?

BY WITNESS FRALEY:

A. We at the South Texas Project are in an area concept. The persons that make those decisions day by day are the area manager, the chief engineer, the area chief engineer -- that is the chief engineer -- the QC discipline, in the area meeting, along with the concrete superintendent's concurrence, of course.

Q. Is it generally true that all safety related concrete placements are classified a complex?

BY WITNESS FRALEY:

A. No, sir.

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22-1 ge

Q. On line 29, you note that the nine-point action plan was fully implemented. What do you mean by "implemented"?

BY WITNESS CARVEL:

A. I think with respect to that that all of the steps committed to in the nine-point action plan had been filled as of that date.

Q. Beginning at the bottom of page 8, you list the commitments that were made.

On page 9 you have a commitment, No. 4, "Assignment of a complex pour coordinator from Brown & Root Construction to oversee complex concrete placement."

Can you tell me who this individual is?

BY WITNESS FRALEY:

A. Yes, sir, that's myself, Albert Fraley.

Q. Does that mean, Mr. Fraley, that you have to be at the actual site where the concrete placement is being made and oversee the entirety of that placement?

BY WITNESS FRALEY:

A. No, sir.

Q. What is your understanding of your duties as charged by this commitment addressed on page 9?

BY WITNESS FRALEY:

A. My duties, sir, are that I would oversee

22-2

the complete program, along with Mr. John Rudd.

That's any aspect of the program, whether it be at the placement, engineering support, anything concerning complex concrete.

Q. Does Mr. Rudd work with you?

BY WITNESS FRALEY:

A. Mr. John Rudd works with me as a co-chairman. He has been replaced by Mr. Glenn Yiesley.

Q. Can you spell that for me, please?

BY WITNESS PURDY:

A. Y-i-e-s-l-e-y.

BY WITNESS FRALEY:

A. Which is QE.

Q. Can you tell me who the person is with regard to Commitment No. 5, the assignment of a complex pour coordinator from QA?

BY WITNESS PURDY:

A. Yes, sir. That's Mr. Glenn Yiesley, who we just related to you.

Q. Okay. Do you know Mr. Yiesley's background and qualifications?

BY WITNESS PURDY:

A. Yes, sir.

Q. Would you address that for me?

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22-3

BY WITNESS PURDY:

A. He's a graduate civil engineer from Lehigh; approximately seven years of nuclear QA/QC experience between Bechtel and Brown & Root; and he is currently assigned the responsibility of assistant supervisor to the civil quality engineering discipline.

Q. On page 10 you address at the bottom of the page the Complex Restart Review Committee, which you chair, Mr. Fraley.

Can you tell me the purpose of that committee?

BY WITNESS FRALEY:

A. Yes, sir.

That committee is -- The purpose of that committee is to look to the future and look at our past.

What I mean by that is to anticipate problem areas and to evaluate each pour weekly and to make recommendations accordingly.

That panel is made up from engineering, construction, QE and QC personnel.

BY WITNESS CARVEL:

A. And HL&P personnel, as well.

Q. Mr. Fraley, when you say "make recommendations accordingly," what do you envision when you say that?

22-4

What are the possibilities of your decision making?

BY WITNESS FRALEY:

A. There is anything possible, when it's -- I don't mean to sound candid when I say this, but in placing concrete there's so many unknowns, weather, heat, slick lines.

We try to anticipate these problems. There are things that you can do to do away with -- or to limit the problems.

Our job is to look at those things and make recommendations and make sure that they are followed out; to take a program that we have right now and to make it better day by day.

Q. As I understand it, a possibility might be that you would recommend corrective action with regard to a particular pour that's been placed, or you might recommend a procedural change?

BY WITNESS FRALEY:

A. Yes. We may make any recommendations that we might feel necessary or helpful.

BY WITNESS CARVEL:

A. I think we're looking more toward the procedural end of things in this committee than we are the specific problems that come up on each individual placement, because they are addressed prior

22-5

to our meeting in this Review Committee.

Q You state this project instituted a simulated complex concrete pour program. How was that done?

BY WITNESS FRALEY:

A We took and made non-complex pours and treated them according to our new specs -- I mean our new procedures. Pardon me.

