A. Right.

Q. When you -- before you moved out to the West Coast, you lived here in the Knoxville Oak Ridge area.

A. Yes.

Q. And you worked for, what, six years in and around the Oak Ridge facility?

A. Yes.

Q. And you wore a dosimeter film badge --

A. Yes.

Q. -- every day for six years?

A. I think I was only routinely badged for two -- approximately two years I was at the K-25 facility.

Q. Okay. And do I remember you telling me that you never registered anything on that badge that worried you?

A. No. No.

Q. So what I said is true, you never registered anything on the badge?

A. No, that worried me. I did register positive dose on the badge, of course.

Q. Okay. It didn't worry you?

A. But it didn't worry me.

Q. Do you know how much radiation you got during that two-year period?

A. Oh, seems to me like it was on the order of 50 millirem, something like that.

Q. Millirem?

A. Yes.

Q. And a millirem is, what is that, one-one millionth of a rem?

A. One-one thousandth of a rem.

Q. Thank you.

Now, I know that you don't -- you didn't calculate and to be fair, you don't feel like you can calculate what Mr. Payne's radiation dose was at the railroad but you would agree with me that it wasn't likely to have been more than 10 rem, was it?

A. I wouldn't care to answer that.

Q. You don't --

A. I guess you're wanting a yes or no. No.

Q. Not likely to have been more than 10 rem.

A. Yeah, I'm not sure that -- since we have no information, okay, if you will allow me to answer it as more -- as unlikely, sure, I'll answer

that, it's unlikely to have been 10 rem.

Q. Okay.

THE COURT: Talking about total?

MR. JORDAN: Yes, sir.

A. Yeah, total.

Q. (BY MR. JORDAN) And it's actually unlikely to have been even as much as 5 rem, isn't it?

A. Let's just stay with the 10 rem.

Q. Okay.

I wasn't going any lower than 5. I'm not going to 3 and to 2 and to 1, so let's go back to 5 for a minute. Would you agree with me that it was unlikely that it was as much as 5 rem?

MR. SHAPIRO: I'm objecting, I don't know what the question asks, what period, when.

THE COURT: It was a total radiation he would have received during the time that he may have been at Witherspoon as I understand it; is that correct?

MR. JORDAN: That's correct.

Q. (BY MR. JORDAN) Unlikely as much as 5.

A. And, Mr. Jordan, that's a difficult

question since we don't -- we don't really have a clue, have a clue what he could have been exposed to during that period. You know, that's a -- that's a difficult question to ask -- to answer.

I mean, there was -- I think that there was sufficient material there in that scrapyard and on that train that given the right circumstances and internal dose of 10 rem to the lung could have happened. Now, is it likely? Don't know.

Q. Just because it was there doesn't mean he was exposed to it, does it?

A. Just because it was there doesn't mean -- doesn't 100 percent mean that he was exposed to it but we don't know he wasn't either.

Q. And just because that's a source of radiation sitting over there on the bar and I'm standing over here, I'm in the same room with it, but it's not exposing me, is it?

A. Sure it is, that's a source of radiation, to some level it is absolutely exposing you to some level of radiation.

Q. Let's say that's a low level exposure right there.

A. Well, then you are going to be

exposed lower because you are further away from it.

Q. Is that going to hurt me?

A. Again, it depends on the size of the source. I have encountered sources in my career that you would have been in danger at that distance, so --

Q. Dose reconstructions, Dr. Dooley did a dose reconstruction for us, and I know that you have some concerns about some of the assumptions he made, not his methodology.

A. Not his methodology.

Q. The methodology he used, the equations he used, maybe the software package, I don't know --

A. It's pretty standard stuff.

Q. Standard stuff.

Okay. So you don't quarrel with that, you just quarrel about some of his input, I guess; is that fair?

A. That's fair.

Q. Now, just generally and not talking about Dr. Dooley's dose reconstruction, but would you agree with me that a dose reconstruction is a legitimate thing to do in your profession?

A. Generally yes, it's a legitimate

thing to do.

Q. And there is a program, a workers' compensation program for radiation workers?

A. There is, yes, sir.

MR. SHAPIRO: Your Honor, could we approach the bench, please?

(Bench conference out of hearing of jurors.)

MR. SHAPIRO: I thought we had a motion in limine that they were not going to mention any other particular law that has no application to the FELA, Mr. Jordan.

MR. JORDAN: Mr. Shapiro, we did have such a motion and I understood that the agreement was I would mention it, I would talk about the methodology, I would not talk about its applicability to the Payne case and I don't plan on talking about any of that, nor would I talk about the fact that Mr. Payne would not have been eligible for compensation under it. I'm talking about --

THE COURT: Just going to talk about methodology, that's all we are going to talk about. Okay.

MR. SHAPIRO: So you are not going to talk about the probability of causation?

much.

Q. 500 millirem?

A. What?

Q. 500 millirem?

A. It's 500 millirem to the maximally exposed individual, it's a hundred millirem average.

Q. Do you know if Mr. Payne's exposures ever exceeded 500 millirem?

A. I do not know, no.

THE COURT: Is that within a certain time or is that lifetime or what are we talking about?

A. It's per year.

THE COURT: Per year.

THE WITNESS: Yeah, per year.

MR. JORDAN: May I approach one more time, Your Honor?

THE COURT: Yes.

Q. (BY MR. JORDAN) I'm going to ask you about another publication from the Health Physics Society, Mr. Mantooth, and I'll hand you a copy of the article. It's called "Radiation Risk and Perspective, Position Statement of Health Physics Society," adopted January 1996, revised August 2004.

Are you familiar with that one?

A. I'm not sure that I am. And let me say, these are available on line, I could go look at them if I wanted to, it's just that I don't believe I've actually read this one.

Q. Okay. Well, you're welcome to spend as much time as you'd like reading it.

Let me just read you a sentence and see if you agree with what they say, the Health Physics Society talking about radiation risk and perspective on the first page.

A. Uh-huh.

Q. Second paragraph.

A. In italics?

Q. Yes, sir. Says "There is substantial and convincing scientific evidence for health risks following high dose exposure."

You would agree with that?

A. I would agree with that.

Q. "However, below 5 to 10 rem which includes occupational and environmental exposures, risk of health effects are either too small to be observed or are nonexistent."

Would you agree with that?

A. I would agree that they are too

small to be observed.

Q. And are nonexistent?

A. Well, since you really don't know what's causing the health effect down in that lower region of exposure, I mean, maybe the health effect was caused by radiation, maybe it wasn't so I'll give them that, or are nonexistent.

Q. Okay.

A. But certainly, the first part that they are too small to be observed, they can't be differentiated by effects that are caused by other environmental things.

Q. Yeah, I understand.

But what they are telling us is below 5 to 10 rem risk of health effects are either too small to be observed or are nonexistent and you told me just a minute ago that, in your mind, it's unlikely that Mr. Payne had radiation exposure of up to 10 rem, didn't you?

A. That's what I said.

Q. There's one other statement in there that either I don't have a blowup for or I've lost it.

It's on the second page. I want to ask you about it.

What does radiogenic health effects mean?

A. Means radiation caused health effects.

And as it says up there, it primarily means cancer.

Q. Yes, that's what we are talking about here, cancer.

Do you agree with that sentence, "radiogenic health effects, primarily cancer, have been demonstrated in humans through epidemiological studies only in doses exceeding 5 to 10 rem delivered at high dose rates. Below this dose, estimation of adverse health effect remains speculative"?

A. Absolutely. Yes.

Q. And that last sentence, "epidemiological studies have not demonstrated adverse health effects in individuals exposed to small doses, less than 10 rem, delivered in a period of many years."

Do you agree with that?

A. Yeah, I would agree. I think the key word is they haven't demonstrated adverse health effects.

Q. And you told us a few moments ago that it was unlikely in your mind that Mr. Payne had up to 10 rem. Right?

A. That's what I said, yes.

Q. You talked a little bit about the Witherspoon facility and I want to touch on that just a minute.

Did you tell me when I was with you out in Washington that you thought you might have been there?

A. I believe I was, yeah, when I was at K-25, we were asked to go to a site in Vestal. And so memory is foggy, I don't remember whether that was the 901 site or whether it was the other site but we basically found a Sealink container full of drums with uranium tailings.

Q. Okay. You don't really remember where that was?

A. No, I don't.

Q. There were a couple of sites, separate and discreet sites out there that -- that Mr. Witherspoon did something with. Right?

A. Yes.

Q. Okay. The one we are talking about here is -- is 901 Maryville Pike.

A. Yeah, at that point it's just identified as, okay, we are going to look at this further.

Q. Okay. Now, how many such discreet sites of plutonium were there at the Witherspoon site?

A. In that one report, I believe it was like three out of five samples in one case, eight out of eight on another, something like that.

Q. Okay. Where were they located; do you know?

A. They were surface soil and I think they were in the -- they were actually in the non-Candora triangle area. And this was actually after all -- after the metal was gone. These samples were taken essentially after the site was cleaned up.

Q. The Candora triangle is a little triangle of land that's about a half acre maybe and that's where the trains came in?

A. That's my understanding, as I read through the documents, I find people flip-flop back and forth but I believe for our understanding, the Candora triangle is the part that the railroad owned.

Q. Yeah. And that's where Mr. Payne worked, isn't it?

A. Primarily that's where he would be. Unless he was off looking for the yard foreman.

Q. So if the plutonium was found in the non-Candora triangle, I take that, and you tell me if I'm wrong, to mean that it wasn't found in the Candora triangle?

A. No, actually, there were positive results but they didn't exceed the threshold.

Q. Okay. Let me redial for a minute.

A. Okay.

Q. Are you referring now to the Candora triangle?

A. In the Candora triangle, yeah, the -- there were -- analytical results were positive for plutonium but they just didn't exceed that particular study's threshold that they were going to do the health --

Q. To get anybody's attention.

A. Right.

Q. Okay. The three that did get somebody's attention because they reached the threshold, not necessarily being a hazard but getting somebody's attention, they were not in the

Candora triangle?

A. They were not in the Candora triangle.

Q. So you don't have any evidence that Mr. Payne was ever exposed to those three sites, do you?

A. To the ones that were in the non-Candora triangle?

Q. Yes.

A. No.

Q. And if there were positive sites in the Candora triangle and that's where he worked, they were not of the level to get anybody hot and bothered about. Right?

A. Well, not in 2007.

Q. Right.

A. After the site had been cleaned up. It's hard to say what it would have been in 1964 or '5.

Q. Because we don't know.

A. Because we don't know, that's right.

THE COURT: Getting close to the end?

MR. JORDAN: I am, Your Honor, I'm

I'm trying to shut it down.

(Brief pause.)

Q. (BY MR. JORDAN) You know, finally, Mr. Mantooth, you told us -- told us about the state of Tennessee Department of Radiological Health, they are the agency in the state of Tennessee that's supposed to take care of everybody in terms of radiation exposure; is that right?

A. That's true. I think.

Q. Have you had professional interaction with some of those folks from time to time?

A. I would have to say no.

Q. Okay. Now, in all the mass of materials Mr. Shapiro sent you, did you see where the Tennessee Department of RAD Health had had quite a long and intense interest in the Witherspoon site at 901 Maryville Pike?

A. Yes.

Q. They had been out there since the 1960's, hadn't they?

A. Yes.

Q. They had sent health physicists and industrial hygienists and other investigators out there to test for radiation exposure, hadn't they?

A. Right.
Q. And they did that in the '60s?
A. In the '60s, the '70s.
Q. And they did that in the '70s?
A. Yeah.
Q. And they did that in the '80s.
A. Yes.
Q. And I guess one of the things they were looking for is plutonium.
A. Right.
Q. And uranium and anything else that was radioactive and potentially harmful. Right?
A. Yes.
Q. Now, those folks at the Tennessee Department of RAD Health knew that there was a railroad out there, didn't they?
A. I'm sorry.
Q. They knew that there was a railroad?
A. Oh, yeah.
Q. They knew there was railroad tracks and they knew that the railroad crews would come in and switch there periodically as we said.
Mr. Mantooth, do you have any evidence that at any time in the 1960's or the

1970's or the 1980's anybody from the Tennessee Department of Radiological Health even so much as picked up the telephone and called somebody at CSX and said, fellows, you got a problem with radiation with your crews, did they ever say anything like that to them?

