UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

In the Matter of:

IE TMI INVESTIGATION INTERVIEW

of Mr. Kenneth H. Frederick
Senior Chemist, GPU

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

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NRC PERSONNEL:

Mr. Gregory P. Yuhas
Mr. Larry L. Jackson
Mr. Mark E. Resner

RESNER: This is an interview of Mr. Kenneth H. Frederick. Mr. Frederick is currently a Senior Chemist for the General Public Utilities Corporation. Previously he was employed with the Metropolitan Edison Company at the Three Mile Island facility as a Staff Chemist. The present time is 1:07 PM Eastern Daylight Time. Today's date is May 21, 1979. This interview is being conducted in Trailer 203, which is located just outside of the south gate to the Three Mile Island facility. Individuals present at this interview representing the Nuclear Regulatory Commission are Gregory P. Yuhas. Mr. Yuhas is a Radiation Specialist, Region I of the U. S. Nuclear Regulatory Commission. Also present is Mr. Larry L. Jackson. Mr. Jackson is a Radiation Specialist with Region II of the Nuclear Regulatory Commission. I am moderating this interview and my name is Mark E. Resner. I am an Investigator with the Office of Inspector and Auditor, Headquarters, U. S. Nuclear Regulatory Commission. Prior to taping this interview, Mr. Frederick was given a two-page document, and this document apprised Mr. Frederick of the purpose, the scope and the authority with which the Nuclear Regulatory Commission has to conduct this investigation. In addition, this document apprised Mr. Ferderick that he was entitled to a representative of his choice to be present at this interview, should he desire one. Also, this document apprised Mr. Frederick that in no way was he compelled to talk with us, should he not want to. On the second page of this document, there are three questions which Mr. Frederick has answered, and I will state these for the record. Question one: Do you understand the above? Mr. Frederick has checked yes. Is that correct Mr. Frederick?

FREDERICK: That's correct.

RESNER: Question two: Do we have your permission to tape the interview? Mr. Frederick has checked yes. Is that correct Mr. Frederick?

FREDERICK: That's correct also.

RESNER: Okay. Question three: Do you want a copy of the tape? Mr. Frederick has checked yes. Is that correct?

FREDERICK: That's correct.

RESNER: We will provide you with a copy of the tape at the conclusion of the interview. At this time I would like to ask Mr. Frederick if he would give us a brief synopsis of his education and job experience in the nuclear field. Mr. Frederick.

FREDERICK: I was graduated from Glenville State College in Glenville, West Virginia, in June of 1964, with a Bachelor of Science in Chemistry and a Minor in Mathematics. I joined Metropolitan Edison in June of 1966 as Chemist at Saxton Nuclear Experimental Corporation, a position which I held until October 1968. At that time I was transferred to the Three Mile Island project and spent about six months at the Reading office undergoing a project, doing various sorts of work for the project. I spent some time in training at Lynchburg at the B&W facility, and then came to the Three

Mile Island site in April 1969. I was at the Three Mile Island site during the construction and startup of Unit 1. I was made Staff Chemist in late 1973 and remained as Staff Chemist until March 1, 1979, at which time I joined General Public Utilities Corporation, which is, which was actually a transfer to the GPU Service Corporation.

RESNER: Allright. Thank you very much, Mr. Frederick. At this time, I'll turn the questioning over to Mr. Yuhas.

YUHAS: I'll think I'll yield to Mr. Jackson for this interview.

JACKSON: Okay Ken, would you describe what the normal chemistry response is to a reactor trip?

FREDERICK: The normal chemistry response to a reactor trip is confined to--let's see, with respect to the primary system--is confined to the items required by the technical specifications. These primarily include items such as dose equivalent iodines, which are run in a specified time following a power, following certain specified power changes, which are defined differently in the two units technical specifications. But primarily, the chemistry that is run are to do a gamma scan for a dose equivalent iodines following the reactor trip. Any other specific requests which may be made from the control room, such as borons or things like this, may also be made at that time but they're primarily on a request basis rather than things that would be done as a routine.

JACKSON: Okay. Do the technicians know the significance of boron determinations? Do they know what those values mean in terms of reactor reactivity?

FREDERICK: The technicians primarily--and it's kind of hard to generalize in that particular aspect--but the technicians primarily know that boron is a control mechanism and that the boron number they give is used in calculations that have to do with reactivity control. Various technicians may know more or less than that, but that's about as far as I can generalize on what they know.

