UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

In the Matter of:

IE TMI INVESTIGATION INTERVIEW

of

Ex-Control Room Operator (CCRO)

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

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NRC PERSONNEL:

Mr. James S. Creswell
Mr. Anthony N. Fasano
Mr. Robert Marsh

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MARSH: The date is May 22, 1979. The time is 6:49 p.m. This is Bob Marsh, MARSH, and I'm and investigator with the U.S. Nuclear Regulatory Commission assigned to Region III, Chicago, Illinois. This evening we are located in Room 119, the Red Roof Inn, in Swatara, Pennsylvania. That's SWATARA, and we are here to conduct an interview of CRO , who is an ex-CRO for Met-Ed at the Three Mile Island site. At this time I'd like the other individuals in the room to identify themselves, to spell their last name, and to identify their position.

CRESWELL: This is James S. Creswell, CRESWELL. I'm a reactor inspector located at Region III.

FASANO: I am Anthony N. Fasano, FASANO. I am an Inspection Specialist out of Region I.

CRESWELL: I'd like to make a reference to CRO first name being CRO .

MARSH: Thank you. CRO you indicated that you go by CRO even though your name is CRO right.

CRO : Right.

MARSH: CRO , before we turn the tape on we had sat here and discussed this two paged memo and I just want to make a few items in there a

matter of the taped record. As I indicated the memo does cover the purpose and scope of our investigation and goes to some degree into the rights of the individual being interviewed. On the last page there's several questions which I just would like to get your response to on the tape and that is (1) do you understand the above which addresses the two page memo?

CRO: Yes.

MARSH: The second question reads, do we have your permission to tape this interview?

CRO: Yes.

MARSH: And thirdly, it says do you want a copy of the tape?

CRO: Yes.

MARSH: Fine. On the tape I will get you a copy of this tape probably tomorrow and I will get a copy of the transcript when its available mailed out to you so you have that also. There's a fourth question covered in the body of the text that does not pertain specifically to you, but it addresses the individuals rights. We can abide by it if you so want, and that indicates that for the Met-Ed employees in that if they so desire, they could have a union representative or a Met-Ed

representative present. I think you've indicated that you did not, but can I get your response now?

CRO: I waive my right have any...

MARSH: Fine. Thank you. CRO, to get going with, we'd appreciate it very much if you could give us some words regarding your background, you association with the nuclear field, and your experiences with Met-Ed. I'd also like to include the dates that you went to work for Met-Ed and the date that you separated.

CRO: I started my nuclear career in the United States Navy. I went to basic nuclear power school in Bainbridge, Maryland. I graduated in the top quarter of my class there. I went to West Milton S3G prototype in West Milton, New York. I was then transferred to the Woodrow Wilson. I served aboard her 2 1/2 years. I was transferred to the U.S.S. T_____ who was in overhaul in Pearl Harbor Naval Ship Yard. I was separated from the navy in November '73. I started work with Met-Ed, January of 1974. I believe it was the 28th. I was hired there as an auxiliary operator. I went through six months of technical training on the operations, systems, and technical training, some reactor theory about Babcock and Wilcox reactor plants. I spent 2 1/2 years as an auxiliary operator and was promoted to Unit 2 control room operator in September of 1976. I attended the 8 week cold licensing program at Lynchburg, Virginia, the simulator training. I graduated

there No. 1 out of 6 and in October of 1977 I passed the requirements for a Nuclear Regulatory Commission operators license. From October of '77 until April 13 I served in the capacity as a licensed control room operator in Unit 2 and I resigned my employment as of April 13, 1978, 1979. And that's about it.

CRESWELL: CRO, I wonder if you could go back to the time of March 28, 1979 and tell us briefly when you got on shift and what went on as you got on shift.

CRO: This is gonna be amusing because I was in Lynchburg, Virginia at the one week reactor operation training course down there. So I was in Lynchburg on the morning of the 28th. I guess, well I woke up about 7:00 that morning and my shift foreman came over and said that his girl said Unit 2's down. The safety's were blowing for a couple of hours. I thought that was rather odd since they should never blow that long. And through the course of the day we just gathered bits and pieces of information as it went by, as they became available to us down there. Mostly from B&W people. In fact, we had a shift supervisor, Bernie Smith, he was there with us at the time my supervisor of operations in Unit 2, Jim Floyd was there, at the time and I guess later in the day when they figured things weren't so hectic, they called up and got a little bit more technical information as to what happened. And the way I understood it at that time was that they had a reactor...a loss of feedwater to both steam generators...and for

some reason they didn't have auxiliary feed. Now we didn't know the real reason why they didn't have auxiliary feed when the pumps failed to start, or we didn't really know. So the rest of the day was then just spent simulating the accident, trying to see exactly what happened. We had several parameters that we knew happened, the pressure excursion in the primary system. They assumed that they had maybe one tube, had ruptured, it separated in the tube sheet on the B steam generator, because that's where the activity came from, that they knew was released at that time. We just, basically then, well, Jim Floyd and Bernie Smith, they left Thursday in the afternoon. They took a plane out and came back to the site and they left myself and the two other operators and the shift foreman down there just to continue with the training. And really the only information we got back then was either from the news papers, the television, or what we could get from Babcock and Wilcox and they didn't want to admit too much. Especially about fuel damage and any design deficiencies that may have been present or have thought may have been a cause of the accident. I got back from Lynchburg on Friday and I didn't really find too much out then. But I did hand in my resignation that day, it was the 31st of March. Or the 30th of March, excuse me, it was a Friday. And I went in to work then the next Wednesday and basically the accident was over. They were still in a state of general emergency according to the radiation, emergency plans. And my duties there were, I was only there for three days from the time the accident happened until I resigned. The three days that I spent there were basically a data taker, a log keeper, and such as that. I didn't really get into the operation of the plant.

CRESWELL: Okay, CRO. Who was your shift foreman that was with you up there on the...

CRO: It was Dick Hoyt.

CRESWELL: Dick Hoyt?

CRO: Dick Hoyt is my shift foreman, yes.

CRESWELL: Do you recollect who the other CROs were there?

CRO: Yeah. Ray Boyer and he's a licensed CRO, and John Blessing, he is a trainee.

CRESWELL: Now you, if I recollect properly, learned of the event through your shift foreman...

CRO: Yes, who had learned through a phone call from his girlfriend.

CRESWELL: His girlfriend where was she located?

CRO: Well, I didn't really get that personal with Dick, but to the best of my recollection he was dating a guard. It was a Gregg guard. Or...

CRESWELL: Gregg's Security?

CRO: Gregg Security. And I'm not sure if she was on that evening or what. Her information may have been second hand, I don't know.

MARSH: I think that was the point as to whether she just lived in the area or...

CRO: Yeah. She lived in Mount Gretna. As best as I can remember she lived in Mount Gretna which is a small mount community about 10 miles from the site, I believe.

MARSH: But also employed in and around the site, right.

CRO: Yes.

CRESWELL: Okay. Now basically at that point in time was, is it a fair characterization that the information was restricted to the relief, the safety relief valves blowing for a substantial period of time?

CRO: Yeah. At that time when she said that the safeties had blown for two hours and it raised a question in my mind that the safties, they couldn't have blown for two hours unless something was really wrong. The reactor would have had to stay at power in order for those things to blow.

CRESWELL: Okay.

CRO: So there's no two ways about it.

CRESWELL: So you...

CRO: So I assumed that they were the atmospheric relief valves. Now I, the atmospheric dump valves, yeah. I really didn't know the circumstances which opened. I knew how they could open, but I really didn't know the specifics on why they opened on the morning of the 28th.

CRESWELL: Okay. What happens after, are you at breakfast eating when you found this out or...

CRO: No. We just got, we were in the motel room.

CRESWELL: Oh, you were in the motel room.

CRO: Um um.

CRESWELL: Okay. So then what do you do? You go on into work...

CRO: Yeah. We went in, we went right into the training center there.

CRESWELL: On Old Forest Road. Does Jim Floyd try to get in touch with the plant or anything at that int in time?

CRD I really can't remember. I know, I think he did. But the information, yeah, as a matter of fact he did. He called up and he got, he was really interested in finding out some of the parameters, some of the things, sor of the events, the sequences of the event, some of the readings that they were getting on the radiation monitors, and some primary and secondary chemistry analyses so that we could simulate it, so that we could see if we could simulate it, see some of the transients that took place. They had said that the pressurizer went solid. They said that the primary system pressure went up above the safety limit. At the time we didn't know that the pressurizer relief valve, electromatic, I guess it was, it was stuck. I don't even know at this time, to this date. I just assume that it was the electromatic relief valve. We didn't know that until I think it was Thursday morning we finally simulated that the valve actually failed opened.

FASANO: This is Fasano speaking. CRD you did mention that, in the conversation and the information that came to you o the first day, that you knew that the aux feed was not feeding. Were you told that over the phone?