A. There were -- I did see things where there were communications between the Department of Health and CRX -- or CSX, I can't recall any specific, like, warning or anything else that had to do with the hazards to the railroad.

Q. What you're talking about, and tell me if I'm wrong, were communications between the railroad and the RAD Health people involved a gentleman by the name of Paul Maynard.

A. That was one.

Q. Who was a foreman at the railroad who called them and said tell me if I have got a problem out here. Right?

A. That, as well as Mr. Freeman and Mr. Badders were in communication as well back in the '80s.

Q. But you don't find any evidence that the state of Tennessee ever told the railroad they had a radiation problem or that its crews had a

radiation problem, did you?

A. I did not, no.

Q. You don't find any evidence that the investigators for RAD Health that were out there for a couple of decades ever said to the railroad you got such a problem, you got to quit coming here, they never said that, did they?

A. No, I don't believe they did.

MR. JORDAN: Thank you.

THE WITNESS: You're welcome.

REDIRECT EXAMINATION

BY MR. SHAPIRO:

Q. Mr. Mantooth, I promise to this jury three minutes or less, okay?

In the first 20 years Mr. Payne was there, did he ever get provided a simple film badge?

A. No, there's no records to that.

Q. And when you talked about the regulations that you said you felt were not complied with, would it matter whether the railroad had gotten -- I'm sorry, I got to figure out how to word the question properly.

Let me start this over.

Did the railroad ever produce a bill of lading from any shipment from Oak Ridge to

Q. Could they have put a car not at the front of the train that had contaminated scrap in it?

A. Yeah, or you know --

Q. Yeah. This 10 millirem or 10 rem, I really don't know what it means, I'm not sure anyone here does, but let me ask you this, one trace of plutonium that came off one piece of scrap at the Witherspoon site, was that enough to be a health hazard?

A. It may be low but it could be enough and I'm glad you brought that up. The 10 rem, I'll be short, the 10 rem essentially is a level where we have clearly demonstrated health effects. The below, the 5 rem piece is -- it doesn't mean there's not a hazard or there's no effects, it just means you can't tell them, we are talking about cancer, you can't tell it from what happens naturally. Doesn't mean it doesn't happen, so, I mean, each of us sitting here have a 30 percent chance of getting cancer about and maybe a 16 percent chance of dying of it if we never get the first rem of radiation so when you get down into those low levels, you just don't know. You just don't know. So to answer your question, one atom I

think may be rare but one atom could cause cancer.

MR. SHAPIRO: That's all my questions.

MR. JORDAN: Nothing further. Thank you, Mr. Mantooth.

THE COURT: Thank you for being here.

If we can try to start at 8:30 again in the morning.

One little brief comment to the jury. When we were preparing to have this case, I asked them how long it was going to take and how long everybody would take. You can go ahead, Mr. Mantooth.

And we are already a day and a half behind schedule now.

I know we got Thanksgiving coming up. You all be thinking about what your wishes would be. I'm going to try to get a more accurate estimate in the meantime before tomorrow about what's left in this case. But be thinking what you would like to see happen as far as the time you spend here in court. We got a lot of options, just go on, skip days, we can come in the

the railroad.

A. Uh-huh, there's just spur tracks there.

Q. And the deliveries were mostly in the afternoon?

A. Yes, as far as I know.

Q. And you all closed at around 4:30.

A. Yes.

Q. The workers did, true?

A. Right.

Q. But you worked longer.

A. I worked until 5:00.

Q. And based upon your knowledge, did there come a time where Mr. Witherspoon began the process of bidding on scrap metal from Union Carbide, for example?

A. Yes, that was in the 60's. He bid a lot. We got a lot of material from Union Carbide whether it was contaminated or not.

Q. In other words, you were in the business of scrap metal.

A. Right.

Q. We reviewed those records.

You had some records of sales, and the first sale of metal to Mr. Witherspoon was

sometime in 1963.

A. Yes.

Q. And the first delivery of this low grade metal was in 1964.

A. Yes.

Q. And then the last delivery of this low grade metal was in 1972.

A. That's correct.

Q. So between 1964 and 1972 you all were in the business of this low grade radioactive surface contaminated metal, true?

A. That's correct.

Q. White Wing. What is White Wing?

A. White Wing was a yard at Oak Ridge where they stored the contaminated metal.

Q. Was that a gathering place for like Y-12 and K-25 and ORNL? They would bring all of their metal to this place.

A. I think it was, but I'm not --

Q. There was a smelter out there, I believe.

A. There was a -- it was just a yard, and we moved a crane in and loaded some of the material that he had bought.

Q. There was not a railroad siding out

there, apparently.

A. No, there was not a railroad siding.

Q. So all of the metal that was delivered to White Wing would have been taken to your place of business by truck.

A. That's correct.

Q. Okay. Now, you've told the jury about this low grade material through these licenses, and if we looked at the licenses --

THE COURT: Maybe the jury has them.

MR. BAKER: I'll just use a sample one. That's okay. Keep them.

Q. (BY MR. BAKER) These licenses provided that these folks at Union Carbide or Martin Marietta or any nuclear facility, they promised you that they would provide this metal and it would be very low grade.

A. That's correct.

Q. And they were the people who were selecting the metal that was low grade; is that true?

A. Uh-huh.

Q. And you relied on them to provide

you with this low grade material.

A. Yes, our contract stated the amount of surface contamination that it would contain.

Q. Okay. And they were the ones who were doing the -- they tested the metal.

A. Right.

Q. And you relied upon their expertise to do the testing.

A. Yes.

Q. And that would be Union Carbide, Department of Energy or any one of these places who was responsible for the metal.

A. That's right.

Q. And then will they would load it on these rail carries, correct?

A. They would -- yes, it would either be loaded on a rail car or truck, depending.

Q. Some of the metal was delivered by rail and it was, for example, Union Carbide or one of these other places, they were the shippers and they would to the loading on to the railroad cars.

A. Yes.

Q. And then the metal, on occasion, would be shipped by rail to your place of business.

A. Yes, that's correct.

Q. Now, you've told us that in 1972 you received your last shipment, and that was when the last metal was brought in.

Tell the jury or give the jury some idea of whether this metal, this low grade radioactive metal, was a large part of your business, a small part of your business or what.

A. It was a small part of the business because we had all of our container scrap, plus the scrap that we purchased across our scale. Also, he did demolition where he would tear buildings down for the steel and so forth.

Q. I believe you told us that this was about five percent of your business.

A. Five to ten percent, I would say.

Q. Okay. And during 1964 to 1972, you all continued in the business of processing and receiving this non-contaminated metal as you had done before.

A. Yes.

Q. Now, then after 1972, this business continued on.

A. Yes, it did.

Q. In other words, you all continued to receive rail cars with metal that was

non-contaminated.

A. Yes.

Q. And then you continued to receive empty rail cars that would come in so that you could fill them up with the non-contaminated metal and send them out to all of these mills that you were talking about.

A. That's correct.

Q. That's how you made money.

A. Uh-huh.

Q. The mills would pay you money for the metal.

A. Yes, we went through a broker.

Q. So if a rail car was delivered to you, say from 1972 on, there would be no radioactive material in that rail car.

A. That's correct.

Q. And before 1972, you all received plenty of empty cars that had no metal in them so that you could use them to fill them up with metal to send them to these mills.

A. Yes.

Q. Now these licenses, when we look at the licenses, the various licenses, those were contractual agreements between Witherspoon and the

it was.

Q. Do you have a memory -- this is difficult. I mean, it's been a long time.

Do you have a memory of his being out there on your property for like an entire several month period of time?

A. He could have been. He was there a lot but I don't know, you know, whether it was for months at a time.

Q. And you've told us about your health physicist, Mr. Fields.

A. Yes.

Q. He's deceased now, isn't he?

A. I honestly have not had any contact with him for the last 15 or 20 years, so --

Q. Did there come a time when some publicity developed there in the early to mid 80's where the railroad stopped delivering cars to the --

A. Yes.

Q. -- to your property?

A. Yes, I think in 1985 they decided to -- that they would bring the cars up to the gate, and then it was our responsibility to bring them into the yard to load the -- you know, so that they would be ready for loading.

Q. That gate was located over there at the Candora Road crossing.

A. Right, uh-huh.

Q. Because right next to you was the marble company.

What was the name of that company right next to you? There was some sort of cement company, wasn't there?

A. Oh, Tennessee Asphalt.

Q. Right. Right there.

A. Yes.

Q. If I can just take this, I'm going to circle Tennessee Asphalt. That was just right next to you.

A. Yes.

Q. And then over -- then there's Candora Road. I've circled that.

A. Uh-huh.

Q. And they stopped there at Candora Road before they came into the property.

A. Right.

Q. And they would just drop the cars there, and then it would be your company's job to go out there and use some sort of device and pull them in.

not, that you sent to me?

A. Yes, some hand sketches, yes.

Q. Let me see if I can find them. Maybe you can first of all I shared these with defense counsel before the deposition and I marked these 2-A through I think G. Are all these your handwriting?

A. Yes, they are. They are my handwritings.

Q. Why did you do these?

A. I did these again when you talk about loop holder and you talk about air compressors and you talk about engines. I am quite familiar with them, but I am sure you people in this room aren't. Anyone who would be listening to this deposition would not be familiar with them.

Q. Okay, let's talk about briefly 2-a, you got --- it's a little small, I hope the videographer can get in on this. Is one a top view and one a side view or what are we looking at?

A. You would be looking down at the top of the locomotive. This is supposedly a top view and this would give you a side view.

Q. And so you --- just briefly can you tell any areas that you just recited that you

removed asbestos from on a typical engine?

A. Yes, the radiator would have sat above the air compressor compartment and over top of this area of the locomotive. The line would have run overtop of this area and hooked to each side of the loop holder.

Q. And what kind of line, is that a pipe?

A. That is a pipe, and I would say that pipe is roughly three inches.

Q. Anything else on this diagram here that you want to --

A. You have asbestos there, the air compressor feed line would be on the top of the air compressor. It rolled over and it come over like this and around. It was like an S pipe. And it hooked into what we had, I called it a temperature gauge on the loop holder rack, right behind the loop holder rack.

Q. Where is the crew in relation to this drawling?

A. The crew would be in this area up here.

Q. Okay. Well, that area that you are pointing to are nowhere near them. What is the

significance of that, if anything?

A. This --- these areas here are all friable. These materials that were used in these particular areas, all between the engine and the asbestos used over top of the loop holders and off the air compressors was a wrap, asbestos wrap that became friable.

Q. But what does that have to do with the crew cab on the other side of the engine? Go ahead sir.

A. Okay, what it has to do is when these things become friable and these materials --- this --- you have to understand a locomotive vibration when you have them running. These asbestos fibers would be released and they would move throughout this area and they are connecting to the crew cab.

Q. Well, let me see here. Here is another drawling, 2-b, this is another drawling that you done, what if anything is being shown here of any relevance?

A. AS to --

Q. As to asbestos?

A. This would be your cab area. And these are your seats, three seats across. There

would be a cab heater here, in front of the engineer seat, this would be the engineer seat in front of the control stand. This would be brakemen or fireman seat whichever you would choose to. These cab heaters had asbestos that ran through the floor, the piping ran through the floor and up to the cab heater floor.

Q. Okay. For those of us who are not on engines and are not familiar with them, what do you mean, what does a cab heater do?

A. A cab heater is --- it is the same as a furnace in your home, it is heating device to supply heat for the crew in the cab.

Q. Did the typical cab heater have any fan control?

A. Yes, it had a three speed fan.

Q. Were the cab heaters on these classes of engines that you worked on, was it forced air or radiant air?

A. They are forced air.

Q. Did it have a dial so a crew member could turn the dial?

A. Yes, there would be a dial on the left hand side of the cab heater itself.

Q. Okay. That is another little sort

of a view of a cab heater?

