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ANN RILEY & ASSOCIATES, LTD.
1612 K St. N.W., Suite 300
Washington, D.C. 20006
(202) 293-3950

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UNITED STATES NUCLEAR REGULATORY COMMISSION'S

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

DATE: October 31, 1990

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

SUBCOMMITTEE ON ADVANCED BOILING WATER REACTORS

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Wednesday, October 31, 1990

Nuclear Regulatory Commission

Conference Room P-110

7920 Norfolk Avenue

Bethesda, Maryland

The Subcommittee met, pursuant to notice, at 11:10 o'clock a.m., Carl Michelson, Subcommittee Chairman, presiding.

PARTICIPANTS:

C. MICHELSON, ACRS Member

J. CARROLL, ACRS Member

I. CATTON, ACRS Member

C. SIESS, ACRS Member

E. WILKINS, ACRS Member

R. COSTNER, JR., ACRS Consultant

M. EL-ZEFTAWY, ACRS Cognizant Staff Member

C. MILLER, NRC/NRR

C. POSLUSNY, NRC/NRR

J. E. MAXWELL, GE

J. CHAMBERS, GE

G. EHLERT, GE

P R O C E E D I N G S

[11:10 a.m.]"

MR. MICHELSON: The meeting will now come to order. This is a meeting of the Advisory Committee on Reactor Safeguards, Subcommittee on Advanced Boiling Water Reactors. I am Carl Michelson, Acting Subcommittee Chairman. ACRS members in attendance are J. Carroll, Ivan Catton, Ernest Wilkins, and we have a consultant coming, Bob Costner, who is supposed to be here by now, but his airplane must have been a little late.

The purpose of this meeting is to review the physical separation and general plant layout of the GE ABWR design.

Dr. El-Zeftawy is the cognizant ACRS staff member for this meeting.

The rules for participation in today's meeting have been announced as part of the notice of this meeting previously published in the Federal Register on October 17, 1990. A transcript of the meeting is being kept and will be made available as stated in the Federal Register Notice.

It is requested that each speaker first identify himself or herself and speak with sufficient clarity and volume so that he or she can be readily heard.

We have received no written comments or requests to make oral statements from members of the public..

The purpose of the discussion on the ABWR today is to look at the degree to which hard barrier physical separation is going to be used in the ABWR to assure that we will minimize our problems with hazardous events, such as fire, internal flooding, and so forth.

To do that, we want to pursue with GE their physical separation through looking at the general plant layout, and also looking at specific aspects of the separation boundary, such as the doors that may be present, electrical penetrations, ventilation ducts, floor drains, things of this sort that can penetrate the separation barrier. We'd like to see how they propose to handle these areas.

My own view, at least, is that we know that there can be potential problems with hazardous events, such as fire, that are very difficult to address on a purely deterministic basis. So one of the perhaps best methods of handling the problem is to assure that it cannot spread beyond some certain boundary point, and then assure that the equipment on the other side of the boundary will take care of the event irrespective of what might be happening within the zone of the event itself.

So we're quite interested in assuring that, for future plants, we do have good barriers between such events and the rest of the plant equipment.

With those thoughts in mind, I think we now are going to proceed with GE making the presentation. If you will, then.

MR. CHAMBERS: Okay. This is John Chambers with GE. I have with me today Gary Ehlert from our Plant Arrangement Group, and Ed Maxwell from our C&I Electrical Design Group. What we're going to do is Mr. Maxwell is going to give the presentation and just lead you through essentially the fire hazards analysis that we have in the SSAR, and then as we get into other areas, or you have questions of similar concerns with other areas, we can get into those.

With that, I'll just let Mr. Maxwell start.

MR. MICHELSON: Okay. Thank you. Now, it's my understanding that nothing at our meeting that will be said will be proprietary, but we may be looking at some handouts that are proprietary. Is that correct?

MR. CHAMBERS: That's correct.

MR. MICHELSON: Thank you.

MR. WILKINS: Carl, I notice that the posted agenda had a presentation from the NRC staff on it. Are we going to hear that?

MR. MICHELSON: It's my understanding that the staff doesn't wish to make a presentation because the person that would have made the presentation was unable to be here.

Is that right, Charlie? Do you have any words that you want to say now, or just at the end? Certainly, you're free to say them. I assumed you meant at the end of the discussion.

MR. MILLER: I guess the only words that I would like to say are, first, I'd like to say that, you know, we're here today to try to listen and to try to respond to any questions to the extent that we can, and also to try to, as the discussion progresses, if we hear concerns, take those back and try to factor those into evaluations that we're performing.

I'd like to introduce the gentleman to my right to the Subcommittee because he's going to be joining my staff in working with Deno Scalletti on the ABWR, and his name is Chet Poslusny.

MR. MICHELSON: Can you spell that?

MR. MILLER: I'll let Chet do it.

[Laughter.]

MR. POSLUSNY: It's P-o-s-l-u-s-n-y.

MR. MICHELSON: It's like it sounds.

MR. POSLUSNY: Yes.

MR. MILLER: Our intention is, from this day forward, we're going to double up on the project management on the ABWR to see if we can get the review accelerated.

MR. MICHELSON: Okay. Would you proceed then, please. Certainly, if the staff wishes to ask questions

along the way, this is kind of an informal get together here, and so if you have questions, feel free to ask within reason.

[Slide.]

MR. MAXWELL: My name is Ed Maxwell. I'm principal engineer at General Electric, primarily in charge of electrical and fire protection.

On the first slide here, I'd like to run over the ions that I prepared for this meeting. They look a little different than the agenda that I just got, but I think they'll cover the subjects that you want to cover.

The first thing I'm going to talk about is our ultimate fire protection design objective, and I'm going to talk a little bit about some of the passive features contributing to the achievement of this ultimate fire protection goal.

Then we're going to talk -- we have some three-hour fire separation exceptions, and this is all introductory material to what I'd say is a tour of the plant. We're going to start in the reactor building with a set of colored arrangement drawings, and we'll start at the bottom floor and come up through the plant, describing the separation. Any questions you have, we'll try to answer them.

MR. MICHELSON: Before we get started, maybe you

could give me a feeling for something that I've wondered about. That is, as I understand it, this is the nuclear island being built in Japan, and that apparently, this is the Japanese design of that island.

MR. MAXWELL: That is not quite correct. It is the modification of the Japanese design to meet the US requirements. In some cases, their design does not meet our US requirements.

MR. MICHELSON: Could you give me an example of wherein within the reactor building it didn't meet it, just to get a feel for it?

MR. MAXWELL: Well, for instance, they don't keep three-hour separation, hard barrier separation between divisions. They only meet IEEE 384. So we've had to go back, add separations.

MR. MICHELSON: I see.

MR. MAXWELL: And that requires some modification to the HVAC systems.

MR. MICHELSON: So if I were to walk into the Japanese plants comparable to this when it's available, I would find certain walls missing that I would see in a US version?

MR. MAXWELL: That's correct.

MR. MICHELSON: And I would find some rerouting of ducting and electrical and so forth to accommodate our

perhaps more stringent requirements?

MR. MAXWELL: That's correct.

MR. MICHELSON: The reason I ask this is because you're probably aware that the Japanese have maybe less concern about severe accidents than perhaps we do, and therefore do not have some of the accommodations that we've been asking for in our plants.

MR. MAXWELL: Yes. I'm aware of that.

MR. CARROLL: Did you mean what you said, that you'd find walls in the US plant that don't exist in the Japanese plant?

MR. MAXWELL: That is correct, yes.

MR. WILKINS: I would have thought they might be thicker walls.

MR. MAXWELL: Generally not thicker because our walls in our plants tend to be thick enough to give you three-hour separation regardless of whether they're fire barriers or not. About seven inches of concrete will do that. You have to look to find a seven-inch thin wall in any plant.

After we go through the, and on the buildings we're going to go through the reactor building and the control building, those are the two buildings. And then I'm going to talk a little bit about secondary containment HVAC, and its fire separations. That's one of the areas where we

had to make a change.

And then later this afternoon, we're going to make a big shift of gears, and I'll talk a bit about solid state controls, the use of solid state controls in the plant.

[Slide.]

MR. MAXWELL: Our ultimate goal in the fire protection design is to have complete burnout, to be able to accept complete burnout with recovery of a single fire zone.

And when we say without recovery, we mean forever. You don't in a week to have it, other than maybe regulatory considerations, but that we can go ahead and shut the plant down safely for any given fire in the plant.

MR. CARROLL: What does complete burnout mean with respect to the way equipment performs while all this is going on? Does it mean that we're going from a piece of equipment being operable to it being inoperable? Do you take into account when you say burnout in between kind of things? If fire affects a controller, and it makes a valve open that isn't supposed to open, that sort of thing, is that considered in your definition of burnout?

MR. MAXWELL: We assume that because of the fire, everything in the fire zone goes to its worst possible condition or sequence of events that is reasonable with respect to the fire. For instance, hot shorts, opens, and

spurious signals.

MR. CARROLL: So you do look at such things as spurious actuation of equipment?

MR. MAXWELL: Yes. For instance, if we have two isolation valves, if we have an isolation valve that can be opened by some combination of events due to the fire, then we check to see if there's another isolation valve that is immune from the consequences of the fire in that particular fire zone.

MR. MICHELSON: So you do then look for unwanted responses from equipment located within the fire zone?

MR. MAXWELL: That's correct.

MR. MICHELSON: I don't find that in the SAR, not even stated. But that's a good idea. If that's what GE's going to do, that's great. I wasn't, I looked at your fire hazards analysis. That's not the assumption made there. You assume loss of functionality. You don't look for unwanted actions.

MR. MAXWELL: We probably, that's not a full statement of what we do. Yes, we state it in terms of functionality.

MR. MICHELSON: Okay. It may be that your hazards analysis is not quite up to your current thinking then, perhaps.

MR. MAXWELL: Yes. It is due for an update.

We're working on it right now.

MR. MICHELSON: I think that is a very important, that is the consideration of concern to us is making sure that we don't get, that you have adequately accounted for unwanted action from a given fire zone. That's important.

