UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

In the Matter of:

IE TMI INVESTIGATION INTERVIEW

of Mr. William Zewe
Shift Supervisor

Trailer #203
NRC Investigation Site
TMI Nuclear Power Plant
Middletown, Pennsylvania

April 23, 1979
(Date of Interview)

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NRC PERSONNEL:

Bob Marsh
Dorwin Hunter
Donald Kirkpatrick
Joe Creswell

MARSH: The date is April 23. The time is now 11:54. This is Bob Marsh, Investigator for the U. S. Nuclear Regulatory Commission, Region III, Chicago and we are about to commence an interview of Mr. William Zewe at the Three Mile Island site. Before we begin, I would like each of the individuals at the table to indicate their name, spell their last name, and identify their position. Dorwin, if you will start.

HUNTER: Dorwin Hunter, Inspector Specialist, Region III, Performace Appraisal Branch

KIRKPATRICK: Donald Kirkpatrick; Headquarters, Nuclear Engineer.

CRESWELL: Joe Creswell; Reactor Inspector, Region III.

ZEWE: Bill Zewe; Shift Supervisor, Three Mile Island, Metropolitan Edison Company.

MARSH: Also initially gentlemen, if when you choose to make a statement if you would initially start out by mentioning your last name to assist the girl who has to type this. Bill, if I may, Bill O.K. or do you want Mr. Zewe or what's your pleasure?

Bill is fine.

O.K. Bill, before we turn the tape on, we sat here and discussed this letter for a moment or two, I do want to discuss this a little bit on the tape. I've shown you a the two page letter and asked you to read it and then sign the second page. That more or less sets down the ground rules for the investigation, at least the interview portion of it. And on the second page, were a series questions which I would like to get your response to now. The first question reads, "Do you understand the above content of the two-page letter?"

Yes.

And the second question indicated, "Do we have your permission to tape the interview?"

Yes, you do.

And the third question reads, "Do you want a copy of this tape?"

Yes, I do.

O.K. I will provide you with both a copy of the tape and the transcription. As soon as that's available. There's a fourth question that doesn't appear on the second page, but is covered in the body of the first page and that addresses your right if you would like to have a company representative or a union representative present when I get you to respond to that material?

It really makes no difference to me.

O.K. I'd like a yes or no answer.

No. Not at this time.

Fine. If you should desire one at any point, as we go along, feel free to indicate that move. We'll get one in here.

O.K.

O.K. At that point then, I would like, one thing on this if you will just give me an initial on the edge of the first page and Dorwin, I guess you are going to start off and pick up with your questions.

O.K. Bill, just to get started I want to ask a specific question. In one of your previous interviews, and at the morning of the 28th, and you were at the point in the incident where you were attempting to restart a reactor coolant pump, O.K. And you have trouble restarting that fuel pump. You tried a number of pumps, before you were able to get the last pump started. And one of your comments, as I read it, was that we had had trouble with pressure switches and different things in the control circuit on the pump before. And you sent somebody to could check H3 relays on the reactor coolant pump.

K3 relays.

Would you explain that, what you were referring to?

Alright. The K-3 relays were located at the coolant pump breakers themselves and they actually are either picked up if all the starting interlock requirements for the reactor cooling pump are met or not, so that normally if the coolant pump does not start we normally check to make sure that the K3 relay which monitored the starting interlocks is energized.

O.K. An example of these inputs to that relay circuit would be what?

Seal injection flow, intermediate cooling flow, power level and so forth.

O.K. Thank you Bill. Would you, we have some special points we want to make tonight and we will, just to get started, let's, I wanted to talk a little bit about the, the reactor coolant drain tank operation, the night of the incident and to get your input as far as at what time you had noticed that the reactor coolant drain tank pressure had increased, temperature had increased, relief valve had lifted and whether or not the ruptured disc had blown. Could you try to recall at which point one of the operators or yourself had noticed that the drain tank had in fact, seen hot water?

I was not sure of the exact minute, because based from the other interviews that I've had, I've seen that my time frame has really been quite far off.

But I would say within, you know, within the first twenty to twenty-five minutes, at least that we noticed that the drain tank had a high temperature and a very low water level. And that the recirc pump on the drain tank had a very low discharge pressure.

More important again, is what you noticed, rather than time frame.

Right.

O.K.

And also the pressure was very low.

Was the drain pump run, the pump itself run as indicated?

It was running.

And it had a low suction pressure?

A low discharge pressure.

A low discharge pressure. That would indicate to you that the was what? Dry? Or it wasn't - had no suction?

Right. That it had a very low water level in it.

Is there anything available to you at that time to verify the condition of the reactor coolant drain tank? What the condition was?

Well, we have pressure level and we have a temperature gauge level.

Do your recall those, the conditions of that tank at that time?

Yes. The level was off-scale level low. The pressure, as I remember, was zero, or pretty close to it. And the temperature was over 200 degrees.

O.K. In my review, I seemed to have picked up a point where there's a flow recording available for the water pumped out of the reactor coolant drain tank. Is that a fact, or

Yes, there is. Periodically, we pumped on the RC drain tank, and we pump it down using the closed loop cooling water pump. And then there's a valve we open up, and it's a flow control valve and right above the valve we have a stripped chart flow recorder, where you can record the flow that your feeding on a system.

It' a - and this is located on the panel, I presume.

Yes, it is.

Which panel?

This would indicate the amount of steam that was in the reactor cooling drain tank?

It isn't on three or four or five.

While you are looking, I'm am going to indicate that we are making a reference to two loose leaf binders containing a series of color photographs that the investigating team has secured from Med Ed training branch.

This is the flow recorder right here.

That flow recorder would indicate water pumped from the reactor cooling drain tank over to where?

Over to an RC bleed tank.

O.K. And that's the normal lineup?

And here's another one here. This is the top of your first? One right here. This here on the back. Right here. So we have the level, the temperature and the pressure of the tank right here.

O.K.

And then our two closed loop pumps, which situate - right here, right.

O.K.

And then you pump here, out through here.

Just a moment. We should identify some of this equipment. The pumps that Mr. Zewe is referring to are WDL-P-9A and 9B.

Then O.K. The right Reactor Building right beside the RC drain tank themselves.

And they pump through coolers - individuals coolers - they can go through a flow recorder which to the reactor to the miscellaneous drain.

RC drain tank.

RC drain tank.

O.K.

And here's another, two others

The tank

We're down here yet, I want to see if we have any more of the

O.K. Would you identify the names of the recorders and so forth.

We aren't there yet.

Go back one.

Here's a flow recorder here.

Is that the one?

No. No. This is the one, that's on the radwaste panel where the RC bleed tanks are at. Which I beleive are second. That is this here portion of this plan, here.

Alright.

I don't believe you have one of the lower section which includes that.

Right. That's O.K.

The pumps pump flow through the flow recorder and they go the miscellaneous drain?

RC drain tank.

The RC drain tank.

They don't show it here at all.

O.K. Go back through the line up again. If you run the pumps and you're pumping water, you would go through a flow recorder.

That's right.

And the water would go to the Auxiliary Building.

Right.

Through to the isolation valves, on that particular system.

Uh, uh.

Right. And where would the water go then?

It would

Normally?

To the RC drain tank.

Would it have been lined up to the drain tank that night?

It probably should have been lined up, except for the isolation valve right there at the flow control. And at the time of the incident, we were not pumping down the RC drain tank, to my knowledge.

Alright.

Normally, when we have a high level alarm in the tank, we have the operator go back and manually pump the tank down to the required level. We normally maintain about 74 and a half inches to 77 inches in the RC drain tank. And the operator, to my knowledge, and they have also told me that they had not recently pumped it down. Alright, so, that that valve wasn't back shut, at that point. And the valve was shut, and when I remember looking at the RC drain tank there, for the pressure and the high temperature conditions, the valve was shut.