A. Yes, this is a view of a cab heater. Similar to what they would look like on TP9's, 30's, 35's, had them.

Q. Okay, let me go here. Here is 2-c. What are you drawling here?

A. This is an overhead view of what the piping would look like running underneath the cab floor of the locomotive if you can see through the cab floor. This is the piping diagram of the cab heater piping. There was a feed and return line to both cab heaters, and this would be wrapped in asbestos.

Q. How many feet long is those pipes, I mean, this is obviously not in any particular scale here. How many feet are we talking about?

A. You are talking over all length of those pipes would be --- I would estimate somewhere between 10-12 feet.

Q. Okay, well let me see. A 2-d, what is this?

A. This is what I was talking about earlier. These cabs heater lines, these are cab heater lines going up to the floor. There was a floor inside the heater itself, it looks like

radiator. If you wanted to know what a cab heater floor is, it looks like the radiator in your car and these are your pipes that come up through the floor and connect there. These pipes would be wrapped in asbestos there.

Q. Well, would you personally handle removing asbestos insulation from those pipes?

A. Yes.

Q. Would you have to take some sort of any type of cover off the cab heater to get in there? How would you get access to the pipes?

A. This has a shield that fits like this, it is molded to the front of the cab heater. And you would remove that shield and then you break these marmons loose and you can remove this core from the inside of the cab heater.

Q. Okay, in the times --- you personally did this type of repair?

A. (Indicates).

Q. You are nodding, can you say verbally yes or no. Did you do this type of repair?

A. Oh, I am sorry, yes I did. Yes.

Q. Okay, when you would take the heat --- I'm sorry, a heat shield or the metal cover off, would you observe what was going on inside of there?

A. Yes, you have what looks like to be asbestos residue from again, this was friable asbestos in these areas on older locomotives. And what you would see is residue build up inside this cab would be laying down here and you would see it in the front or the back of the cab heater shield when you took it off.

Q. You never worked as an engineer or a conductor on engines, did you?

A. No sir, I did not.

Q. You wouldn't normally be riding with them when they did their work, would you?

A. No, I would not.

Q. How do you know if there is vibrations inside engines?

A. We run locomotives in the test shed. And they run at full throttle for eight hours a day to be tested.

Q. Were there any vibrations?

A. They definitely vibrate, yes.

Q. Okay. Let me go to the next one here. Here is a diagram here, it is real small. What is going in this --- what are you showing here, 2-e?

A. Let me look at this carefully. This is -- it is, I am trying to see. I am trying to read

the writing and I can't read it from this angle.

Q. Is it your drawing?

A. Yes, it is my drawing. And it looks like --- what it is, it's another diagram of how cab heater piping is set up underneath the cab.

Q. All right, 2-f, what is this?

A. This is a --- if you were sitting down in a short nose of a locomotive and looking up into the cab, this is a two step area that goes up into the cab. This would be the cab heater on the back wall if you can see through this wall that would have been here. And this would be the cab heater on the engineer side. This is the toilet area. And this area here on the 30 and 35 was open to the air brake compartment there.

Q. Did some engines have two cab heaters and some have less or more?

A. All the locomotives that I have ever worked on had two cab heaters.

Q. And did those, were those the HVAC or the heat system for the crew cab?

A. Yes.

Q. To get the air blowing into the crew cab, could one cab heater basically supply the air for the entire crew cab?

A. In the northeast sector I would say probably not.

Q. Anything additionally to add in 3-g, the last sketch you provided?

A. This would be a side view of what a -- if you were looking from the side. Again, this is the short nose area of the locomotive, this would be the cab. There was a water cooler down on the lower deck.

Q. Does the water cooler or toilet have any asbestos insulating material?

A. These areas had no asbestos insulating material. The material would be underneath this cab floor and going to your cab heaters. The area here that you are looking at, is always open. It is open to that air brake compartment which is what we call that area underneath the cab floor.

Q. What is significant about that, sir?

A. That is significant because if you have damaged asbestos underneath this cab floor. The fibers can also move through the air floor in this area and enter the cab.

Q. What is 2-h showing sir?

A. A 2-h, I gave that to you and again it is nothing more then to identify for those who do not know what I am talking about. I say marmom couplers or O-Dots, they are just rough diagrams of what we would be looking at.

Q. Is it a value?

A. The O-dots is an actually a thermostat.

Q. Are these parts contained inside the cab heater?

A. These parts are contained in the cab heater piping that goes to the heater.

Q. Now did you also supply I believe it was a total of 17 photographs?

A. Yes, sir.

Q. And are these photographs that you took yourself?

A. Yes, I did.

Q. Before I get ahead of myself here. I want to move to introduce all of those sketches, 2-a through, that you have just identified. We will go organize them in a minute.

Can you look through 21, 1 through 17, did you look through them before the deposition?

A. Yes.

Q. Are those the pictures that you just outlined that you took yourself, Mr. Rhodes, except for one I believe which you are in the picture?

A. Yes, these are pictures that I took in 2002.

Q. Okay, I want to go through what if anything that you want to describe about these pictures, okay. And I have on the screen here, Number One. What are we looking at here sir.

A. Picture 21-1 is a picture of the air brake compartment underneath the cab floor.

Q. Is that helping to orientate where some of the stuff is that you were talking about?

A. That is correct. When I say the asbestos piping runs underneath this, this would be the cab itself. This side of the locomotive would be the brakeman side and the other side would be the engineer side. This is the area directly below that cab.

Q. And I am sorry, does the cab heater pipe enter the floor of the engine in this area?

A. The cab heaters pipes on this particular model have been --- have already been taken out and abated. But they would come out up in

this area and one of your cab heaters for your brakeman side would be over here on a 38. The pipe would run to here and then would cross over to the engineer side and go up also into the engineer cab heater.

MS. YOUNG: 61, 25.

THE WITNESS: Where?

MR. SHAPIRO: 61, 25.

Thank you. Actually we're going to 64, okay?

Q. And in 21-13, what is being shown, is that another view of the same?

A. That is another view of the same type and as you can see it gives you a closer view of the damage to the asbestos and the fraying areas on it.

Q. We talked about a lot of classes of engines, GP38's, EMD, SD40's, were engines used for --- how long were engines in use generally that were coming into your repair shop?

A. Railroads get as many miles as they can from a locomotive as they could possibly get. GP38's are still alive and well on the railroad. GP40's, 45 --- excuse me, SD40's and SD45's are still around.

Ridge, if it was railroad cargo, it came through that spur, didn't it?

A. It came from that spur when I was there, yes.

Q. And you've heard other evidence, some of the stuff was probably brought by truck. Right? Not all of it came through here. Right?

A. You mean Witherspoon?

Q. Yes, sir.

A. I would say that -- from my knowledge of Witherspoon, he probably received more of his stuff by truck than --

Q. More by truck. That's all right.

So you knew that that spur that I just showed you was closed down sometime in 199 --

MR. BAKER: May I have a continuing objection, Your Honor, to any reference to this through previously stated rulings?

THE COURT: Sustain the objection to that slide. Jury won't consider that.

Q. (BY MR. SHAPIRO) I want to talk to you about some of the railroad manuals, Mr. Maynard, because as a supervisor you told this jury there were a lot of safety rules on the railroad. Right?

A. There were.

MR. BAKER: Your Honor, Mr. Freeman will be here and will be able to talk about this document that this gentleman did not prepare.

MR. SHAPIRO: Okay.

Q. (BY MR. SHAPIRO) You never saw it?

A. Not until this trial came. I don't recall it.

Q. Okay. But you contacted him in 1985, and one of the reasons you contacted him that year was you were concerned about health hazards at the site. Right?

A. Correct.

Q. And you learned about a worker --

MR. BAKER: Objection, Your Honor.

Q. (BY MR. SHAPIRO) -- that claimed that Geiger counters went off scale --

A. Never heard that.

THE COURT: Sustain the objection. The jury will disregard that slide.

Q. (BY MR. SHAPIRO) Didn't you read the newspapers, Mr. Maynard?

A. I don't recall reading that in the newspaper.

Q. (BY MR. SHAPIRO) What --

THE COURT: The Court has already ruled on that, Mr. Shapiro, move on.

Q. (BY MR. SHAPIRO) Okay. And who was in charge of the overall health and safety in 1985 and made choices, that's spelled wrong, on workers' safety, sir?

A. In charge of our workers?

Q. Yes. In charge of CSX's workers?

A. CSX Transportation.

Q. I mean, was Mr. Badders the industrial hygienist in charge?

A. He was part of it.

Q. Now, I want to talk about that time frame from 1985 until 1991. You were gone but I think you know what we have been talking about in that time frame.

Now, were there any changes that Mr. Badders instituted after 1985 when you talked to him that you can tell me about in the way the work was done at the Witherspoon yard?

A. Well, yes, there was a change after --

Q. What was the change?

A. Started in 1985. In 1985 we started going to, as I testified previously, we went

cabs?

A. Well, I guess to a certain degree it can.

Q. Did you ever smell diesel fumes inside the crew cabs?

A. Any time that I was ever around a diesel engine, a diesel locomotive, inside the cab or just in the general area, you are going to smell diesel fuel, same as you do when you get in your pickup truck.

Q. Have you ever seen black looking smoke coming out of diesel stacks on engines before?

A. Well, to the degree of -- if you say it's excessive, if you have excessive black smoke, you probably have a malfunction, you have something wrong with your engine. It may be a busted ring, piston ring, or you could have mechanical malfunction on it.

Q. You have seen that happen on the railroad before, haven't you?

A. I have seen it happen, yes.

Q. And until it's fixed, it blows the black smoke. Right?

A. Until it's fixed -- a lot of times we shut it down.

Q. Have you ever seen any smoke like that?

A. If that engine is smoking like that, it's not going to make it another mile.

MR. BAKER: Put it back up there, I'd like to see it some more.

Q. (BY MR. SHAPIRO) Is that an engine for the L & N Railroad?

A. It is.

Q. I don't know where this picture was taken, but can we agree --

A. Well, I can, but I can tell you with 30 years of rail experience that that is an engine with a serious mechanical malfunction.

Q. Okay. Now, this is a newer engine, this 2742 and --

MR. SHAPIRO: Tommy, can you take the lights down one more time for me, please?

Q. (BY MR. SHAPIRO) Now, do you see any stacks sticking up real high from that type of engine, Mr. Maynard?

A. No, because you got the long section or whatever you want to call it that's built higher. That's part of the design of the engine,

it's -- it exceeds the level of the cab locomotive, cab of the locomotive.

Q. So you don't know anything about what was learned by claims representatives with the railroad back in the '50s, do you?

A. Nothing.

Q. Did you ever know while you were a trainmaster about a regulation relating to fumes not getting inside crew cabs?

A. That would have been more for our mechanical, mechanical guys. No, all I knew is that they were governed by the FRA and had to meet the FRA standards and they regularly checked them.

Q. Thank you, Mr. Maynard. Those are all my questions.

MR. BAKER: I have no questions.

THE COURT: Lunchtime. Let's try to get back by 1:15, and we'll go to lunch.

(Off the record at 12:04 p.m.)

(On the record at 1:16 p.m.)

MR. BAKER: I would rather be shot in the foot by making this motion, but I must make -- move for mistrial because plaintiff's counsel, against what he told us and what he represented to the Court about

the cesium, threw up on the screen unbeknownst to me something that said Oak Ridge with Mr. Maynard, of all people Mr. Maynard, "Oak Ridge Y-12 spur cleanup, tracks closed down, cesium radiation contamination, tracks, ballast rock cleaned, remediated by DOE."

That was supposed to be out. They introduced no evidence whatsoever about cesium. Now we have to address the blooming thing, so I must move for mistrial because of what they did on that.

MR. SHAPIRO: Your Honor, there was never any motion in limine that said that we were never going to offer something about cesium or the Y-12 tracks. And in fact, Mr. Badders through CIH, who they advised me they are calling him to testify, was notified Friday afternoon, answers inquiries about cesium being cleaned up from Y-12. And they told me they were calling him on Friday. It's in his deposition that was taken in this case, and I don't understand what they are -- you know, this was cross examination, and they have an industrial

hygienist who has confirmed those facts already, and I can read the portions of his deposition to Your Honor --

THE COURT: The Court is under the impression we agreed we weren't going to talk about that for whatever reason.