When you talk about a fire zone, is it correct to assume it's always surrounded by three-hour fire barriers?

MR. MAXWELL: That is correct.

MR. CARROLL: Let's see. This morning -- did you get your answer, Carl?

MR. MICHELSON: Yes.

MR. CARROLL: This morning I keep hearing about fire hazards analysis. I thought we got rid of the terminology "hazards analysis" some time back in the '60s.

MR. MICHELSON: Well, maybe it's called "risk" now.

MR. CARROLL: A general term.

MR. MICHELSON: I think it's probably called "risk" even in the ABWR. I don't remember now. It's a risk-scoping study of some sort.

MR. CARROLL: All right.

MR. MICHELSON: I'm just old-fashioned.

MR. CARROLL: Wash your mouth out.

MR. MICHELSON: Oh, no; I'm not going to do that. I'm just way behind the times, that's all.

MR. MAXWELL: I was there when this happened. It still is "fire hazard analysis" in the various depositions. And the first time I saw it, I was just like you. I thought we got rid of that. But it came back, as fire hazard analysis.

MR. CARROLL: So we should be talking of Conrad McCracken, or somebody like that? Okay.

[Slide.]

MR. MAXWELL: Okay. I just want to run through these features --

MR. MICHELSON: One more question, just to make sure I understand this complete burnout, and all of its ramifications.

If there is, if we have a fire in a given zone and we are trying to mitigate the fire in that zone, and so forth, are the effects of those mitigating steps included in this analysis --

MR. MAXWELL: Yes.

MR. MICHELSON: -- such as equipment getting wet, and not necessarily getting hot, because it's in the same zone?

MR. MAXWELL: That's correct.

MR. MICHELSON: Sprinklers are coming on, but that wasn't where the fire was.

So you're going to analyze the other equipment

from the viewpoint of what happens when water gets in it, in looking for your unwanted actions?

MR. MAXWELL: Again, if it's in the fire zone, we figure out the worst possible failures that we can have either from the fire or from the suppression activity, and ascertain that that's acceptable.

MR. MICHELSON: Okay. Sounds good.

MR. CARROLL: Can we terminate the meeting at this point?

[Laughter.]

MR. MICHELSON: At this point, I think we can forget about everything else.

MR. MAXWELL: That is our objective.

I sincerely hope you're able to do this, because that is the right ultimate thing to do. Not easy, however.

MR. MAXWELL: Even more difficult to document, maybe.

MR. CATTON: You'll put the PRA people out of business.

MR. MICHELSON: It's going to require a significant change to your report that's in the ABWR SSAR so far.

MR. MAXWELL: Okay. Some of the features of the plant design that you might watch as we go through the drawings, that contribute to meeting our objective of

complete burnout of a fire zone, are:

Three independent divisions of water injection and decay heat removal. And I'm sure you're aware of this, that on the ABWR we put heat exchanger capacity in the third division so that it now is a full division as compared to Division 1 and 2. And any one of those three divisions is capable of safely shutting a plant down.

MR. CARROLL: And when you use the terminology "three independent divisions," you're talking, in addition to the fluidic systems, you're talking about the power supply system, the electrical power supply systems?

MR. MAXWELL: That's correct.

MR. CARROLL: So you've got three diesels plus the EPRI-prescribed alternative AC power system.

MR. MAXWELL: Yes. Three batteries, three 6.9 KP switchgear groups, the whole thing. Yes.

MR. MICHELSON: I unfortunately forgot to bring the page with me, but I read one place, and it probably is out of date now, in the SAR where it said that you needed two out of three of those electrical divisions to do certain things that were required for safe shutdown, but that's probably no longer true. I had thought it was always three pure divisions too, but I read that. I'll bring it for our next meeting when we get to that.

MR. CARROLL: Is that your addition of the heat

exchanger?

MR. MAXWELL: It is that, but we have some difficulty getting the word to all our people also that it's that way.

MR. MICHELSON: I think the SARs sometimes get out of date.

MR. CARROLL: So you're a full N+2 plant?

MR. MAXWELL: For safe shutdown, yes. Now, some LOCA -- I understand there are one or two LOCA situations -- I mean, I can't tell you which one -- that may require two.

MR. MICHELSON: Well, that's where I read about it, in the LOCA situations.

MR. MAXWELL: Yes.

MR. MICHELSON: That's what safe shutdown has to do with.

MR. MAXWELL: Well, that's emergency shutdown.

MR. MICHELSON: There is a difference in your terminology? I certainly never picked that up in reading it.

MR. MAXWELL: Safe shutdown -- as you know, as I read the branch technical position, safe shutdown is not LOCA. The emergency shutdown is LOCA, and they make the statement that --

MR. CHAMBERS: As Ed said, there are one or two instances because -- of the three divisions, one of the

divisions has for its high pressure system RCIC, so you can get into one or two situations, and I don't remember what they are off-hand either, where you don't quite have N+2, but you still meet all the reg guides and the requirements in the SRP.

MR. MICHELSON: For any external events, you do meet N+2. Is that what you're saying? But for certain LOCA events, you do not?

MR. CHAMBERS: That may be a fair assessment, yes.

MR. MICHELSON: Well, we're looking at these boundaries from external event viewpoint, of course. They're not in there for LOCA, they're in there for external events.

MR. CARROLL: That may be something you can check on during our lunch break and give us a good description of what the exceptions are?

MR. CHAMBERS: Yes, I should be able to do that.

MR. CATTON: I'd be interested in what's not quite N+2.

MR. MICHELSON: Yes. That's the exception.

[Laughter.]

MR. CATTON: Oh, but I'd like to know what it is. What's missing to make it N+2?

MR. MICHELSON: That's where the event will be, and it will be missing.

[Laughter.]"

MR. CARROLL: I did read your submittal on accidents in modes other than power operation. I'd be interested, if there's any exceptions for those modes for the kinds of accidents you're looking at. I'm not sure there are. I think you're N+2 if you're not in power operation.

MR. CHAMBERS: Yes. I'll check that as well.

MR. CARROLL: Do you understand what I'm asking?

MR. CHAMBEPS: Yes. That's our shutdown risk analysis in answer to one of the staff's questions, I take it.

MR. CARROLL: Yes.

MR. MICHELSON: Yes. In other words, if you had an external event during shutdown, what would be your requirements. Do you have N+2 available -- well, it won't be available, but do you have an N+2 configuration? Proceed.

MR. MAXWELL: Okay. Then we have three independent divisions of safety related support systems: HVAC, reactor building closed cooling water, service water.

MR. MICHELSON: Now, when we pursued this on ABWR at an earlier meeting, you indeed had these three separate HVACs, but then you also told us you had for normal operation a common ventilation system that served all areas.

Is that still the case?

MR. MAXWELL: At the secondary containment?

MR. MICHELSON: The reactor building.

MR. MAXWELL: In the reactor building, and that's one we're going to dig into a little later.

MR. MICHELSON: Okay. You're still looking at that question.

MR. MAXWELL: Yes. We think we have a solution for it. But it is a modification that we had to make to the Japanese design.

MR. MICHELSON: Because if you have a common ventilation system, then you have common connectors between your otherwise good barriers.

MR. MAXWELL: That's correct.

MR. CARROLL: At some point, and maybe this isn't the right time, I'd like to really get a good appreciation for what differs from the Japanese plant and this one, and, more importantly, why they tend to be more cavalier about the fire issue than we are.

MR. MAXWELL: Probably the best way to handle that is to go through floor by floor, and I'll point out the additions that show, and then maybe we can talk after we've gone through the arrangements and a little more summarize it.

MR. CARROLL: Okay.

MR. MAXWELL: Ask me a question. If I don't answer you, ask me.

MR. CARROLL: Oh, yes.

MR. MAXWELL: Okay.

MR. CARROLL: You don't have to worry about that.

[Laughter.]

MR. MAXWELL: I haven't in the past.

The only equipment of one division in the fire area or zone -- now, you'll hear me use "fire area" or "fire zone," and, to me, they're synonymous, but we only have one division of equipment in a fire zone, except there are a few special cases. I'm going to talk about those as a separate item.

MR. CATTON: And give us the reason.

MR. MAXWELL: Why it is. I'll explain that, if you don't mind, in one case, okay?

There are only safety-related services -- piping, HVAC, cables -- of one division within an area. Again, we follow through with the service systems --

MR. MICHELSON: But see, you're talking again about safety-related services. I might be equally concerned about non safety related services -- a big water line going through the room that doesn't perform a safety-related function; it's just in there for whatever reason. Clearly, that's a part of this analysis.

MR. MAXWELL: That's correct.

MR. MICHELSON: So if you take a water line and run it through one division, what are the rules about also running it through other divisions?

MR. MAXWELL: Well, you have to assume the failures that we assume, modes of failures, for that line and that division, and the consequences of that failure cannot progress to another division.

Now, if the line goes to another division, then you assume the failure is over in that division, and go through a similar analysis.

MR. MICHELSON: And you assume, of course, that there aren't two failures, just one failure.

MR. MAXWELL: That's correct, yes.

MR. MICHELSON: A little different than how we treat electrical associated cabling. You remember, once associated with a safety tray, it isn't put in any other tray.

MR. MAXWELL: That's correct, yes.

MR. MICHELSON: Any other safety-related tray, that is.

MR. MAXWELL: Yes. And then we try to get fire zones of like divisions contiguous to each other, if possible, so that in your route between the fire zones, you don't go through divisions of other divisional areas. We

also take only safety-related services of one division between divisional fire areas.

MR. CARROLL: I am getting lost here now. Try some other words on that --

MR. MAXWELL: On the last one?

MR. CARROLL: No, the one before that. Fire zones of like divisions. You have three divisions in the plant. Are you using divisions in a different sense?

MR. MAXWELL: That's right. Let me give you a good example. We have the reactor building site, and then we have the control building between the reactor building and the turbine building. Now, if you look at the interface of the reactor building to the control building, in the reactor building, if you're standing in the reactor building looking out to the control building, Division 2 cable trays, piping and services will be on the left of the building, Division 1 will be in the middle, and Division 3 will be over on the right.