O.K. And is my understanding that the valve is closed, is controlled on low level. If you have a low level, the valve will not open?

No. That's true. That's true.

If it maintains a minimum level, then the reactor drain tank goes to 74 and a half inches or so, whatever that number is whatever the level is?

Correct.

O.K. And it is a manual operation, if you get a high temperature, the operator has to put it on recirc to cool the tank down?

Well, we normally always have it on recirc.

On recirc? O.K.

But then we just manually pump it down, as required.

Creswell: Could you briefly describe what the effect on the reactor coolant drain tank, of say, leaking safety valves or the EMOV on a pressurizer would have on the reactor coolant drain tank, if you were to have some leakage through those valves?

That is the main reason why we have been pumping the RC drain tank down so frequently is cause we have leakage from the safeties o: the pressurizer. Alright. We have thermocouples down stream of the safty valves and the electromatic valve and they are high normally in the neighborhood of 180,

170 degrees, which indicate that they do leak by. And then that water goes right into the RC drain tank and we have been pumping it down, a couple of times per shift, because of this leakage.

How much would you transfer each time you pumped out? Just a rough estimate.

Well, just from the high level point down to the low level point of 7 inches, down to 74 and a half. And I don't recall exactly how many gallons per inch that is.

Alright.

We could get that out of the tank right, yeah. That's no problem.

We looked that up today and it shows 300 gallons approximately, if the numbers that we had were correct.

That sounds very familiar.

If you pump from the high to the lowest, it's 303 gallons or something. So everytime you pump it then. How much would you feel like, how did you pump, would you think per shift?

Well, at times it, it was more than that. And I can't recall the exact number that we had been doing as of the time of the incident. Because

really, the _____ does that on an automatic type basis. And we knew that we had a leak. And we had been pumping like once every couple of hours.

Right. So it could have been pumped four or five times per shift.

Kirkpatrick: Were you also getting leakage from the cold safety valves?

It appeared to be so. But we weren't positive, because the discharge line downstream, where the thermocouples is, alright. There's a - we weren't sure exactly how many for sure, or exactly which ones were leaking, except by their discharge temperatures. Alright, and depending how accurate they were. We dont' know for sure.

Do you know about what they were reading? Normally?

We had - they had fluctuated a little bit, but they had basically been in the 170 or 180 range.

That's what you said previously. Didn't you say also that you thought that you had a safety valve leaking some into the reactor coolant drain tank?

Yes. Safety or electromatic and -

But you didn't know which one it was?

Or all three or two or three for sure.

O.K.

And our really big indication other than this, was that our pressurizer boron samples were coming back a lot higher than the reactor coolant system boron. Meaning that we were, in fact, leaking past and concentrating the boron in the pressurizer. And that's why at the time of the problem, we also had the heaters and spray in manual. And continually springed the pressurizer to try to equalize the boron concentration. We have also had the same problem in Unit 1 before. So it was a problem that I had been used to in Unit 1, during the first fuel load that we had exactly that same problem.

Hunter: Bill, has this problem existed since Unit 2 started up last fall?

Yes, it has.

O.K. In the case of the boron concentrating in the pressurizer, what type of differential boron were you used to seeing between the primary and the pressurizer when you got your samples?

Normal basis, you mean -

Right.

Well, normally they should be less than 100 ppd or ppm.

Is that where you actually maintained it, less than a 100, or attempted to or did you maintain it much less than that?

Well, we'd like to have it as low as we could. Alright. Because ideally, the concentration in the pressurizer and the RC system should be the same. But we had had sampled differences that approached 300, 400 vpm between the pressurizer and the RCS. And whenever we would recirc the pressurizer then, the boron would then come into the system and we would see a reactivity change in the reactor compensation.

Your indicating that the boron in the pressurizer is specifically as higher than the coolant system ___?___.

Oh yes. Cause actually you are, you are boiling away some of the water and leaving the boron behind so it's acting like a big concentrator, really .

Right. And so this would give you a negative reactivity insertion when you put the pressurizer on recirc?

And ou ontrol rods would come out to compensate for and that has been the case all along that our, all rods are configuration with boron control

results that are rod groups, six or seven that we control on is always out at greater than 90%. Alright. And it really doesn't have that great amount of reactivity that far out. So that if you have a boron change of any significant amount you end out with the all the rods fully out of core.

So how would you counter that situation?

Then, we would add demineralized water to reduce the boron concentration, and bring the rod back in to an acceptable rod index.

And this is a normal procedure for deluting and reducing the boron concentration.

Yes, it is.

O.K. In the case of the power operated relief valve in the RD 2 valve and the reactor coolant drain tank, can you recall when it came to your attention that you had a problem with the - let me make a couple of points. The first point is, that when you had the reactor trip, I think it was generally understood that you did in fact, lift a safe, a power operated relief valve a safety during that trip.

Yes. Our pressure recorder went up in the neighborhood of 2350 or so. Alright, Electromatic should have lifted. Alright, so the electromatic lifts before the trip. Alright, before the reactor trip, so we did have a

high pressure trip and the recorder showed higher than the setpoints for the electromatic. so it should have lifted normally, but we did get high enough to lift a code safety valve.

Have you been involved in other trips at Unit 2?

Yes, I have.

Has the power operated relief valve before?

Yes. Depending at what power level your at.

Do you have a feel for that, as far as on most any trip would you expect the power operated eelief valve to lift or would it be a different type of trip.

Well, it depends on a - if the trip involves anything to do with feedwater being less than what is required for your power level. Alright. Or your heat removal capability on the secondary side is less than the primary heat addition. You always result in a higher pressure in the primary side beause you'll heat up, because your no longer transferring the heat. So it would result in a higher pressure.

In your case, in your experience at the plant, in the trips that you have been involved in, did they include feedwater type transiential trips?

We have had, right now I can't remember a feedwater induced trip in Unit 2, other than tripping the turbine for testing. Alright, I have had a couple of feedwater action baited trips on Unit 1, which is basically the same type of Unit itself and the response is the same.

Do the power operated relief valves lift in most cases?

Yes, they do.

The feedwater trip, in this particular event, caused a loss of heat sink, caused the heat pump to start we'd been through the sequence.

Yes.

The auxiliary feed flow(?) did not start, although the pressure came up because the feedwater, the 12A and B valves were closed. O.K. So the reactor had a l[illegible] of heat sink.

Exactly.

And then this resulted in primary system pressure increasing and lifting of the power operated relief valve and the RV2 valve on the pressurizer or and/or a safety valve. It depends

Yes.

Can you tell if you lifted more or both or by looking at the pressure?

Just by - right. Just from the pressure recorded. Looking back on it now, I would think for not having feed for the period of time that we did, that I would have expected maybe, a higher primary pressure. But from our recorders, the highest that we seen was about 2360 or 2370, at the most. And

O.K.

Maybe, well just looking at it now, I would suspect that if Ihave a total loss of feed where I didn't regain feed for 8 minutes, which in this case was so, that I'd expect maybe the pressure to have gone even higher. Because I have seen pressure that high on a trip where we really didn't lose total feed.

O.K.

Let's pursue the question concerning the reactor coolant drain tank sump. And the fact that since the power, the RV2 valve, the pressurizer relief valve, the electromatic relief valve would lift it. Did this, the fact that the read coolant drain tank pressure or, temperatures were indicating high, did that bother you or did you consider it normal?

Well, the pressure should have been high, not very low like I seen it. And we should have water level in it, alright. But we should have had a higher than normal temperature because of relieving all of that energy into the RC drain tank, it would heat it up considerably. But the pressure should not have been low. It should have contained the pressure from the volume of steam.

With the pressure being low, what would that indicate to you.

Well, plus the level low and the temperature high was either that we either had lifted the relief valve on it and it was still open or we blew the ruptured disc on it. Or something else happened to the tank. We blew off a line. I didn't know at that point.

Right. But that night were you, fairly early in the event, were you aware of that condition?