We made seven initial pours and got into two more before we started pouring complex pours.

What we did is after we got our program put together, we tested the program, which we did find satisfactory.

Q Could you tell me what a zero defect program is?

BY WITNESS FRALEY:

A Yes, sir. Zero defect is a quality improvement program that we have on the project, and it is in the area of attitude.

We build things to tolerances, all of us, and what we're looking for is zero tolerances. We're looking for zero defects.

We're trying to get better at what we're doing.

Q Can you give me a little bit more information

22-6

about how you carry this out.

Are you offering incentives to employees? Are you designing special programs?

BY WITNESS FRALEY:

A. There's approximately 13 or 14 steps to the quality improvement program. I spent about two weeks in Florida going to a college there myself on it.

It's a very simple program. There's 14 steps to implementing the program.

There are measurements in the program to tell where you are at today and where you will be tomorrow.

It's a very beneficial program, not only to construction but anything that anybody would try to do with their hands.

Q. You mention on line 42, page 10, that you re-evaluated the construction organization to move some people around.

Is this an ongoing process in light of your zero defect program? Are you continuing to do that?

BY WITNESS FRALEY:

A. What we did, we recognize that the containment building is very important. We've always recognized that.

We re-evaluated and put the key people that we had on the project and could get in those areas.

22-7

That's what we did.

Q. Were there any individuals that were fired as a result of this re-evaluation? Was it that intensive?

BY WITNESS FRALEY:

A. No, sir. There were some individuals that were moved to different locations in the plant.

In simple layman terms, what we did was pull the best we could get and put in that area.

Q. Did you recruit any new people?

BY WITNESS FRALEY:

A. Yes, we did.

We brought in a civil general superintendent, who was the assistant project manager on another site, to take the civil activities over on the site.

Q. Can you tell me the name of that individual?

BY WITNESS FRALEY:

A. Yes, sir, I can.

Q. Who was it?

BY WITNESS FRALEY:

A. Harlon Fowler.

Q. When was Mr. Fowler hired?

BY WITNESS FRALEY:

A. I can't answer that question. I couldn't even get within a month of it, but I can get it for you.

Q. Could you give me his qualification and

22-8

background again?

BY WITNESS FRALEY:

A. Twenty-some-odd years in civil, heavy civil, which 12 or 13 of those, I think, were with Brown & Root.

Q. Continuing to page 11, you list some other items that you've done in your program in addition to the ones we've just discussed.

Can you tell me, Mr. Fraley, how you've involved the issue of proper supervision in your recommendations and changes?

BY WITNESS FRALEY:

A. Sir, I don't understand the question. I'm sorry.

Q. Well, what I'm trying to get at is you tell me on the bottom of page 10 that you've re-evaluated all the construction organization and you've implemented a zero defect program.

You've got an ongoing training program and you've given QC inspectors the authority to stop work.

What I'm asking you is how do you ensure that in addition to all these steps and instilling the quality in the construction personnel themselves, how do you deal with whether or not they are obtaining proper on-the-job supervision?

22-9

BY WITNESS FRALEY:

A. Of course, the answer to that is daily monitoring the situation and having good craft superintendents in the areas, which I'm very confident that we do.

And by getting involved in meetings, personal, one-on-one, which I do personally.

Q. Had you had any prior problems with supervision of crafts that you are aware of?

BY WITNESS FRALEY:

A. Yes, we've had several problems with supervision of craft.

Q. Can you tell me when and where that occurred?

BY WITNESS FRALEY:

A. No, sir, not right now. I'd have to go back and check and -- you know, off the top of my head, I can't say that.

Q. Well, would you agree with me that irrespective of procedural changes that are made in a program, that improper supervision can subvert potential progress?

BY WITNESS FRALEY:

A. Would you repeat that, please?

Q. Would you agree with me that if you've got

22-10

improper supervision, if the manager or supervisor isn't doing their job, that that's going to subvert the work, the quality of the work irrespective of the procedural changes that have been made?

BY WITNESS FRALEY:

A. Yes, I think that applies to anything that we would talk about.

Q. I'd like to ask your Counsel to hand to you what has been marked for purposes of identification as CEU Exhibit No. 29.