CRO Yeah. They had said that the auxiliary feed, they didn't get it into the generators at the initial point. We didn't at that time, we didn't know how the feed was stopped. We didn't know whether it was a malfunction of the pumps, the piping, or valves. We really know what the cause was.

FASANO: Do you know what valves they were talking about?

CRO: Absolutely. I checked those every time I come on shift.

FASANO: Why?

CRO: They're important. And 1 is they're always doing surveillance. They do a monthly surveillance on each one of those three pumps when we're at power. In fact, they have to do a once a month in mode 4 or above and I know that those two valves had to be shut in order to do the surveillance so that they didn't feed the water through the air operated regulating valves into the generators.

CRESWELL: This is Jim Creswell again. Have you ever found those valves closed before?

CRO: Yes.

CRESWELL: How many times?

CRO: Once, that I can remember.

CRESWELL: Why was it, why were they closed?

CRO: I can't recall why they were closed. I asked my foreman, when I found them closed, I asked my foreman if this was a general procedure that I follow, I asked him do you know why the ESV 12 valves are shut. He said no, I don't. I said okay, Dick, I'm gonna open them, and then I opened them and everything lets loose.

CRESWELL: The foreman's name is...

CRO: Dick Hoyt.

CRESWELL: Dick Hoyt. Do your recollect when this happened?

CRO: There were so many things that, there were so many things to recollect, I really can't even put a time frame on it. I really don't know.

CRESWELL: Would it be like weeks before the event?

CRO Yes. It would have been weeks. Maybe, perhaps months.

CRESWELL: Okay.

CRO: Several months.

CRESWELL: Okay. But as far as you know it, there's not a practice of leaving those valves closed for a specific reason? You know of no reason?

CRO: No. None whatsoever except that the surveillance procedure calls for them to be shut when the actual test is being conducted.

CRESWELL: Do you know if that was reported to the NRC that those valves were shut?

CRO: No, I do not.

CRESWELL: Do you know if the unit was operating at power when that happened?

CRO: I can't recall that either.

CRESWELL: Okay.

CRO: But it doesn't make any difference, in Mode 4 they're required.

CRESWELL: Okay. Getting back to the sequence of the event, the time sequence of that day, you went on into the B&W facility on Old Forest Road in Lynchburg and you started simulating the event on the simulator and I guess all of you were in the simulator at that...

CRO: Well, it was, they kind of pushed us aside, really. And every once in a while if we get a break, we had some classroom training when they were running this and the three CRO's, in fact, it was the three CRO's, well myself, and two other guys, and Dick Hoyt, the foreman. We spent most of the morning in class while they ran the tests...

CRESWELL: When you say they...

CRO: Jim Floyd, Bernie Smith, there was one or two other instructors, I know then later there was some of the big wheels down there from B&W that were on the test site, I don't know their names. But I guess they conducted tests from like 10:00 in the morning when they got the information that they needed until probably 2:00 in the afternoon.

CRESWELL: Okay. What basically was the information that they were using when they started at 10:00 in the morning? Did you run down through it?

CRO: Loss of both feed pumps caused by low suction pressure and that caused a high pressure reactor trip and they said that 8 minutes later they got emergency feed. So that's when we simulated turning on the emergency feed pumps. It was 8 minutes into the accident. We also simulated, we also assumed, we didn't get this I don't believe we got this from any information that was sent down that morning, but we knew that the pressurizer was on continuous spray to equalize boron or to keep boron in the pressurizer and the RCS equalized.

CRESWELL: And that was the because of the leaking valves on the pressurizer?

CRO: The leaking pressurizer code safeties.

CRESWELL: The safety valves.

MARSH: Excuse me. Have you nodded in afirmation to that statment, right?

CRO: Yes, yes.

FASANO: CRO, you knew that the code safeties were leaking, I mean...

CRO: Absolutely. They were leaking, I know for at least 3 months before the accident.

FASANO: Now, my understanding the electromotive, the electromatic, was the main cause of leakage prior to the event. Now this is a little different so...

MARSH: Well, this is his understanding.

FASANO: I understand...I just wondered where he gets his information.

CRO: I can look at the computer. They have an analog value of the temperatures at the outlets of these valves.

FASANO: These would be the thermocouples?

CRO Right. The thermocouples downstream. The electromatic relief valve was the lowest of the three and it had been for 3 months. The other two would kind of weep up and down and they would sometimes maybe every once in a while you'd see them above 200 degrees, but most of the time they stayed between 150 and maybe 180 which before they started leaking they were always down around 100, 105. I know for a fact a leak rate is required every 3 days. That leak rate had to be fudged every time we got, just about everytime that we got it, we had to do something to make it right. We as control room operators on my shift, I know, we kept asking what are you gonna do about these valves. They're leaking. We can't get a leak rate out of the computer. We can hardly even do a hand calculation and have it come out right. We

don't have to maybe go look at something. It was just a bad situation. I didn't like it.

CRESWELL: Let me ask you this. Who did you inform?

CRO: This would be Dick Hoyt knew about it. I know Bernie Smith knew about it, and every other shift supervisor and shift foreman and control room operator that operated the plant in the previous 3 months had to know about it.

CRESWELL: Now you said that you felt that the figures were inaccurate. What other evidence did you have?

CRO: I mentioned that when we simulated the accident we simulated it down at the simulator with the spray valve open and the pressurizer heaters on. And the reason that I know that this, relief valves, were leaking was the fact that if you turned the spray valve off and put the spray system back in its automatic mode that you'd have a continuous rod motion in which indicated that the plant was deborating. When you turn the spray back on and recirculated the pressurizer, force that borated water that was in there back into the primary system the rods would move out.

CRESWELL: Okay,...

CRO: We fought that for 3 months. I hated it. Every minute of it.

CRESWELL: So this was a substantial boron change that you were getting in system.

CRO: Absolutely.

CRESWELL: Due to distillation in the pressurizer.

CRO: Right.

CRESWELL: Okay. So we should be able to look like at the power range charts or the rod positions. Probably rod positions.

CRO: This was during the early days. You know there's a lot of people up there, a lot of, I consider, top notch operators. But when sometimes it comes down to the basics of knowing what happens, you know, they really, they look for the complicated picture a lot of times. They don't go back to the basics. I picked up how to operate this system right off the bat. You just put it in automatic and you leave it there. If something happens, ...or not in auto I mean you put it into manual...and you just let it continuously recirc that way you have no boron change to worry about except normal leakage, maybe you have to add some demin water for fuel burnout just to bring the

rods back in a little bit for control. A lot of the operators didn't understand that and they'd get themselves in trouble with all the rods out at 98% power or they get them down in too far so that you get close to the rod index curves and I don't know...

CRESWELL: Let me ask you this, CRO. Regarding the reactor coolant drain tank, the leakage from those valves could go into the reactor coolant drain tank.

CRO: That's correct.

CRESWELL: Now if there was excess leakage it would require frequent startup of the transfer pumps. Correct?

CRO: That's correct.

CRESWELL: Was that an operation that you customarily go through?

CRO: Since the relief valves were leaking I ca.. remember, and there of late we had to pump it at least 4 times a shift.

CRESWELL: Okay.

CRO: And that was, I can't even remember the number. We pump it for about 5 minutes and it was probably 100 gallons per minute. So probably a total of 500 gallons each time.

CRESWELL: Or 2000 gallons per 8 hour shift?

CRO: Right. In fact, I took a backlook at the logs from the time that we started to have to add water into the makeup tank to keep RCS inventory. And at one time I can remember they would pump 3000 gallons of demin water a day. Now that is your information. You can get that right out of the control room operators log to verify that. I even, you know, they, the people that I had to report to didn't even understand the seriousness and I believe that that was a serious problem.

CRESWELL: In what way?

CRO: Control wise, because everybody had a different way of controlling. One time I would come in and the spray would be on automatic building up boron in the pressurizer. Pretty soon I'd end up with my rods at the index limit. Now, where's my boron in the RCS? I don't know. Now, what do I have to do to get the rods out? Well, I can only assume that the boron is in the pressurizer and manually spray. How long it was there, the only thing I can do is go back to the log. If the records were kept accurately, then I could make a pretty good judge of, you know, whether my rods were gonna go out the top or whether I was gonna have to add some demin water to keep them in.

CRESWELL: Well, let me ask you this, CRO. Could ask for a sample on the pressurizer and ask for a sample on letdown, would that help?

CRO: Yeah. I'm not sure how often those samples were taken. I know they were taken at some interval and I believe it was once a week. And I can remember at one time a sample came back and it was 100 and, well to the best of my knowledge, it was around 120. Difference between pressurizer boron...

CRESWELL: 120 ppm difference between the pressurizer and the reactor?