Well, like I mentioned before, as far as I can recollect, something like 20 or 25 minutes into it, is about when I remembered. It could have been earlier and it could have been a little later. I'm not sure at this point. But -

You ended up with a reactor coolant, the Reactor Building sump pumps pumping over to the Auxilary Building.

Correct.

During this time frame, shortly there after that also. And later on you isolated the - you turned the reactor coolant -the reactor sump pump, the Reactor Building sump pumps off.

That is correct. I gave direction to have that done and the operator reported back that he had in fact done it, yes.

O.K. The extra amount of water level in the reactor containment sump will - how about expound on that some and what that would have meant to you, and where the water was being pumped to also.

Well see, that's why it, we had the sump pump secured because they alarmed on the computer saying that they were both running. And we knew at that point, that something had happened, in fact, to the RC drain tank and that the water from the RC drain tank was going into the sump. And we didn't want to send all that water over to our Auxiliary Building misscelaneous waste holdup tank because we really didn't have a great amount of capacity. And I didn't know the extent of the problem, either, so we just had them secured until we knew more about it. So that was really just a precautionary note. I said yes they should be on because there is something wrong with the drain tank and that would put water into the sump. But I just wanted to keep the water for now in the Reactor Building and not bring it over to the Aux Building.

Let's go one step further. On the pump discharge line there are containment isolation valves.

Yes, there are.

On the sump pump discharge. Also on the reactor coolant drain tank discharge valves.

That is correct.

Also on the vent, there are isolation valves goes over. These valves will close on a ES system.

We had that problem in Building 2.

Did you ever get that?

Yes we did. But not until about 9 o'clock.

O.K. In between 6 - in between like 4:30 and

6 o'clock?

9 o'clock - then those valves are open.

Yes, they would be.

O.K. In between this time, is this when you got the water in the Auxilia Building out of the floor drains?

Yes, we did. The water - well, I'm convinced that as soon as the water got into the building, we seen it from our activity monitors in the Aux Building and Fuel Handling Building. Because the activity of the water was high enough to where, with this much quantity of water and as high as it was, we would have seen it right away. And this occured about 20 to seven, or so, that we first seen the activity problems in the Aux Building and the Fuel Handling Building. So this is the time frame before 9 o'clock. Yes.

O.K. At that time, did you take - do you recall any action to stop the water from going across the Auxiliary floor or attempting to stop?

Well, I didn't - at the time when the radiation levels came, I did not know that it was because of water in the Aux Building until the operators evacuated the building and called the Control Room and said that there was water coming up out of the drains.

And was that from Terry Dorherty or was it from other operators?

It was from Terry Dougherty and I believe the other one was George Servich(?).

O.K. Let's take a break and then we'll start again.

The time is 12:24 and I'm reading about 470 on the meter. And I'm at this time going to break for a moment and change these tapes.

O.K The time is 12:26. Same people are present. We are going to continue. Dorwin, I think you finished with a question. Will you continue.

O K. We were still discussing the flow paths from the reactor coolant drain tank to the Auxiliary Building after the reactor coolant drain tank pumps were secured and the sump pumps were secured. And the fact that the containment isolation valves on the discharge lines of those two tanks and also the vent line off of the RC drain tank. Even though they have isolation valves on them, they are in fact, isolated at full pounds on the containment and you did not have an isolation until 9 o'clock and also between that 6:30 and 9 o'clock is when the water showed up in the Auxiliary Building.

That is correct.

That's a fact. O.K. In the case of the water in the Auxiliary Building - once you said you knew radiation levels, were you, were you convinced or did you have a feeling that it was the reactor coolant?

I was convinced that it had to be based on the activity. We didn't have any other water in the system in the Aux Building that really that high in

activity to cause the increase that we observed in the radiation instruments in the Auxiliary and Fuel Handling Building. I was certain that it had to be some transmittal between the reactor coolant system and the Auxiliary and Fuel Handling Buildings themselves.

Kirkpatrick: Did the activity that you saw at this time, could that be accounted for by normal activity levels in the reactor coolant?

I wouldn't see how. Because as I remember it, we had pretty close to 100% of every alarm in the Fuel Handling Building and Auxiliary Building. Normally, the only system that really transfers much coolant in and out from the Reactor Building to the Aux Building is the makeup and purification system through the letdown and purification path and reinjected through the seals and through normal makeup. Alright. And this would not be seen in all the other monitors that I had seen. It had to be more widespread throughout the Aux and Fuel Handling Buildings at this time.

What time are you talking about now?

Just about 6:40 or a quarter to 7.

O.K. This is after the primary coolant pumps were shut off?

Yes.

Alright. During this time looking at this same type problem, did you see any - was there any unusual problems associated with the letdown system, the letdown flow or the makeup flow?

Prior to this, you're saying?

During this time period was there any unusual conditions that you recall relative to letdown flow system?

I don't remember any abnormal letdown flow indications at all. I learned later from the one operator, which I didn't personally observe, but he did have some pulsing of the flow signal. Alright - from our gauge there in the Control Room of some pulsing of the letdown flow. But I did not in fact, observe that.

This information wasn't provided you that morning? You found out later, later in the day or later during discussions with this operator?

Yes, exactly.

O.K. So, that at that time you thought, well you didn't have any indication that there was any problem with letdown at all?

I did not.

O.K. The site emergency came about, general emergency, site emergency, general emergency that occurred. Now, you said at 9 o'clock, you in fact, had a building isolation. In that time frame? Both panels?

Yes.

Now did all those vent valves and all the containment isolation valves go shut at that time?

We did a check of the isolation for the ES per our normal procedure.

Yes.

And I did not have a report from the operator who verified it. Saying that there were any valves that were out of position, alright. We have an ES panel there, alright, that as matter of fact, is right underneath here, alright.

Could you describe what you said right underneath here? What panel number would you be talking about?

Well, here's panel 15, too. They have - see this here shows the valves that go into the Reactor Building and this shows that go out of the Reactor Building. Alright. And then on panel 13, which is the one here, monitors all our ES components for both high pressure injection and for building

isolation. And right under here, which you can't see from the photograph here, but there is strings of component lights that monitors the position of the components, alright. And it should go to the ES position which would be a white light. So he just looks down for the actuation that we get, and he says, "Yes, I have all the white lights for the various actuations." And I'm not sure if you have that in here or not.

O.K. Bill. He indicated, while we're looking through there, he indicated that all, you got it, I realize being supervisor, he did not indicate that you had any abnormal conditions, so you assumed that they are all closed.

That is correct.

Alight. On building isolation, they reset the building isolation fairly quickly. Because for whatever reason it was coming up, and then also you had some other things to do.

Well see, during the course of the incident, alright, we got up as high as about 2 and a half pounds maybe, whenever we had isolated the B steam generator and also had isolated the electromatic block valve, RCV 2. Alright. So that we had pressure then was coming down. So the pressure wasn't a problem until, and I'm sure that it was close to 9'oclock, when discussions after that was that we had our first building isolation. And that was somewhere where we were, were probably reventing the coolant system into the Reactor Building again, causing the pressure in the Reactor Building

So it was a direct vent?

Exactly.

O,K. When you reset the ES signal containment building isolation signal, did any of the valves change position or did the operators have to change the valves. In other words, all the vent valves and the isolation valves that are closed, do they remain closed, even though you isolate the, even though you defeat and even though the signal cleans?

We've taken control of them and then we manually repostion them, then.

Did you in fact, or do you call repositioning any of the valves, did you reposition any of the valves?

Only the valve that we needed.

Like, as an example?

Then it wasn't ones - well, the lines going to the reactor coolant pumps, alright. We had problems trying to start them to begin with, alright. But we did unisolate the valves going in and out to the Reactor Building, alright, for the nuke service cooling, which cools the coolant pump, oil coolers and the air coolers.

Alright.

72 and 81 and so forth, alright. Then we open them up as required. But I do not remember opening up other valves, just for the sake of opening up all the valves.