JACKSON: Do the technicians normally know what to expect when they run a boron--as far as results, I'm asking?

FREDERICK: They will have a feel for the ranges that the boron is in for each unit, yes.

JACKSON: What would be the technician's actions if the boron were not what he expected?

FREDERICK: He would call the control room and ask for ...well, let's see...and might speak with either a licensed CRO or perhaps the Shift Supervisor or Foreman, if it were not what he expected. Okay, he would then pull another sample and would run a second sample to confirm his number.

JACKSON: Are you familiar with the boron results that were obtained on the morning of the 28th? I know that you weren't here that morning, but I'm asking, are you familiar with the numbers that they were coming up with like 700 PPM, 400 PPM, and I think maybe there was a later one less than that?

FREDERICK: No, I'm not familiar with those. I was aware that there were questions about the boron but I'm not directly familiar with those numbers.

JACKSON: These numbers are considerably lower than the expected 1,000 or greater PPM, and the technician when in determining these they were reporting them to the control room. Of course, I don't know what concern the technician had over the numbers but I know the control room people were quite concerned. In your experience here at Met Ed, had you ever run across a situation before, where you had this type situation where the boron was significantly less than what you expected?

FREDERICK: Not in the reactor coolant system, I don't recall any such an instance. There had been instances for certain tanks where they were, perhaps, required to make significant dilutions or something, where perhaps someone did not account for a factor of 10 dilution, or something, and there might of been a little confusion in tanks. But these were primarily batch tanks that were being used to batch into other systems, not necessarily the primary. I can recall a few instances like that but I do not recall any instances in the primary coolant system.

JACKSON: Okay. So no previous trips, to your knowledge, you had a boron, what seems to a boron dilution.

FREDERICK: No.

JACKSON: Okay. Are you familiar with the problems with operating a condensate polishing demineralizer?

FREDERICK: Yes.

JACKSON: Can you detail a little bit what those problems are?

FREDERICK: Well, the problems that I believe you are referring to are the difficulties with the resin transfer. There are quite a few problem areas but I think the ones that you're probably concerned with would be anything that might have caused the trips in the secondary system. Is this true or false, that you're looking for things that might have caused trips in the secondary system?

JACKSON: That's true.

FREDERICK: Okay. The problems primarily have to do with the difficuly of transferring resin, and this is not a problem that is unique to these particular condensate polishers. This is a problem wherever you have deep bed polishing systems. And it's perhaps worse here than at certain other

stations that I've seen, but it's not a unique problem to this station. The problems have to do with getting the proper slurry and being able to keep the resin moving in the transfer lines between the operating vessels, and the "sched" (schedule) whether any regenerations are carried out. And of course, the return process in the "sched" back to an operating vessel after the regeneration is carried out.

JACKSON: What kind of a problem did you experience--you're talking about resin blockages in the line?

FREDERICK: Right. The lines can become, for reasons that I certainly wouldn't--well let's say, for unknown reasons, I guess--do become blocked periodically. As I said the problem is not unique to us, it's something we've come to expect. This is not unique to this particular station--it happens in our coal stations. Resin transfer is somewhat of an art.

JACKSON: Have these problems with this system then, have they caused any secondary plant trips, to your knowledge?

FREDERICK: The resin transfers directly have not caused secondary plant trips to my knowledge. Other things associated with the condensate polishing system have. Blown blown fuses in the panel have caused plant trips, or rather have caused the outlet valves to close. Now, I'm not sure whether any of these were at times when the reactor was critical. I think there may have been one or two times, at least, when this has, but I'm not aware that a resin transfer has caused a plant trip.

JACKSON: Okay. I was really kind of leading into the other operational aspects when I was referring to the plant trips. Do these resin beds have operational limitations on them, like temperature diverts around them, or do you have hot-well temperature alarms, this type of thing?

FREDERICK: No. There is no temperature divert around the resin bed. The resins are probably capable of sustained operation at 130 to 140 degrees fahrenheit. This is probably much higher temperature than the actual condensate pumps would operate at, and I suspect the limitations on the condensate pumps are probably more limiting than those on the resins. So there are no pressure or temperature diversions around the bed. There are Delta P alarms on the system which consists of eight beds, seven of which are in normal service. There are Delta P alarms on the whole system, which go from header to header, but they don't take any automatic action other than alarming.

JACKSON: So if you have a high Delta P, the operator has to manually bypass...?