(Document handed to witness.)

(Witness reviews document.)

Q. Do you have that, Mr. Fraley?

BY WITNESS FRALEY:

A. Yes, sir.

Q. Would you take a moment to look that over?

(Witness reviews document.)

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3-1

BY WITNESS FRALEY:

A. All right, sir.

Q. You are the same Albert Fraley to whom this memo is addressed, are you not?

BY WITNESS FRALEY:

A. I am.

Q. Mr. Fraley, in the fourth paragraph of that memo Mr. Tolley is addressing the fact that HL&P Engineering Design is mentioned or address the ability or inability of Brown & Root to manage and control activity to craftsmen.

Were you aware of the problems in this area at the time of the writing of this memo in 1979?

BY WITNESS FRALEY:

A. Yes, sir. I was aware that we had some problems on the job, yes, sir. And if you will look in the personnel records you will see that we did dismiss some supervision because of being incapable of following or capable of doing their assigned tasks.

We have had that problem in the Containment Building. We have had it on several areas of the job. We have had some supervisors that were not capable. We identified those problems, and, in my opinion, professionally took care of them.

Q. Were you directly responsible for any of those

3-2

decisions that were made? Did you have a role to play in the firing of any individuals of craft supervisors?

BY WITNESS FRALEY:

A. Well, let me answer that this way: The positions that I have had on the Project, the various positions that I have had on the Project, I have not personally fired a man on the Project, but I have personally been involved with the decisions that have been made in several cases.

Q. Can you name those cases for me?

BY WITNESS FRALEY:

A. No. I would have to go back and look.

Q. Mr. Fraley, on the second page of that memo the next to the last, Mr. Tolley is apparently re-emphasizing to you that he wants to make sure that you realize that more control has to be maintained over men performing the "hands on" task of constructing the components of the plant.

What was your response to this memo after you received it?

BY WITNESS FRALEY:

A. Well, I identify -- when Ed wrote this letter, I identified it with the problem. We were working on problems, continuously working on problems. We are working on problems now.

23-3

We had a good amount of work that was going on in the reactor, and what this problem is is people problems. We had a supervisor who had took a piece of paper and went down and performed an activity prior to the authorization or the closeout of an NCR.

Q. When did that event take place?

BY WITNESS FRALEY:

A. Beg your pardon?

Q. What was the time that event took place?

BY WITNESS FRALEY:

A. It was in May. I think it was in May.

Q. May of 1979, 1980?

BY WITNESS FRALEY:

A. Yes. May of 1979.

Q. Can you give me some more factual information about that occurrence?

BY WITNESS FRALEY:

A. What happened was that we had 20 blockouts, and we had an upper and lower blockout, which are the large supports that support your steam generators.

We had some hairpin movement in the blockouts, the placement. And the placement was congested, massive. We had some movement in the blockouts.

We asked for disposition. There was an NCR written up on it. The NCR was written, was dispositioned,

23-4

and to expedite the work we had a three-part memo that was signed, which was not uncommon, it was signed by PSE, site engineer, authorizing us to go ahead with the work.

We did, which that was the people problem that I spoke of awhile ago. We violated a procedure, and the procedure simply says that when an NCR is placed on a condition it does stop the work.

The Foreman in good faith took the three-part memo from an Engineer, and proceeded with the work.

Q Was the Supervisor disciplined in that particular instance?

BY WITNESS FRALEY:

A Yes. He was.

Q Was he terminated?

BY WITNESS FRALEY:

A No, sir.

Q Would you identify that Supervisor for us, please?

BY WITNESS FRALEY:

A Sir, that has been -- I could not give you that name. I can probably back track and get it for you.

Q Mr. Fraley, do you recall any similar incidents that occurred, like you address people problems. Is this a recurring problem at that point in time, in 1979?

23-5

BY WITNESS FRALEY:

A. I can recall two or three NCR's that I dispositioned, or helped dispositioned that were people problems.

In all those NCR's I addressed to those people problems, but the problem was that we needed to follow our procedure. There wasn't anything wrong with the procedure, and one of them was for removal. I don't remember what the other one or two were, but I did address those as people problems.