What about the Reactor Building's sump pump valves and the reactor coolant drain tank valves?

No. We did not to my knowledge. No.

Then at that point you have completly isolated the containment, with the exception of the essential service valves that you indicated that you need to continue operation on the reactor coolant pumps, the intermediate cooling system, that type of -

And so forth. Right.

O.K. So at that point then, all leakage from the containment should, no matter what its source, should cease. From any source, other than the letdown system. The letdown system was still operating. That's the one path that comes out of containment under pressure, goes through the filter, back to the demineralizers in the makeup tank and is pumped back into the coolant system via the normal makeup valve, and the seals to the pump and the actual 16 valves, which are your injection valves, depending on what the mode that you are operating in. O.K.

Exactly.

So we're down to the - after that point, we're down to a let down flow system and the makeup system, as far as the source of any activity outside - outside of the containment. That's what I'm trying to establish.

Exactly.

O.K. I want to make sure that I understand.

Can you go into that

Certainly.

Creswell: When you got the building in isolation was that when you got the pulse of pressure in the containment?

No. It wasn't. The peak that your probably referring to, was the time that we actually started the building's spray pumps automatically, on a high pressure signal which was right around 30 pounds. I think the recorder showed about 28 or 29 pounds. But that wasn't till a couple of hours later. Somewhere around 2 o'clock, a quarter to 2, or something like that in the afternoon. Because we were then attempting to depressurize the plant and try to get down to the pressure, so that we could get on to decay heat removal. So we had the electromatic lock valve opened and we were

opening up the electromatic valve manually with our switch in order to reduce pressure so that we could get down there. And it, it was one of these times when we had cycled the RC RV2, the electromatic valve, that I was right in front of the Reactor Building pressure recorders. We have two recorders there. And I was right in front of them. And I believe it was Fred Scheimann, my shift foreman, that was operating the valve. And I said, "Alright Fred, vent now." You see, we were trying not to get high enough in pressure to have another building isolation, but yet reduce the pressure to come down. So he hit it, and I was right on the recorders themselves and they just went (whistle) up and right down. And I said, "What the heck was that." And then the Control Room operators off to my left, in the building spray pumps, are probably three and a half to four feet over from the RB pressure recorders at the very end of the panel there. And he said, "Bill, we've started the buildings spray pumps." And I said, "What?" And so I looked over, and they were running and I pondered that for about 30 seconds. I guess, because I thought, there just must have been some electrical fault surge from the electromatic, that caused the building spray pumps to come on. And I thought, that's something we'll have to look into, but then I had the operator secure the building's spray pumps and then we went on with trying to depressurize then. And we didn't have any more problem in that time period of the high pressure. I learned later on that sometime I believe later that night, after I had left, they had had another pressure spike in the building. And also had started the reactor coolant pumps. So,

What's the reactor coolant pumps?

I mean, when we cycled the electromatic relief valve, rather. I'm sorry. And it wasn't until the next morning that I came in, that we were still trying to find out why we had that pressure surge. So we were talking with the electical engineers on how we could possibly go from that DC operated valve over and trip the pressure switches, which are set at 30 pounds for the building spray pumps and their on a logic of 2 out of 3, before you'll start a pump. So, at least we had picked up 4 of those, plus both of the pressure recorders showed an increase. So, he looked at it, and he said, "Bill, there's no way that the, that cycling the electromatic could cause an electrical fault to cause the pressure switches in the building spray to come up." So then we thought, I wonder if the real reason was a hydrogen explosion, because in order to pressurize a volume that large so quickly, it was almost like an explosion. But at first, then I thought, no, 2.1 million cubic feet like that - no way. But then I guess we have determined now, pretty well, that it probably was a hydrogen explosion inside the building.

Did you hear anything in the Control Room when that happened?

I did not. No.

O.K.

I learned later that at least two other people did.

How did they hear it? I mean -

Well,

How did they hear it? Do you have noise monitors or something? Or -

We do have noise monitors that are in the Reactor Building, loose parts and noise monitoring system. I don't recall hearing on that. But the person in question, who I first learned it, they had heard something. Pardon me, it was Gary Miller, who is the Manager of the Island. And he said that the had heard something. And that he had mentioned it to whoever was beside him at that time. And they thought that it was dampers in the ventilation system which sit directly above the Control Room. And he didn't think anything more of it, at that time. But then as he looked back on it, that's what he feels it was the same time.

Bill, did these pressure spikes were proceeded by the operation of the EMOB?

Well, maybe I should clarify that. The one that I was there for was from the electromatic, alright.

O.K.

I assume that the other one was too. Though I'm not sure of that. It may have been from operating something else from inside the containment. I don't know that for sure.

Hunter: We're interested in, in you know the - it's important - you saw the - you had the electromatic cycle, Fred opened the valve?

Right at that instant.

And at that instant you had the pressure spike. You saw the pressure spike?

I'm positive. Because he was waiting for my direction on when to open it up.

O.K.

Alright. And I said, "Alright Fred, open it up now." As soon as I said now, you know within a fraction of a second, the spike went boom.

Alright, you saw the spike. You saw it come back down?

Yes. It came up and came right back down.

Then it leveled out?

Yes.

O.K. And so then having the operators disappear in the containment spray pumps - the operator. You - did you - what was your basis for securing the pumps?

Well, at the - I thought then that it was just a faulty indication and the pressure had come back down to

Do you have - how many channels of pressure do you have in front of you narrow range and wide range?

For the Reactor Building itself?

Right.

Two. Two separate recorders.

O.K. then. So you were sure then the pressure was back down?

Yes, I was.

O.K.

I was convinced at that time that it was just a false electrical type signal.

O.K.

It never entered my mind that it was a hydrogen explosion, at that time at all.

I - can I - can I - I'll ask you the question of hydrogen analyzers on the containment building - on the Reactor Building. Do you -you apparently do not have that type of

We need a sample for hydrogen.

You, I'm sorry go ahead.

We sample for the hydrogen, alright.

Later on?

We did later, yes, but I mean normally that's the only way we can determine what the hydrogen concentration is in the Reactor Building. Is through sampling. Or if we run the hydrogen recombiner, we can take - there's a formula for figuring out, based on the reaction chamber temperatures and the heater chamber temperatures. You just take the Delta T and divide it by a constant. You can come out with a relative percentage of hydrogen based on the reaction volume of the chamber, knowing the flow rate through it and everything else.

O.K. Had you ever had to take a hydrogen sample of the containment before that your aware of? Had you yeah - did you ever, before?

I'm sure that we have. And, well, the only time that I can remember actually doing that is anytime that we have the building closed for any period of time, alright. We normally go in an take an air sample for the quality of the air. And then they get the results and the shift supervisor reviews the results, to make sure you have the least enough oxygen to support life and that you don't have any combustible vapors in the Reactor Building before you send people in.

And that would include hydrogen in an analysis?

I think it's just combustible vapors. There's oxygen on it and I believe the other one is just combustible vapors. Like

O.K.

If you'll excuse me at this minute, but hydrogen being a combustible, it would be considered in that.

Creswell: What would the radiation levels have been in the area of where you could have drawn a hydrogen sample?

Well, our normal sample point for the building, alright, is a monitor that is right down on the 305 elevation of the Aux Building. Right near the intermediate CRD filters. Right next to the seal return filters and the seal return coolant from the coolant pumps. And at this point in time, I'm not sure of the radiation levels, but throughout the building. They were - I had heard numbers and not just certain areas, but pretty well generally in the 50 R range, at this point.

So from that information, what would your decision be about drawing a sample or asking for a sample?

Alright. Your referring to - I seen the pressure spike and did I think about drawing an air sample, at this point or what?

What things entered your - what sort of things did you have on your mind at point of time regarding that?

I didn't. I totally thought that it was just an electrical problem.

O.K.

I didn't even pursue it any further than that.