CRO: Right, between pressurizer and reactor. And if I remember correctly, that was with continuous spray. After a while we had gotten to the point where everybody was kind of operating the pressurizer spray system in a, I don't want to say it, a coordinated fashion, where everybody kind of did it the same that you could know where you were at, how to operate it.

CRESWELL: What brought about this consistency of operation?

CRO: Well, I did a lot of screaming.

CRESWELL: Do you have any indication that management beyond operations was informed or knew about this problem?

CRO: Oh, they had to. My supervisor, Bernie Smith, would, he would make a reminder to all the operators on our shift, the operator that had the panel, the console that day, hey, don't forget to spray

the pressure and don't forget to recirc the pressurizer for at least a couple of hours. And one of the operators, Ray Boyer, he always just liked to put it on recirc for a couple of hours and then take it off. And maybe he'd do that two times a shift and everytime he did it he would end up with rods out. And, you know, it wasn't really funny but then again you kind of had to laugh at the guy because he was ignorant. He didn't you know, I don't like to make any comes about the way a fellow operates but...

CRESWELL: Let me ask you this. Why wouldn't management have shut down and repaired those leaking valves?

CRO: My impression of Met-Ed management was number one, they put the reactor into commercial operation before it was ready. It was so obvious I could run down a list, and maybe I will later, I don't know. I'll run down a list of problems, design deficiencies, that really they should have never gone up with them. They should it even have, never have, attempted to up with them.

CRESWELL: Let's go into that list, let's go down.

CRO Right now? Okay.

CRESWELL: Just take you time and we'll give you plenty of time to think.

CRO: We started power operations back in, well I won't say power operations, maybe we did too, back about a year, almost a year before, back in March, I believe we made initial criticality. We did the low power physics testing and I believe we escalated to 15 or 20% power. No, I take that back. We got up to 40% when we had the safety valve problems. There was one of the biggest design deficiencies that cost them millions of dollars for that job. And to me it was just misdesign.

CRESWELL: That was when they replaced the Lonergan valves with the Dresser...

CRO: Dresser...

CRESWELL: Dresser valves.

CRO: Dresser valves. The condensate polishing system. It was a nightmare. They didn't have an automatic bypass. If you lost instrument air, all 8 discharge valves from the polisher vessels would fail closed. If that happens the booster pumps loses suction pressure, they trip, they cause the feed pumps to lose suction pressure and they trip. Seven vessels is normally all we were designed to operate with. Okay, you could operate with 8 but that's bad engineering practice. Seven vessels could hardly take the load at 98% power let along 100. The condensate reject valve which was located between the condensate booster pump suction and the polishers, if it would cycle because of a

high hotwell level, if we are...or a low hotwell level...if it would cycle open because of a low hotwell level, it would starve the booster pumps of water that they desperately needed to pump and a booster pump would trip on low suction pressure, taking a feed pump along with it. This really wasn't too evident until we got up to, to higher power levels, when two feed pumps were really required to supply all of the feed flow. Whenever the turbine bypass valves, I can't remember the numbers...23 A & B, 24 A & B I believe they are. .whenever those valves open on a transient, say we had it in a trip, and the bypass valves would open...dump steam into the condenser ...hotwell level indication would fail low. It would also cause the controller that controls the normal and the emergency makeup valves to see a low level and those valves would fail open, or they would go open thinking that there was a low level. Now the operator at this time saw less than 10 inches in the hotwell and I don't know how many of the other operators realized this, but when I see less than 10 inches in the hotwell and I've got 3 pumps setting there sucking at 1,000 horsepower apiece, I am very concerned about that-equipment damage. So I would watch the hotwell level, it just would stay low. It was horrible. And I would watch the amps on the on the pump, and watch the discharge pressure. That way I could tell if the level was actually low then. That was, yeah. Other than I knew the indicator said less than 10, I can only believe my indication, but I also realized the necessity for condensate flow during a transient like this. So I was a little hesitant to cut the pumps off at that particular point.

CRESWELL: That was the indication you had of hotwell level was the absence... that the condensate pump won't run. Turn the pump off? If you lost the condensate flow, you would trip the main feed pump?

CRO: Trip the booster pumps on low suction pressure trips the feed pumps.

CRESWELL: So, you got a loss of feedwater event?

CRO: Right.

FASANO: How many of these did you have?

CRO I can remember for sure 2 times. I don't know the exact dates. It was during one of the many trips they had there. Well, I wasn't really on them but I was a bystander. I was on dayshift. I was probably on the lead shift or training shift or something when they had a trip and I ran up to the panel to see what I could do. Then I saw it. But then see, the next problem is with that, I mentioned that the normal and emergency makeup valves saw that low level. They would open and they would dump tons of water in the condensor. Now, the actual level is going high. Now, if it gets too high, vacuum pumps. You also use all that space that normally was vacuum, is now water, and any steam that you've got coming into the thing, it covers tubes, you can't condense the steam as well. So what happens? The vacuum, pow. You lose vaucum, atmospheric dump valves open!

CRESWELL: What about them?

CRO: If you got OSTG tube leaks, you're in bad shape.

CRESWELL: Have they operated properly, the atmospheric dumps?

CRO: The only time I ever remember those things operating, we had just gotten off shift at 3:00. At 3:30, the oncoming shift had a trip and they lost, I don't know how they lost vacuum. Maybe they lost circ water. I think it was one of the same type transients I just described with the emergency makeup. They just lost vacuum because of a high level in the hotwell and the atmospheric dump valves opened and just if there was anybody down in that room, they would have been PAR boiled, they totally wiped out the pressurizer heater cabinets with steam. Steam was noted to have escaped through the area where they are located. I guess that was called the M20 area. Through the piping holes in the concrete structure down over into the control building area and it went as high as the control room floor, back into the instrument shop. They had steam from the bellows rupturing on the discharge of that valve.

FASANO: Both bellows ruptured or one bellow?

CRO: One that I can recall. I know that one bellows did rupture. I can't recall, I don't think the other one did, but they replaced it with one of the similar design to the other one.

FASANO: Okay. Other equipment problems?

CRO: Main steam line supports. Two years ago I can remember somebody coming up to me and saying I don't want to be around when they trip the turbine from 100% with the restraint system that they have on those pipes. You'll have steam, pipes and lagging everywhere if that turbine trips. I don't really know, I know we went up, we heated up so we did have saturated steam in those pipes before the restraints were put in. I believe those restraints were put in during the relief valve outage when we replaced all the relief valve, they redesigned the pipe hangers and snubber arrangement on there or those. (1) I'm not too hot on Burns and Rowe because they never designed a pressurized water reactor plant, they only ever designed boiling water reactors which is obvious because of the 5 foot concrete wall between the turbine building and the control room. I don't know. Did you ever notice that?

FASANO: There is a, okay, you're talking about where the fire door is between the turbine building and the...

CRO: And the control building, yeah, where they are.

CRESWELL: I've often wondered about that wall that's, not the wall between those two buildings but if you'll notice there's a wall that comes down in that hallway where that door opens up and its separated from the floor by an inch to 2 inches.

CRO Yeah, I've seen that. I never really wondered why that was there but I just kind of chalked it up to the rest of the crazy things I saw.

CRESWELL: Okay. What about the engineered safety features equipment itself? The high pressure injection pumps, where there ever any problems with them?

CRO No. I can't really recall any problems with those. Unit 2's kind of lucked out. We hadn't burned any up. Unit 1 went through 4 of them, I guess, before they learned their lesson.

CRESWELL: I understand the suction switches, low suction switches have been taken off those pumps.

CRO That's correct. They used to have a 3 pound low suction pressure trip on them, I believe. I don't really remember too much that far back, but I knew that I didn't like that particular thing because a lot of times you would start the pump up and it would trip right away because of the low suction pressure. It also had a low discharge pressure. No, no it didn't. It just had a low discharge pressure alarm that I can remember. No, those pumps, everytime I've operated them I never really had any problems with them.

FASANO: Sounds like most of your design deficienies are concentrated on the balance of plant on the secondary side at least, were there any on the, I mean about, are there any more you that you have in mind? Can you continue on you list? And if indeed on the NSS side?

CRO Well, the whole nuclear steam supply system, in fact the whole plant was designed for a place down in New Jersey. So in order to accomodate fuel handling buildings they had to take and rotate the reactor building, the guts of the reactor building, the inside part, 90 degrees. So that you could go into the reactor building and look at the wall and you'd have another 150 foot of pipe running around the outer edge of the walls that should have never been there. It should have gone straight out but I can't help but think that because of trying to, having a plant on the drawing board 15 years ago for Forked River, New Jersey, and then just take and modifing those plans, bringing them to Three Mile Island and constructing a power plant of that complexity that things aren't going to be wrong. You know, there are definitely going to be design deficiencies. Somebody that designed the system, somebody else is gonna come along and change it to fit TMI. One thing that I have...that I never really had close contact with, I know that the auxiliary operators, just because the were out in the plant, they had a close contact with it, was the fact that they had extension controls that went through the wall and they had clutches that operated the valve behind a concrete wall for radiation. Those each limit, limiting type thing. And most of the time the valves

would never operate, so you'd have to go through these, back into the valve alley to operate the valve anyway and you had to spend anywhere from 2 to 3 times as much time in the valve alley, crawling over all these extension controls that were in your way that, you know, the poor guy would end up getting three times as much radiation than he should have.