In all cases that I remember it was people, you know, going out to expedite work.

But, yes, I can say that I personally have experienced two or three of those problems.

Q. Mr. Fraley, do you know of any way that the people problems can be addressed or avoided in the context of implementing new procedures to take care of --

BY WITNESS FRALEY:

A. Yes, sir.

Q. -- hold concrete placements?

BY MR. FRALEY:

A. Hold, physical hold points that we put in in the procedure, inspection hold points.

Clarity on what an NCR is for everyone, which has been done.

23-6

Q. Should there be any requirements demanding that a Supervisor be constantly in a certain position overlooking the work that is being performed?

BY WITNESS FRALEY:

A. Pardon me? I'm sorry.

Q. I said should there be any procedural requirement that a Supervisor be at a particular point constantly overlooking the work that is being performed, particularly with regard to complex concrete placements?

BY WITNESS FRALEY:

A. Are you asking should we write a procedure covering this or addressing this?

Q. Yes.

BY WITNESS FRALEY:

A. In my opinion, no.

MR. GAY: Mr. Chairman, I would move for the admission of CEU Exhibit No. 29.

MR. SINKIN: No objection.

MR. HUDSON: Your Honor, we would observe that it is not within the scope of this panel's direct testimony, and as far as I can tell from the examination regarding the document it is not related to any of the contentions.

Therefore, we would oppose its introduction into evidence as being irrelevant.

23-7

MR. GAY: Mr. Chairman, I think is -- Are you ready for me to respond?

JUDGE BECHHOEFER: Go ahead.

MR. GAY: I think it is clearly relevant within the context of the character incompetence. Clearly relevant in the historical context of supervisory problems that have existed at this plant, and the need to constantly supervise or to re-evaluate the supervision of crafts at the South Texas Project.

This is the area that Mr. Fraley is involved in. He is the one that this memo is addressed to. He has indicated that this is a recurring problem. And I think that this memo is illustrative of the problems that have existed out there in this area, and the need to be aware of that problem in any context in establishing new procedures, and requirements, and in meeting really head on to the problems that existed out there before.

I think if we are going to find a remedy we have to put the problems in historical context. I think that this memo is clearly relevant.

MR. GUTIERREZ: If the Staff could be heard.

JUDGE BECHHOEFER: Go ahead.

MR. GUTIERREZ: Under the rule that chair announced relative to when a document should be moved into evidence, Mr. Fraley is presented admittedly for another

23-8

purpose, but he is the only sponsoring witness. It seems that this is the proper time.

With respect to relevancy, as we read the document it is relevant to managerial attitude, which is an issue in this proceeding.

Therefore, the Staff would not oppose its motion, CEU's motion to move it into evidence.

MR. SINKIN: Mr. Chairman, if I could comment for one second on that, too. A point I wanted to make, that Mr. Gutierrez had made, we ran into a problem with introduction of certain evidentiary documents in San Antonio, and it was called to our attention that one of the people on the documents is coming on later on in a panel. The document does not necessarily relate to the panel at all, but we were told, well, introduce it through that sponsoring witness. That's the proper way to do it.

(Bench conference.)

JUDGE BECHHOEFER: The Board will admit this document.

(The document heretofore marked CEU Exhibit No. 29 was received in evidence.)

JUDGE BECHHOEFER: Have the proper number of copies been given to the reporter, or did that happen when it was identified?

23-9

MR. GAY: It was previously identified as Exhibit 29. I think everyone should have copies.

The Board does have copies?

JUDGE BECHHOEFER: Yes.

MR. GAY: Gentlemen, I just have a few more questions.

BY MR. GAY:

Q I would like for one of you, again, to explain to me the basic difference between the complex Restart Review Committee, and the Review Committee For Safety Related Complex Pours. How would you distinguish those two, and strictly point out what this Safety Related Complex Pour Committee does.

BY WITNESS FRALEY:

A Would you repeat that, please?

Q Yes, sir. I was asking you to distinguish the two committees that you refer to. The first one is on Page 10, the Complex Restart Review Committee. And on Page 16 you refer to the Review Committee For Safety Related Complex Pours.