O.K.

I - I just didn't.

O.K. Lets assume that you had thought of drawing a sample, would it have been practical to have drawn a sample?

No. Because at that point, I had learned - and I'm not sure if it was before that or after that, but that the - I believe that it was the Health Physics technician had said that we had had water blowing from the Reactor Building containment monitor.

That was very early on in the morning though. That was four or five o'clock apparently. Say five a.m. in the morning, wasn't it?

I'm not sure of the exact time of that. But that stuck in my mind - like now that your asking it, alright. But at that time, I didn't even consider sampling. But just looking back on it, I did recall that they did report that it was blowing some water and we knew that the building was hotter

than normal. At a higher pressure than normal. And that we would have some condensation and water come back through the containment monitor itself.

Hunter: You've had this trouble before with water - this problem before with water in the Reactor Building sample system?

We haven't - to my knowledge I have not been involved in any problem with the Unit 2 Reactor Building monitor, alright, the containment monitor. We have in Unit 1 but we have not that I've been involved in in Unit 2.

But you did have water in Unit 1, that's your opinion?

Yes, we have. Many times before.

O.K. Now let me ask you. If I wanted to read the - if you wanted to read the humidity at that time in the containment, was that available to you?

Yes, it is.

Well is it reported, indicated?

On panel 25. It's just an indicator.

Alright. Would you, in fact, have looked at that during this incident - during this time frame?

I remember going back and looking at the building level temperatures. Looking at the penetration temperatures at which your looking at right now here in the log. These are penetration temperatures -

But were're now looking at the Photographs.

There you go. There you are.

Alright. We're looking at four indicators.

Relative humidity Reactor Building elevation 305 south and north and at this time of course on the drawing they're indicating 55, 62% humidity. Did you look at these during that morning between four and 9?

I remember looking at the building temperatures. The high - the recorders over there in the penetrations and so forth. I do not recall specifically looking at the relative humidity. No, I didn't. I don't remember that at all.

Have you in either Unit 2 or Unit 1, ever had a problem with relief valves, topple relief valves, safety valves blowing down and getting into the humidity problem in the Reactor Building, to your experience?

No, I haven't. The only - the problem that we arrive with, with humidity, is just that if we don't purge the Reactor Building for rather long periods of time. Just the heat from outside, air temperature and the heat from within the building creates a humidity problem inside. You go into the building, all the cooling water lines coming in and out have the floor completely wet, you know, from just dripping from the humidity.

The Reactor Building cooling system is not adequate to maintain a lower humidity in the containment?

I would say it maintains an adeqate humidity but still the pipes themselves that bring the cooling water into those cooling fans, the elevan fans just sweat. And the mixed service line sweat, so that it is - constantly just a mass of sweaty pipes that are just dripping on the floor.

Have you ever, during your, in your experience, entered the containment immediately after shutdown or during operations?

Yes, I have many times.

O.K. For leak detection - that type of

Right. I have been in Unit 2 Reactor Building at 90% power or greater on several different occasions and I'm saying like maybe 4 or 5 times.

What were the activities that you were involved in at that time?

Radiation wise?

No. What were you looking for? Why were you in the containment?

We had indications of greater than normal reactor coolant system leakage. And I was going in to try to find out where the leakage could be from and evaluate the leakage.

And what did you, and generally, what in these cases did you find?

Well, one time around Christmas, that I remember the most is that we had a line that a fitting had been blowing steam right inside the D ring(?) underneath the pressurizer. Another time we had - there was a bonnet leak on the pressurizer level lower tap instrument, that I went up along side the pressurizer and manually isolated it.

I am not concerned about radiation levels at this time. You went up you obviously appropriately protected and knew the radiation levels and got in and got out. How did you detect those particular leaks? What was the method which you detected them and you used to decide to go in the containment?

Alright. Well, we do a leak rate test every shift, alright, to where it's really a program on our computer. And to where we give it the information and then just ask for a leak rate and then an hour later, it will compute our water inventory, just doing a mass balance, alright. And then it will come out with a generated leak rate that we have, alright. These were higher than normal, greater than a gallon a minute. And we didn't have any other indications that we had a leak outside containment because we sent operators into the Auxiliary Building to check on valves, packing, leaking by drains and so forth. So that once we explore all the possibilities outside, alright. And then plus, we had been pumpling the RB sumps, say more frequently than normally, and if the activity in the building may be a little higher. And there are various reasons that you put together. And then, after that I finally, in my own mind, I exhaust all the possibilities outside. So then I get permission to make an entry at power and I go in there and normally what I do is that, I go in and I try and locate whether its inside the D rings or outside the D rings just to minimize my own exposure.

Right.

Normally I start on the ground level, 305, and then I'll just walk around and see if I can hear anything. See if I can see any water.

O.K.

We'll take a break.

O.K. I have 12:55 on reading 925 on the meter, so that at this time, 12:55 a.m. I'm going to cut this tape and change tapes.

MARSH: The time is now 1:02. We've changed to April 24. This is Bob Marsh, and we still have the same people: Jim Cresswell, Don Kirkpatrick, Dorwin Hunter, and and we are going to continue with the interview with Bill Zewe. You're on, I think you had the floor.

HUNTER: OK, thank you, Bob. Bill had just been describing entering the containment and making his tour around the outside the D rings, outside of the radiation areas, specifically listening and trying to determine where a leak might be. And I would assume then that you would pursue that particular leak, if you saw steam or heard any noise.

ZEWE: Right. And then from the ground level then, I would go up to the operating floor and then do the same thing there. And then from there, up to the top of the D-rings and walk around them to see if I could hear anything or see any puffs of steam or what not. And then, I would go down to the basement and check the reactor building sump, you know, to see what, how much water was coming into the sump and from what lines. And then go inside of the D-rings and walk around the basement floor of the D-rings and look for water, listen. All right, so basically, on every time that I've done this on either Unit 1 or 2, and it's been many times considering both units at various power levels. That's basically what I do.

HUNTER: Okay, and I want to get back, Bill, to the humidity indicators provided you in the control room, and they are available to indicate relative humidity in the containment. Did you normally look at those and use those as an indication for leaks in the containment-steam leaks, water leaks, that type of activity?

ZEWE: I look at them very infrequently. Very, very infrequently.

HUNTER: Would there be any procedure, to your knowledge, that would include those humidity indicators?

ZEWE: One does not come to my mind, no.

HUNTER: Okay, thank you. That's adequate to get through that item. I think... Jim, do you have any questions concerning the drain tanks, or anything?... Okay, I think we've gotten through that adequately. I'd like to change the subject and look at, and talk somewhat about the makeup system. And I'll set the stage, okay, a little bit. Where we are is the makeup system at 4:00. You've gone through, apparently, the normal procedure and the B pump was on; the A pump was started by the operator; the letdown flow system, the letdown valve was isolated due to pressurizer level--normal procedure; and the makeup system, then, was in a two-pump mode, anticipating the drop in pressurizer level, to try to recover and bring the pressurizer back on scale or get the level back up.

ZEWE: Correct.

HUNTER: In the incident, it appears that within a few seconds, the pressurizer increased, dropped down to about 158 inches and then started to increase, and then increased on a fairly substantial, at a fairly substantial rate, with at this time two pumps running. Can you give me, to the best of your recollection, the method that the letdown system and the makeup system was operated? The pump configuration and the flows, at that time? And walk through the first few minutes of the event, the best that you can recollect, the way it happened.

ZEWE: All right, well, we started the A makeup pump to catch the shrink, just as you said, and then we opened up the one high pressure injection valve, 16-B. And then we were then running with 16 Bravo open and the letdown isolated and A and B pumps operating.

HUNTER: Can you, excuse me, elaborate? At that particular time, can you give me the makeup flows?