CRESWELL: Is this a wide spread problem or an isolated problem?

CRO This is wide spread. Especially at filter rooms, the makeup valve suction alley, the discharge alley and the 305 valve alley.

CRESWELL: Those are only high radiation areas during operation?

CRO Yes. Now I'm not sure, I know the levels were creeping up there in the later days of power operation. I know they were climbing up there and there were still valves in there that had to be operated for surveillance procedures, valve lineups and the like. Filter rooms is the same way only the filter rooms, you can't get into them.

CRESWELL: Do you recollect a trip that occurred back in around November 3rd, November 4th of 1978, a loss of feedwater type of trip? This is where an instrument technician threw the wrong switch and in condensate polishing system, all feedwater was lost. Do you remember any of the details of that event?

MARSH: You were nodding in affirmation, were you not?

CRO: Yes, I was. I remembered. I'm trying to think. I have to reprogram myself, here. I have got to get back into that. I've been through two total loss of feedwaters.

CRESWELL: Here?

CRO: Yes. One was at zero power or very low power and the other one was at 20% power. And I really don't remember too many of the details. I do know that the switch that the guy threw was control power for all of the valves in the condensate polishing system that made them shut cutting off all condensate flow path.

CRESWELL: Do you remember any operators on shift discussing that with you, hearing anything about it?

CRO: Well, I remember, they had the LER that was circulating and they had a synopsis of the event that e read in. We had to sign and initial.

CRESWELL: Well, this particular event that I'm speaking of, I don't believe there was an LER generated.

CRO: I see.

CRESWELL: There was one November 7th that was a loss of one feed pump, but that was with the run back. Okay. At this point in time we're getting very close to the end of the tape, so we'll break right here and continue with a new tape.

MARSH: Time is 7:32. I'm gonna break at this point and turn the tape over.

MARSH: Resuming at this time, the time is 7:33.

CRESWELL: Okay. What about you training at Three Mile Island Unit 2, how's that been?

CRO: I hate to say this but I'm gonna have to. They train, my training I thought was very well done. They put us through a pretty comprehensive program, the 8 weeks at Lynchburg, plus we had lots of time to ourselves just constructing the plant when things weren't very busy. We could get out into the plant trace systems and alike. We went through a mock NRC test that was given by a General Physics, the walk around and the test and then we had the actual test. We had a lot of prelicensing training that I thought was a big help. Onshift we had several lectures. They weren't always done as planned but we did get in some training onshift. The guy would take a system and

give everybody on the shift a lecture about it. But the licensed operators that have come on since the cold licensing groups, since the initial group of operators that went up, those operators are trained to take an NRC examination. They are not trained to operate the plant. They have copies of NRC tests, the questions, you know. They're...

CRESWELL: CRO, let me ask you this. You stated that general physics conducted a dry run of the licensees. Do you find that the NRC exams are predictible, the way the test will be conducted?

CRO: Yeah. I think they are fairly well predictible. TMI has got an excellent record. I don't know the records of any of the other operating plants. But I do know that TMI's record is good. I don't think we've had but one failure and that was in Unit 1. We've had several senior operators that went up for a senior's license but did fail the senior part but got a reactor operators license. And, you know, I can just say that I feel that this operating record is indicative of knowing what to expect. They can build up on it. If they know that a certain examiner is going to come, they can dig out all his old tests, they can, we have old interviews that somebody might have snuck a little tape recorder in their pocket and taped the entire walk around and you can get the tape conversations of those. I've seen those flying around.

MARSH: Have you actually seen a tape or heard a tape before this was done, or just transcripts thereof?

CRO: I've just seen transcripts, no tapes. In fact, I don't even know of anybody at Three Mile Island making a tape.

CRESWELL: Do you know what the source of the tape was?

CRO: I do know this, I know that it was a Babcock and Wilcox reactor.

CRESWELL: Okay.

CRO: And it was a specific examiner. I can't even remember his name. No, I wouldn't even begin to attempt to remember his name. I don't remember.

CRESWELL: One interview, it was one interview that you had heard of?

CRO. I think there was one, one for sure, maybe two

CRESWELL: Okay.

MARSH: Where would I look if I wanted to find a set of those? Who would be my best shot that I could talk to?

CRO: I threw all my old stuff away.

MARSH: You had had a set of them?

CRO: I had a set at one time.

CRESWELL: Did you receive those through your employment at Three Mile Island?

CRO: Yeah. I can't recall who I got them from. I can't remember if it was the training department, which I don't think it was. I think it was one of the other operators and he might have gotten it from training.

MARSH: Okay. If you have any additional recollections on those, I'd appreciate you get in touch with me. I'll give you a card and a phone number and all that where you can reach me.

CRO: Yes.

CRESWELL: You mentioned before you'd come on shift and found those twelve valves shut before. What about, have you done your lineup on your panel before and found other valve mislineups?

CRO: I came in one day, this is just an example of some of the things that I've had to come into. Met-Ed was always famous for performing an evolution 20 minutes before shift relief. Turning the plant over in total chaos. I hated to turn the plant over that way myself and I more than hated receiving a plant like that. I came in one day to relieve the shift that had had a trip and I can't recall the exact, what happened, but I know that there was an operator was trying to control pressurizer level with MUV 16B. Now that's a high pressure injection valve on the A loop. He was throttling this valve, pressurizer level would go up, he would close it, it would come back down again, and he would just keep doing this. And I asked him, "what are you doing?" He said, "I'm maintaining pressurizer level." I said, "what happened to the normal?" "I don't know, it just doesn't work." And he went over to the pneumatic controller for MUV 17 and he showed me, nothing happened. I said "did you check MUV 18?" That's the manual isolation to 17.

CRESWELL: You're indicating something there...

CRO: I'm indicating that I pointed to MUV 18 and that valve was in fact shut. And he says, "Ah," and other explicitives. And you know, I says you gotta wake up. I said you can't operate a plant this way. I came in another time. Now, I wasn't really taking over the shift but we were walking out the passage way coming in from Unit 1 which is normally the way we came in and every once in a while we'd

hear a safety go. And it would go for maybe 30 seconds then it would eseat. We'd walk a little further and it, pow, went again. What are they doing up there? I was with another CRO, we were just about ready to take the shift. I don't know. They're not testing them. I thought we were at power. You know, what would they be testing them now for? We got up there and what had happened was they lost feedwater, pressure in the steam generators went down to the point where they actuated in the feedwater latching system which cuts off all feed to the generators from the normal feedwater pumps, and it also shuts MSV 4A, B, 7A, and B, which are the main steam isolation valves. The sensing point for turbine header pressure which controls the turbine bypass valves is downstream of the MSV 4's and 7's. They restored normal feed, but they forgot to open the MSV 4's and 7's. So that the turbine bypass valves were seeing 750 pounds pressure and the turbine, the relief valves in the steam generators were seeing 1050, 1060. So everytime they tried to control pressure with the bypass valves, they had those in manual, they would close them down because they'd see pressure was starting to decrease, in closing down the pressure would come back up again and poof. It wasn't two minutes into the shift and Ray Boyer, the guy that was taking the panel said, "what are you trying to do?" He said, "you're blowing safties out there." "But we can't control pressure enough. And look at header pressure. It's down low." Right next to it is OTSG pressure. It was 1050. He says, "Man, what's the difference here." And he looked up and the MSV 4's and 7's were shut. He says, "crack those valves." They cracked the valves, they closed

the turbine bypass valves, put them in automatic and the thing came right on up [illegible]. Now these are trained operators. I don't like to say that my shift was the best but, you know, I think we were.

CRESWELL: Let me ask you this. What are the difficulties that you encounter in operating a plant of this design?

CRO: Feedwater is very sensitive. It, I don't know. I don't want to say that feedwater is sensitive. When you move 11 million pounds of water an hour, that, needless to say, is going to be touchy, you know, whatever its just that a slight change in flow is gonna cause a big change in the steam generator, but not only that the primarly system is very sensitive. The pressurizer was totally too small. Any decrease in primary system temperature, which would result from an increase in feedflow, would cause the pressurizer level to go down and the pressurizer pressure to go down. It was really very hard to control in this respect. You know, I, in fact, when we, when I control the feedwater, the amount of feedwater to know how much to put into the steam generators to keep the reactor basically as stable, as stable as I can keep it in a transient situation. I look at reactor pressure. If pressure goes up I feed a little more. When I start to see it come down again, I back it off a little bit. And that's how I know where to keep feedwater flow.