Now, if you go look in the control building, it's laid out to match up so that the divisions -- you have two different fire zones in a division, and they're adjacent to each other.

MR. CARROLL: All right.

MR. MAXWELL: So we don't get cross overs and things like that.

MR. CARROLL: So that is what that bullet means, then?

MR. MAXWELL: Yes. Ideally, what you'd want to do is take all of your Division 1 fire zones and put them in cube, all your Division 2 fire zones and put them in a cube, and Division 3 and put them in a cube.

MR. CARROLL: Unfortunately, the plant is not in cube form.

MR. MAXWELL: We try to line them up adjacent. The can be adjacent horizontally or vertically. You will see this in the arrangement drawings.

MR. CARROLL: I understand.

MR. MAXWELL: Let's see, only safety related services of one division between divisional fire areas.

MR. MICHELSON: What does that mean?

MR. MAXWELL: Well, like if you have a division fire area 1 in the reactor building and you've got services going over at the control building, it would be Division 1 services going between those two Division areas and that's all.

MR. MICHELSON: Let's take a Division 1, Division 2 separation within the reactor building. These are again two separate divisions. What does that statement then mean?

MR. MAXWELL: It means that there will be no Division 1 or 2 services going between the Division 1 and 2

areas.

MR. MICHELSON: You are saying none of these services will cross divisional boundaries?

MR. MAXWELL: That is correct.

MR. MICHELSON: Yet there are some cases where -- and as it must be the exceptions --where you have to cross talk.

MR. MAXWELL: With the special cases, with the exception of special cases.

MR. MICHELSON: There are a few cross talks required?

MR. MAXWELL: Yes. We will talk about that.

MR. MICHELSON: Now, do these statements apply equally to piping versus cables and so forth?

MR. MAXWELL: Correct.

MR. MICHELSON: So, you have no cross over piping?

MR. MAXWELL: Yes, that is correct.

MR. MICHELSON: Now, if it is a non-safety related function, do you allow cross over piping?

MR. MAXWELL: Yes.

MR. MICHELSON: So, you are not following that pure rule that we have about association of electrical cables in the case of water pipes?

MR. MAXWELL: Correct. No, we are not.

MR. MICHELSON: How about in the case of

electrical cables? You are still using that philosophy there?

MR. MAXWELL: Yes. Right now we have not identified any associated cables.

MR. MICHELSON: But there wouldn't be any because you can't cross divisional boundaries with it.

MR. MAXWELL: That is right. They would still be -- yes.

We have also, with the multiplex design of the plant, reduced the cable quantities and concentrations which helped. Then we have our diverse high and low pressure systems.

MR. MICHELSON: Now, in the case of multiplexing, I assume maybe you are going to get into this detail later, but you have both safety and non-safety parameters that you are wanting to multiplex. Those can both be put on the same multiplexer, I assume? In other words, you have only safety related inputs, and then a safety related multiplexer?

MR. MAXWELL: We have an essential multiplexing system and then we will have non-essential multiplexing systems.

MR. MICHELSON: And they will be separate?

MR. MAXWELL: Separate, yes.

MR. MICHELSON: Now, if it is a non-essential multiplexer, the inputs coming to it still only come from

within that division?

MR. MAXWELL: Well, non-essential, they would come from non-essential instruments. They would --

MR. MICHELSON: But not necessarily within that divisional boundary, then? They could be coming through the boundary wall from instruments on the other side?

MR. MAXWELL: That is correct.

MR. MICHELSON: So, you would have electrical, non-essential electrical, penetrations of your boundaries?

MR. MAXWELL: Yes.

MR. MICHELSON: And if so, we have to look then at how you provide -- that has to be a good penetration from the fire viewpoint, for instance?

MR. MAXWELL: Yes.

MR. MICHELSON: Why do you do that? Why do you puncture holes in the boundary for that sort of thing? Is there some real problem that you've gained enough by doing that?

MR. MAXWELL: The real answer to that is that non-essential equipment gets laid out with an A and a B pump side by side. We finally got the grade made in the United States, anyway, if we've got an A and a B pump we put them in separate rooms. Whereas, in non-essential they tend to put an A and a B pump side by side so that the maintenance people and so on can go look at them both at the same.

So now you are in a common area. If that happens to be in a Division 1 area, then you have got to get out, probably, to another division.

Now, in most cases, if it is in a -- it will stay by natural routing. The cable would stay within the same division as where the pumps are located, but we don't control it. When I say you have cross throughs, I am not aware of any, but I don't have a method of controlling and preventing it from happening.

MR. MICHELSON: If there are penetrations of the boundaries they will be mostly associated with non-safety related systems, apparently?

MR. MAXWELL: Yes, that is correct. They will be of the same fire rating as the boundary penetrated, which would be three-hour.

MR. MICHELSON: No, that is not going to be true of ventilation, non-safety ventilation though, necessarily? Is that the part you are still working on?

MR. MAXWELL: Well, I would like to show you the drawings we have on that.

MR. MICHELSON: While you are getting that, for the benefit of the Committee, Consultant Bob Costner is here now.

Bob, did you have a problem with your plane?

MR. COSTNER: No, I had problems underground.

MR. CARROLL: Did you mean to skip over the fourth slide at this point?

MR. MAXWELL: Did I miss a slide? Yes. That one is later. These are an insert now.

[Slide.]

MR. MAXWELL: Each of you should have before you an 11 X 17 drawing, a set of drawings, and it should be the reactor building. This should be the right hand half of the top sheet. It should have a 1B at the bottom.

Drawing 1 of 10.

I have broken my flimpsies up into two flimpsies per sheet so that we get a bigger size up here.

I just want to talk about this a little bit. You will notice that there are some notes on this drawing. It is a set of arrangement drawings which we have marked for fire protection. If you look, you will see on the notes an NFW symbol somewhere on your drawings. That means a New Fire Wall. That tells you a change that we made from the Japanese design to our design.

NFD, New Fire Door. Again, that is another change.

Then a solid wall, such as this wall up here, that is a fire barrier, a three-hour fire barrier.

MR. CARROLL: Is that necessarily a change?

MR. MAXWELL: Not necessarily, no. Unless as such

as identified with an NFW, it is a wall. It is a change in that the Japanese do not designate fire walls. But, if it does not have an NFW with a hexagon on it, why we did not designate that wall.

MR. CARROLL: You find that wall in both plants?

MR. MAXWELL: Yes. Then we have the black, cross-hatched plan of floor and means that that's a fire barrier floor.

MR. MICHELSON: What's the colored cross hatch mean?

MR. MAXWELL: The colored cross hatch is down here in Note 6, but it means that that's an area that has some safety related equipment in it, but it's primarily non-safety related. In this particular example here, there will be Division II Reactor Building closed cooling water piping go down this corridor and most of the equipment her. -- let's see, it's reactor water cleanup system, I believe. It's non-safety related.

MR. MICHELSON: From the viewpoint of being concerned about the quality of your barriers between safety and non-safety, there is no barrier between the safety and the non-safety, for instance, on the yellow side there.

MR. MAXWELL: When they're cross-hatched, yes, there is no barrier.

MR. MICHELSON: Now, apparently the symbolism if

the door is not darkened in, it is not a fire door?

MR. MAXWELL: If it's a door in a wall that's black, it's a fire door.

MR. MICHELSON: Okay. If it's -- whether it's darkened up or not, it's a fire door?

MR. MAXWELL: Yes.

MR. MICHELSON: Okay.

MR. MAXWELL: The darker ones are the one that I added, basically.

MR. CARROLL: One other piece of confusion. I had my mind all made up that you have three divisions and now we've got four. What's going on there?

MR. MAXWELL: Okay, we have three divisions of emergency core cooling and support systems. We have four divisions of sensors.

MR. CARROLL: Sensors, okay.

MR. MAXWELL: Okay, and that fourth division does not have a diesel standby power system. It has a battery and I look at it as being more as a -- it's a safety division, but it's also more of a plant production type system because it gives you two out of four logic and allows you to have one more failure without shutting the plant down.

MR. CARROLL: Okay, then, just one other question: what process do you use for these pretty colored drawings?

Is this is color xerox or what?

MR. MAXWELL: It's Canon on the reproduction. It's a plastic film overlay on the sheets. It's a little bit of effort. This is how I keep the separation clear in my own mind. I work with colored pencils, but they don't reproduce this way, so this is a special set so that we can see what the plant design really is.

Okay, any other questions on this particular half of the first sheet?

MR. MICHELSON: I guess we had so much discussion I'm not quite sure what the big point was that you wanted to make on that half. What was that?

MR. MAXWELL: We have the notes here.

MR. MICHELSON: I've got that.

MR. MAXWELL: You should look at those and you can tell what's been added.

MR. MICHELSON: But there was nothing important about that drawing at the top of your slide?

MR. MAXWELL: Other than it shows a fire barrier wall here. It becomes really more important when you look at the other half of the drawing because this is just the extent at a higher elevation.

MR. MICHELSON: Now, in looking at your drawing, of course I look out beyond the drawing to the control building. The wall between; how do I know that that's a

fire barrier wall or not, between the control building and the reactor building?

MR. MAXWELL: All exterior walls are 3-hour fire rated walls.

MR. MICHELSON: That means there are fire doors on all of them?

MR. MAXWELL: Yes.

MR. MICHELSON: On all elevations?

MR. MAXWELL: Yes.

MR. MICHELSON: Now, the reactor containment, the concrete portion which, again, is not darkened, that's really a fire barrier wall also; is that right?

MR. MAXWELL: Yes, it is. It's a --

MR. MICHELSON: The problem I have is that I think you -- do you have an annulus in there?

MR. MAXWELL: No, not on this.

MR. MICHELSON: None at all, okay. That's right, I guess that was just the liner on the inside.

MR. MAXWELL: Oh, I did miss a slide. You were correct. I missed a slide on our special cases. We'll go back and get that later.