ZEWE: No, not really because we weren't really looking or adjusting for a specified flow number. All right. Like, when you have a ES actuation you set your flows so that you do not exceed the pump capability of the makeup pumps. So you would adjust it for about 500 gallons per pump or 250 per leg, all right. But in this case, we only had the one valve open plus the normal pressurizer makeup valve. All right, so that we weren't really in a

condition to where we going to run out our capability of our pump, so there is no real need at this point to really monitor our flows. And I really didn't look at it, as I remember, other than verify, 'yes, we are putting it in through the high pressure injection leg'.

HUNTER: What would the flow be, as an example, I'll give you... If the pressurizer level is up, then the makeup valve the 17 valve is closed. Okay, as the pressurizer level came down, that valve opens because it sees a low level and you need to charge--

ZEWE: Automatically, right...

HUNTER: --and there would be a certain amount of water flow through that particular flow path. Do you have a feel for that?

ZEWE: Well, that line is approximately the same size as the high pressure injection lines, and that's about 2-1/2 inches. So, I would assume that in the neighborhood of 200-300 gpm.

HUNTER: And then also, you opened up the 16B valve, and with two pumps running you obviously have the capability of 1000 gallons per minute--

ZEWE: Exactly...

HUNTER: --without even running the pumps out. During this time, I understand that you have seal water injection going to four reactor coolant pumps.

ZEWE: And about 40 gpm total.

HUNTER: Right. And that, we'll always assume except during building pressure it would drop some and then when you reset it, it would come back on. But basically that amount of water or a little more, depending on reactor coolant pressure, generally operates throughout the incident, as long as the charging system, the makeup system, is operating.

ZEWE: Right.

HUNTER: If you have the 16 B valve open, the operator, does he just open the valve, it just comes wide open?

ZEWE: He can throttle it.

HUNTER: Okay, would you have any--

ZEWE: He has a switch where he can just have the throttling capability.

HUNTER: Okay.

ZEWE: And in fact, on the back vertical panel, then, he has his high pressure injection flows for each of the legs, so he can adjust it and look back and adjust where a desired flow that he would like.

HUNTER: What's your understanding that the operators would do or did do during this incident? Specifically, when the pressurizer level is coming up and they're trying to control levels, what was your understanding of how they were operating the makeup system, either through Fred or talking directly with the operators?

ZEWE: Well, shortly after we went to an A and B pump configuration, all right, the pressurizer level did turn and begin to come up. But a short time after we had the two pumps on, we did have high pressure injection.

HUNTER: Okay, and--

ZEWE: Which in turn then, initiates all our high pressure injection components.

HUNTER: Yes.

ZEWE: And for the makeup system, that would have the A and C makeup pump running and the B makeup pump would stop running.

HUNTER: I understand. And in that case, all four 16 valves then would swing to their 250 gallons per minute open position?

ZEWE: Right, and we would normally then take manual control and readjust the valves for 250 or less, all right.

HUNTER: If the pressurizer level is increasing, what would the operators do normally, or are you aware of what they did?

ZEWE: Yes. They would then secure the extra makeup pumps and then go back to operating one makeup pump, all right. And the try to increase the letdown flow to reduce the high pressurizer level.

HUNTER: Okay, and what about the makeup flow itself? How much makeup flow would the operator normally... Would he maintain one pump at 500 gallons per minute?

ZEWE: No, he would reduce his high pressure injection flow, all right. And increase letdown and try to recover the pressurizer level.

HUNTER: Reducing high pressure flow down to where?

ZEWE: As I recall, as low as we did reduce it was in the neighborhood of like 150 gpm, because I remember that we were trying to go down to 100 gpm but it was difficult to throttle at that range. So we ended up at about 150.

HUNTER: And so, then you would end up with 150 plus reactor coolant pump seal water injection?

ZEWE: Yeah, 190...

HUNTER: In that range?

ZEWE: Uh-huh.

HUNTER: Do you recall ever being below that? And you can take--

ZEWE: Specifically, no.

HUNTER: All right, you can take the time frame with one pump or two. If, and I bet, I'm very honest and straightforward, by the way, you know. Ed had the panel for a specific period of time working directly under Fred Scheimann.

ZEWE: Yes, right.

HUNTER: They were there together. Was it then your understanding or your assumption that the high pressure injection flow then was maintained at approximately 190 total flow during that period of time? Were you aware of if they went below that at all?

ZEWE: I really don't know the exact number, all right. And he may have throttled back further than that. I don't really know, because at this point was when I told Fred and Ed, you know, to try to catch the pressurizer level, and it was about this time that Craig was having problems with emergency feed and I went over to help him.

HUNTER: Okay.

ZEWE: So, during this time period, you know, the exact flow, I'm really not aware of, because we really weren't throttling for a specified flow again. We were reacting to what we had as far as the pressurizer level so that we were reduced flow alright, but we really weren't... if we had had a low level problem, looking at how much flow we had would really have been a problem to say all right, keep increasing flow but don't exceed the pump runout capability.

HUNTER: By increasing the letdown during that period of time, what would you suspect the normal letdown flow would be... the maximum letdown flow that you would see in your system?

ZEWE: 140 gpm.

HUNTER: And that would be through the normal orifice, or through a bypass, or how would that be obtained--the letdown?

ZEWE: Well, that would be through the normal orifice, plus through the bypass valve that we have control of.

HUNTER: Okay, and the operator has control of that, and he would take care of that?

ZEWE: Yes, and also through two letdown coolers.

HUNTER: All right. Okay. Then, when you went, when you moved over to help Craig Faust on the secondary system, then we have Fred and Ed -- Fred Scheimann and Ed Frederick -- on the makeup system.

ZEWE: They were right there the whole time, as I recall, yeah.

HUNTER: Okay. There's a point in time when--again I'm picking specific points, okay, changing speed a little bit, changing position. There's a point in time when you were discussing securing the reactor coolant pumps, the first two and then the other two, the next two. And it was like securing the two, and then 40 minutes later or 30, securing the other two. But before you secured the first two, during this decision to secure the pumps, you were discussing this particular issue of securing the pumps with George Kunder, I think.

ZEWE: Yes.

HUNTER: With the net positive suction head curve, as I recall right?

ZEWE: Yeah.

HUNTER: Okay, during this time was there any discussion about high pressure injection, increasing high pressure injection or changing high pressure injection flow? Or did you initiate manual high pressure injection? Or...

ZEWE: We did increase the high pressure injection flow at about this point because then we started to think that the pressurizer level was not really high, that it could actually be low and we weren't seeing the two conditions, so that we stopped the increased letdown and increased our makeup flow back into the system. All right. And that was before George and I were discussing with Ken and Fred and, well, everyone really was in the discussion about the pumps, all right, about the coolant pumps.

HUNTER: Okay. And when you increased high pressure injection, I think at that time with two pumps running, then you were going through four valves even, the available flow path. But what was your reasoning besides... excuse me, your reasoning was that the pressurizer levels might not be indicating the true condition. Did you get any results from that or did you see any results from increasing the high pressure injection flow?

ZEWE: Not immediately, no, we did not at the time.

HUNTER: Okay, later, did you see anything or do you recall any...

ZEWE: No, well, we did later on, after we had shut the RCV 2, the block valve for your electromatic. Then we did see the increase in pressure in the system. But it wasn't until that point that where we really seen any significant change in pressure.

HUNTER: Were you charging it, was the makeup system running during that time...?

ZEWE: Yes, it was.

HUNTER: ...quite, I mean, after the injection condition where you had maximum flow, or had it been throttled back again?

ZEWE: At that particular point, I don't believe that we had maximum injection flow, now.

HUNTER: Okay.

KIRKPATRICK: When you raised this flow, do you have any idea at all what the flow rate might have been? I presume that before you turned on the C pump you would have increased the A pump flow or the B pump, whichever one was running at the time. So that that pump would be above 190 gpm before your turned on the C pump? Would that be right?