CRESWELL: How do you, after a reactor trip, what are the immediate actions that you take? Could you walk us through what actually goes on?

CRO: Well, the first thing that you do is you insure that, you mainly trip the reactor. Okay, that just insures that, well, I don't know why it would, but the second thing says that you look up on the PI panel and verify that all the rod in-limit lights are on. You check to make sure that the turbine is tripped. That it's auxiliary oil pumps are operating. Make sure that the turbine bypass system is controlling steam header pressure at 1010. You close MUV 376, which is a letdown isolation valve. If pressurizer level gets down below 100 inches, you're supposed to start a second makeup pump and just keep it ready to go if you need it. If pressurizer level gets down below, I think its 20 inches, then you're supposed to open MUV 168 to admit more water. If the makeup tank is low and the pressurizer level is low, then you shut, or you open the DHV 580, which is allows the BWST to come down to the suction of the makeup pumps and then you shut MUV 12.

CRESWELL: Is that a valve you have to go out and manipulate manually or do you...?

CRO: Its one you have walk around 20 feet of panel and back 20 feet to open.

CRESWELL: What about the feedwater control...?

CRO: Well, if you have any feedwater stations in hand, you should verify it, you should run those back consistent to the parameter that they should be, in other words just take it and take it all the way down.

CRESWELL: What if they're in auto?

CRO: Well, if they're in auto you just verify that feedwater flow is coming back at a rate consistent with the header pressure.

CRESWELL: Now, they're set, the feedwater is set for 30 inches, right?

CRO: On the low level limits, right, yeah.

CRESWELL: Has that always been the case? It's always been set at 30 inches?

CRO: Well, 30 inches is the nominal, is a nominal number. It could be plus or minus. What they do is they set the levels in the steam generators at 532 degrees so that they could get 532 degrees 885 psig. If they need a little bit more heat transfer to get that 885, then they would raise the level slightly, you know, varied maybe plus

or minus 3 inches from 30 on either generator. I knew one that was about 32 and the other's 28.

CRESWELL: I guess you've had a chance to talk to the operators since the event. Have they noted anything to you that was peculiar about the event? Where they had to take special actions and...?

CRO: I really didn't get that specific with them. The only time I ever talked was in a bar room. And I, you know, I don't like to repeat what I hear in bar rooms.

FASANO: You mentioned that you at one time found MUV 18 shut. What reason would anyone have to have that valve in a closed position?

CRO: To the best of my knowledge that particular event came when somebody tried to change a light bulb in the ICV 5 valve controller. They removed the lens covers and everything. They pulled the old light bulb out and they went to stick the new one in and, you know, these were those PSB 120's that they're telephone lights. They're about that long and they have a contact making surface on either side of them about maybe a half inch. And as they slid this thing into the socket, it made contact with the hot side and the ground it blew the fuse for that indicating circuit. It also took away the indication for all the other valves and happened to fail when MUV 18 shut, when they re-energized that.

CRESWELL: Was it, did maintenance repair it promptly?

CRO: I really don't know the time frame. What I saw, I understand it, how it happened. I can't remember when the trip happened. I knew they had a trip on that particular instance. I can't remember what the time frame was between the time that the fuse actually blew and the time they got it fixed. I wasn't on shift at that time. Then I do recall a sign back on that particular operating panel that said operators are not to change light bulbs in this panel, call the electricians. So we have to call the electricians and have a light bulb changed. Another one of Burns and Roe's designs.

CRESWELL: Okay. One thing we haven't talked to you about is why you quit.

CRO: Why I quit? About a year ago, well, it was even, no, it wasn't a year ago. It was a year ago. Back in June I had wanted to leave this racket for a while. I think it can be a good career. In fact I enjoyed my work up there. What I did, or what I had to go through to do what I did, it was hectic. When I left Met-Ed my blood pressure was 180 over 110, which for a man of 30 years old is outragious. My blood pressure had been high for over a year. In fact, I had gone job hunting back about this time last year and I had gotten a job but it was a little less money than I really wanted to take and it was in St. Louis, and I didn't want to move. So it wasn't really a spur of

the moment type decision, which a lot of people thought it was because of the accident. I did know that once the accident happened, when I realized the severity of the accident, I knew that it was gonna be a long time. I had just gone through 2 1/2 grueling years of bullshit, which is what it was, with GPU startup, UE&C startup, and then Met-Ed. And I didn't like being hassled by 3 or 4 different foremen and 2 or 3 different supervisors plus 3 or 4 shift test engineerings and various other mechanical and electrical engineers, you know, it was just too much. I couldn't take it anymore. I thought I was a good... There was shift supervisors that would actually stand over your shoulder and tell you exactly what to do. Raise steam water, you gotta get feedwater up, now check this and check that. It was, you know, ridiculous. I knew how to operate the plant. He should have been back there taking care of his paper work, but instead, he was right up there in the front lines, and trying to keep myself oriented in my own head I always had to listen to this guy. And if I wouldn't do something he told to do, well, he was right on me. He says why didn't you do that, why didn't do that. Well I didn't see any importance to do that right at that particular time. And most times I was right.

CRESWELL: Well, did they know what they were doing? The shift supervisors?

CRO: Yeah, for the most part, but they worried about the wrong things. You know, they put their priorities a little different than I did.

CRESWELL: What should they've been worrying about?

CRO: The overall picture. They should have been back staying taking a big, a big look at everything that was going on around them and not getting themselves involved in what the control room operator or the shift foreman is doing. The shift foreman could direct. Its a team effort and I tried to promote that my 2 1/2 years that I spent on that shift, I tried to promote team work. And it just didn't work. There were personnality conflicts, conflicts of interest, period, you know, the guy just doesn't do it the way I tell him, or the way I ask him or the way I show him that maybe that's the best way of doing... He wouldn't do it just plum because I told him, and he would do it just to defy me. Now, this, you can't have team work that way.

CRESWELL: Let me ask you this. When the supervisor was standing over you shoulder, was this during a trip condition or during normal operation?

CRO: No, this was during, in fact, I remember this startup really well. My problem has been diagnosed as labile hypertension which means it goes up and then I'm gradual to bring it back down. I don't have a constant high blood pressure problem. I keep things bottled up inside of me. This particular night I came in, I had the panel, we were scheduled to do a startup from 1% shutdown to 15% power. With all the paper work and everything that's involved in mode to mode checklists and the surveillance tests that had to be done prior to

going critical, getting the operators stationed where they needed, just getting the plant in a general stable condition to perform this thing, it takes a lot of concentration. It takes a lot of effort on the part of the control room operator to do that. At that particular time there was, in our alarm system is totally ridiculous, there were too many of them and the system that they have is it fails all the time. An alarm card could go bad and it would just send an alarm. It would just keep flashing in and out. You would silence it and it would just keep coming in. And that God-awful horn, it would just, you know, you're trying to concentrate on doing a startup and you got this buzzer going off and I'm particularly conscious of alarms because if you just ignore this stupid thing, what if you get one that's important. If you get one that's important and it goes unrecognized because you're ignoring this one over here you might as well not be in the control room. My job is to keep the plant safe. If I, you know, if I can't see what's going on around me then I felt apprehensive about the whole thing. I didn't feel like I can keep as close a surveillance on the whole thing as I really wanted to. I asked this supervisor, I'll even mention his name, Brian Mehler. I asked, I said, "Brian, could you have an instrument tech take a look at that alarm?" I said, "its driving me nuts." I said, "am I gonna have to listen to that all night through this startup?" "Well, I guess you're gonna have to." Those were his words pretty close. And with that I told him, I said, "I won't do the startup under those conditions." I said, "either get that thing fixed or find me a relief." And he said,

"you know if you become, if you are relieved you might as well get your lunchbox and take off." Well, at that particular point I wasn't ready to leave my employment there. Maybe it was a prayer, I don't know what it was. The alarm settled down and I didn't have to listen to it at that point. It did come back later but not until after the whole thing was done. They had an ECP there ready for me. I looked it over and I can generally tell whether the thing is gonna be close by just looking at the numbers. I've done enough of them, you know. And by just looking at the numbers I can tell whether they're gonna be...

FASANO: ECP end concentrator pointer...

CRESWELL: No, estimated critical position.

CRO: Estimated critical position, yeah. And this one looked good. It was, I think, somewhere around 60% on groups 6 and 7. It was where they wanted it no, no, I'm sorry. It was about 68%, its the closest I can remember, on group 5. No wait, no wait, I'm getting screwed up here. I've been away for a month and a half and it's a little...

CRESWELL: Well, I don't think that this is critical information.