MS. YOUNG: It's on the record.

MS. THOMPSON: I filed a motion and they never called Badders in their case in chief.

THE COURT: In any event, I would like to make this comment. The Court is struck by the fact that apparently both sides in this case are not able to do anything that's not already written down, and that means ask questions and the questions not written down in a notebook they can't ask a question and if the question is written down they are going to ask it no matter what. This is not a good way to present a case in my opinion. I doubt the jury thinks it is. But I try to make allowances because it seems that that's the only way either side can do anything in this case, so then we reach problems like we

just had with this last witness, we ask him things that were in the notebook which probably shouldn't have been gone into, for example, like the picture of the smoking locomotive, if that's what it was, there's not even a claim by plaintiff he was ever exposed to that sort of thing.

Anyway, but you all knew that after we started the case, that's what I was faced with, and I guess I have to sort of make allowances because that's the only way we are going to get through this case.

The Court takes no action on your motion at this time.

Let's go ahead, and who is your next witness going to be?

MS. YOUNG: Mr. Billy Freeman.

THE COURT: That's another thing, they represent they have never seen these things you flashed up on the screen. Anything that's shown has to be shown to the other side before you do it.

MR. BAKER: I agree.

THE COURT: That goes both ways.

A. I was.

Q. So when you got this phone call from Mr. Maynard, what did you do?

A. I contacted Eddie Nanney because he was my supervisor and I didn't know the answer to the question. But I also knew that from my minimal file review that Eddie Nanney who was my supervisor had experience there. He was there prior to my showing up, so I knew he was someone that might know more about it than I would.

Q. He had been pretty active at the Witherspoon Scrapyard?

A. He had been involved with it, yes.

Q. Okay. And what did you and Mr. Nanney decide to advise the railroad regarding their concern about whether it was safe for railroad switch crews to go inside Witherspoon Scrapyard?

A. Eddie told me to tell them that as long as they stayed out of the vicinity of the contaminated barrels that they would be okay, so that's what I related and I documented it.

Q. All right. What I've shown up here, Defendant's Exhibit 380, what is that? Is that one of your file memos?

A. It looks like the top may have been

cut off. I tried to put from BHF that's my initials, so that I could track what I did.

Q. Let me show you this.

A. At the bottom it says BF. That's me. And then colon, and then the next two letters are the secretary that typed that.

Q. So is this a memo that you put in your file documenting the contact from Mr. Maynard?

A. Yes, and my conversations.

MS. YOUNG: Your Honor, move to admit Exhibit 380.

THE COURT: Hasn't that been done? It's already been done.

MS. YOUNG: Okay. Thank you.

Q. (BY MS. YOUNG) Back to this subject for just a moment, Mr. Freeman.

If you or your supervisor, Mr. Nanney, had believed that the railroad switch crews in response to this inquiry, if you all had believed that they were not safe, would not be safe going in Witherspoon, what could you have done under your authority?

A. I would have asked them not to go in.

Q. All right. You could have told

them not to go in the Witherspoon Scrapyard, or ask or advise them not to go in, you could have done that?

A. I could definitely have asked them, yes. I ask people to do things all the time.

Q. Sure. But that's not what you did because you felt it was safe?

A. Yes, I mean this was an active site and there were workers there that we were not asking to leave as well.

Q. There were workers of Witherspoon himself, had some workers there?

A. Yes, Witherspoon. It was an active scrap metal business.

Q. Is Ms. Nanney still with the Tennessee Department of Radiological Health?

A. He retired this summer and is hired back on as a part-time employee, yes.

Q. Prior to retiring, what was his position with the state?

A. He was the director.

Q. He was the director for the state Division of Radiological Health.

A. Yes.

Q. Okay. Did there come a time maybe

investigation in September of 1985 with Mr. Badders when you went out and he went and looked at the site and this is what the site looked like, did you advise the railroad to get the railroad switch crews out of the scrapyard?

A. No.

Q. And why not?

A. And as I've said earlier, I didn't think there was a risk in bringing in empty car rail cars and railcars filled at the electro magnet shed which would be at the bottom of that long and narrow spur. I didn't think it would be a risk to coming in and filling them up and removing them.

Q. You can keep that up.

That longer square, does that appear to represent a magnet house?

A. Yes, scrap metal pile, that's the end of the spur where the magnet house is.

Q. All right. Mr. Freeman, can you explain to this jury why you decide -- why you decide even though there's some readings, you a ran your survey meter, Geiger counter type meter and you came up with those readings that were on that diagram, can you tell the jury are there three tenets that you use, three principles that you use

to determine whether those readings means it's unsafe for somebody to be out there?

A. Yes, I think I understand the question.

Q. Time, distance and shielding?

A. Okay.

Q. Explain that to the jury.

A. When you are working with radiation or radioactive materials or x-ray, any type of radiation, there's three principles that we would apply and they are called time, distance and shield.

You want to reduce the time you are near the radiation source, you want to put shielding in between the radiation source and you want to put distance between you and the radiation source. Kind of common sense proposals, but those are the three tenets of health physics they are protecting.

So applying those here, I just didn't view that, considering the dose rates that you had shown up there and considering the time they would be in there and the distance that they were away from the sources, that it would provide a risk.

Q. Okay. Well, let me ask you in a little bit more detail about the time principle.

What did you understand from your

observations of the switch crew doing their job out there at the Witherspoon Scrapyard, what did you observe about the time that a switch crew may have been in the scrapyard?

A. I didn't time the switch crews when they were in the scrapyard. I had already decided that their time there was not significant as far as radiation risk, so I didn't -- I didn't do any time studies.

Q. Less than an hour?

MR. SHAPIRO: Objection, leading.

Q. (BY MS. YOUNG) Withdrawn.

Can you approximate the amount of time?

A. They weren't there very long. They rolled in, the car was filled up and right out. Somewhere between 30 minutes and two hours. I don't really know. It seemed like a brief period of time. I'm not really prepared to talk about the minutes on it.

Q. Let me talk to you about distance there.

We saw a diagram a minute ago and it had the railroad track out in the middle and some barrels on each side. The distance from those

barrels to the tracks, that was sufficient distance to lead you to believe that the distance would not put the railroad crew at risk?

MR. SHAPIRO: Objection, leading, Your Honor.

Q. (BY MS. YOUNG) Tell me about distance and the barrels and what it meant to your recommendation that the railroad switch crews were not in danger.

A. Dose rates on the rail line were far enough, enough distance from the sources of radiation to create low enough dose rates that they were insignificant in my opinion.

Q. Let's move on to shielding.

We're talking a lot about barrels. Do the barrel -- what might provide shielding as to the barrels?

A. Well, in this case because it's uranium and there's a significant beta -- alpha beta component, they were in metal drums and the metal drums themselves provide shielding. They provide a hundred percent shielding for alpha and, no-risk shielding for beta, and much less shielding for gamma. So there was -- whatever got out of the barrels was gamma radiation.

something to compare it to. It varies depending what you are around. You know, a lot of natural things have different backgrounds, so background in your office and your office will be different.

Q. All right.

A. So there I would take backgrounds say out on the Candora spur or something nearby so that I would have something that is comparable.

Q. Is this what's been marked as Defendant's Exhibit 310, is this another one of your memos to the file?

A. Yes.

Q. Move to admit Defendant's Exhibit 310.

(Exhibit 310 received).

MR. SHAPIRO: No objection.

Q. (BY MS. YOUNG) Let me move quickly and I want to talk to you about enforcement, what duties you have regarding enforcement.

Could your authority as -- in your position with Tennessee Department of Radiological Health, could you and your colleagues actually cite a person, a company or an entity, cite them with a violation of a radiation regulation?

A. That is what I do.

Q. Okay. Could you -- does your authority, does it or does it not include the authority to tell a person, a company, or an entity to use film badges or to use respirators or use protective clothing?

A. As needed we do that, yes.

Q. And does it matter to you who owns the property where something may be going on as to whether you can tell somebody to wear a respirator or recommend they have a film badge or wear protective clothing?

A. I've never encountered a situation where title or ownership was relevant to my regulatory authority. No, I don't pursue who owns the property or who owns the business; I pursue the management over the facility.

Q. Let me ask you this.

In your time with Tennessee Radiological Health and your involvement with the Witherspoon Scrapyard, did you ever cite the railroad, tell the railroad that it was in violation of any radiological shipping regulation?

MR. SHAPIRO: Objection, Your Honor.

THE COURT: Go ahead.

A. No.

Q. (BY MS. YOUNG) Did you with your authority, did you ever cite the railroad for any violation of a radiation regulation that might not pertain to shipping but just another radiation regulation?

MR. SHAPIRO: Same objection.

THE COURT: Go ahead.

A. I haven't cited the railroad with regard to this facility at all.

Q. Okay. Have you ever advised the railroad or recommended or ordered the railroad to put film badges or respirators or protective clothing on its switch crews that go into Witherspoon Scrapyard?

A. No.

Q. From your review of the former file of the Tennessee Department of Radiological Health prior to your coming on board, did any of your colleagues or predecessor colleagues ever cite the railroad for any radiation regulation or tell the railroad that they had to put certain equipment on their switch crews?

A. No.

Q. Is that something, Mr. Freeman, is

that or is that not something you would have done if you felt those railroad switch crews were in danger, you would have told them to either get off the property or wear protective equipment, would you have done that?

A. Yes.

Q. All right. Let me move on to a concept that I want to touch on just briefly, because the jury has heard a little bit about this.

Does the dose-response phenomenon apply to radiation exposure?

A. I'm not sure I understand the question.

Q. In radiation exposure, the more exposure you get the greater the risk of harm?

A. That's correct.

Q. And the converse or reverse is true also, that the lower the exposure the lower the risk of harm?

A. That's correct, down to a certain point.

Q. Okay. Let me ask you if -- I'm going to -- let me show you what's been marked as Defendant's Demonstrative Exhibit No. 117, and I'm going to hand you a copy so it's easier for you to

asbestos released brake shoes?

A. Yes, I have.

Q. Use -- do you know what this is?

A. That's a railroad brake shoe.

Q. Is that a new one or an old one?

A. That's a used one. Looks like it came off of a rail car.

Q. Have you tested for asbestos release from this kind of equipment?

A. Yes, I have.

Q. Can you tell the jury about that testing?

A. Sure. I've done it on a couple different occasions. When I first started working for the railroad, I was wondering what would happen if you were in a -- if any asbestos would be released during braking from a shoe like this, so we found the heaviest train we could, which was a train, it was a 40-car train of rock, we found it coming down the longest grade we could -- no asbestos.

Which was coming out of the Rocky Mountains. And so we -- so we tested in the caboose during the entire application of brakes coming out of the Rocky Mountains with all the composition --

all asbestos containing brake shoe train.

Q. We've talked about asbestos being in railroad brake shoes.

Has asbestos always been in railroad brake shoes?

A. No, it has not.

Q. When was it in railroad brake shoes?

A. It was -- it was first allowed in 1964. The American Association of Railroads has very strict rules so that cars and locomotives and trains can be interchanged from one to another, so you can't use something unless you get the approval of the overall organization.

These brakes -- they want to make sure they are safe and things, too.

These brake shoes were first approved in 1964. They were never universally used, probably never got to be in over maybe a third of the fleet and by 1978, they were being phased out and by the early '80s, they were entirely gone.

Q. Does the railroad use asbestos brake shoes anymore?

A. No.

Q. Do automobiles use asbestos brake

shoes?

A. They can. There's nothing wrong with automobile brake shoes. There's certain manufacturers that were putting asbestos-containing brake shoes on cars very recently.

Q. So is it possible to go to an auto parts store today and buy a brake shoe for your car or truck that has asbestos in it?

A. It's legal. How available they are, I don't know. I haven't tried.

Q. Okay. When you did your testing of this rock train, what kind of results did you come up with?

A. We measured some very low levels of fibers, which in those days we didn't have the technology to determine whether or not the fibers were actually asbestos. We weren't concerned even with the levels they were even if they were all asbestos, which most likely they were not.