The problem on the containment, the difficulty there is the penetrations. We're going to talk about those in a little bit, too. You know, you have a main steam line, for instance penetrating the containment --

MR. MICHELSON: Now, you didn't show us the other side of that first slide that you had there. Was there some reason? It was the basement elevation. You're already up one elevation.

MR. MAXWELL: I've got my flimsies mixed up.

MR. MICHELSON: I've got a question on the basement elevation.

MR. MAXWELL: Somehow I've got a 1-B up here. It should have been right here. Here it is.

[Slide.]

MR. MAXWELL: Here it is.

MR. MICHELSON: In the case of an elevator, for instance, there are stairwells and as long as the next elevation, up and down, are also blue in that area, then no firewalls are needed; that's your -- as soon as you --

MR. MAXWELL: We didn't cross hatch those in. Actually, they will be fire barriers for personnel access. When you go through a division barrier, yes, you have to have it.

MR. MICHELSON: As you move up through the building, just flipping the pages, as long as that elevator remains in a blue zone, when you get to the next elevation, you're okay. It looks like if it changes to a different zone color, then you have to put a fire barrier around it.

MR. MAXWELL: That's correct.

MR. MICHELSON: But that wasn't what was done. When I get to 6-A, for instance, it changes from blue to red and then it didn't show any fire barrier around the elevator.

MR. MAXWELL: That's correct. It needs --

MR. MICHELSON: But that is your philosophy? You've got to put barriers in once you change the divisions, otherwise it becomes a funnel or a chimney.

MR. MAXWELL: That's right, exactly.

MR. MICHELSON: That may just be detail you're going to do later.

MR. MAXWELL: Yes. When these go in the fire-hazard analysis, that will be in there.

MR. MICHELSON: One other question on the bottom elevation: I see some things that are labeled "watertight doors." Unless labeled, I assume it is not a watertight door. Is that correct?

MR. MAXWELL: That's correct.

MR. MICHELSON: Okay. Now, what does "watertight" mean? We had asked that you supply us some kind of a specification or something on a watertight door, so we know what you are prescribing, what kind of elevation, water is can withstand and things of this sort. You know, "watertight" can mean all kinds of things.

You know, at this stage of the game, doing an SAR

analysis, I thought we would be able to look at details where we needed to to assure ourselves of the acceptability of the design. So, the staff presumably has access to the specification of a watertight door, so we know what it means. Is that the case?

MR. EHLERT: Yes. The doors are designed to mitigate internal flooding.

MR. MICHELSON: Do we have a copy of the spec?

MR. EHLERT: We'll have to get you one.

MR. MICHELSON: We had asked for one before the meeting, well in advance of the meeting. I thought we would have one by the time we got here today.

MR. EHLERT: I didn't see the request myself.

MR. MICHELSON: The message didn't get through? I wanted the specification itself, just to read it. One or two of these things would be nice to look at to see what they really do.

Okay. Then it was our mistake. I'd like to see the specification for your fire doors, for your fire-rated doors and for your watertight door, to get an idea of how good these boundary penetrations are, compared with the walls.

Also, can we get a copy of how you specify the 3R fire-barrier wall?

MR. EHLERT: Okay. We'll get something together

and get it over to you.

MR. MICHELSON: I assume you're doing these things. You're going to build this plant. There must be specs out there now, well towards advanced engineering, I thought. They're procurement specs. There will be, I assume, a procurement spec.

This is the kind of thing that's talked about in Part 52; that's what I'm looking for. It says that, if we think we need it to make a safety determination, it's available.

MR. MAXWELL: The fire-hazard analysis has some special -- a couple of wall requirements in there, a type of -- it specifies the equivalent 3-hour for a steel-stud tip door wall. I don't know whether you have seen that or not --

MR. MICHELSON: I haven't seen any of it.

MR. MAXWELL: -- whether that's what you're looking for.

MR. MICHELSON: That's the sort of thing I am looking for. While we are at it, the complete list included the ventilation penetrations, if any. Hopefully, there are not, but if there are any, I'd like to know how you specify ventilation penetration and the electrical penetrations.

How do you specify an electrical penetration? Because this is supposed to be a real good wall, and

apparently, there will be electrical penetrations of it. So, they have to be quite comparable to the wall rating.

Just saying the words doesn't really do it.

MR. CARROLL: Watertight doors are great, as long as somebody remembers to close them. How are you dealing with that issue?

MR. MAXWELL: Those are also -- you're talking about the doors here, for instance. That is a security door and is monitored to assure that it is closed.

MR. CARROLL: Now, I notice we have three NFDs between the divisions. Maybe this is a good time to ask why the Japanese didn't think that they needed a door in that location, or is it because you had upgraded a Japanese door to a fire door?

MR. MAXWELL: No. There are no doors there in the Japanese design.

MR. CARROLL: Those are the ones between red and blue in the corner and blue and yellow and yellow and red.

MR. MAXWELL: I assure you we have discussed this at great length with the Japanese, but what the results of those conversations are is that they have defined a set of fires, allowable fires for their plant, based on testing. Their electrical fires -- they have three degrees of electrical fire.

If it's an instrument cable, there is none; there

will not be a fire. If it's a controlled or a low-voltage power, it affects a couple of cables. And if it's a high-voltage or 480-voltage power, it can affect one tray. And they believe they have testing that will substantiate that. So, they meet IEEE 384.

MR. MICHELSON: I believe you missed the point, perhaps. Watertight doors are not --

MR. CARROLL: No, these aren't watertight. These aren't the watertight doors.

MR. MICHELSON: I thought you were discussing the watertight --

MR. MAXWELL: That's right. We switched over to the fire doors now.

MR. CARROLL: They do use the watertight doors.

MR. MAXWELL: Oh, yes. The watertight doors are there.

So, then, this means that they don't have a 3-hour fire, or they don't have a fire that's large enough to go beyond the -- to breach the separation mandated by 384. They don't give credibility, a great deal of credibility, to smoke and the confusion factor with the operators due to smoke in all divisions of their safety-related equipment from a single fire.

MR. MICHELSON: Do they provide automatic fire protection?

MR. MAXWELL: No.

MR. MICHELSON: Well, then you don't have as much problem with smoke and heat. If you have automatic fire protection, then you have to worry about it being set off in an area not related to the fire.

MR. MAXWELL: I think an operator has a problem if he's got an indication from his fire-alarm system he's got a fire in all three divisions, falsely or truly.

MR. CARROLL: Yes, he does.

MR. CATTON: These volumes are really sealed up pretty tight, then, these different areas.

MR. MICHELSON: In this case, they are, yes.

MR. MAXWELL: Well, there is another feature of the Japanese design. Let me just talk about it here.

We've put the fire doors in, the new fire doors. Here is one between division 2 and 1, and one over here between 1 and 3, and then another one over here between 2 and 3.

Now, at this elevation, the reactor building closed cooling-water piping comes into the reactor building from the control building, in the bottom of the control building. Division 2 piping comes through here, division 1 here, division 3 over here.

Now, in the Japanese design, you can stand in one of these corners and see all three divisions. So, we put

the doors in.

Now, the ventilation system was to introduce air into the corridor and then lead it into the rooms off the corridor by what they call transition ducts or transfer ducts. That's just a duct through the wall and then take the exhaust out from the room, so that you get air coming in.

Now, our HVAC system will still function that way, but the only -- the air supply in this area here is division 3, the air supply in this is division 1, and the air supply in this is division 2.

MR. MICHELSON: Now, you eliminated those transition ducts, then. Is that right?

MR. MAXWELL: No, they're still there.

MR. MICHELSON: How do you keep the smoke going from division 1 to division 2 through the transition ducts?

MR. MAXWELL: Your transfer ducts only go from within the division.

MR. MICHELSON: I'm talking about this corridor over here, that little, long, red, skinny corridor.

MR. MAXWELL: This one here?

MR. MICHELSON: Yes. You pointed to transition ducts between --

MR. MAXWELL: You're right. For the division 1 here, we have to come in from above.

MR. MICHELSON: Okay. You're not using the corridor there as a common ventilation duct, so to speak.

MR. MAXWELL: That's right. We can't do it there.

MR. MICHELSON: Because you can't do that if what you said earlier were true.

MR. CATTON: When there is a fire, you close off the system in the zone that has the fire. Is that correct?

MR. MAXWELL: No, not really. We pull it more negative, so that it's negative with respect to the other zones, and remove the smoke from the zone.

MR. MICHELSON: But the equipment may not work because -- depending on where I locate the fire.

MR. CATTON: What I was trying to get at was the pressure buildup in the zone of the fire, but it looks like that's not a problem. If you closed the room when you started a fire, the pressure in the room would build up, but you don't do that, do you?

MR. MAXWELL: No.

MR. CATTON: You actually try to reduce the pressure in the zone where the fire is.

MR. MAXWELL: That's correct.

MR. MICHELSON: But he's doing that with equipment that might be involved in the fire. If it's on the next floor up, then he'll put the fire on the next floor up and see what happens. You can't always count on division 2

ventilation working.

MR. EHLERT: The reactor building main smoke removal system is in the turbine hall.

MR. MICHELSON: Yes, but see, now you're getting back to that common ventilation system that you said you're rethinking.

MR. EHLERT: The fans themselves that are doing the blowing are back in the turbine hall.

MR. MICHELSON: Then you're saying it's a non-essential ventilation system.

MR. EHLERT: For the fire, for the smoke-removal system.

MR. MICHELSON: You're putting in a separate smoke-removal ventilation system. Is that what you're saying?

MR. EHLERT: No. The normal HVAC that handles both the smoke removal and the normal cooling for the building is located in the turbine hall.

MR. MICHELSON: That is common for all the areas. It is in that turbine hall, and that's the question I asked initially, and you said you hadn't decided yet whether you were going to have a common system or not.

MR. EHLERT: We have one common set of ducts coming from the turbine hall to the building, and then they split up into the three divisionals, with fire dampers at

the header.