CRO: Anyway. Well, just the way they operate. Its, the estimated critical position was something. We have a guideline if you go critical before half a percent less than when you're anticipated to go, you should shut back down. You should put all the rods in until you get the safeties in and then investigate why. So, I wasn't even, I was just getting to the minus .5% position and all of a sudden I looked up and I had an alarm, it was the startup rate rod withdrawal inhibit circuit. The only thing that throws that into count is 3 dpm in the source range. And I looked down and I did have 3 dpm in the source range. It stopped the rod motion. I put the rod stick in and he says, "no, no, no. Just take it down one." I said, "what do you mean. We just went critical here at 28% on group 5." I said, "the ECP called for a half a percent above that or better." Now that's alright. That's alright. We'll calculate a new ECP for where we went critical. Now that's what they did. Now that doesn't show on any log books or anything like that. But that is a fact...

CRESWELL: Was Mr. Mehler still a shift supervisor at this point?

CRO: Mr. Mehler is still a shift supervisor at that plant.

CRESWELL: At that point.

CRO: Yes, yes.

MARSH: Mehler was the one that was on duty at that time...

CRO: Yes. He was the one that I kept telling you that he would look over my shoulder. So I told him, I said, "I don't believe that that's right. I think that that is unsafe. I think that there's something wrong here." Well, we'll recalculate it and make it right. Which is what they did. They redid the numbers and somehow they fudged them, I don't know. They...

CRESWELL: Did they have a nuclear engineer come in?

CRO: To the best of my knowledge, no. This was on a midshift. This was pretty late at night, which normally that doesn't hamper them from calling anybody out but I don't recall any nuclear engineer coming in.

MARSH: CRO, you say they. Who else besides Mehler would be involved in that calculation?

CRO: The shift foreman.

MARSH: Which would be who? ...

CRO: That was. I can't recall.

CRESWELL: Okay.

CRO: I don't want to name any names if I can't be sure. Because we were well, Mehler is not my normal shift supervisor so I'm not sure that I was with my normal foreman at the time.

CRESWELL: Could you estimate when in time, it would help us to pursue this matter if you could give us the approximate date. Was it early in the startup test program?

CRO: Yeah, I believe it was right back before the relief valves.

CRESWELL: And that would have been like in April or May in 1978.

CRO: Right. Yeah, it was about that time.

CRESWELL: Okay. You mentioned team work before. Are the panel assignments clearly indicated to people when they're onshift?

CRO: Generally on our shift what we did was we had a panel operator. He was in charge of taking the, filling out the log book and just generally overseeing the operation of the plant in a wide scope. Normally we were at steady state. We also had a person that was assigned to what we call the switching and tagging desk, and he would take care of any safety tags that needed to be hung. He would also

perform the daily logs and the shift and daily surveillances and any computer information that had to obtained that day. Then we usually had a third operator that was assigned to surveillance desk and he would oversee the, take care of coordinating the control room and the auxiliary operators in performing monthly or weekly surveillance tests. If anything went wrong generally what would happen the closest guy to a section of panel, you know, like we used to divide it up into 3 sections. We had the secondary, we had the reactor plant and we had the nuclear steam supply system which was basically makeup pumps, low pressure injection and that sort of thing. And then the foreman, he would kind of rove around and maybe if he was in the back panel and if there was some valves back there that he could operate. This is generally the way we worked. If something happened, you know, you'd yell out and say...analyze the problems as best you could...and say, "we lost feed water." And at that time the three operators would come up and they would key in on a position that wasn't occupied and then take over.

CRESWELL: What about shift turnovers? What sort of turnovers did people ordinarily make to your knowledge?

CRO: Well, they varied between shifts. It depended who you turned over to and I always turned over to major stuff, any, I always let them know where they were in rods, what they were doing, whether they were coming in or going out. I let them know of any abnormal

conditions that existed in the secondary plant, you know, like they are doing a polisher vessel, regenerating that. Or we throttled this down and put this in automatic and something, maybe a major change throughout the day. Any jobs that were in progress, I'd go over to the computer and show him the primary system parameters, pressure, boron concentration, reactor power, and such things like that. We generally have a written sheet. Sometimes guys would draw it our for 3 or 4 pages and they would put the most miniscule items on there that, you know, generally I looked over those. But the major stuff, the turnovers, I guess, were generally pretty good and I say that on a steady state basis. Like, I don't know how may times I've taken the plant over in a transient and it was total chaos. You know, they'd leave you know...

CRESWELL: You would have a turnover in the middle of a transient?

CRD: Well, maybe nor necessarily in the middle of a transient. I, let me rephrase that. Let me say after the transient was over, perhaps during the recovery which sometimes took days. But generally, you could get things straightened out in a shift to the point where, you know, the major work is done. The big things that have to be done and the small things. Most of the small things are done. The big things and they can come later, you know. But its really hard when you have a trip. There's so many things that you might have seen that you took some corrective action for, that maybe somebody else might

not have done that or maybe the procedure didn't call for but it was okay to do it. It was safe, it was conservative. And you forget to mention that to your relief, and you go this valve open and then you go and try and do something else and, you know, it just doesn't respond right and you looking around for a problem-why that dummy left that valve open. Why did he do that? You get mad at the guy because he didn't tell you about it but, you know, it was an honest mistake. I very seldom got mad at guys for poor turnovers because I generally made a pretty good tour of the, right after he left I would go around the plant, the panels, and look for abnormalities that I saw. If I had any questions I would ask the foreman.

FASANO: Did you have a check sheet or did you do this just by knowing the system, its all in your head.

CRO: Just by knowing the system, knowing how the board was to look. The positions of valves, you know, its like it almost becomes instinctive after a while.

FASANO: After a while.

CRO: Yes.

FASANO: You mentioned that you did have design concerns on both the nuclear and the steam side of the plant. Are there any ways other

than complaining verbally that you could have reported these to your management? I mean, are you people...

CRO: Yeah.

FASANO: Allowed to report things on paper?

CRO: Yeah. We can generally write a little letter to, you know, the cognizant engineers of the problem. And generally some of the operating conveniences, they used to take care of but things like, and we'd write these or even a verbal comment, they would normally jot it down themselves. They were pretty good. Sometimes they never got done, but at least they'd listen. But the major things, you know, like the relief valves, condensate hot well thing. I don't even know if he has yet today, whether that system has been modified. But, yeah, you could write him a letter and even a little diagram showing what you'd like to see, explaining maybe even perhaps how to go accomplishing the change.

FASANO: How about reporting to say other agencies? I mean can you, I mean talk to other people like ourselves or...?

CRO: Well, that is, I forget the part number. 10 CFR 20? I can't remember the regulation...?

FASANO: 21?

CRO: Yeah. Its the one where if you see the company doing something in violation of any rules that you can go to the NRC with the complaint.

CRESWELL: Have you done that?

CRO: No.

CRESWELL: Why not?

CRO: Because I felt that if I had of gone there, to the NRC, then they would come down on me. I was a little afraid of that.

MARSH: What makes you think that way? Do you know of other instances where this has happened? Have you been told anything formally or informally?

CRO: No. They never really came right out and told us that, you know, that you would be "prosecuted." But I just felt that knowing the way they operated that it would be kind of like being the black sheep now all of a sudden and it was tough enough to get along. I found it was tough enough trying to get along with the other people up there. Just, you know, team work type thing. And trying to develop the rapport of the other shift supervisors as well as with my own. That would just make it totally miserable for myself.

FASANO: You're mainly on Unit 2?

CRO: Unit 2.

FASANO: Do you have any knowledge that this is similar type of operation on Unit 1 or are they different? To your best knowledge. You know, I mean if you don't know, you don't know. If you do...

CRO: The only thing I can make is an assumption. The only thing I can assume is that the shift supervisors that are at the plant today were either former control room operators in Unit 1 or they were former shift supervisors in Unit 1. Now I can't help but think that they gained some experience in Unit 1. That's all I'm gonna say. There's nothing really else I can say about it.

CRESWELL: How about the performance of surveillance tests at TMI. Can you comment on that?

CRO: Surveillance procedures, I guess, sometimes I, well, I did a lot of them In fact, I did the one that caused the first safety features actuation where I tripped the alternate feed supply to the inverter and lost a DC supply. I corrected that too, by the way, while everybody else stood around, looking around like they didn't know what was going on. Now generally, the surveillance procedures, we did them and sometimes they required a change, you know, like well

there was a small procedural deficiency or maybe a valve number was wrong or maybe there was a better way of doing it to get the end result. We would change those, the TLNs would take two licensed operators or two senior licensed operators unless nuclear safety was involved, then it would take PORC approval. We would change those, make them right. Sometimes in the performance of a test you couldn't get the required results and we'd go back out with the shift foreman and he would get the proper results. Sometimes we'd..

CRESWELL: Excuse me. Could you elaborate on that?