Q. Up on the screen we have -- tell us what we have.

A. You're looking at the wheel. It looks like it's a car, and that's the brake shoe right there.

Q. Is that what this thing is over

there?

A. That's correct.

Q. And how does it stop the train?

A. The brakes operate on compressed air.

The compressed air is used to keep the brakes off of the wheel.

When the engineer releases some air, then the brakes apply to the wheel and stop the train.

Q. Have you seen that happen?

A. Oh, yes.

Q. And when that happens do you see any smoke or anything?

A. Sometimes you do, sometimes you will see -- there will be oil or grease or something. In fact, there's often grease on rails on curves to reduce friction, and often there's grease, so, yes, you will get some smoke sometimes.

Q. If -- let's say that shoe that's up there, not here, has some asbestos in it.

When the brakes are applied to that asbestos-containing shoe, does it give off asbestos fiber?

A. No, it doesn't.

Q. How do you know that?

A. That's been studied by a number of different people, and what happens is you get very high temperatures right at the surface of the brake shoe, and any asbestos that's -- that's present is changed into a different form, a different material because of the high temperature. The high temperature breaks it down so it's given off as something else.

Q. I've asked you to look at Mr. Payne's work history at the railroad.

A. Yes.

Q. And I've asked you to look particularly at his asbestos and diesel claims. Have you done that?

A. I have.

Q. And you know that Mr. Payne was a trainman/switchman at the railroad.

A. That's correct.

Q. Over the -- over your career in working in the railroad industry, have you found out what switchmen do at the railroad?

A. Yes.

Q. And in your -- as a result of your history with the railroad, do switchmen have much of

an opportunity to come in contact with asbestos?

A. No, they don't.

Q. Why not?

A. The railroad is -- is heavily unionized and you don't do what -- a job that's done by another craft. So trainmen, switchmen switch trains, make up trains, move trains; they don't do work on locomotives, they don't do work on cars, they don't change brake shoes.

A brake shoe would be changed on cars, changed by a carman. A brake shoe on a locomotive would be changed by a machinist. Only in an emergency situation if you're out in the middle of nowhere and something happens they could do something with the brake shoe. Under normal circumstances they would never do anything like that.

Q. You said from your experience with the railroad that you generally know what switchmen do.

Specifically to Mr. Payne, what have you reviewed in this case that can tell you about what he did and what his allegations are?

A. Oh, I reviewed his deposition, both depositions. I reviewed expert reports. I'm

familiar with the areas where he worked and my general experience in railroading.

Q. What is your understanding of what Mr. Payne claimed were his sources of exposure to asbestos?

A. My understanding is for asbestos it's brake shoes, it's being in buildings, where there might be some asbestos-containing materials in the buildings, being in locomotives and cabooses where there might be some asbestos-containing materials.

Q. All right. Let's talk about each of those briefly. You told us a little bit about your experience with brake shoes.

What does Mr. Payne claim was the source of his asbestos exposure from those brake shoes? Did he ever change them? Did he ever handle them?

A. He would not have ever changed them or handled them. Even if he had, that's also been studied by me and by others and there's no exposure from changing a brake shoe either. It's a very simple operation as opposed to doing it on your car or your truck.

Q. Would Mr. Payne have ever had any

asbestos exposure from brake shoes that would have been potentially harmful to him?

A. No.

Q. You told us about PEL's.

A. Yes.

Q. Permissible exposure limits. Would he have ever had any exposures to asbestos from brake shoes that would have been above the PEL's?

A. Not even close.

Q. And if he didn't have any exposure above the PEL's, what does that tell you?

A. That tells me that that's a reasonably safe place to work.

Q. You discussed being in buildings and being around some -- you mentioned being around some pipes.

A. Yes.

Q. What is your understanding of his claim about being around some pipes in buildings?

A. Well, again, as a trainman he would not have had the opportunity or even been allowed to work on any pipes, so it's simply a matter of being in a building where there are pipes, and there simply isn't any exposure from doing that.

I've studied that, studied aboard

Navy ships, studied it -- collected hundreds of samples in CSX buildings where there was asbestos-containing material. Didn't measure any airborne fibers whatsoever. Environmental Protection Agency studied it extensively and said the same thing, there's no more asbestos in the air in buildings that have asbestos-containing materials than in buildings that don't have asbestos-containing materials. So there's no exposure simply from being around it.

Q. Would he have had any exposures that exceeded PEL's just by being in the vicinity of those pipes?

A. No, not even close.

Q. Cabooses, do you remember cabooses?

A. I do.

Q. What is your understanding of what Mr. Payne claims about exposure from cabooses?

A. He claims and he's correct that there was often a heat shield behind the stove on a caboose to keep the caboose from catching on fire. Typically it was a very hard, non-friable material containing cement, and then further it was covered by a piece of sheet metal.

Again, he would have had no work --

no opportunity to do any work around that material or with that material simply being in the caboose.

Q. Did that heat shield have a percentage of asbestos fiber in it?

A. Yes.

Q. Why was it even there?

A. To keep the caboose from burning up.

Q. Would being around that heat shield when he rode in the cabooses, would that have given him any asbestos exposure?

A. None whatsoever.

Q. Mr. Liukonen, what is that?

A. That's a cab heater in a locomotive.

That particular heater is on the engineer's side.

Q. Are you familiar with those cab heaters?

A. I am.

Q. Have you seen one or two of them before?

A. Many.

Q. There's been some discussion about the cab heater, and I think there's an allegation

that maybe that cab heater is the source of asbestos exposure to Mr. Payne.

Have you investigated that particular allegation before?

A. Yes, I have.

Q. Tell the jury what you've done about that.

A. Well, we have done bulk sampling on many locomotives to determine where the asbestos is and where it isn't. We do not find it in the locomotive cab. When it was on locomotives, it was outside the locomotive cab. And we have also taken many air samples in locomotives that still have the asbestos-containing material on them both in the cab and in the air compressor compartment where most of the asbestos-containing materials is and we collected those samples when the trains are in operation and, again, we found no airborne asbestos during operation.

Q. Mr. Liukonen, there's been a claim that there's a pipe down at the bottom of that heater.

A. Yes.

Q. And the pipe comes up through the floor?

A. Yes.

Q. And that there has been some insulation on that pipe that goes from the floor to the bottom of the heater?

A. Yes.

Q. Do you understand that?

A. I do.

Q. Have you heard that before?

A. I have.

Q. Have you ever looked to see if you could ever see that pipe on a locomotive and that pipe being insulated; have you ever looked for that?

A. Many times.

Q. How long have you looked for that?

A. Probably since '79. I have been looking extensively for that for probably 20 years.

Q. Have you ever seen it?

A. No. Well, I've seen one pipe possibly where that could have occurred.

Q. One locomotive?

A. One locomotive. You can see that most heaters sit right on the floor. There is no pipe -- there is no pipe underneath the heater.

Q. There's also been some discussion about a fan inside the heater blowing asbestos

around in the locomotive cab. Does that make any sense to you?

A. No, it does not.

Q. Why is that?

A. Because the asbestos-containing material is primarily underneath the floor. Where the pipe comes -- this is a hot water heater, and where the warm water comes from is the engine compartment, so it comes from the engine compartment, runs underneath the locomotive where it's outside and needs to be insulated, comes up inside. There's a double floor in the locomotive. It comes up inside that double floor and again it's insulated, and then it comes into the heater where there's no reason for it to be insulated.

Q. Would the operation of that heater create any asbestos exposure in people riding in locomotives?

A. No.

Q. Would just being around that have given Mr. Payne any asbestos exposure?

A. No.

Q. I think I jumped the gun. I'm going to ask you about that in just a minute.

But to wrap up on asbestos,

Mr. Liukonen, have you told us about all of the exposures to asbestos that Mr. Payne claims he had or --

A. I think we left one out.

Q. What did we leave out?

A. I think we left out the potential of insulated pipes in gondola cars on trains he was working on.

Q. How do you assess that?

A. I'm of the same opinion of that as any other material that he would have been around.

He wouldn't have been doing any work with it, so that there would be no exposure, simply being around something doesn't create exposure.

Q. If there's a pipe that has some insulation on it, just by looking at it, can you tell if it's asbestos or not?

A. No, you cannot.

Q. If there's a pipe sitting right here where my glasses are that has got asbestos wrapped on it, is that a danger to everybody in the room just sitting here?

A. Not at all.

Q. Now, thinking about all the

allegations of asbestos exposure that Mr. Payne and his counsel have made, thinking about the testing that you've done and thinking about what you have just testified to, Mr. Liukonen, do you have a scientific opinion about whether any of that gave Mr. Payne a significant asbestos exposure at the railroad?

A. I do.

Q. What is your opinion, sir?

A. My opinion is none of that gave him any significant exposure to asbestos. I doubt if he had any days where he ever had a measurable exposure to asbestos.

Q. Is that opinion something that you hold to a reasonable degree of scientific certainty and something that is based on your years of testing for asbestos?

A. Yes, it is.

Q. Let's go to issue No. 2, Mr. Liukonen, and then we'll be done.

Let's talk about diesel exhaust. Are you familiar with diesel exhaust?

A. Very much so.

Q. You understand Mr. Payne claims that he had some exposure to diesel exhaust in the

railroad industry.

A. Yes, I do.

Q. Have you ever looked at the issue of diesel exhaust exposures to people like Mr. Payne?

A. Very extensively.

Q. What have you done?

A. Well, I've done a number of things. When I first started in the industry, when I worked for Burlington Northern, we had the two longest railroad tunnels in the country, one of which was seven miles long and the other one was eight miles long. So I started studying the issue of diesel exhaust exposure to train crews early on.

And then when we were working for CSX, we did a lot of work in shops because in many locations the diesel locomotives were running inside of the shops so we had opportunity for exposure there.

And then in the early '90s, Mark Badders said, "Larry, I really would really like you to take a look at train crew diesel exhaust exposures and start doing some really good studies on that." So we started doing very extensive work on train crew exposures to diesel exhaust.

Q. Was that for CSX?

A. Yes, it was. I also did it for other railroads, but a lot of it has been for CSX.

Q. For how many years have you been doing diesel exhaust studies for CSX?

A. Oh, I would say -- well, we started in '87, so it's been at least 20 years.

Q. Do you know how many different tests of the air on diesel locomotives you have done for CSX?

A. Well, I've counted it up many years ago and we were well over a thousand samples then.

Q. Now, there's been some discussion in this case about smelling diesel fumes or diesel exhaust. Have you ever smelled it?

A. Absolutely.

Q. And in any of the testing that you've done -- well, number one, have the trains been operating?

A. Yes, we test on operating trains.

Q. And have you ever smelled the diesel exhaust while you were doing the testing?

A. Many times.

Q. And despite smelling it, what do the results tell you?

A. The results tell us that train crew exposures to diesel exhaust are well within accepted levels.

Q. Even if you can smell it?

A. Even if you can smell it.

We've specifically set up situations where we would have a locomotive idling and then test downwind in another locomotive. We've done it in tunnels. We've even stalled or stopped locomotives in tunnels to simulate situations like that to try and find out what would happen if we had an emergency situation.

Q. We have an article up on the screen.

Can you tell us what that is, Mr. Liukonen?

A. Yes, that's an article that a couple of us published on train crew exposure to diesel exhaust. Historically there's lot of different things we've looked at. In the recent past, there's a particular thing that we looked for in the diesel exhaust which is part of the particulate called "elemental carbon," and we published some of our results on that to the scientific community to show what train crew

exposures to diesel exhaust are.

Q. Elemental carbon?

A. Yes.

Q. What is that?

A. It's an indicator of diesel exhaust. It's something that's given off by combustion of diesel fuel and has very few interferences. It's not given off by cigarette smoke, it's not given off by gasoline engines, we don't find much of it in the natural environment, so it's a very good indicator of diesel exhaust exposure.

Q. Can you tell the jury what this article is about and what you did and what your results were?

A. Sure. We -- a lot of it is based on the work I did for CSX and a lot of it is based on work I did for a couple of other railroads. And our focus in all of these was to try and find -- to look for the worst case scenario.

When we first start out doing something, we don't -- obviously don't look for the cleanest thing. We want to look for where the highest exposures are. So that was something Mark Badders asked us to do when we first started out.