BY WITNESS FRALEY:

A That is the same committee. The word "Safety" should have been struck out of that.

Q Okay. On Page 11, Line 35, you talk about a multi-disciplinary undertaking between Brown & Root and

23-10

HL&P. Are you referring to the disciplines previously addressed, the QE involvement in construction and QA, or is this -- or you envision something else?

BY WITNESS FRALEY:

A. All right. We are referring to here that in addition to craftsmen, craft supervisors, engineers that are involved in civil activities.

BY WITNESS CARVEL:

A. With respect to HL&P, both HL&P QA and construction were involved in the re-evaluation and re-writing of the concrete procedures.

Q. How was HL&P involved in that, Mr. Carvel?

BY WITNESS CARVEL:

A. We participated in all of the meetings and all of the decision making process along with the Brown & Root personnel.

Q. Were you the person from HL&P that had that responsibility?

BY WITNESS CARVEL:

A. No. There was a gentleman from my staff that participated in those meetings. The same man for the whole duration.

Q. Who was that man?

BY WITNESS CARVEL:

A. His name is Brian Shulte.

12-11

Q. On Page 13, gentlemen, in Response No. 15 you mention that you focused your attention on the following procedures, and you go on to list them.

Can you tell me why or how you selected these particular matters?

BY WITNESS FRALEY:

A. Let me give you a shot at it first.

Q. Okay, Mr. Fraley.

BY WITNESS FRALEY:

A. I'd like to focus in on eliminating references to code and standards, and I believe Bob would be more capable of talking about some of the others, but eliminating references to code and standards outside the procedures, this was confusing somewhat to the supervisors in that we had seven procedures that all referenced codes and standards, which when you'd pull a procedure out you'd have to run to the standards, or what have you, and get a good clear picture of the whole entire need, and what we did there, instead of referring to these standards we incorporated those into the procedures where it's very clear, there's no gray areas.

We took it verbatim out of the standards put them into the procedures. That improved our documentation flow. Improving our documentation flow also was in the fact that we had incorporated seven

procedures into one. That meant that the construction supervisor, or the supervisor, whoever, would need one document instead of seven different documents, and that would lessen the burden or the possibility of problems in documentation also, providing additional information where required.

We had some -- we identified some gray areas and we clarified those gray areas, more clearly defined hold points. We actually put hold points in the process on the paper that stopped the work, or not necessarily stopped the work but told the inspector that here's the inspection points.

BY WITNESS PURDY:

A. Let me add something to that, if you would, Al. There's one point that I believe is very germane to the presentation, and that's the last part of it, the set increasing input from affected craft, QC and engineering personnel.

The particular environment under which we were operating, management felt it was very, very necessary to re-orient the attitude and the philosophy of all the interfacing organizations and activities.

We have done this not only in this procedure but in the procedures that we have developed in accordance with our commitments to improve those

12-13

programs. It is in essence a move of trying to develop a sense of motherhood, and it's a cliche you may not be familiar with, but what we are trying to develop, and I think very effectively developing in many instances is it's my plan, it's my program, it's good, it's valid and we'll make it work, and I believe that that was a very critical point in the particular procedure the development moved.

BY WITNESS CARVEL:

A. I think also to clarify one point Albert made, with respect to eliminating references to codes and standards outside the procedures, my understanding was that previous to the implementation of CCP 25 we made excessive reference to -- well, we made many references to national codes and standards without the particular tolerances being stated that we were referring to, in which case the construction procedure did not stand on its own.

Our attempt here was to come up with a construction procedure that would stand on its own so that no outside references were needed to do the work or to do the inspection.

BY WITNESS FRALEY:

A. I'd like to add one other thing to that that was very important to me. I'd like to relate to it.

12-14

And that is in the clarity of it. We've got some supervision on the job that don't have college educations. We had some big words in there that was confusing to some of them and we cleaned those things up and we made it to where people with that level of education could understand the procedures, and that's one reason why we got them in and they were actually involved in looking at the procedure and shaking their heads that yeah, I can understand this, and I think that's one of the most important things that we've done with the procedures.