FREDERICK: Well, he would change beds probably to--we believe in operating at full flow condensate polishing and we don't bypass beds. Okay, we would probably reduce power instead of actually bypassing.

JACKSON: One general question. When you got here on the 30th, can you think of any plant specifics that might be of interest to us? I don't really have a specific question for you ... not to my investigation.

FREDERICK: No. This is--a good deal passed. I can't think of any specifics that would probably be of interest. I could try to answer questions specifically but I'm just not sure of what you're looking for. I could try and answer any questions that you had specifically. That's about 2 months ago and my recollections may not be very good, but ....

JACKSON: Do you know or can you detail a liitle bit about what you did when you came onsite?

FREDERICK: The first two days were spent primarily with providing advice to people on matters of chemistry, calculating chemical additions, as needed. There was some concern about the bubble at that time. One thing that had been suggested, and which I worked a little with, was to add oxygen to shrink the bubble. Okay, then within a day someone had come up with the idea that we're probably also making oxygen, which I think was later disproved, and there was a calculation to add sodium sulfite and I think that dropped after we found out it would take maybe some 6 tons of sodium sulfite with some 10 to 15,000 gallons of water to get it into solution to put it in there. Fortunately, that delay probably prevented anybody from really seriously considering adding the stuff. I worked some with moving the Unit 1 gamma spec system out of the plant into an area with a lower background so it could be used, at least on higher level samples.

JACKSON: Did you state that you did add hydrogen to the system to reduce the hydrogen bubble?

FREDERICK: No, no. There was some consideration to adding oxygen, okay, to the system to combine with the hydrogen to shrink the bubble. This was, a I believe, a suggestion that had been made by people at the Lynchburg Research Center from B&W. We considered it and it wasn't a very popular idea, apparently. Looking at it, I think, in retrospect the idea still seems like it might have been feasible.

JACKSON: Did you, in fact, make any chemical additions of any type to the system?

FREDERICK: Not during those days, no. The only additions were water that came at that time, I believe, from the borated water storage tank. Okay, these were the only ones--you know, I can't personnally confirm that that's where they were made from, but I understood at that time that that's what we were using for makeup, was borated water storage tank water--but those were the only additions that were made to the system to my knowledge.

JACKSON: One other question, just kind of a general type question because it's something that I ran cross in a casual conversation, and see if you can provide any details. It appears that there were some operations involving transfers of water on, I think the 28th, involving rubber hoses. And I heard, in casual conversation, that the transfer might have been from Unit 1 Makeup Tank to Unit 2 Makeup Tank. Have you ever experienced any operations like that, to your knowledge?

FREDERICK: No. I think there may have been--and this I'm not sure of--but the casual references--and it seems as though I've heard casual references toward, perhaps, transfers from Unit 1 Borated Water Storage Tank to Unit 2 Borated Water Storage Tank. I'm not even sure that that occurred. I had heard that operation discussed but I'm not certain in my own mind whether it actually did occur. But I'm--well, I've never heard references even to transferring between Unit 1 and Unit 2 Makeup Tanks--that I have never even heard reference to.

JACKSON: Okay. Well, it's quite possible that the information was in error and I think it makes much more sense that it would be between the borated water storage tanks, if that were the case. However, I was just kind of fishing for information, if any of these rubber hose transfers were semi-routine operations, in your opinion.

FREDERICK: Not between primary systems, I think. That type of operation might not be unusual between the secondary, or perhaps various other systems, but I've never seen an operation like this dealing with the primary system or even anything in the waste treatment areas. I've never seen this. Okay, with secondary systems the operations are done usually after some kind of a special operating procedure is written, but I have seen them done on secondary systems, never on the primary.

JACKSON: I don't have any further questions.

YUHAS: Mr. Frederick, would you describe the facility organization while you were employed with Metropolitan Edison? To be more specific, who did you report to and who was subordinate to you?

FREDERICK: Okay. I reported--since 1973, when I took the position of Staff Chemist, I was essentially an Internal Advisor. The reporting structure was to the Supervisor of Chemistry and Health Physics within the organization. Functioning as an Internal Advisor, I did not have anyone reporting directly to me.

YUHAS: Who filled the position of Chemistry Supervisor, as described in the Unit 2 Facility Technical Specifications, Section 6.2?

FREDERICK: Frederick: I'm not familiar with that particular specification. Unit 2 Chemistry has primarily fallen under Kerry Harner. I'm not ... I can't, I'm not familiar enough with the organization to know whether that was his title or not, but Unit 2 Chemistry has primarily fallen under Kerry Harner.