ZEWE: Well, each pump is capable of 550 gallons per minute. All right, that we can feed the two legs. See, what we have is, we have isolation valves that are between the B makeup pump and the C makeup pump. And the A or B can feed through the 16A high pressure injection valve or B together. And that the C can only feed through the C and D legs, so that we spent the greater part of the morning, which is after we had the coolant pumps off, with the A and C running, and then feeding the C through C and D leg and the A feeding through the A and B leg, all right, just to make sure that we have flow in all legs.

KIRKPATRICK: I see. So just the fact that you turned on C doesn't mean that you wanted more flow. It means that you wanted it going into all legs.

ZEWE: Exactly.

KIRKPATRICK: So you would not necessarily have increased A above the minimum before you did that?

ZEWE: Exactly. And it's just the throttle effect, then, of the high pressure injection valves. So it's strictly an operator type setting.

HUNTER: Alright, let's go back a minute to the throttling the valves, specifically. When you get that valve down to throttling through A loop--any valve through like A or B through the A, B, C or D--what's the minimum

position that you could throttle that valve? I mean you could shut it off, obviously. Okay what about down, is there is a point where it loses control? Where you have... is there a point where it becomes unstable, or do the operators normally... have they to your knowledge throttled them closed?

ZEWE: We have throttled them closed, but usually anything less than 100 gallons a minute, it isn't very stable.

HUNTER: That's 100 gallons through A loop, right?

ZEWE: Through one of the four legs.

HUNTER: It isn't very stable.

ZEWE: Yeah, well the indication that we have is so low on the meter that you're really not certain of staying at one set flow rate. It oscillates a little bit, so it could be 50 to 125, you know, it's oscillating. And then as you can open further, like anything more than, I would say, 125 gpm, you have better throttling capability of the valves. You get steadier flow indication.

HUNTER: All right. Would it bother you that you were feeding two loops at 125 or four loops at 125, even though the pressurizer was full? Wereyou concerned about taking the system solid?

ZEWE: Yes, I was. And then we kept a very close eye, all right, along with the pressurizer level, on coolant system pressure too, looking for, if we did start to go solid, to look at the indications very carefully.

HUNTER: And what did you see, looking at pressure?

ZEWE: Pressure did not change that much. It oscillated around about 1100 pounds, you know, give or take 25 or 30 pounds...

HUNTER: What did that mean to you, as the shift supervisor?

ZEWE: That the pressure was holding relatively stable.

HUNTER: And what would that... what would that be... for what reason would it hold stable?

ZEWE: For what--well, just that the pressure controlling medium at that time, which I know now was the steam bubble that was in the hot alright, was actually controlling pressure. But at that time I didn't realize that we had shifted our steam bubble from the pressurizer over to the loops themselves.

HUNTER: During that time, were you able to look at core thermocouple temperatures?

ZEWE: I was able to but I really did not. Quite soon into it, once the other shift supervisor, who was on Unit 1 at the time, came over to Unit 2 and he was there within about 6 or 7 minutes after we tripped, I had Ken -- Bryan's his name -- to look at the computer and to look at some of the temperaturE, the discharged of the relief valve, and so forth, and to monitor the alarms that we had so that we didn't miss anything. So I did not go over to the computer and specifically call up for the thermocouples of the incores. I did not.

HUNTER: What about watching T_H and T_C and T_{avg}?

ZEWE: We watched T_H, T_C and T_{avg} and they were fairly normal at this time. The time just before I left the control room, which was within probably 15 minutes after the trip, I left to go out to try to handle the problem with the hot well and the condensate polisher bypass valve. Just as I was about to leave, I noticed that T_{avg} was about 528, and our criteria for running four pumps is that we must be above 525. And I remembered saying 'Don't forget to stop the one pump if you get below 525'.

HUNTER: And the reason for that?

ZEWE: Well, we have a--it's due to core lift. All right, because as the water is colder, it's more dense, so that if you run four pumps at a lower temperature, you have a higher DP across the core, and you're worried about lifting the core itself. The core has large springs on the upper end

fitting of each of the fuel assemblies, which is loaded by the upper plenum, which sits right down on it and loads it, and if you shift the fuel assemblies and lift them up, you compress the spring. And if you compress it too much, the spring will lose its spring tension to come back down and properly load the fuel assembly.

HUNTER: Okay.

ZEWE: So, that's what they call--it's just core lift due to a certain temperature and that's... so, up until 525, we always operate on a three pump configuration and after that, then, we can start the fourth pump.

HUNTER: Okay...

ZEWE: And it's part of coolant interlock, again, for starting the reactor coolant pump.

HUNTER: Okay, good. At that point you ended up, I believe, going down and doing some more work in another area, okay? No problem there, I have no questions at that point. Again, I'm picking out some questions. If you take the incident from 4:00 up until that time, did you realize that you had a LOCA, a loss-of-coolant accident, at any time? That day now, don't try, try to run back... Did it enter your mind that you had a loss-of-coolant accident going on?

ZEWE: It really did not enter my mind that we had a loss-of-coolant accident. I didn't fully understand what I had, but I always think in terms of a loss-of-coolant accident, all right, is that your pressurizer level is a big key. But I had the reverse of what it would have been for a loss of level.

HUNTER: Okay. Is there a time where you then, during the first eight hours, excuse me, during the first four hours or five hours, you stayed on during that day, I guess, and worked. But, during that first four or five hours, was there a time you realized that you could have had a loss-of-coolant or that you were having a loss-of-coolant?

ZEWE: Certainly. Once we isolated the electromatic block valve, hit me like a ton of bricks that that's where the water was going and that's exactly what caused the high level in the pressurizer. I had--well, we had looked at the discharge temperatures on the relief valves earlier and they really didn't seem like they were high to where the valve was open and I had indication on the valve that the valve was not still open.

HUNTER: Okay.

ZEWE: So I dismissed that and went on, and I didn't go back to that until, it was probably some time after 6:00 that I went back and I said, 'the thing's still high, so let's go ahead and shut it anyway'. So we just shut it and that's when the building pressure turned rapidly and came down. And

at that point, then, I knew that the electromatic was not fully seated, that it was leaking through and, through the ruptured RC draining tank and into the building.

HUNTER: Okay, one more question concerning that. At that point, did you discuss initiating high pressure injection again fully and taking the flows up to 1200, up to 1100, 1200 gallons a minute? Or why not, if apparently they still were throttling because of the...?

ZEWE: Yes, we were still throttling at the point, all right. And I felt that we still had sufficient water in the system. All right. And then, with the high pressurizer level, that we still had water boiling in the reactor coolant system.

HUNTER: The pressurizer level, after you closed the EMOV, was still up?

ZEWE: It was still up, yes.

HUNTER: You were able to maintain pressurizer level at that time?

ZEWE: No, the pressurizer level was still high.

HUNTER: Right, you were able to maintain it? It didn't go out the bottom?

ZEWE: It did not.

HUNTER: Okay, indicating a loss of coolant or that it was, that you had a problem somewhere, that you had a problem elsewhere?

ZEWE: Exactly.

HUNTER: Okay. We'll drop that particular subject presently, and then I've got some more research to do and then, I hate to say it, but probably get back with you again to do a little more in that area for now. Okay, let me ask you a couple more questions and we'll try to get going. In the event, coming down around 6:50 or in that range, at that point you were considering this a site emergency. Right?

ZEWE: I certainly did, yes.

HUNTER: General... or local, then site, then general right, in that order, I guess. You had an auxiliary building problem, and then you had a site problem, and then what, did you go into a general emergency after that?

ZEWE: Yes.

HUNTER: Seven something... Did you have any problems or delays getting in contact with the agencies and the people that your procedures require you to contact?

ZEWE: Well, all of the notifications were made by other people other than me, because at this point where, at 6:50 you said, I believe that that is the exact time that I announced a general, the site emergency, rather. And at that point, and long before that point, we had most of our senior plant people there already on site. At that point we had the Unit Superintendent, the Unit Superintendent-Technical Support, the Unit 1 Supervisor of Operations and various other engineers and support people that were already there. So that as soon as I had seen the increase in the radiation alarms, all right, that I told George Kunder, who was there with me, that I wanted to announce a site emergency, then he says 'Yes'.