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24-1 ge

Q. Mr. Purdy, you mentioned the importance of structuring attitude development into these changes that were made and into the procedures; and previously Mr. Fraley had mentioned the importance of attitude with regard to evaluation of personnel and moving them in a certain direction.

Is there any way that you've developed of monitoring attitudinal improvement over time? Is there a self-critiquing process involved in these changes?

Can you state with any certainty that positive improvement is being made in attitude?

BY WITNESS PURDY:

A. Perhaps I can field that one.

Brown & Root management and HL&P management had requested the services of a human resource development specialist out of Management Analysis Company, an individual who would interview personnel involved in the construction, the quality activities.

He interviewed personnel in Brown & Root and in Houston Lighting & Power, and part of that program was to ascertain what, in essence, was the pulse of the project, or did they in fact feel that we were making progress in the management concepts and

24-2

translating philosophy and making the work easier for the people to do.

Were attitudes improving? Were relationships improving?

To this particular point, although I have not seen an official report, I have talked to the individuals involved, and I am very optimistic that he has found that it has improved the particular attitudes.

When you get a project as large as South Texas Project, it's impossible to assume that at some particular point, you know, that it's going to be Utopia and that everyone is going to be floating along and just happy as a lark with everyone else.

But I believe that the desire is there to work together. The way the supervision and management of both the Engineering, Quality Assurance Department and construction organization is at South Texas Project, I would find it very hard to believe that if a serious difference in philosophy or associations, relationships occurred at this particular point, that some of us or someone in a position to do something about it would not be made aware of the situation.

Q On page 17 of the testimony, Mr. Carvel, you mention an HL&P QA specialist in line 29.

Can you tell me who that person is?

24-3

BY WITNESS CARVEL:

A. Presently I have two QA specialists on my staff. That could be one of two people.

Q. Who are those people?

BY WITNESS CARVEL:

A. Mr. Clark Von Mybenheim -- I'm serious. V-o-n Capital M-y-b-e-n-h-e-i-m.

And Mr. Thomas McGriff, M-c Capital G-r-i-f-f.

Q. Tell me what a QA specialist is.

BY WITNESS CARVEL:

A. That's a title that is given to a person on the HL&P QA staff who has no four-year degree, although the experience might qualify him for the job. If he had a four-year degree, his title would be QA engineer. Without the degree, he's a QA specialist, and that's the only distinction between them.

Q. So the QA specialist without the degree is monitoring the performance of Brown & Root PTL inspectors?

BY WITNESS CARVEL:

A. Yes. He is one of the people.

Mr. Shulte is also involved in this effort, and he is a QA engineer.

Q. Mr. Carvel, let me complete my questioning

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with reference to your testimony on page 19.

In the first paragraph of your response to Question No. 22, you talk about the creation of a QC arm within HL&P that provides inspectors in addition to those from QA.

Is your reference here specific with regard to your testimony for this panel? That is, is this arm specific with regard to the concrete or does it have broader QC functions?

BY WITNESS CARVEL:

A. It's got much broader implications. There are QC inspectors on our staff for all the disciplines, as a matter of fact, civil, mechanical and electrical at this point.

Q. Then this isn't any different than the testimony of Mr. Frazar or Mr. Oprea would indicate with regard to over-all QA/QC functioning within HL&P?

There's nothing particular special about this QC arm?

BY WITNESS CARVEL:

A. No, that's the QC arm, I'm sure, that Mr. Frazar alluded to.

This was just an indication that in addition to people from my QA staff, that generally two of the QC inspectors were involved in the placement, HL&P QC

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inspectors, were involved in this placement as well.

Q You don't mean to infer that you supervise this QC arm, do you?

BY WITNESS CARVEL:

A. No, not at all.

MR. GAY: I pass the witness.

JUDGE BECHHOEFER: I think we'll adjourn for the day at this time.

MR. NEWMAN: Mr. Chairman, may I just have one last word before we close?

JUDGE BECHHOEFER: Yes. I was just going to make sure that we were all anticipating the same testimony tomorrow.

Am I correct that the welding panel is next after this panel?

MR. AXELRAD: Yes, Mr. Chairman.