YUHAS: In your Advisory position, did you respond primarily to trouble-shooting, or did you respond to implementation of procedures, development of the program and review and audit of that program?

FREDERICK: Primarily to troubleshooting and/or development of new procedures, as requested by various other organizations onsite, chemistry being one of

them, also some for operations. But I would say more to troubleshooting or problem areas.

YUHAS: Did you yourself at times draw reactor coolant letdown samples and analyze those samples?

FREDERICK: I've never drawn a reactor coolant sample for TMI-2. In the early days when we were starting up TMI-1, I probably have taken reactor coolant samples in the aspect of training technicians. At that time, we had no one with much experience and we trained the technicians actually by hands-on type procedures. And during the startup of Unit 1, I think I probably have taken reactor coolant samples as a training means.

YUHAS: During the construction of Unit 2, did you at any time perform audits to determine that Unit 2 was, in fact, being constructed in accordance with the FSAR description?

FREDERICK: No. Auditing was not one of my functions.

YUHAS: Are you fairly familiar with the design of the nuclear sample room?

FREDERICK: Yes.

YUHAS: Are the Unit 2 reactor coolant sample lines or letdown coolers shielded?

FREDERICK: No.

YUHAS: Are you aware of any impact this lack of shielding has had on the nuclear sample room?

FREDERICK: Pre or post accident?

YUHAS: Post accident.

FREDERICK: Yes. It's made it very difficult to obtain samples and it's certainly had a fairly large impact on the overall exposure of personnel taking samples in the Unit 2 reactor coolant system.

YUHAS: In the final phases of construction, or any period in the design and construction of the Unit 2 sample systems, were you consulted as an advisor, or did you have a part in the decision to route the Unit 2 reactor coolant sample lines to the Unit 1 nuclear sample room?

FREDERICK: In the very early design phases--and this goes back a number of years and I'm not very clear-- I think I must have attended meetings at which, where the topic was discussed. That's a long way back and I'd have to almost go back and try and dig through the files and find notes to be sure, but I'm sure I must have attended some meetings where it was discussed. And the primary purpose, as I remember, was to provide man-power savings and also to consolidate all the sampling facilities into an area where they

wouldn't be spread throughout the plant. It's ones zone of contamination rather than two or three. And I believe this was the primary intent when they were built in the sampling room.

YUHAS: Were you involved in the decision to procure various solid state detectors for routine chemistry analysis?

FREDERICK: Yes.

YUHAS: Were you instrumental in writing the procedures and the programs for the library for determination of isotopic content of various samples?

FREDERICK: I had input into them, I'm not sure if I was instrumental or not. The programs for doing the actual analysis were done under contract by people with the LRC facility for Babcock and Wilcox. I had some input into what the librarys were.

YUHAS: Are you familiar at all as to why the Unit 2 solid state detector, the GeLi Detector, had not been fully utilized in the last year?

FREDERICK: There had been some problems with the detector. It had been damaged. There had been a problem with the liquid level monitor. It had, I think, run out of liquid nitrogen at least once, which caused them to go for redrifting. There was a further problem with the detector--I'm not sure that it was a drift problem--but there was a problem with some of the

electronics. All of these, combined with the activities during startup, combined to make the thing not available when the actual source material for its proper calibration was available. So I don't think you can say there is any one reason--there were a number of reasons why it was not calibrated before the accident.

YUHAS: One common mentioned reason that the thing was not utilized is that the backgrounds in the Unit 2 auxiliary building--or service building, excuse me--were such that they had an excessive dead time and additional shielding needed to be provided for calibration, operation of that detector. Are you familiar with that?

FREDERICK: I think that statement is inaccurate. There was a question with shielding. We were in the process of procuring shielding, but it had nothing to do with dead time. It was in an effort to reduce the background further to obtain lower MDAs. It had nothing to do with excessive dead times. You can put that detector sitting right out in the middle of an open field, and then, there is no problem with dead time. So I feel that that statement would be not accurate. I would say that the question with shielding was more to reduce background to obtain lower MDAs, and to permit lower MDAs with reasonable counting times.

YUHAS: Okay. You mentioned earlier that you were involved in the relocation of the Unit 1 counting system to apparently the screen house.

FREDERICK: Right. Okay, the Unit 1 circulating water pump house.

YUHAS: Okay. Do you remember the approximate time and date that that was done?