MR. MICHELSON: So, indeed, you are going to have a common ventilation system, a common duct, and you're going to have to show us some -- indeed, split that thing up.

MR. EHLERT: Yes. That's showing up later.

MR. MAXWELL: We will show you that schematic later.

MR. CATTON: I am still not sure my question has been addressed. There's some concern about pressure buildup where the fire is. Do you do something to insure that that doesn't happen or does it happen?

MR. MAXWELL: We smoke vent it. We smoke vent it.

MR. MICHELSON: But that's a nonessential system you're using to smoke vent, if I understand the system you described.

MR. MAXWELL: That's correct.

MR. MICHELSON: You can't count on that for these events for --

MR. MAXWELL: That's our first line is to smoke vent it. If, for some reason, that smoke venting system fails, the adjoining areas are held positive with respect to the fire area.

Now as the fire -- if it starts to increase the pressure in the room, it's going to vent through the ventilation system atmosphere. And, eventually, it's going

to consume the oxygen in the room and limit the fire.

MR. MICHELSON: That depends on whether your ducts are closed or not, your dampers are closed.

MR. MAXWELL: That's why we try to avoid fire dampers in the ducts that we used --

MR. MICHELSON: Well, if you're putting an open chimney in or even with a blowout panel, what you say is correct, but I don't think you're putting open chimneys in. Or even blowout panels.

MR. MAXWELL: Well --

MR. MICHELSON: And if you're using a common ventilation system I think you have to have -- for other reasons -- isolation dampers, and they can be closed depending on what the fire's done to the control system. And you told me you're going to do an unwanted action analysis, and that's an unwanted action. I'm going to accidentally isolate this area and now the pressure starts to build up.

MR. MAXWELL: Would you prefer that I stop and go into the ventilation now?

MR. MICHELSON: No, I think that we have to address them as we go along, but --

MR. MAXWELL: Okay. But --

MR. MICHELSON: If you want -- you're going to cover the whole ventilation concept later, that's fine.

Okay.

MR. MICHELSON: Yeah. You know, I'm glad to get your questions, but -- okay.

MR. CARROLL: Is this a good time to have lunch?

MR. MICHELSON: What's a good time to break your presentation?

MR. MAXWELL: Any time as far as I'm concerned. We'll just come back and start right here.

MR. MICHELSON: Yeah. We have the afternoon available as needed.

MR. MAXWELL: Because we aren't going to make it through this building before lunch. I won't --

MR. MICHELSON: No. No. No. I'm sure we won't.

MR. WILKINS: In fact, we're still on the basement.

MR. CARROLL: However, one question -- the three NFD doors on that drawing, they're also alarmed as part of the security system?

MR. MAXWELL: Gary, do you want to answer that one?

MR. EHLERT: I don't think we've really looked at it yet as whether we need them to be alarmed for security purposes or not. We haven't -- we're still in the process of factoring in the new fire doors.

MR. CARROLL: Okay. Well, if it was for security

reasons that you alarmed the water tight doors --

MR. EHLERT: I assume that we're probably going to be alarming them. Right now it's just my own guesswork because we haven't done anything along that line yet. But just for the divisional separation requirements we probably will alarm them.

MR. CARROLL: It's not too uncommon in a power plant, even with a door closer on a door, to find some maintenance guys that are moving equipment in and out propping it open and that sort of thing. So if you really are counting on fire doors and water tight doors, you better have some better control than just a door closer.

MR. MICHELSON: Let's finish any questions on Figure 1A, though, so --

MR. MAXWELL: I have just a few more.

Let's see, we covered the piping coming in and down the corridor and into the three areas and talked about the HVAC duct here. I'll just mention that the electrical cables for these rooms come in from above, and we'll see where they come from as we go on up in the plant. And with that, why I'm ready for lunch.

MR. CARROLL: Good thinking.

MR. MICHELSON: Okay. Any other questions on this slide before we break for lunch?

[No response.]

MR. MICHELSON: Seeing none, let's break for lunch and start at 10 minutes after 1.

[Whereupon, at 12:10 p.m., the meeting recessed for lunch, to reconvene this same day at 1:10 p.m.]

AFTERNOON SESSION

[1:17 p.m.]

MR. MICHELSON: Let's proceed, then, if you will.

MR. CATTON: Before you get started again, when you talk about separation, that means water, air -- what about elect.

MR. MAXWELL: Yes.

MR. CATTON: Do you have electrical separation?

MR. MAXWELL: Yes.

MR. CATTON: So when your Zone 1 or Zone 2 or Zone 3 has a fire in it, I mean, it's isolated.

MR. MAXWELL: Yes. It is only that division that is affected.

MR. CATTON: But that part of the building is separate in all respects from the rest of it?

MR. MAXWELL: Yes.

MR. MICHELSON: I don't think you understood the question.

MR. CATTON: Well, I heard the answer and I liked it. I don't believe it. I'm not sure I believe it, anyway.

MR. MICHELSON: Well, let me take the liberty of rephrasing it slightly. We had a discussion at noontime about worrying about getting unwanted actions out of equipment, and one way of resolving that might be to kill the power to the equipment before it has a chance to do

something you don't want it to do.

And we were wondering, is killing the power to electrical equipment -- that kind of isolation, to my knowledge, has not been in the game in the past although I think when we had one of our ABWR meetings we chatted about it just slightly. Is your intention to kill the power to an area experiencing a fire as a precautionary step before the equipment produces unwanted actions?

MR. MAXWELL: It's my belief that if you have a fire in an area you should be able to kill the power and go in there and take the action that's necessary to put out the fire.

MR. MICHELSON: The capability is certainly built in to kill power all right, but is that going to be a part of standing procedure that when the fire alarm goes off you kill the power to that area, for instance?

MR. MAXWELL: I would expect -- that will be in the plant operating procedures, but I would expect the operators to go investigate, and if they determine that they do have a fire and they need --

MR. MICHELSON: You see, it's all too late by then for some of these events.

MR. CATTON: But they have to have decided what they're going to do if they've done a fire PRA because this would enter into the PRA.

MR. CARROLL: You don't want to kill the power just arbitrarily, believe me.

MR. MICHELSON: It's something you do with great reluctance, but it certainly could also be a part of a master plan, all right. But I hadn't seen it proposed seriously thus far.

MR. CATTON: Maybe I don't understand. I thought when you had a fire in one of these colors you just literally isolated that region and then you could simply forget about it.

MR. WILKINS: Let it burn itself out?

MR. CATTON: Well, no, but I mean as far as interaction with the rest of the system.

MR. MAXWELL: You could kill the power to that region, and you will kill it to other blue regions. For instance, if you've got a fire in a blue region and you kill all the power to one blue region you'll get the other blue regions also, but you have two other divisions of equipment that are available to safely shut the plant down.

MR. CATTON: I understand that so why would you be concerned?

MR. CARROLL: Because I've got a whole bunch of equipment that isn't affected that I may want to use.

MR. WILKINS: That's on different levels.

MR. CATTON: But then shouldn't you go back in and

turn it on again if you think you need it?

MR. CARROLL: No. I think I want the options -- maybe it's too late and maybe it isn't.

MR. CATTON: Wait and see if it screws up before you decide to turn it off?

MR. CARROLL: But the operator can selectively keep the equipment in the blue region, for example.

MR. WILKINS: Without disabling the entire blue region.

MR. CATTON: Why not selectively enable it and avoid this question that Carl keeps raising about unwanted action?

MR. CARROLL: Then he'd ask the question they'd probably enable the wrong thing or something.

MR. MICHELSON: It could be done, I think. I've never seen it seriously proposed. You'd just have to go through and show that when you -- if you do it quickly enough you do know the failure mode with reasonable certainty. And you know that that failure mode's acceptable because it has to be for other reasons. You've already done that kind of analysis.

MR. CATTON: Separation drives it, I think.

MR. MICHELSON: Well, isolation, I think, is the right word, and not separation.

MR. CATTON: Why not do it completely and stop

screwing around.

MR. MICHELSON: Shut off everything to that area. That means that whole blue part of the plant, everything including non-safety equipment and everything would have to be shut off.

MR. CATTON: Just eliminate that as far as your plant operations.

MR. CARROLL: I'm trying to think of a good analogy here. You've got two other zones that do the same thing.

MR. MICHELSON: Presumably, it should be okay.

MR. CARROLL: One of which has got -- both of which have got equipment out of service for maintenance.

MR. CATTON: You better be sure in your plant operations that you don't let yourself get caught that way.

MR. MAXWELL: Your tech specs would allow you only to take one other division out.

MR. CATTON: He's got three divisions so he's always got one that's operational. One burning, one out for maintenance, and one he ca use.

MR. CARROLL: I guess maybe part of the problem is that I don't take fires seriously. I think more along the lines of the Japanese and I think we have greatly overplayed the safety importance of fire in a nuclear power plant.

MR. CATTON: Have you read the report on the

Spanish reactor and the fire? I think you should.

MR. CARROLL: No, but I think I know what happened.

MR. CATTON: There were lots of unwanted things going on there.

MR. MICHELSON: Is there an NRC report on that? haven't see it yet either.

MR. CATTON: It came through my mail.

MR. MICHELSON: I didn't see it. How come it didn't come to all the subcommittee members?

MR. CATTON: I have no idea.

MR. MICHELSON: Send us a copy because I would like to see it.

MR. CATTON: He got it for me. There was a one liner somewhere about the fire and I asked for the foreign incident report.

MR. MAXWELL: There is a pretty good report on that fire, yes.

MR. CATTON: It really shows you what can happen when a fire occurs.

MR. MICHELSON: I think we also have to question -- if we believe the PRAs, then I think we have to recognize that this is one of the more significant severe accidents to worry about, maybe the most significant, in fact, depending on the plant.

If we don't believe the PRA, then we should do something about that.

MR. CARROLL: I don't.

MR. MICHELSON: We need to make sure the PRAs are done correctly, whatever that means.