CRO: Well, an example, the emergency feed pumps, running at surveillance, it was a bear. Every time that we did the surveillance that they called for a thrust bearing vibration measurement and it also called for a temperature reading on the bearing and called for a certain differenital pressure, suction pressure had to be between a certain amount. We've never done that test where it came out the same way twice. So we tossed up our hands and we say, you know, what do we do? We can't get the reference values, we can't get the proper data. Okay, well never mind. I'll take this procedure and I'll throw it down at the surveillance... I assign people, the inservice inspection type and they would evaluate the data and then they would come up with a new set of reference data everytime. And of course the surveillance that we did would fall right into that. I never did understand that.

CRESWELL: Any other systems besides the emergency feedwater system involved?

CRO: I can't recall. I know that a lot of the balance of plant surveillance. It wasn't tech specs or balance or anything like that, that would go by the wayside. You know a lot of time it would call for maybe the secondary service coolers to be backwashed and we don't have time for that. Then you just sign it, you know, throw it in the basket not completed, and it would come back next week to do it, you know, never get done. There was a lot of things like that on the secondary side. We normally did all the surveillance that was required for tech specs, but there was a lot of times, you know, I can't really name any specific instances but...for specific procedures...but I know that there was exceptions and in the exceptions they could paper those away somehow. I never did really understand. I don't go in for that kind of thing. I figured if it can't be done by the surveillance procedure, you change it so that it can be done correctly and within the scope of the surveillance requirement or you don't do them, you know, you get the thing right and then do them.

CRESWELL: CRO, are there any other operators like you that are concerned about some of these occurrences?

CRO: Yeah. I would imagine that there's quite a few that are concerned. I'm not sure that their attitude is the same as mine. I

know that they like money. I mean obviously I didn't quite up there for a higher paying job and that I know that a lot them stay around there just because of the money, that they're afraid to leave because, you know, they like money so much. But not only that, I guess they're a little bit more, well, they are just cut out of a different mold. They're not as, they don't say things the way I say them. They have to be concerned. I can't really see where they couldn't be concerned. I have respect for everyone of the operators up there. I have respect for the supervisors too because well they went through hard times but somethings that they do I really lose respect for. There's a couple I just, you know, I wouldn't work with them for anything and that's one of the reasons I left.

MARSH: We are getting towards the end of the tape. The time being 8:14, so at this time I'm gonna break for a moment while I put a new tape on.

MARSH: The time in 8:15 p.m., the data is May 22 and we're continuing with the second cassette on interview of CRO. Jim, you were asking some questions when we broke to put a new tape on?

CRESWELL: At this point Hal, I'd like to ask you if you have any comments, any other comments. These are of an open nature, they can be directed toward NRC, Met Ed, whatever you feel like commenting about.

CRD: Well first, I don't know...this whole accident seems to me like a nightmare. When it happened, I didn't really want to dissociate myself completely from the accident, I wanted to be there to take part. But I realized that my health was endangered at that point, I knew that I had a problem. They say that high blood pressure has no symptoms but I could actually feel it. It was so tense inside that it was just indescribable. That's why I resigned, on the spot. I was looking, I had said before that I had looked for other employment and couldn't find any satisfactory to that point. I figured that by doing this that they would, that I would force myself into it and I would be finally rid of this, this emotional pressure. The emotional pressure- I operated the plant a lot of times, especially during transcients or tests, knowing that the plant was already 40 years old and they weren't even in commercial operation, and the plant was a wreck. It was dirty, there were oil leaks, there were water leaks, there were steam leaks, the design deficiencies that I had mentioned before, pump controllers not functioning, you know, if you want to start the booster pump because you need it, maybe it doesn't start because the auxiliary oil system has got so many leaks then it can't build up pressure. Just not being able to tell myself that when I go to do something at that panel, that what I want to do is going to actually take place. You know, I operated it a lot of times up there when I had the panel and I dreaded it. I really dreaded it. I would go in there and my stomach would be in knots for eight hours, I wouldn't eat anything, and I was on the verge of becoming an alcoholic, I would go out after

a shift and drink and it was terrible because I was becoming a physical and emotional wreck, and it was due to these things-the design of the plant, I knew how the GPU startup program and the people that performed those tests were all very smart men, but they had no common sense. They would have a test procedure, it would have more E's and D's than it had pages. And you can't conduct a startup program like that.

CRESWELL: What are the E's and D's?

CRO: Oh, those are exceptions and deficiencies. Let me say, maybe not deficiencies, I'll say exceptions for sure. But they had many exceptions to the test procedure. When Met Ed took a system and accepted it as operating properly, we still had the oil leaks, we still had the water leaks, we still had impellers in backwards, we still had suction strainers that would clog up every two hours of operation. It was a nightmare to operate the plant. Over a year ago, I told Bob over the phone when he contacted me that I told my wife over a year ago that that plant was an accident waiting to happen. Like I said, teamwork, interdepartmental teamwork was one of the biggest things that I saw was a detriment to that plant. Operators were always trying to pin something on maintenance, maintenance was always trying to pin something on the engineers, it was just a constant fight back and forth, the operators would get stuck with this because maintenance didn't want to do that. You have the maintenance people from Unit 1 would come over to do maintenance, "Man this place is

fucked up, who'd ever want to work over here?" Now how does that make an operator who has any pride in his work, any pride in his unit, how does that make me feel? After a while, it drags you down. Then pretty soon, you start taking on the same attitude. Management recognized the problem but they didn't do anything about it. In fact they probably did more detrimental to moral than anything else. They bring in a Navy captain to be Unit superintendant just because Jack Herbein, up there, wants to be a captain in the reserves. I don't know that to be a fact, but that's the rumors that go around. The administrative assistant that they appointed up there, four months ago, five months ago, a Navy captain. They had perfect qualified people, with a masters, they had a guy, a master's degree in personnel management, they brought in a Navy captain. I don't care how long you've been in the Navy, I don't think that Navy people have got an ounce of leadership capability. They don't know how to lead people. If you're in the Navy, they tell you to do something, if you don't you go to the brig or you go on report. Well, see I'm getting the job done, but they have to do the job. And it was getting to that point with me that they were telling me I had to do something and I cut them off, I fired him. You're fired. You can't fire me, I'm supposed to fire you. No, I'm firing you as my employer. You know, that was the type of atmosphere that was generated, I, and I finally had it. I know that with all good conscience all the other operators up there felt, feel the same way as I do, but they're just not willing to get out.

CRESWELL: I've got one other point that I'd like to cover. You're experiences with the alarm computer printer.

CRO: Yeah. I've had several experiences with that thing.

CRESWELL: Can you go into that in a little bit of detail? I'm interested in history of that printer and the problems that had been encountered with it.

CRO: Well first off, the mid-shift is supposed to gather up the paper that has been pushed through it during the day and then they make a nice neat package of it and give it to the operating engineer. A lot of times I'll see the printout for the day, I usually go over just to see what happened. But they, you can see where the typer would stop or the paper would tilt and it would just print a bunch of garbage. The alarm typer itself, it'll back up sometimes for, I've seen it backed up for as far as an hour, where it was printing out it was two o'clock in the afternoon and it was still printing things from one o'clock.

MARSH: Misalignment, and paper feed, paper jams, was that a frequent occurrence? I'd say in a weeks time or a months time, what would you expect in terms of difficulties?

CRO : Sometimes we'd go a whole week and not have any problems, but then other times we'de go and again, it was an operating problem, people didn't understand how the roller-feed mechanism worked and they would take and they would clamp the roller down to the, and make the paper tight in the roller where it shouldn't have been. And then if there's any misalignment in the back feed, and that roller overcomes the force of the little pins that stick out through the holes. And then that would cause it to run off the track and a lot of times you'de find that to be the problem. We never really had too much problems on our shift, but like I said, going back and looking through the logs for the day, when I would collect them, I'd say that I'd see maybe three or four times in a week, or on a shift, that we'd have problems like that.

CRESWELL: Have you ever known of an operator shutting the alarm printer off purposely?

CRO : No that depends for what purpose. Sometimes I've seen people turn it off, but the only time I can ever say that I saw anybody, in fact t was me that turned it off, was the fact that the alarm printer tself has the selectric and there's a little tape in there that moves the ball back and forth for upper and lower case. Well the thing got stuck on upper case and it was just printing garbage. So, at that time, I turned that typewriter off and then the utility typer is supposed to take over in that case and it didn't. In our case, now

I can't really say. I've have never personally seen anybody intentionally turn it off when it was functioning properly. I don't really see any need to do that.

FASANO: I have a couple of things I'd like to ask you. In the training when you were at the B&W simulator, did you go through simulated events where you actually did some practicing? Where they adequate in your opinion?

CRO: Yeah, we went through reactor trips, we went through turbine trips, they had individual instrument failures that we had to respond to with various stations at hand. It, for me, it helped me a lot. In the Navy reactor program, everything was done just manually, everything, there was no computer involved. It was such a simple system, it worked so well and then you come up here to a complicated mess like that is up there. In fact, I want to make that, I think the place is complicated beyond any technical ability to operate it. And maintain it. But I feel that the training that I got down at Old Forest Road down there was some of the best training that I ever got, in plant operation.