He said I want you to look for older engines, I want you to look for tunnel territory, I want you to look for mountainous terrain, and I want you to do a lot of sampling in the trailing engine, in the second unit in case anybody is ever riding on the second unit.

So that's what we would do. We would go somewhere, tell the trainmaster, whoever is in charge, we want to do some diesel tests, sampling what kind of trains you have coming out. And then we would pick the one that would have the oldest units on and we would look for heavy trains. And again, we were looking in the territory where we find the highest exposure, that is tunnels and mountains.

So then we would -- now I've forgotten what the original question was, I'm sorry.

Q. Just tell us about the article. I think you have pretty well done that.

A. Right. So then when we finished, we took the elemental carbon, which is pretty well accepted that that is the best indicator of diesel exhaust. We took all of our elemental carbon results, put them together into a published paper, which is -- this is the final result.

Q. And generally, can you describe what your results were?

A. Yes. We find that typically a train crew member like an engineer or something like that, their typical exposure to elemental carbon is two and a half micrograms per cubic meter.

If we take a trailing unit, the average exposure is about 10 micrograms per cubic meter.

Again, we would do the worst case scenario with open windows. I remember doing this testing in the wintertime with open windows because, again, we are looking for highest exposure.

Q. Sorry.

We've heard about the Federal Railroad Administration. Do you know who they are?

A. Yes.

Q. Have they studied the diesel issue?

A. Yes, they have.

Q. And what is your judgment about the position of the FRA?

A. They started off, as I did early on, looking at things like this long railroad tunnel, and they determined that there was not excessive exposure to train crews, even in this

eight-mile long tunnel.

They have continued to study. Most of their studies -- they are an enforcement agency, so most of their studies have been a result of employee complaints and things like that, but they have continued to study and continue to find that they don't find excessive levels of exposure.

Q. Even if you can smell it?

A. Even if you can smell it.

Q. Okay. We are about to wrap up here, but let me ask you to talk about standards again for a second. And we talked about the standard for asbestos in the air being the PEL, permissible exposure limit. Right?

A. Yes.

Q. That's something that industrial hygienists use to assess whether a workplace is safe or not. Right?

A. Right.

Q. Now, is there a permissible exposure limit for diesel exhaust?

A. There is not. Diesel exhaust is a complex mixture. What OSHA would do, for example, is they would look for some of the gases, nitrous dioxide, carbon monoxide, although you don't find

much, but those are the sorts of things that they would do. But there is not a specific standard for diesel exhaust itself.

Q. Well, how do you know if the measurements that you get indicate that it's safe or dangerous?

A. A couple of ways.

It's been pretty well accepted in the past several years that elemental carbon is our best indicator of diesel exhaust exposure.

There's another organization called the American Conference of Governmental Industrial Hygienists, and they published something called the threshold limit value, or TLV. It's similar to what OSHA does, but it doesn't have the -- it's a recommendation and doesn't have the force of law behind it.

And they several years ago, they published a recommended TLV for diesel exhaust of 20 micrograms per cubic meter as elemental carbon. They have since rescinded that, but that was the recommendation that was there and so that's what we used to compare our exposures to.

And we can see that our exposures typically are about one-fourth of what their

recommended standard is.

We can also look at people, what people find in other industries or what people find in normal areas.

We find that -- the exposure we find in train crews is less than living in an urban area like Los Angeles. They have a higher exposure 24 hours a day than our people do eight or 12 hours a day.

We can look at people in underground mines where the exposures are about 400 compared to our two and a half. So you can see that our exposures are much, much less than other industries. So you can do lots of different things to see that our exposures are pretty much in an acceptable range.

Q. Even if you can smell it?

A. Even if you can smell it.

Q. Okay. You said there was a proposed standard that did not go into effect?

A. That's correct.

Q. And that -- help me here. I'm not sure of the terminology. It was 20 micrograms?

A. Micrograms per cubic meter of elemental carbon.

Q. So that was the standard that you used?

A. That's correct.

Q. Even though it's not in effect, that's the standard that you used?

A. That's correct.

Q. Now, what do you understand to have been Mr. Payne's claims about being exposed to diesel exhaust?

A. It would have been, you know, as a switchman, a trainman, he would be in the yard, he would be around the locomotives, he would be occasionally riding on locomotives, sometimes riding on cars either in front of or behind the locomotives.

Q. And was he involved in what are called "shove moves"?

A. He was.

Q. And does that have an impact on diesel exhaust exposure?

A. Sure. It really eliminates it because what he's talking about is you have several cars and the locomotive is at one end and he's riding the other end doing what we call "protecting the crossing," so he's several cars in front of the

exhaust.

Q. Mr. Liukonen, based on all the studies you've done, I think you said thousands of diesel exhaust in locomotive cabs and understanding what switchmen do and understanding what Mr. Payne says he did, do you have an opinion about whether he had any significant exposures to diesel exhaust while he worked for CSX?

A. I do.

Q. What is your opinion, sir?

A. My opinion is he did not have any excessive exposures, had very low levels of exposure, similar to working in an urban area, probably not much different than driving down the interstate.

Q. Would he have gotten even remotely close to that 20 whatever it is standard you told us?

A. No, he would not have.

Q. Did Mr. Payne need a mask or respirator while he was working for the railroad?

A. Not at all.

Q. Do you know of any railroad in America that requires people like Mr. Payne to wear a mask or a respirator while he's in a locomotive

the jury what you have done, but would you think that Mr. Payne, a railroad worker, a switchman working for the railroad, based upon what you have done and what you know about him, would have had as much radiation exposure as a nuclear worker?

A. No, I do not.

Q. Why do you say that?

A. Well, I say that because when we -- when we went through the -- basically a time motion study of where Mr. Payne was when and how long he was there and what he could have been potentially exposed to. We gave Mr. Payne every benefit of the doubt over those exposures and try as we might to make those numbers as high as we could, they are still just not high enough to say that Mr. Payne over his 15-year working career where he was in and out of Witherspoon and in other locations when he was with the railroad, you know, could have ever gotten doses that would have been -- would have been something that even as a radiation protection professional would have been on my radar.

Q. Okay. I want to -- as I mentioned earlier, what I want to do in the next little while is talk to you about your dose reconstruction, and I want you to tell the jury what you did and why you

did it and what you came up with, but tell us first what a dose reconstruction is and whether you do them.

A. Okay.

MR. SHAPIRO: Your Honor, just for the record, I want to state that plaintiff objects to the dose reconstruction testimony for reasons known. Thank you.

THE COURT: Overrule the objection. The witness may answer the questions. Go ahead.

A. Okay. Do I do dose reconstructions? The answer is yes.

What does it entail? Well, you basically, like I said before, you want to look at all the details of what an individual does and I've got a pretty good example.

My first couple of weeks at the nuclear power plant I had to go and do a time motion study on a security guard whose dosimeter came up on a routine batch at 52 rem. Well, a security guard at 52 rem is all the bells go locked. The Nuclear Regulatory Commission comes into your site, and he sat in my lab for about two months while I got all this data together. And it was basically because in

a power plant when you go through the doors to go into the plant there's a key -- card key system, so we knew where he was and when he was and where he normally traveled, and we actually knew who had met him in the air lock as he was going in and out of the plant so we interviewed those people, we interviewed him obviously, and we tried to figure out how he could have possibly gotten 52 rem on his badge given the fact that the average nuclear worker in a year only gets 200 millirem.

So because those bells and whistles were going off, we did everything we could to figure out where he was, when he was there and how he could have gotten the dose. Well, it turns out he had lost his badge next to an area that was very radioactive and he left it there. Somebody found it, they gave it back to him and he put it to normal processing.

So he got a couple weeks off with no pay because he didn't tell us the truth of what was going on.

But in Mr. Payne's case, what we wanted to do was take a look at all the records for Witherspoon and all the shipments that came into and out of the site, the amount of time that he was

there walking around on the site, having a good understanding of what he was doing on the site at the time, and then understanding what the radiation environment that he might -- that it actually consisted of.

So we know there was soil samples taken on the site, we know there were some drums that were left there from the early '60s that were sent over to Witherspoon and Witherspoon could not do anything with them other than keep them on the site. And the state had come in and they had done some radiation readings on those drums so we took that into account. We took any kind of potential airborne exposure he might get from dust on the site being kicked up as the train was moving on site or even as he was walking on the road next to the train and, you know, how long he was there and how long he actually spent riding in the rail car from either the Y-12 site or from the Knox yard. We wanted to make sure we knew how long it was, where he was in the car, what was in the car, and then we basically put all those numbers together to come up with a number for his career of work with respect to Witherspoon.

Q. (BY MR. JORDAN) Good.

Now, is this the first dose reconstruction you have done?

A. No, it is not, no.

Q. Do you -- are you involved in dose reconstruction programs for the Federal Government?

A. I am, yes.

Q. And do you have a position of leadership in such dose reconstruction programs?

A. I do. MJW was one of three companies that had been working on dose reconstruction under the EEOICP program, Energy Employees Occupational Illness Compensation Program. And that's EEOICP, they couldn't come up with a better acronym than that.

Anyway, this was a --

MR. SHAPIRO: Your Honor, I object to this going on any further.

THE COURT: Okay. Ask another question.

MR. JORDAN: Yes, sir.

Q. (BY MR. JORDAN) Just tell us what your position of responsibility is.

A. I am on the management team for this project.

Q. Okay. And are dose reconstructions

part of that project?

A. That's what it is, it is dose reconstruction of DOE complex workers, former workers.

Q. Okay. Let me ask you about a couple of terms and then we'll go right to the meat of your dose reconstruction.

The jury has heard about direct versus indirect exposures.

Can you explain the difference for us?

A. Sure.

Direct exposure basically if this cup were radioactive and it were sitting in front of me and it was emanating radiation, because I'm close to it, it's direct exposure. So I'm being exposed by whatever radioactive substance is in this cup.

If there were a radioactive substance in the air and I was breathing that radioactive substance and it got inside my body, then it's an indirect dose because whatever I take in it either goes into my lungs, into my stomach, it circulates around in my blood and it can irradiate all of your body, may irradiate just a particular organ like iodine.

People that have thyroid issues will have iodine-131 injected into them, into your blood system so that it gets taken up by your thyroid, and then they can do a scan of your thyroid because it's preferentially taken up, and they can see if you are having an issue with your thyroid. And that is an example of indirect exposure, something inside you that may irradiate one or more of your organs.

Q. What is a time motion study?

A. Well, as I was saying before, time motion, like the security guard at the power plant, we had to figure out where he was, what he was -- as he traveled through the plant, how long he was there and what he may have been exposed to.

So in the case of Mr. Payne, we wanted to make sure that we knew where he was, when he was and how long he was in each of the places as he did his job for the railroad.

Q. Is that part of what you did?

A. Yes, it is.

Q. Okay. All right. Two more things.

I suspect that when you explain what you did to the jury, you are going to use the term "conservative."

A. Yes, I am.

Q. And I think from watching the news we hear that a lot, but I suspect in your world that might have different definition.

What do you mean by "conservative"?

A. Well, conservative is probably just another term for favorable in the vernacular that we use when we do a dose reconstruction for somebody. And especially in the program that we work in with the government, what we try to do is give the -- every benefit of the doubt to the claimant in terms of what dose we got.

And that's the same approach that I used here with a dose reconstruction for Mr. Payne, is that in every instance I tried to use the upper end of the numbers that I saw from the data that we had for either soil analysis or for airborne analysis or whatever it was in terms of the radiation exposure he could have, we used the upper end of all those numbers.

Q. Did you follow the same scientific methodology in assessing Mr. Payne's radiation dose as you would in this federal program that you're an advisor to?

A. Yes, I did.

Q. So you think you told the jury about all of your calculations in the dose reconstruction?

A. Yes, I have.

Q. Did I understand you earlier to say what you do when you do all those various scenarios is you add them up to get a total dose?

A. Yes.

Q. Have you done that?

A. I have and the total that we came up with for the 15 years, giving every benefit of the doubt from dose time motion point of view, it came out to be about 1426 millirem over 15 years, or, you know, roughly about, you know, 100 millirem a year, and this is dose to the lung.