FREDERICK: I believe it was done on Saturday, March 31. It was either Saturday, March 31, or the first day of April.

YUHAS: In reviewing the health physics aspects in general prior to the incident and during the incident, we note that there were particularly long counting times involved during routine operations of Unit 1. Is this because of the same sort of problem with--you just needed more shielding for the detector, or was it due to the detector location, or...? We saw particularly long delay times in talking to people, for instance, people tell us to just to count a couple of air samples, charcoal filters, noble gas for entering the reactor would require two to three hours.

FREDERICK: Dead times and/or MDAs were not a problem, to my knowledge. The original Cram program, which is the name that we've assigned to the program that analyzes the spectra, operates on a Hewlett Packard Model, I think 9830A, which is a fairly slow calculator. Its actual analysis of the program would take anything from twenty-five to fourty-five minutes, depending on the number of peaks that it found. Counting times, the Unit 1 GeLi detector, I should be more accurate and say the Unit 1 intrinsic, was located in the shield and was capable of the kind of sensitivity, so I

don't feel that contributed to longer count times. Well, count times to get the sensitivities that we need are frequently on the order of twenty minutes, anyway. So I don't feel that the shielding, or lack thereof, would have contributed to longer count times.

YUHAS: What's the purpose of your routine gross fifteen minute degased activity?

FREDERIK: It's primarily a number to see whether the activity is going up or down. It's something to--it's a trend number.

YUHAS: Is that number corrected for power history?

FREDERICK: Frederick: No. The number is essentially a fifteen minute gross beta gamma degassed, which is used as a trend number and to make a proper--or to use the number it is necessary to know what had been done with the reactor plant for some time preceeding the numbers generation.

YUHAS: Could you describe your involvement in the TMI 2 or TMI general emergency plan?

FREDERICK: Pretty much what most of the people--essentially, to follow the drills and to go the musters. I was not directly involved with either of the two emergency plans. That was primarily a health physics function. The chemistry personnel were designated as one foreman or supervisor in

each unit who responded to the plan in the slot provided, but I didn't fill any of those positions at a time which we actually had one of the drills. And I responded pretty much as anyone else that was onsite, not specifically called--to go to the muster areas and stay there and be counted.

YUHAS: Were you contacted or--rephrase the question. When were you contacted and informed of the incident TMI 2?

FREDERICK: Mid to late morning on March 28th. I was at one of our coal stations in North Jersey. I was contacted, from an informational standpoint by Kerry Harner and Gary Reed, who were the two chemist onsite, who at that time had very little information. I talked briefly with them again in the afternoon of that day, and I believe the next morning--on the 29th, I was back in my office in Reading.

YUHAS: Did either Kerry Harner or Reed describe to you the sequence of decreasing boron sample results?

FREDERICK: No.

YUHAS: In the ensuing days--I am thinking primarily of the urgent need to take a reactor coolant sample to identify the extent of fuel damage and some other aspects--were you contacted or asked, or did you volunteer any information in the planning, preparation or execution of this sample?

FREDERICK: You mean prior to the taking of the first sample?

YUHAS: I mean prior to taking of the first real deliberate sample which occurred the evening of Thursday, March 29.

FREDERICK: No.

YUHAS: Were you aware the sample was going to be taken?

FREDERICK: No.

YUHAS: Were you informed after the sample had been taken, as to assist in the evaluation of the sample, with the results, or who was going to analyze it for what?

FREDERICK: I had seen some of the results as they came back from the areas where they were to be analyzed. And I was involved with discussions of who might be capable of analyzing the sample. I was more involved with subsequent samples, okay, the bomb samples that went to Idaho, to Bettis and I believe to Oak Ridge.

YUHAS: You mentioned that you were aware, to a certain extent, that a sample was going to be taken and who might ...

FREDERICK: I was aware that the sample had been taken ... not was going to be taken ... after it was taken.

YUHAS: You had not been contacted prior to it being taken?

FREDERICK: No.

YUHAS: Okay. Again, this is an entirely subjective comment on your part, but knowing that the plant has suffered severe transients and the likelihood of fuel damage may have occurred, could you describe what you would consider to be the proper methodology for collection of the sample, if the objective were: one, to know the boron concentrations; two, to try to perform those analyses that might best provide information as to the extent of fuel damage or other parameters within the reactor coolant system?