FASANO: Was the simulation pretty much what you can anticipate at TMI-2?

CRO: I used the control reactor pressure the same way.

FASANO: Yes?

CRO: Yes, it was very close. The only thing that wasn't really close was the size of the control room. The Old Forest Road simulator panel would fit inside this motel room, where you might be able to get panel 6-A of Unit 2's in here. It was a lot closer and working with it for 8 weeks, like we did, you became very familiar, it was very easy to have a reading become instinct to you where you can just scan the panel and see something, that was abnormal, it was good training that's really what I kind of worked on myself.

FASANO: Then, in your comments I gather, could you elaborate on how you would like to see a control room and what would you have different in this control room that could help the industry, for nuclear power import, for nuclear safety, and ease of operation to keep it safe.

CRO: Unit 2, the general comment that I have is that there is too much, well the panel, the front console is just entirely too big. And there's too many components that have to be operated from the back. Like, if you want to open a feed-water valve to recycle feed-water for clean up, it takes two people to do it, sometimes three. One guy to watch the pump, the other guy to jog the valve open from the back of the panel and another guy over at the computer to read the flow. Just

for a simple, ordinary manipulation, the whole control room could be a lot smaller, they could have less indication there. That may seem kind of dumb, but in Unit 2 they have so much needless information, like panel 6-A. I still don't know what those things were, those meters. I couldn't instinctively look at a meter and say that that is bus 26 volts, I couldn't do that, in fact, I just put it totally out of my mind, except for the ones for the generator and then I could look at those and say that's close, it's what it should be. And the other ones, it was a very hard control room to become instinctively familiar with, just due to the nature that you had so many gages that were not necessary, or if they were necessary, they could be located maybe somewhere off to the side, where you look at them every now and then.

CRESWELL: Could you comment on the location of the leakage recovery system panel.

CRO Yes, you can't see it from where you have to operate. So, if you're the only one in the control room, and the drain tank needs pumped down, you can go back there according to the procedure for routine operations, or to investigate alarm and correct that alarm, in which case you would, but you would have to leave the main operating console, with nobody there, which is entirely within the scope of the procedure. There's supposed to be at least one licensed operator in the control room at all times, and the procedure, operator at the

controls, it shows a shaded area where you can go, it shows during normal operations and normally it was within the confines of straight lines back to the wall to the shift supervisor's office there from the computer to panel 6, the electrical panel. If you had an alarm condition you could leave that area and go back along the side panels to the leakage recovery system, the ventilation control panel and then back to the RPS cabinets and some of the electrical relays back there, you could go back there to investigate an alarm. Which if you got a high drain tank or a low drain tank level you would have to go back there, if you were the only one in. In panel 25, the annunciator system there doesn't give you a flash on the front panel that you have an alarm back there. So, again if you're only one there and you push the button, it doesn't silence any alarms on panel 25, you have to run back, around the back of the panel, and push the annunciator silencer button on the panel 25.

CRESWELL: Previously you mentioned that you were having to pump down the RCDT about 4 times during a shift. Could you tell us what impact that would have if you were the only operator in the control room?

CRO: Well generally if I was the only one in there and I had to pump the drain tank down, what I would do is, it's one of those instinct things again, or not an instinct, but it's kind of like an operating method, so to speak. I would see the high drain tank level. What I would do is I'd go over and push the valve that admits the water to

the bleed tank from the drain tank at maybe 50 gallons a minute. And I would just let it pump. And then I would get the low level alarm and I find it, or I'd get an alarm, I'd find I couldn't silence it from up on the console itself and I would walk back and then secure the pump down at that time. A lot of guys would stand back there and wait, they'll just push the valve and stand and wait for it to pump out 10 or 15 inches of water.

CRESWELL: I've got three questions to ask and they may seem a little bit silly to even bring them up, but I do want to cover it and I would like to get any knowledge you've got personal, heresay, or even borrowing knowledge on any of these matters because they are relatively serious. First of all, would you know of any information regarding personal action by anyone that would have brought this event about or increased the severity of it? Anyone who would have had an axe to grind that in any way could of kicked this thing off?

CRD: Absolutely. I don't know. I've never heard anything to that nature.

CRESWELL: Then you are indicating in the negative?

CRD: That's correct. I don't know of anything like that.

CRESWELL: Secondly, from your experience, your work experience with TMI, what are the demeanor of the work crews when they are on duty? I'm specifically addressing getting lost, sleeping on duty type of thing. Do you have any comment on that? Any knowledge of people that going out and taking a nap when things are running in a good steady state?

CRO: On our shift we were pretty good, but we did have our sleepers, now the auxiliary operators, I know they used to sneak off for maybe an hour, two hours, something like that. To my knowledge, the plant was covered in his absence, that somebody else was if he was supposed to be someplace at a panel, he was covered. The only thing I quess really detrimental to the plant's safety would be if he was a fire brigade and didn't hear the fire alarm go off, or if we had a small break loca and he was the respondee and he wouldn't be able to take his action.

CRESWELL: Could you go into that a little bit, the small break loca respondee?

CRO: Well, we had two, one was a control room operator who had so many minutes... A month ago I could have spit these things out, no sweat. The control room operator would have like two minutes to recognize that you did have a problem. A loss of coolant accident, with the failure of a diesel on the side of the break, or the side of

the makeup pump didn't start. The control room operator would then go down to the, whichever affected valves, whichever valves did not have power and he would get on the phones and throttle open those valves two turns. And then at that time he would be in communication with the control room operator at the panel. The auxiliary operator, at that time, was to go down and open up the one remaining shut suction cross connect valve, so that all three makeup pumps suction valves, or suction lines would be tied to one common source, which would be from the borated water storage tank outlet valve to the decay heat suction header on the unaffected side. All this had to take place within ten minutes after the discovery.

CRESWELL: Do you have any comments on that?

CRO: Well, we were supposed to check the communication headsets once a shift, and I'm just as guilty as everybody else. It was just one of of those things that if the guy called you up and said, yeah, lets check the loca headset, we did it. I guess generally the feeling was that it was being done and it was being done at an adequate interval. I don't really think that there was any safety lost. I don't believe that it did that, but we didn't do, we had drills every month that we were supposed to run and generally those were run with a great deal of consciousness. I know that that one valve down there that they had to open was a bear, it was a bear to get open. But, I think that the requirement was for like 2 or 3 turns open and the requirement, it didn't have to be fully open.

CRESWELL: Do you feel that it was in your capability to respond as required, as control room operator for a small break loca?

CRO: Yes. Unless...they had scaffolding down there...if they ever took the scaffolding away, it would be tough. It would be tough on both sets of valves, the A and the B valve. There's no permanent scaffolding leading up to those valves. We've been lucky so far that it has been there, and you climb up and get it. As of today, I don't know if it's still there.

FASANO: This wasn't there purposely for the purpose of doing this? It just happened to be there?

CRO: It was there. I don't know if it was there for that reason or not, I really don't know.

FASANO: It might have been there for that purpose?

CRO: It might have been there for that purpose.

FASANO: In your opinion is it?

CRO: Yes, but then again, it may not have been.

MARSH: I have one last question addressing those areas that I wanted to cover. That's the fact that this event occurred on March 28th, which happens to be an anniversary of the plant. Do you have any information, or have you heard anything at all regarding the possibility of a party going on, concurrent with this or any type of celebration that may have been planned or taken place?

CRO: No. I have no knowledge of that. I haven't even heard anything about that.

MARSH: That's all I've got. Do either of you have additional questions? I'll open it you one more time, Hal if you have anything else, more you'd like to put on tape?

CRO: I don't think I should. No, I'm about drained. I really am.

MARSH: I would also indicate that if more comes to mind, or in cleaning your stuff up and moving around, you come across something you think would be of value to us, you have a phone number, you have my address, you have several phone numbers where you can get hold of me and I'de very much appreciate anything that you do come across additionally. Likewise, if in going over the tape, we do have some interests we would like to pursue a little deeper, do not be concerned if I get back to you again and would like to talk to you again. It does not indicate problems, it just indicates that we've found something of

interest that we'de like to pursue in a little more detail, so I'm going to hold on to your local number and don't get concerned if I try to get hold of you.

CRO: Okay, fine.

CRESWELL: We would like to say, very much thank you coming in on your own time. I know you've got to travel a ways to get here, and we've taken up most of your evening, we very much appreciate it. You've given us some good meat to consider and get into. We'd just like to say thank you for all of NRC.

MARSH: The time being 8:41 p.m., at this time we are going to terminate the interview of CRO, the meter reading on the second cassette is at 466, so I'm ending at this time.