HUNTER: Okay, let me ask you a question concerning that. Did you consider a site emergency before that at any time?

ZEWE: I did not. I did not have any of the criteria for a site emergency.

HUNTER: Criteria meaning... what would you construe to mean, to require the criteria for initiating a site emergency? What were you key points that you were looking at?

ZEWE: Well, this one here was basically from the monitor in the reactor building, or the dome monitor, which isn't actually in the dome, but from that monitor if you reached the alert point, that is one of the criteria for a site emergency.

HUNTER: Did you reach that at that time?

ZEWE: Yes, we did.

HUNTER: Okay. Then George Kunder and whoever they had appointed in the back room, they then, would be making the notifications?

ZEWE: Exactly.

HUNTER: Okay. All right, let's stop here for a minute...

MARSH: We'll break at this time. I've got 1:32 on time and about 477 on the meter. We're going to break and turn the tapes here.

MARSH: It's 1:33 a.m., 4/24/79. This is Bob Marsh. We are continuing the interview -- Dorwin, you had asked a question. I'll turn it back to you and let you continue.

HUNTER: Okay, the one criteria is the dome monitor; another criteria?

ZEWE: If the reactor building evacuation alarm, which in Unit 2 is a manual actuation, in Unit 1 is automatic on the source range. We have other ones, based on alarms in the buildings and radiation alarms set the sites security fence of 125 mr/hr, and so forth.

HUNTER: Okay. To your knowledge, did anybody attempt to call NRC Headquarters in Washington?

ZEWE: To my knowledge, we notified our Region I NRC people.

HUNTER: Okay. When you go back and look at the time where the motor-operated valve on the electromatic relief valve was closed, you realized you then had been blowing out, did that put you into a specific emergency procedure? A loss-of-coolant procedure?

ZEWE: Well, I didn't think of it in terms of going to a loss-of-coolant procedure because once we had shut it we had already isolated the loss-of-coolant, if you will. All right. And that we still had level and that we still had considerable pressure. So I really didn't go the the loss-of-coolant procedure, per se.

HUNTER: Okay, and, if you didn't go through the emergency operating procedures, the loss-of coolant procedures, then the key to get into your emergency plan then would be just the radiation alarms, the procedures for high radiation alarms in those areas or in the dome, or evacuation alarms--those type of procedures?

ZEWE: That's what I used, yes.

HUNTER: Okay, I want to make sure we got that. Okay. In the case of the installed instrumentation for accident classification, you indicated that you had the dome, the containment reactor building dome monitor, available to you. Did that go up gradually or did it just go up high, and go to the high alarm condition?

ZEWE: Prior to the time frame of about quarter to 7 or ten to 7, in that neighborhood, I do not recall any significant alarms on anything except the intermediate letdown cooler monitors that were on high alarm.

HUNTER: Another question--at this time the pressure in the primary system was still running fairly low, was running low, at 1250, 1300 pounds, maybe cycling around that area. Did that indicate to you an emergency or loss-of-coolant condition or a condition that would indicate requiring a site emergency or a general emergency?

ZEWE: No, it did not.

HUNTER: Earlier in the morning, you called, on a normal unit trip, you called Joe Logan...

ZEWE: Yes.

HUNTER: And, who else did you call?

ZEWE: Well, I personally didn't call anyone, but I directed other people to do that--

HUNTER: Okay, fine.

ZEWE: --but I had asked for Joe Logan to be notified and George Kunder, Gary Miller, Jim Floyd and Mike Ross.

HUNTER: Why notify these people? You did that earlier...

ZEWE: Right. I did that shortly after it happened, all right? One was just to notify them that we did have a trip. And then, I knew that we had a problem with the drain tank at this point, or close to this point, and I wanted some more help with the problem that I had. I really didn't realize the extent of the problem that I had, all right.

HUNTER: When did you get that feeling, what time, about...?

ZEWE: Well, initially, I had asked to have these people called, to inform them and to explain what I had and then for them to come on in. Within, I'd say, about 10 minutes after the trip, with the high pressurizer level, and not being able to reduce it to where it would be something normal, I knew that I had a problem there that I wasn't too familiar with and I really couldn't grasp what the problem was. So at that point, I really wanted some more help one that.

HUNTER: And who was the first one to get back in touch with you personally?

ZEWE: George Kunder.

HUNTER: And what time was that about?

ZEWE: As I recall, it was some time shortly after 4:30.

HUNTER: Okay, and how long did it take him to get in? To--

ZEWE: Well, no, that's when he arrived.

HUNTER: Oh, okay...

ZEWE: Because George, well, George used to be the Unit 1 Supervisor of Operations...

HUNTER: Yes.

ZEWE: ...and the Unit 1 Superintendent of Technical Support, and he's in Unit 2 now under that same capacity. And George only lives less than a mile from the plant, from the north gate. So I usually rely quite heavily on George from his technical background of an engineer, and so forth, plus he's so close and accesses there that he comes in very quickly.

HUNTER: Okay.

ZEWE: And that I rely on him first, in that case, because everyone else lives, you know, a much greater distance from the site.

HUNTER: Who was the next guy you saw, after George, besides the Unit I people?

ZEWE: I think it was probably Mike Ross and Bryan Mehler and Joe Logan.

HUNTER: Okay. I don't have any more questions, go ahead and talk.

ZEWE: And those three were varying times, that I'm not sure exactly which one showed up first. Because George was al-- George Kunder was already in the control room when I came up from the problem with the condensate polisher bypass valve in the hot well.

HUNTER: What was he doing at that time?

ZEWE: He was up there talking with the operators and the shift foremen and Ken Bryan and the shift supervisors.

HUNTER: What's his position?

ZEWE: Whose?

HUNTER: George Kunder.

ZEWE: George is the Unit 2 Superintendent of Technical Support; he's in charge of all the engineers and he's the Chairman of PORC, our Plant Operational--Research--

HUNTER: Is he a senior licensed individual?

ZEWE: He is senior licensed, but on Unit 1, not Unit 2.

HUNTER: Okay. Was Fred Schiemann in the control room at that time?

ZEWE: Oh yes, Fred came up to the control room within about a minute and a half after the trip; as quickly as he could when he heard the trip go, then he ran up to the control room and he remained there the whole time.

HUNTER: How long did you stay at the Shift Supervisor position in Unit 2 that day?

ZEWE: I left the control room at about 6:30 or 7:00 that evening and I was sharing the duties at that time with another shift supervisor, Joe Chwastyk

HUNTER: Okay, all right.

ZEWE: I was assisting him and he was helping me, and so forth. He actually had the shift, but I was still there helping out.

HUNTER: All right, I have no more questions. Do you have any comments or any questions or anything that you would like to say? You know, anything that has come to your mind during the interviews or in your off time, because I have the feeling we're going to have to talk again.

ZEWE: Okay.

HUNTER: I'm not going to apologize for it because we have a certain amount of things we've got to get through, and you guys are the best sources that we have. So certainly we'll be getting back with you again. Any--

ZEWE: However I can help, fine.

HUNTER: Okay. Jim...

CRESWELL: Nothing.

HUNTER: Don...

KIRKPATRICK: No, I don't think so.

HUNTER: All right.

MARSH: Okay, Bill, we appreciate your time, and as Dorwin says, if anything comes to mind or any comments you want to make, feel free to put it in the record. We do want to draw out of this anything that we can to benefit us in the future. So if anything comes to mind that you want to mention, feel free to bring it up.

ZEWE: We all want that, I feel. We have to, so...

MARSH: Okay, then. The time being 1:43 on April 24, I am reading 671 on the meter. At this time we're going to shut the recorders down.

[END OF CASSETTE]