MR. CARROLL: At the meeting we had with the Sandia guys, I said, okay, I've had enough of this and I'm going to go find out about what kind of fire PRA --

MR. MICHELSON: But they've been doing it over and over again on other plants now and they're coming up with about the same observations.

MR. CARROLL: Sure, because it's the same people doing it.

MR. CATTON: You'll have to come to our subcommittee meeting. It's going to be a tutorial for me.

MR. CARROLL: I may need some tutorial help here.

MR. MICHELSON: We either have to recognize that it is important as a contributor risk or we have to show why the studies that say that are incorrect. I have no problem with either one.

If it turns out that the studies that I'm basing my judgment on are incorrect, I'd sure like to know. But so far, nobody's come forth with anything concrete to show that they aren't.

MR. CARROLL: I typed about the first paragraph of

my critique on the Sandia fire risk study, even before I left. It does tend to produce something because I think that is a very good piece of work in assessing fire risk.

MR. CATTON: Your turn.

MR. MAXWELL: I did miss a flimsy here and if you don't mind, I'd like to back up and catch it. It's the one on the divisional separation exceptions.

[Slide.]

MR. MAXWELL: The control room has all divisions, all four of them in that control room and the redundant control is provided at the remote shutdown panel. That is the primary purpose of the remote shutdown panel; is to back up the control room.

The remote shutdown panel has two divisions on it. They're in separate cabinets and the room has a sliding fire door in the center between the cabinets. During the time that the remote shutdown panel is not in use -- and we'll see this in the arrangement drawings later -- but when it's not in use, that door is closed and the two halves are in two separate, three-hour fire barriers.

Now, if the operator has to go to the remote shutdown panel to operate, why, they slide open the partition door between the two and during the time that they're operating from the remote shutdown panel, you would have the Division 1 and 2 in the same room.

The separation at that point would be equivalent to IEEE 384 Reg Guide 1.75.

MR. WILKINS: What happens if the operator presses the right button and the wall that separates it fails?

MR. MAXWELL: It's just one of these manual sliding fire doors.

MR. WILKINS: He just does it with his hand?

MR. MAXWELL: He does it with his hand, yes.

MR. CATTON: When you're talking about fire doors, we've been hearing some disconcerting stories about how three hour fire doors last 15 minutes and apparently this was based on tests. There was some work done at Berkeley and also in the Sandia fire study.

They both talk about how the fire doors rated for three hours fail much earlier. What do you do to make sure your three hour door is a three hour door?

MR. MAXWELL: Were these doors -- did they have the UL label?

MR. CATTON: Apparently they do have the UL label.

MR. MAXWELL: Well, that's what depend on; having that label which says that that door has been submitted to the E-119 test.

MR. CATTON: Some of these tests are flawed. You know, the guru of fires at Harvard had a paper in Scientific American maybe 8 or 9 years ago where they took a group of

different materials that were in a half a dozen western countries that were ranked. It turned out that in each country the ranking was different.

He plotted it all on one graph and then he repeated the exercise using a random number generator and the curves looked the same. The reason is that sometimes the testing doesn't specify quite angle you're supposed to have it at when you try to ignite and all sorts of things.

I just wonder why the UL which is more for a factory or something is just taken and used in a nuclear power plant.

MR. MICHELSON: Well, it's only used in the US and Canada. Everywhere else in the world there's a different qualification. Apparently those doors come much closer to three hours in their duration.

MR. CATTON: I'm wondering why you just take this door as given for three hours.

MR. MAXWELL: Because it's got a standard that says it's been tested in a wall with the hardware that the door would utilize in its actual application with a furnace created fire. It's on the inside of the room that meets -- when you say the three hour -- the E-119 curve which gives you a temperature with time curve that you -- that furnace has to produce.

Then it gives you defined temperatures that you

can experience on the outside of the door and the amount of leakage through the door and the --

MR. CATTON: How do you get leakage through the door.

MR. MICHELSON: You don't get leakage.

MR. MAXWELL: Around the cracks.

MR. MICHELSON: They allow negative pressure on the fire side. That's part of the problem with the test, which is an unrealistic test in terms of real world fires in rooms and chances of negative pressure are probably somewhat low.

MR. CATTON: I have also heard that even within the National Bureau of Standards -- they have a group who have been studying fires for years and there is a great deal of disagreement about the meaning of these various tests that qualified a door for three hours. I think when there's something like that, you guys ought to look at it and not just take it off the shelf as a three hour door.

I don't know how many other of these standards are used. How do you decide that a given penetration is good for three hours?

MR. MAXWELL: Again by test, but, you know --

MR. MICHELSON: Well, the realism of the test --

MR. CATTON: There are tests and there are tests.

MR. MICHELSON: Yes.

MR. CATTON: I mean, you know this if you try to light a log in your fireplace.

MR. MAXWELL: That's correct, and that's why, with this furnace test, there's a specific curve that you have to follow on the temperature profile. It's not how you happen to light your log, whether it's wet or dry, it's a reproducible test. Now, if the --

MR. CATTON: Now reproducible, does that mean that you take that door, and you're going to put a heat flux on the face of it that's the same as you're going to get in this area that you're isolating?

MR. MAXWELL: No. We're saying that that is what's been tested. Now, if the fire in the area exceeds that curve, then there's a question as to whether the door would meet the design criteria for the temperature on the outside face, or warping of the door.

MR. CATTON: I mean, this is so simplistic. This is the kind of thing I give students in a junior heat transfer class.

MR. MICHELSON: This is one of the reasons why we would like to get a copy of the specification being used for three-hour fire barrier doors, and we are also going to pursue the meaningfulness of the tests themselves.

MR. WILKINS: These are not your tests. These are the underwriters.

MR. CATTON: Well, they're essentially just saying, Gee, three hours, we'll take it, and I think it needs more than that.

MR. MICHELSON: We wonder why GE accepts it without question.

MR. CATTON: Well, it's not just GE; it's everybody.

MR. MICHELSON: Well, everybody. GE is the one we're --

MR. MAXWELL: Now, we haven't accepted them without question. We have looked at the tests, the test procedures and requirements. We've observed tests, and, you know, it appears to be a good way to test --

MR. MICHELSON: Let me ask a couple questions about the -- indeed, did you recognize that the pressure may be positive in the room instead of negative in the room where the fire is located? I think it's more likely to be positive and negative, in fact. Now, what does the positive pressure on the face of the door do to the validity of the fire test that was done with an allowable negative pressure on the door?

MR. MAXWELL: It then gives you a leakage out through the door.

MR. MICHELSON: Or inward, the door would be leaking from the cool side back to the warm side, and that's

why the door lasted three hours, because it didn't suck the flame through, it blew it backwards. In other words, it got rid of the problem that Browns Ferry had when the candle was sucked into the flammable material. That's why they allow the negative pressure. Also, they like to because it makes the test easier and so forth to keep a negative pressure on the fire side. You'd have to exhaust all the smoke, and that creates negative pressure.

MR. CATTON: Now, the English have decided that they need to vent these rooms to keep the pressure from rising.

MR. MICHELSON: The English also had a problem with --

MR. CATTON: Because they had a concern about the three-hour door remaining a three-hour door when there was pressure built up in the confined region.

MR. MAXWELL: That's what I stated earlier, that we do vent the rooms, we keep them at negative pressure. That's why we do, so that the leakage is into the fire area and not out of the fire area.

MR. MICHELSON: But you do that with a non safety related piece of equipment?

MR. MAXWELL: Yes.

MR. WILKINS: Did you make any determination that likely fires -- I don't know quite what that phrase means

since fires are unlikely, anyway -- but the more likely of the unlikely fires would, in fact, be contained within an envelope that was in the testing conditions?

MR. MAXWELL: Yes.

MR. WILKINS: I am glad you understood my question because I'm not sure I phrased it correctly.

MR. MAXWELL: Okay. If I understood your question, in areas where we might get fires that would approach a three-hour fire with materials, flammable materials that are there, like a day tank room or a diesel generator room, we've provided suppression, fixed automatic suppression, and that should contain the fire, suppress the fire, at something less than that test curve.

In other areas of the plant, where we do not have automatic suppression, there isn't a fire load there that would give you a fire that would approach that test curve. If you take into consideration transient loading, then, you know, how much loading would you bring into an area, would you allow with your housekeeping procedures to be in an area?

Again, we're debating that some, but we've looked at the fire you get from a garbage bag of protected clothing, for instance. We've done some furnace tests on those, and again, that would be considerably less. One bag would be less. How many bags, then, are you going to allow

to burn?

You think in terms, Well, a temporary change area due to spot contamination in the plant. Well, maybe there would be three or four bags in that area where they're changing clothing, and they'd have to take the -- not allow them to accumulate. Any of those are below the curve if the fire is not even suppressed. Of course, then we provide manual suppression means to extinguish the fire.

MR. CATTON: If I read the FSAR, will I find reference to this?

MR. MAXWELL: To this testing? No. In the current version, we're adding a section which discusses that in more detail.

MR. MICHELSON: Well, where is the fire protection features discussed in the SAR? Where are they discussed?

MR. MAXWELL: Nine-point-four-point-five, as I recall, and the fire hazard analysis is 9A.

MR. MICHELSON: I know where the fire hazard analysis is, and it didn't tell me much about the features, but as I recall, the features are virtually undescribed in the SAR, but I'll go back and refresh my memory on that real quick. I looked for them.

MR. CATTON: I think what you're facing is the Sandia report and what the English did, and the question is why did they do it? Why don't you have to do it, take the

same kinds of precautions?

MR. MICHELSON: The English address some of the same problems that Sandia did and did it totally independent and before Sandia ever addressed it. In fact, it was one of the reasons why we asked them to go back and take a look, because we weren't sure who to believe. So Sandia, hopefully independently, went back and looked at the problems again, and arrived, I think, at most of the basic same conclusions. It would be well for you to look at the English report, if you haven't. It's a rather nice document, also.

MR. CATTON: Well, is it proprietary? Maybe they can't get it.

MR. MICHELSON: No, it isn't proprietary. They have to pay for it, though. It costs about $400, I believe. It's a commercial document. It's for sale.