FREDERICK: That's pretty all-encompassing question. Well, first of all let me start with the boron. Practically any method that you'd use to take the sample should not hamper its validity for boron analysis. The same thing would be true for the non-gaseous species; the iodine, the cesiums, many of the others that were there at the time. So the primary concerns that I would have would be less on what was necessary to obtain a valid sample, and more on health physics aspects of actually obtaining the sample. And the only things that I would think would be required to obtain a valid sample would be to assure proper valve lineup to recirculate through the sample sink and back to the Unit 2 makeup tank, for some adequate period of

time. Probably something between thirty minutes and an hour would assure you of valid samples at the pressure ranges that the system was at that time. As far as the validity of the sample, something on that order would have been all that would have been required, I think. The health physics aspects of course would be something different. To obtain the gaseous samples, then there are other considerations: to be sure that the bomb was properly installed--that a bomb was properly installed; that it was, of course, small enough to have an activity level that could be handled, since you have to physically remove swage-lock fittings to remove the bomb. And these considerations, of course, were some of the things that really did delay the next sample for the length of time that it was delayed--making sure that we could do that properly. It was the health physics considerations and the considerations of having a bomb that we felt appropriate that delayed those samples.

YUHAS: The point of my question was, I would think that as a Chemist, if one were going to incur the exposure to collect a reactor coolant sample, to gain the most meaningful information, one would have collected a pressurized sample, primarily so that the knowledge that was available from the gases in solution, especially the mix of fission product gases as well as the amount of hydrogen that would have come out of solution, would have been very important information not to lose by just collecting an unpressurized beaker of coolant.

FREDERICK: Okay. The concerns, I believe--and this is Monday morning quarterbacking, I could say--but the concerns, primarily, when the first sample was obtained was to get a boron number. At that particular time, the only bombs that the site had were something on the order of 150 milliliters, and I think by that time it was recognized that that was a quantity of the coolant that people simply weren't prepared to handle under the circumstances that it would have had to have been handled in that sampling room. The levels would have been extremely high, and I believe the first effort--and this is not speaking from personal experience--the first effort was to confirm the boron number. And that sample would not--or would have been valid under the circumstances it was taken. It was after the fact that people began to have the concerns about the gases that later developed. And I think, looking at it even from the standpoint of looking at it after the fact, I think that for the earlier sample, I probably would have also placed the same priority on the first number being boron. The other things that people were concerned about were concerns that developed at a later date as more knowledge was available.

YUHAS: Are you aware of the amount of reactor coolant that was collected on that first sample that we're talking about?

FREDERICK: I'm told some portion of a 100 milliliter graduated cylinder. I didn't see it personnally.

YUHAS: At this time I don't have any additional questions. Do you have any?

JACKSON: Yes, I've got just a minute--do you know Mr. Yull, a B&W Chemist?

FREDERICK: Dale Yule?

JACKSON: Dale Yule.

FREDERICK: Yes.

JACKSON: Can you state briefly what he did here? I understand he was onsite and is no longer with B&W.

FREDERICK: He coordinated some of the B&W efforts. I'm not sure of all the involvement that he might have had, and I think that would be something that you could better get, say, from Lee Rogers, to whom all of the personnel that came onsite for that company normally report. I think Lee could probably give a much better answer to that than I could. I'm aware of some of the things that he did. Okay, I am sure that he was instrumental in bringing up the small counting trailer, which they set up beside the circulating water pump house, and that he assisted in getting the small secondary laboratory set up that they have in the training facilities. But I'm sure that's not descriptive of the spectrum of his activities.

JACKSON: Was he a technical type or a non-technical type?

FREDERICK: Technical.

JACKSON: Did he get involved in the chemical analyses himself, or was he doing just logistical type support?

FREDERICK: I suspect that he was somewhat involved in the actual analysis. He may not of done them, but I think that he was probably involved in setting them up.

RESNER: At this time we'll take a break and change the tape.

JACKSON: I've got no further questions.

RESNER: All right. Then let's conclude the interview. I have one question for you, Mr. Frederick. You spoke with swage-lock fittings. Would you spell that for the record please.

FREDERICK: I'm not sure if they actually are swage-lock or Ty-lok but the term is used to describe a series of small compression fittings that are used to join stainless steel tubing.

RESNER: Do you know the spelling of that please?

FREDERICK: I believe these are actually Ty-lok and, in which case, that's T Y -L O K.

RESNER: All right. Thank you very much. We'll conclude the interview now, and the time now is 1:50 PM Eastern Daylight Time. Thank you very much for your time, Mr. Frederick.