Q. Now, let's circle back, and tell us again what his maximum allowable exposure would have been.

A. Well, again, remembering that lung dose is a little higher than a whole body dose, it's about 13 percent higher, you know, his whole body dose in this case would probably have been in the range of about 92 millirem, if you call it whole body dose. This is for a year. I'll just put WB for whole body.

If you were just a person on the street and you lived next to a nuclear power plant or Y-12 or X-10 or any of the facilities over at Oak Ridge, they were allowed with a person living on the fence, and there's not too many people who live on the fence, but this is how they calculate it, a person, nonexposed member of the public, you could actually receive about 500 millirem per year back in that day.

In '94 it's been changed to a hundred, but back up until '94 it was always 500.

Q. And you estimated his to be 92?

A. 92 from a whole body point of view, yes.

Q. Have you attempted to demonstrate the various numbers that you calculated and added up in a bar graph?

A. I have, yes.

Q. Is this what you created for us?

A. Yes, this is one of them.

Q. I think it would be fine if you could take the witness stand and let me ask a few more questions while we talk about this graph.

A. Yes, sir.

Q. Dr. Dooley, tell us what that bar

hundred or so leading professionals in all areas of radiation health sciences. It's an organization chartered by Congress and they are asked to write reports for regulatory agencies and other government officials in the radiation area and I have been an elected member of the NCRP for about twelve years.

Q. All right. Can you tell me, Dr. Kocher, have you published any articles or studies in the fields of health physics?

A. I have quite a few publications. One of the conditions of working at Oak Ridge National Laboratory is that you are supposed to publish. I have roughly 220 publications of which around 65 are things like peer-reviewed journals, National Academy of Sciences reports, things like that.

Q. Dr. Kocher, in 1990, were you asked to study potential exposures to public -- to the public and to railroad workers from radiation contamination along tracks in the town of Oak Ridge leading up to Y-12?

A. Yes, I was.

Q. And who asked you to do this study?

A. This request came from a program at Oak Ridge National Lab called the Environmental

Restoration Program. They had a big program back in the '80s to kind of survey the whole site, find areas of contamination and decide what to do about it, and I was asked to assist this particular situation.

Q. Did the railroad ask you to do this study back in 1990?

A. No. This was done -- this came from within ORNL.

Q. And can you tell me what -- can you tell me what you looked at? What did you study in 1990 in regard to this report?

A. What happened in 1990, sometime back in the '80s and I honestly don't know when, someone discovered that there was a bit of contamination along railroad -- along a railroad line that ran from the east end of Oak Ridge into the Y-12 plant, and some radiation surveys had been done, people go out with meters and they count the radiation levels and this was all written up and I was basically given this radiation survey data and asked to do a general kind of assessment, just in general terms about what do these levels of radiation and radioactivity mean in regard to potential exposures to the members of the public,

there are houses along the railroad tracks and people might walk along the railroad tracks to avoid automobile traffic, kids might play out there, trains were still running along those tracks in those days, what would a typical potential radiation exposure of a railroad worker have been, so I was asked based on this radiation survey data to just do a general assessment of how big these doses that these people might get and how big would they be.

Q. Okay. And what type of data did you use to do your potential dose assessment?

A. Yes, I used the radiation survey data that had been collected by the Environmental Restoration Program and given to me. This had been written up with covered memoranda and reviewed within the laboratory and basically approved.

Q. Okay. Is it typical for a health physicist such as yourself to rely on field data collected by someone else?

A. Absolutely, if I had to go out and do it myself, we wouldn't get anywhere.

Q. Well, tell us what you concluded back in 1990 regarding potential exposures to the public and the railroad workers along the tracks at

the east end of Oak Ridge?

A. Well, I concluded that it was not a serious problem and the way I assessed that, I did a dose assessment that probably overestimated a dose that people would normally get. I mean, I was just making a general assumption about how much time would somebody spend walking along the track or how long would a railroad worker spend there and because this was a general kind of assessment, I compared these dose estimates with regulatory standards that existed at the time.

There exists public dose limits, doses above which the public is not supposed to receive and these doses were well below any applicable regulatory criterion so my recommendation to the officials at Oak Ridge was that this is not a serious problem, but I also recommended I think more for public relations than for protection of public health that because these areas are fairly local, they ought to just go dig up a few of them, we are talking about a few cubic yards of contaminated dirt and haul it away and they took my advice.

Q. Okay.

A. But it was not a serious problem at the time.

Q. Dr. Kocher, that was in 1990. 20 years later you get a call from me.

A. Yes, ma'am.

Q. Okay. And was it out of the blue?

A. Out of the blue. Blast from the past.

Q. Okay. What did -- did I contact you to talk more in depth about your 1990 study and the potential contamination exposure out there on the tracks in east Oak Ridge?

A. That was the subject of our conversation, yes.

Q. Did I ask you to look more closely at potential exposures to railroad workers, in particular, to Mr. Payne?

A. Yes, the idea here was to take this general kind of assessment with sort of assumptions that I didn't really know whether they were realistic or not and tailor that assessment to the conditions of exposure that Mr. Payne experienced, essentially based on his depositions.

Q. Did you do that?

A. Indeed I did.

Q. Did you issue a report?

A. Indeed I did.

Q. And can you tell me or tell the jury what -- what did you review and what assumptions did you make and what documents did you review to prepare to issue your report?

A. There's two basic pieces of information that I used. Number one, I relied again on the radiation survey data that had been taken back in the 1980's that I used in my generic dose assessment back in 1990, those data are still valid and they reflected the conditions at the time and the conditions that were roughly the same as Mr. Payne would have experienced. And I combined that with assumptions about where he worked during what year, how many times a week did he go out there, how many runs back and forth to Y-12 from the east Oak Ridge did he make, and I tailored this dose assessment to the particular conditions of exposure that he stated in his testimony that this is what he did and seemed to be, by and large, beyond contention. I basically took his word for it.

Q. You took your 1990 report and applied it to Mr. Payne.

A. Absolutely. That's exactly what I did.

Q. And can you tell me, did you also go out to the tracks leading up to Y-12 just -- with Mr. Maynard?

A. Yes, in early or mid August, I don't remember the exact date, Mr. Maynard came to Oak Ridge and I met Jay Baker and the three of us just went out and we drove along the railroad tracks from the east end of Oak Ridge to Y-12 and around the Y-12 area, we got out and walked around and just saw where the tracks went and kind of got the lay of the land and I explained to them what I knew about the past history of this location.

Q. Did Mr. Maynard explain about switching operations for railroaders?

A. Yes, he explained to me, I'm not a railroad person, he explained to me what Mr. Payne's duties would have been at the time.

Q. Okay. Does this appear to be the track leading up into the Y-12 plant?

A. That's basically how it looks today, yes, that gravel riprap there is where the track used to be and you can sort of see a bit of it in the lower right-hand corner but, yeah, going off into the picture to the center left is going into the Y-12 railroad yard.

Q. And does this appear what it looked like the day you went out there with Mr. Maynard and Mr. Baker?

A. Yes indeed.

Q. Okay. All right.

MS. YOUNG: You can do the lights, if you would.

Thank you very much.

Q. (BY MS. YOUNG) Well, let me go back a little bit to what you based your opinion on.

Was there a particular time frame or period of time that you based Mr. Payne's work on out there from east Oak Ridge leading into the Y-12 plant?

A. He testified that his work activities occurred during the year 1983, this not contended by Mr. Maynard, so that was my assumption.

Q. Okay. And did he -- did you make some assumption based on Mr. Payne's testimony about how often he went out there, how many times, the length of time and where he went?

A. Yes, he stated that he made -- three days a week, he came to work along that rail line and he testified on each of those workdays, he made two round trips from east Oak Ridge into the

Y-12 plant and back and he also testified that he spent 30 minutes each time he went back to the railroad at east Oak Ridge, he testified that he spent 30 minutes there moving cars around, walking around, doing what trainmen do, the kind of thing that Mr. Maynard explained to me, that he spent 30 minutes is obviously approximation, it wasn't 30 minutes exactly but that's the assumption I used based on his testimony.

I also used his testimony that the main function of the runs out there was to deliver materials to the Y-12 plant inside that fence that you showed -- that was seen in that previous photograph, but on some of the trips, they would also make stops at industrial facilities along the way to deliver equipment and so part of my assessment was to assume that he indeed made some stops in an area where there may have been some industrial activity but I basically used the information that he testified to in his deposition about how many days per week, how long a time, it was approximately one year, how many round trips per day, how much time did he spend in rail yards on each trip, that kind of thing, I took his word for it.

Q. Okay. Dr. Kocher, can you tell me the jury has heard from Dr. Dooley about what was called "bounding dose," did you do that in this dose assessment?

A. Yes, my attempt in doing a dose assessment for Mr. Payne from this radioactive contamination along the railroad tracks was to do what I call a bounding estimate, to come up with an estimate of dose that I'm quite confident would be higher than the dose he actually received and I did this because I already knew from my 1990 report that it was virtually certain that his dose was quite low and that's an ideal situation for doing a bounding estimate when you are quite confident that it's low.

Q. Well, give the jury an example, if you would, about how you used a bounding dose or a conservative approach, give the jury an example of how you gave Mr. Payne the benefit of the doubt or was -- were favorable to him in your dose.

A. Okay. One of the things that Mr. Payne did when he was in Oak Ridge, there was a very small switch yard in the east end of Oak Ridge, any of you familiar with it, it's called the warehouse district and there were four railroad tracks in this district, one was a through track

from the CSX mainline over by Melton Hill, and the other three were kind of spur lines and we knew from the radiation survey data that the contamination, the radioactive contamination was almost entirely along one of the three spur lines and so in order to give a bounding estimate of his dose, I assumed that all the 30 minutes that he spent in the warehouse district of Oak Ridge, he spent walking along this one track where the contamination was and that he spent none of his 30 minutes walking along any of these other tracks where there was no contamination and that's virtually certain that that's not what really happened. He certainly spent some of his 30 minutes in uncontaminated areas, but I assumed that he spent his entire 30 minutes out there on each trip walking along the contaminated track only.

Q. Well, based on your bounding assumption or your bounding calculations and based on the information that you've already described to us, do you have an opinion about whether or not -- what is your opinion about Mr. Payne's exposures in the area east Oak Ridge to Y-12?

A. The bounding analysis I did, I came up with in my judgment that his dose almost certainly did not exceed a value of 1 millirem which

is a very, very low dose.

Q. Dr. Kocher, the jury and everybody in the courtroom has heard a lot about rems and millirems and picocuries and maybe some other units of measurements of radiation.

Could you help us out here, tell us what -- put in perspective what one millirem is.

THE COURT: We have already gone over that. Unless he's got a different concept of it, we've done that.

MS. YOUNG: Your Honor --

THE COURT: It's -- a millirem is still one-thousandth of a rem, we've already done that.

When you say less than one millirem, is that the entire time that he was there?

THE WITNESS: During 1983 in Oak Ridge, yes.

THE COURT: All right. Yeah, we have already defined that.

Q. (BY MS. YOUNG) Dr. Kocher, don't -- if you would, don't define what a millirem is for us, but could you put it in context?

A. Yeah, I think when I do a dose

there, but that's a whole other topic.

Q. Is there an association between emphysema and lung cancer?

A. Yes, there is.

Q. Does emphysema increase one's risk of getting lung cancer?

A. Yes, it does.

Q. Now, I think you touched on this briefly but I want to get you to talk about it, and then we are about done. But is there a relationship between asbestos exposure and lung cancer?

A. In a specific type of lung cancer, which is not the classical lung cancer, there is what is known as a mesothelioma, but that's only certain types of asbestos and under most unusual circumstances, but it's not what we call lung cancer.

Q. That's not what Mr. Payne had, is it?

A. That is not what Mr. Payne had.

Q. Now, is it ever proper not in a mesothelioma situation but in a regular bronchogenic lung cancer situation, is it proper to say that asbestos played a role in causing that cancer?

A. Yes.

Q. And under what setting is it proper to make that diagnosis?

A. When you have the disease asbestosis, the lungs are scarred extensively so that it can be seen in an x-ray, and that's the critical feature.