MR. CARROLL: Do you know the document they're talking about?

MR. MAXWELL: No, I don't.

MR. MICHELSON: We'll gladly supply the reference.

MR. CARROLL: It's a study done in connection with Sizewell B.

MR. MAXWELL: Okay.

MR. CATTON: It's actually a very nice study, and I think it has relevance here.

MR. MICHELSON: Yes, very much so. Well, I think that before we get done on ABWR, you will have to answer why the features that Sizewell B added are really not necessary for an ABWR, and it would be a very easy exercise, I think, when it has to be done. The pressure build-up is one of the questions. It isn't addressed in the SAR, and needs to be. If it's a non-problem, fine. All the better.

MR. CATTON: And I'd like to see reference to these studies that you feel demonstrate the adequacy of the UL testing for your purposes.

MR. MICHELSON: Let me point out that Section 951 in the SAR, which is the fire protection section, there's really no detail at all, no flow diagrams, no nothing. I don't know what the fire protection looks like even for this plant. I don't know where devices are located, and so forth. I don't know what the flow diagram looks like. There isn't one.

It's about three pages long. Most of it is a listing of all the codes and standards.

MR. MAXWELL: Building arrangement drawings are in 9-A.

MR. MICHELSON: No, 9-A is your hazard study. That's what I started with first and it's not in there either. In there are the answers and what you have done is simply catalogued through the plant all the items in each

room and looked at those items collectively and said what happens if I lose their function? Can I still safely shut down?

That is all that's in there. That's it. That's why we are going to go back and ask you to come in separately to talk about this at a later date, because it's an analysis that blows my mind and is not really even what we talked about earlier today.

MR. CATTON: It has to be after my tutorial.

MR. CARROLL: So you'll be smart by then.

MR. CATTON: Not necessarily but at least there is a better chance.

MR. CARROLL: So you'll be knowledgeable anyway.

MR. CATTON: Even that's iffy!

MR. MICHELSON: Let's proceed.

MR. MAXWELL: Okay. Have you got to the remove shutdown panel? Primary containment, of course there are four divisions of equipment in there and we attempt to keep the equipment separated as much as possible into four quadrants of the containment.

The containment is inerted during operation so there would not be a fire possible there.

MR. CARROLL: Except for the first 24 hours.

MR. MAXWELL: Yes, while you are inerting the containment and --

MR. MICHELSON: You do have spray in both the upper and the lower portion of the containment which you could use, I gather, if necessary.

MR. MAXWELL: That's correct.

MR. MICHELSON: What its pattern looks like I don't know for sure but I assume it is a pretty uniform pattern?

MR. MAXWELL: That is what I understand, yes.

MR. CARROLL: during non-power operation modes did your shutdown risk analysis come up with any problems inside the primary containment?

MR. MAXWELL: No, because when you shut down, of course your decay heat is dropping off on you. The other thing is that inside primary containment in order to inject water into the vessel, for instance, to the RHR lines, once you are down, depressurized, the only thing that prevents you from injecting water into the vessel that could fail maybe is a check valve.

That check valve is sitting in there immersed in water and it's -- again, there are three of them on quadrants' grounds, so the failure of them, of all three or even one due to fire in containment, we don't think is credible.

You don't need the high pressure spray and the same goes for the high pressure also. There are check

valves in their injection lines. To get water into the vessel with a fire in containment, assuming some way that when you went inert that you did get a fire going, you could still get water in the vessel to keep the water level up.

Then you need to get some valves open, ADS or safety relief valves --

MR. CARROLL: They are outside of containment.

MR. MAXWELL: No. Some are inside.

Again, the electrical -- you could envision that being destroyed by fire at a certain -- again, when you aren't inerted -- but they spring leaks on them and the high pressure core flooder pumps are capable of injecting against those spring relief pressures so that they could push the relief valves open and relieve.

The heat on the valve should weaken the spring and lower its setpoint actually.

Again they are scattered around the vessel.

MR. CARROLL: Best of all, you don't go to mid-loop operation when you're shut down.

MR. MAXWELL: That's correct.

Then we have what we call special cases.

Let me give you an example.

For instance, in one of the blue areas of the floor there in a pump room we have leak detection thermocouples that tell you if you get a high temperature in

the area that maybe you've got a line break.

In order to have redundancy so that the single failure of one of those detectors doesn't cause you to get a false alarm, we put a second division of leak detection thermocouples in that division one room.

In that case each one of those cases is analyzed. For the thermocouple, why, the cabling is routed in instrument tray and conduit with low level signals. There are no power cables with them and a fire could either cause an open or short. It wouldn't affect anything other than that particular circuit.

Each one of these cases is analyzed and listed in that section 9A.5.5 of the fire hazard analysis as to why it's acceptable.

MR. MICHELSON: Just for clarification, I was trying to flip to see if I could find the statement again. I didn't recall seeing a statement that clearly indicated that you did the analysis of fire for all operating conditions including shutdown. Is that true, that you look at fire at any point in the operation including shutdown?

MR. MAXWELL: That's correct.

MR. MICHELSON: So the analysis should include that.

MR. MAXWELL: Yes.

MR. MICHELSON: What kind of assumptions do you

make? Do you assume that you stay within the tech specs, whatever the tech specs allow to be taken out during shutdown you have already taken out, then, was that the kind of assumption you make and you were dealing at the time of the fire only with the minimum set of equipment required to be operable under tech specs?

Is that the approach you use?

I'll have to go back and read it. I don't believe this was discussed in the SAR and it really should be. If those are the kind of rules you use, then if I knew the rules I probably wouldn't worry about the details but I am trying to find the rules.

MR. MAXWELL: I agree. That's not in there. We are revising that section.

Okay, pressing on then --

MR. CARROLL: Before you do that, you first showed us Figure 1-B, which had a couple of corners, or whatever in here. How did those relate to Figure 1-A? What are those?

MR. WILKINS: They've got the coordinates marked. I caught myself checking that first one.

MR. CARROLL: I see. Yes. Okay.

MR. MICHELSON: It isn't quite the same thing.

MR. MAXWELL: 1-B, this corner up here, 1-B, is a detail at an elevation above.

MR. MICHELSON: It's a graded floor.

MR. MAXWELL: It's a graded floor.

MR. MICHELSON: Okay.

MR. MAXWELL: Sort of a mezzanine, over here in the corner, and you can line it up by looking at the rows and columns.

MR. CARROLL: Okay. Because I didn't find the doors.

MR. MICHELSON: Yes. No, it's an elevation.

MR. MAXWELL: And the fire barrier that you see, the wall there, is the continuation of that fire --

MR. CARROLL: How do I tell what elevation it is on these drawings?

MR. MAXWELL: Well, there's a block right underneath there that says TMSL minus 4400, right under the --

MR. MICHELSON: Yes, I see that. But I look down of the bottom of the legend and it says TMSLE 200. So 82 is the ground floor, and minus 4400 is the mezzanine?

MR. MAXWELL: That's correct.

MR. CARROLL: What does the 82 and 44 mean?

MR. MAXWELL: Well, Tokyo means sea level, with respect to Tokyo meaning sea level.

MR. CARROLL: What are the units of 8200?

MR. MAXWELL: Millimeters.

MR. CARROLL: Millimeters.

MR. MAXWELL: We're metric. And it's minus 8200 millimeters below sea level.

MR. CARROLL: So we're talking about 3800 millimeters.

MR. WILKINS: Now, I know what it is. It's about 11 yards.

MR. MICHELSON: A good ceiling height.

MR. CARROLL: So this is below sea level?

MR. MICHELSON: I guess the staff must have known that.

MR. MILLER: Wasn't it obvious?

[Laughter.]

MR. CARROLL: And then the other guy up there is the same thing in the, if I find the right coordinates, yes, okay.

MR. MICHELSON: What we need is an elevation through the plant, which we don't have. I've got one from the SAR, but it's not so pretty.

MR. CARROLL: Okay. I'm happy.

MR. MAXWELL: See, on these drawings, then, unless stated otherwise, the elevation is the elevation of the drawing.

[Slide.]

MR. MAXWELL: Okay. Now, we're up one floor. And this is at minus 1700.

MR. CATTON: Where you have NFW pointing at a door, does that mean you replaced the door with a wall? NFW means new fire wall.

MR. MAXWELL: Well, let's see. Where --

MR. CATTON: Right at the top. That one right there.

MR. CARROLL: No, it means he put a door in. He put a door in that the Japanese didn't have.

MR. MAXWELL: Yes.

MR. CATTON: What does NFW mean that's right there?

MR. CARROLL: New fire wall --

MR. MICHELSON: -- the rest of that black new fire wall up there?

MR. CATTON: But the arrow points right at the door.

MR. MAXWELL: Well, it's a new fire wall with a door.

MR. MICHELSON: The whole black line at the top there a new fire wall?

MR. MAXWELL: This is designating this as a wall. The wall was there. It's designated as a wall. And this actually is a fire wall and a door here. Because we show the door being full width here. But I don't think it's quite the full width. We haven't worked that out yet.

MR. MICHELSON: Oh. So you'll have a spec on double fire doors as well as the single fire door?

MR. MAXWELL: Right.

MR. MICHELSON: That's a different test. Quite a bit different test for a double fire door.

MR. MAXWELL: Okay. Now, on this, if you'll note, again we have the blue as Division 1 in the center up here, and then over on the right side, Division 3, and on the left, Division 2.

And the thing to note here is the divisions are lined up vertically. And if you, for instance, if you punch through the blue floor, you'll be into a blue area.

Now, if you come around on the Division 3, part of that floor there is cross-hatched. And that means that it's a fire barrier floor. And below that floor is a Division 1 area. So it's a barrier between divisions.

MR. MICHELSON: What does a fire barrier floor mean? What all would be required besides the concrete be designed to be rated for three hours? What about cracks, and what about joints and hatches and all the other things that have to be watertight?

MR. MAXWELL: They have to be rated equivalent to the three-hour --

MR. MICHELSON: The three-hour fire barrier doesn't require watertightness of the structure.