I had a couple of matters with respect to the scheduling that I did want to address before we adjourn, and I'll be glad to do that right now.

JUDGE BECHHOEFER: Okay.

MR. AXELRAD: The next panel after this panel will be the welding panel.

In connection with their testimony, we had previously served on the Board and all the parties a report entitled, "Review of Safety-Related Welding at

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South Texas Project Electric Generating Station, April 1981," which will be an exhibit that members of that panel will sponsor.

Since the time that that report was served on all the parties, there has been one set of revisions to that.

I will provide copies of that to the parties and to the Board so that they can have a chance to look at it before it's discussed in the testimony tomorrow.

The other thing that I was going to mention is that after the welding panel testifies, we had previously indicated in our letter to the Board of several weeks ago that we would have Mr. Peverley testify on two contentions; to then be followed by the Singleton, Warnick, Wilson panel.

What we would like to do is to reverse that order. In other words, after the welding panel, we would like to present the Singleton, Warnick, Wilson panel, just to make sure that they do get finished this week.

Mr. Warnick is coming from out of town and we would like to have them finished.

We will also hope, as Mr. Hudson indicated earlier today, to be able to complete Mr. Peverley's testimony this week; but just in case, as he is only a

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single individual, we would prefer to have Singleton, Warnick, Wilson come before Mr. Peverley.

JUDGE BECHHOEFER: Any objections to that shift?

MR. SINKIN: No objections.

MR. GUTIERREZ: No objections.

MR. GAY: None.

MR. AXELRAD: We also indicated the possibility that Mr. Williams might testify this week.

Mr. Williams has been ill the earlier part of this week and has commitments at the site toward the end of the week.

So we would like to just inform the parties we will bring Mr. Williams on to testify in September, instead of this week.

MR. NEWMAN: Your Honors, before we close for this evening, with the permission of the Board and my colleagues appearing before you, I would like to take a moment to recognize the loss of Alfred Geisler, Brown & Root Senior Licensing Engineer.

Al was tragically killed in an automobile accident on his way home from the hearing last night.

He worked tirelessly for years assisting my client, Houston Lighting & Power Company, the other parties, and at times this Board, in assembling the

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large and complex record that has occupied all of us here for months.

While you may not have known Mr. Geisler by name, you have seen him at every session of this hearing.

His unusual dedication and spirit made it possible to gather and evaluate and present to you the vast amount of information about this project which has been and will be made a part of this record.

Al had scheduled a long-delayed vacation with his wife and young children for this week.

After driving them from Houston to New Jersey last week, he in typical fashion flew back to Houston on Sunday evening so that he could be available for these reconvened hearings.

All of us who have worked with Al have been enriched by the experience. He had endless energy and was endlessly resourceful.

We will miss a very bright and kind man and a very good friend.

I thought it would be appropriate to express for the record at this proceeding for which Al Geisler worked so very hard and long our heartfelt condolences to his wife Judy, his son Mike and daughter Melissa. We share in their great loss.

JUDGE BECHHOEFER: The Board joins your

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expression of regret, expresses condolences to Mr. Geisler's family.

MR. NEWMAN: We will convey that to his family, Mr. Chairman.

MR. SINKIN: On behalf of Citizens Concerned About Nuclear Power, we will join in that, also.

MR. GUTIERREZ: Staff joins in the sentiments expressed.

MR. GAY: Certainly, CEU joins, also.

JUDGE BECHHOEFER: I guess with that we will adjourn until 9:00 in the morning.

(Whereupon, at 5:51 p.m., the hearing was adjourned, to reconvene at 9:00 a.m., Wednesday, July 22, 1981.)

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This is to certify that the attached proceedings before the

NUCLEAR REGULATORY COMMISSION

in the matter of: HOUSTON LIGHTING & POWER COMPANY
SOUTH TEXAS NUCLEAR PROJECT UNITS 1&2

DATE of proceedings: 21 July 1981

DOCKET Number: 50-498 OL; 50-499 OL

PLACE of proceedings: Houston, Texas

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

Lagailda Barnes
Official Reporter (Typed)

Lagailda Barnes
Official Reporter (Signature)