Q. Why is it important to first find asbestosis before you can say that asbestos played a role in the tumor?

A. Well, it's a marker of very heavy and prolonged exposure. You don't get it from cutting an asbestos board such as a carpenter does; you get it when you work with asbestos day in and day out, over periods of 15, 20, 25 years. And heavy exposures over long periods of time result in asbestosis.

There's no question under those circumstances that it occurs, that lung cancer can cause or -- I should say contribute to the development of -- excuse me, that asbestos can contribute to the development of lung cancer, but that's the situation where the lungs are extensively scarred by heavy and prolonged exposure to asbestos.

Q. Dr. Craighead, if somebody has a lung cancer and they have been a smoker but they go

to the doctor to see if they have this other disease asbestosis and there is no evidence of the asbestosis, is it proper to say that in that person the asbestos played a role in causing the tumor or is that improper?

A. That's improper.

Q. Is there literature that the supports your belief?

A. Yes, there is extensive literature. There is a chapter in this recent book written by an Englishman that exhaustively studies this issue. And then in a report that I made not long ago I cited four review articles, one of which that I wrote and three that were written by other scientists that say the same thing.

They have been published in what is known as the peer reviewed literature, and they have been carefully analyzed.

Q. Did you see anything in Mr. Payne's medical charts that suggested that he had asbestosis?

A. No, I did not.

Q. If he didn't have asbestosis, what does that tell you about the likelihood that asbestos played a role in the cause of his lung

cancer?

A. I don't think that -- on that basis there's no evidence that it did.

Q. Why is cigarette smoking so bad for you?

A. First, we differ. Some people are more susceptible to the adverse effects than others, and there are over 3,000 different constituents, there's the gas phase, there is a particulate phase, and the particulate phase contains the whole series of carcinogens known as nitrosamines and as polycyclic aromatic hydrocarbons. And those are carcinogens.

But we have a whole series of other chemicals that can damage the lung substance. Some of those are what we know as promoters, they help the polycyclic aromatic hydrocarbons do their dirty work and there are a dozen of those.

But it's the unique combination of all of these gases, particulates and chemicals that are the basis for the adverse effects. And despite what the advertisers would like to tell you, filtering may reduce the toxicity, but filters don't necessarily prevent lung cancer.

Q. You said when we first started

talking, Dr. Craighead, that it was your belief that Mr. Payne had accumulated approximately 30 pack years of cigarette smoking?

A. Yes, from what I could gather in his deposition.

Q. Essentially one pack a day for 30 years.

What did that 30 pack year history do to his personal risk of getting lung cancer?

A. Well, it goes up. It's a dose dependent issue, and it goes up as the years pass. And there's good evidence now that if even if you quit, the risk that you had on the day you quit, the risk of developing lung cancer, if anything increases as the years pass.

And there's something of course about -- about age in cancer, that it's more likely that older folks are going to get cancer, and the effects of the cigarette smoking earlier in life seem to be nullified as the time passes, as one grows into the golden years, so to speak.

Q. Now, I think any of us who have smoked have had a doctor tell us you need to quit because quitting will be good for your health.

Mr. Payne, the evidence is

Mr. Payne quit smoking in about 1988.

Was that a good thing for him to do for himself?

A. Yes, I don't think it decreases the risk of cancer developing, but as we say, there are lots of different gases and there are irritants, there are acids and alkalides, and those enhance the effects that result in emphysema and irritation of the respiratory tract. So, yes, quitting is appropriate. Its major effect will be on the adverse effects of emphysema and the irritation of the lung tissue.

Cancer, unfortunately, the die is cast.

Q. Dr. Craighead, based on everything you have seen in this case and on your years of working in the area of cancer, do you have an opinion you can share with this jury to a reasonable degree of medical certainty as to the most likely cause of Mr. Payne's lung cancer?

A. Yes.

Q. What is your opinion?

A. I think it's highly probable, in my opinion it's pretty definite that Mr. Payne's lung cancer was caused by cigarette smoking.

Q. Did any diesel exhaust exposure that Mr. Payne might have had play any role in the causes?

A. No.

Q. Did any asbestos exposure he may have had play any role in the causes?

A. I don't think so.

Q. Doctor, you've been on direct examination for about an hour. You've given us a number of professional opinions.

Let me ask you, are those opinions that you've shared with this jury opinions you hold to a reasonable degree of medical certainty and are they also the product of your best professional judgment?

A. Yes, they are.

Q. Thank you, Dr. Craighead. These gentlemen may have some questions for you.

CROSS-EXAMINATION

BY MR. GILREATH:

Q. Dr. Craighead, you gave up your pathology practice at hospitals in 1992, is that right?

A. Yes, that's correct.

Q. You have not taught any classes on

epidemiology?

A. No, only in -- well, you see, pathology is the study of disease, so epidemiology is intrinsic to the study of pathology.

Q. My question is you've not taught any classes on epidemiology?

A. Not formal classes, no.

Q. You have done no independent studies on asbestos-containing products to determine how much asbestos dust gets released --

A. Is released when?

Q. You have done no independent studies on asbestos-containing products to determine how much asbestos dust gets released when they are used?

A. That's not my area of study. I depend on industrial hygienists to do that.

Q. So you depend on others to do the study, and then you give your opinions, is that right?

A. With regard to the release, yes.

Q. So you're an opinion witness here today?

A. No, insofar as the quantitation of release from a particular product, the industrial

hygienist has the tools that allow them to provide quantitative information. I don't do those types of studies.

Q. Right. You read their studies and then you give opinions?

A. In part related to my other experience.

Q. And that's what you are doing today is you are giving us your opinion, right?

A. Yes.

Q. And since 1996 your practice has been limited to doing consulting work for lawsuits?

A. Yes.

Q. And your opinions -- in all of those cases you've given your opinions, right?

A. Yes.

Q. As you are doing today.

A. Yes.

Q. You give lectures to defense lawyers who defend asbestos companies and railroads, you give lectures to these lawyers on how to defend cases and have in the past?

A. I have on a few cases, yes.

Q. And do you charge the same amount when you give those lectures as you do when you come

published in the literature since that time. That's a very old study, 1985.

Q. Well, you were working at the same time as Dr. Selikoff did the study?

A. Yes, and we criticized that rather vigorously at the time.

Q. And he was studying asbestos at Mount Sinai.

A. Yes, shipyard workers, yes.

Q. All types of asbestos can contribute to lung cancer, correct?

A. If there is a sufficient exposure to result in asbestosis, to the best of my knowledge, yes.

Q. You've testified before that in theory one fiber of asbestos alone can cause mesothelioma?

A. Yes, in theory.

Q. Of course, you saw a thyroid cancer in Mr. Payne, didn't you?

A. Yes.

Q. And that's caused by radiation, isn't it?

A. That's one of the contributing causes, yes. It's not the only cause. Most

individuals we don't know what the cause was.

Q. I believe since you started doing consulting work you've handled over 5,000 cases, is that right?

A. Roughly that, yes.

Q. That's all I have, thank you.

MR. BAKER: I have nothing further of this witness.

THE COURT: Thank you, Doctor. You can be excused. We'll take a 15 minute break and then come back.

(Jury dismissed from courtroom).

THE COURT: Something you want to talk about right now, Mr. Baker?

MR. BAKER: Yes, Your Honor.

THE COURT: What is that?

MR. BAKER: Mr. Gilreath, plaintiff's counsel, asked this witness about thyroid cancer. This court has excluded thyroid cancer as a cause through the deposition testimony of Dr. Manning and others.

As we all know, everyone concluded that he could not have thyroid cancer, that what they thought was a lesion turned out

not to be a lesion.

Now -- and as a result of an agreement that was reached that no one would attempt to demonstrate to this jury that the thyroid problem was related to radiation -- and that's not been part of this trial. Yet today Mr. Gilreath comes in and asks this witness about thyroid cancer, and the witness testified that thyroid cancer can be caused by radiation when everyone knows that the man did not have thyroid cancer, everyone knows that it was a nonmalignant lesion and that had nothing at all do with his treatment, nothing at all to do with his death, yet he brought that out in front of this jury. So I must move for mistrial as a result of what was done just a moment ago.

MR. GILREATH: Your Honor, I didn't ask him if the man died of thyroid cancer, if thyroid cancer caused his death, I was only testing the credibility of the witness.

MR. BAKER: You asked him, I wrote it down, did he have thyroid cancer? And he said yes.

MR. GILREATH: No, I said did you

find thyroid cancer.

MR. BAKER: Okay. Did you find thyroid cancer.

I just cannot believe that this has happened.

THE COURT: What do you want me to do?

MR. BAKER: You are going to have to grant a mistrial because he brought that up unless you figure out some way to cure it, maybe a statement to the jury, a statement to the jury that he did not have thyroid cancer. There's absolutely no evidence --

THE COURT: Okay. We'll tell the jury that.

Like your previous motion, we'll take no action on that at this time.

THE COURT: So we'll see you back in a few minutes.

(Off the record at 9:56 a.m.)

(On the record at 10:09 a.m.)

MR. SHAPIRO: Your Honor, can I be heard before Mr. Baker asks for the particular instruction?

Your Honor, the part that I want you to be aware of is that Dr. Craighead gave a written report to the plaintiff in this case and, Your Honor, in his written report, Your Honor, he stated in June of 2006 a PET scan demonstrated hypermetabolic activity in the region of the tumor in the left lung, but incidentally showed up a hypermetabolic nodule in the right lobe of the thyroid. A fine needle aspiration of this nodule demonstrated a papillary thyroid carcinoma. I have examined this specimen and concur. And he cites the biopsy. This is in the written report provided by the defendant to the plaintiff.

Your ruling, Your Honor, as we understood it, was that the plaintiff's experts had not discussed thyroid cancer as a part of their diagnosis on our burden of proof, but the plaintiff is entitled to test the credibility of defense witnesses, and this is one of their witnesses confirming thyroid carcinoma. So the way Mr. Baker is proposing this instruction is that he didn't have thyroid cancer.

That's a fiction. Their doctor said he had thyroid carcinoma.

Now, we don't object to you reading to the jury that the plaintiff's experts in this case, or physicians, did not discuss thyroid cancer as being connected to this claim. But it's not true to say to the jury no one diagnosed thyroid cancer. And I'll offer this report into evidence for 566 for identification, Your Honor, the report of Dr. Craighead. Thank you.

(Exhibit 566 marked for identification).

MR. BAKER: Well, first, plaintiff's own expert said he didn't have it. All the doctors said he didn't have it. It went away. They know that. They know that it's not cancer, and yet here they are trying to convince this jury that it was.

This is the instruction that we ask the Court to read.

"I instruct you that Mr. Payne did not have thyroid cancer." That is the truth. "I remind you that its own expert, Dr. Frank, testified that plaintiff did not

have thyroid cancer. I instruct you to disregard plaintiff's line of questioning regarding thyroid cancer and radiation. This was an improper line of questioning by plaintiff's counsel and is not at all a part of this case."

I submit this for the Court's consideration, and ask that that be made an exhibit for identification.

MR. SHAPIRO: For the reasons noted we object to the precise language there, Your Honor.

(Exhibit 567 marked for identification).

(Jury returned to courtroom at 10:12 a.m.).

(END OF VOLUME XVI)

THE COURT: Before we get to the next witness, in the cross examination of the last witness, mention was made of the term thyroid cancer. As you previously heard, there's no claim in this case that the plaintiff suffered from thyroid cancer or that that caused him anything that is the subject matter of this case.

So who is your next witness?

MR. BAKER: Your Honor, I propose to read certain portions of the deposition of Mr. Payne that was taken on October the 2nd, 2008.

May I proceed?

THE COURT: All right.

MR. BAKER: The plaintiff, Mr. Payne gave a deposition on October 2nd, 2008.

THE COURT: This is a different deposition than the one that was previously presented to me.

MR. BAKER: And after being duly sworn testified as follows, at Page 5, Line 4 through 6.

(Whereupon, excerpts from the

CERTIFICATE OF SERVICE

I certify that, on this 21 day of March, 2014, I served a true and correct copy of the foregoing on:

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