MR. MAXWELL: That's a separate item.

MR. MICHELSON: And where will that be found; or how will I know that that's going to be a watertight floor and not just a fire barrier?

MR. MAXWELL: That's part of the structural details of the drawing.

MR. MICHELSON: Well, it's going to be prescribed somewhere, I assume. And I'm asking where will be it prescribed, and I'll read it and find out what you do. Because fire barrier floor doesn't do that alone, unless you write a special spec. for fire barrier floors that include their ability to hold back water levels of a certain number of inches, and all that sort of thing.

MR. MAXWELL: I agree. Yes.

MR. CARROLL: But it is your intent that these hatches in the crosshatched area would be watertight?

MR. MAXWELL: Gary? Would you like to --

MR. EHLERT: I believe they'll either be, they'll probably be watertight, but they'll also probably have a raised lip to prevent the bonding from coming into the door. I'd have to really get out the spec and read it and find out what's going on.

MR. MICHELSON: And if it's a raised lip, you have to show you can drain the water mitigation, the fire mitigation materials away fast enough to keep from getting

over the lip, with a certain number of them plugged and all that other kind of thing.

MR. CARROLL: Because a red fire, and lots of water in the red area, if those weren't watertight, could get water into the blue area.

MR. EHLERT: That's right.

MR. CATTON: What about the hatches? I'm wondering what kind of fire standard they have to meet, and how do you decide? Is it the same UL code?

MR. MAXWELL: Yes.

MR. CATTON: But vertical is different than horizontal when you're doing fire testing. Do they have a code for horizontal surfaces heated from below?

MR. MAXWELL: I don't recall the number for the openings in floors.

MR. CATTON: When you redo you SAR, those things would be called out. Is that correct?

MR. MICHELSON: Yes. And if you're using seals on the hatches to assure the water doesn't get away, you have to show that those seals are rated for 3 hours, also, and so on. I don't think we'll have time to go into many of these, but we're going to select one or two and go through enough to assure ourselves it's done properly.

MR. CATTON: I would hope that, in the right section of the SAR, we'll be able to dig ourselves, if we

need to.

MR. MICHELSON: Yes.

Let me also ask: If a red area -- in going up through a building, if a red area doesn't have cross-hatches on it indicating something special, then I assume that these floors are not necessarily watertight at all, that water can run from the highest elevation of red down to the lowest elevation of red. Is that right?

MR. MAXWELL: Well, it's my understanding that those hatches are watertight.

MR. MICHELSON: That's where you've got a barrier now between two divisions, but are all your stairwells and all your hatches and all your floor joints and all the other things going to be watertight, even if it isn't a fire barrier?

MR. MAXWELL: I have been told yes.

Gary, am I correct?

MR. EHLERT: I think you're correct, but I'm trying to figure out where it's stated.

MR. MICHELSON: These are the kinds of things that need to be described in a safety-analysis report, and then a fellow reads it and says yes, that sounds like they're taken care of, and he goes on, or he says, well, maybe I want to check one of these; I'll pick one and check it.

I don't find the words to even start with. Maybe

I'm just not very good at finding -- wandering through all the words. Just point out where they are, and I'll be happy to read them.

MR. CARROLL: He's good at that.

MR. MAXWELL: The other thing, then, that I'd point out is that the reactor building closed cooling-water piping that came through on the lower floor comes up onto this floor, also, in the three areas, and there are cable trays, cable risers coming down from the floor above and going to the floor below that go through the different-colored areas.

MR. MICHELSON: Now, your control building, I believe, is at the top of this drawing, if I recall correctly.

MR. MAXWELL: That's correct.

MR. MICHELSON: Now, there are some very large component cooling-water lines that must be penetrating, somehow, through some of these walls to get into these areas that they serve. How do you treat those penetrations, since they're not shown on the drawings as being fire barriers?

That wall is not shown as a fire barrier. How about the penetrations of that wall? What do I know about them in terms of fire tightness and watertightness or anything else?

MR. EHLERT: The main closed cooling water comes

in through the basement level.

MR. MICHELSON: Yes, but it --

MR. EHLERT: The main lines.

MR. MICHELSON: Yes, but it doesn't show on the drawing, so I don't know where and how. Now, clearly, though, that is not shown as a fire-barrier wall. At least, on this drawing, it's not shown as a fire-barrier wall.

MR. MAXWELL: I got notification of this meeting, and I put these drawings together, and I didn't go around all the outside walls. The outside walls are fire barriers and will be marked as such in the fire-hazard analysis.

MR. MICHELSON: When we mark a wall as a fire-barrier wall, how about the penetrations? Do we just know that this is a watertight wall, as well, or is there some extra prescription needed?

MR. EHLERT: On the below-grade areas, it's probably going to be backfilled.

MR. MICHELSON: No. The control building is on the other side.

MR. EHLERT: Yes, but there three meters between the two buildings, or two meters, something like that.

MR. MICHELSON: In the elevation of the basement, you may be right. That was a problem I had. I couldn't read the control building elevations, because they don't match the reactor building elevations.

MR. EHLERT: The top of the basement for the two buildings are actually matching.

MR. MICHELSON: Ground elevations are matching, not in number but in idea.

MR. EHLERT: Right.

MR. MICHELSON: So, where does that put the basement of the control building relative to the basement of the reactor building?

MR. EHLERT: They match. There is a difference in elevation, because the control building --

MR. MICHELSON: Well, then, the control building, indeed, is down all the way to the bottom.

MR. EHLERT: Yes.

MR. MICHELSON: And indeed, then, there is another building.

MR. EHLERT: There is still a gap between the two buildings. The buildings are not flush.

MR. MICHELSON: I wouldn't know that from anything I have looked at so far.

MR. EHLERT: It's stated in Chapter 3.

MR. MICHELSON: So, that's a watertight gap, then? Is that what you're saying?

MR. EHLERT: Yes. It's filled in with soil.

MR. MICHELSON: Well, that doesn't make it watertight.

MR. EHLERT: No, it's not watertight.

MR. MICHELSON: If I bust one of these big pipes over in the control building and build up a lot of pressure in the room, you're telling me it won't push on into the reactor building. That's what I'm asking. You're sure that it will not push on it.

MR. EHLERT: I don't think so, because the wall itself is designed for the hydrostatic head, because we assume the elevation of the -- let's just say the water table is only up 2 feet below grade.

MR. MICHELSON: It must be a watertight wall then.

MR. EHLERT: Yes. It's got to keep the building from flooding up from the outside pressure.

MR. MICHELSON: Okay. Then it's a watertight wall. Then that's the answer. Okay.

MR. MAXWELL: Going back, if it's a fire-barrier wall, then the penetrations have to have a fire rating equal to the rating of the wall. If it's a 3-hour wall, which the outside walls are, then the penetrations of pipe through there would have to be sealed with a penetration that's equivalent 3-hour rating for fire. And what I call the reactor building closed cooling-water system is what I believe you are calling component cooling.

MR. MICHELSON: Yes.

MR. MAXWELL: So, they come in at the lower

elevation and rise up and -- on this floor, and there are some valves up on this floor.

Gary, do you know, is the interface drawing in the SSAR?

MR. EHLERT: I don't think there is a drawing per se, but there is a table in Chapter 6 listing all the reactor building penetrations in their elevations.

MR. MAXWELL: Are there any further questions on this?

MR. MICHELSON: Now, the component cooling -- well, you call it the -- what is it?

MR. MAXWELL: Reactor building closed cooling-water.

MR. MICHELSON: The RBCCW -- on that Figure 2A, which is the one you have there, the red part comes in in the red area?

MR. MAXWELL: In the red area.

MR. MICHELSON: So, it comes in above the floor of the red area. If it came in below the floor, it would be in the corner or in the blue area.

MR. MAXWELL: No. It's in the corner.

MR. MICHELSON: It comes in on the 1A drawing in the red area.

MR. MAXWELL: That's correct.

MR. MICHELSON: Is that right? And the blue one

comes in in the blue area on the 1A.

MR. MAXWELL: Correct.

MR. CARROLL: And it all comes in on the yellow.

How do you know the equipment hatch into the primary containment is 3-hour rated?

MR. MAXWELL: That is to be by analysis to be equivalent, and that's -- you know, how do you test one of those?

MR. CARROLL: That's why I asked the question.

MR. MAXWELL: It has to be by analysis.

MR. CARROLL: I suspect it is.

MR. MAXWELL: Any further questions on this before we go on with the next?

MR. MICHELSON: I see none.

[Slide.]

MR. MAXWELL: I will now move on to Slide 2B, which is the mezzanine area. Are there any questions on that?

MR. MICHELSON: Are you going to tell us all about the ventilation later as a separate item, or are you telling us as we go along?

MR. MAXWELL: I was going to zero in on it, but let me just stop for a minute and talk a little bit about it.

All of this floor and all of the floor below it

are in secondary containment. As we get up farther in the plant, why we will see that only portions of the floors are secondary containment.

So, when we are talking about the secondary containment ventilation system, we are talking about that is the system for this floor and the floor below it.

Again, the supply and exhaust for the Division 1 area comes down a duct shaft here on this elevator shaft in the Division 1 area. The Division 2 area has a similar shaft and the Division 2 exhaust and supply comes down that shaft all the way from the top. Division 3 --

MR. MICHELSON: Where is that shaft shown on the drawing?

MR. MAXWELL: It is right behind the elevator.

MR. EHLERT: Yes, it is south of the elevator.

MR. MAXWELL: Both elevators have a ventilation shaft.

MR. MICHELSON: In one case it seems to be labeled like what, DG?

MR. EHLERT: That is DS, duct space.

MR. MICHELSON: That is dedicated just to ducts?

MR. EHLERT: Right.

MR. MICHELSON: Are there more than one duct in there, or is that a single duct?

MR. EHLERT: There are two ducts. There is one

intake and one exhaust.

MR. MAXWELL: That is a difference in the Japanese design. The Japanese have all of their exhaust on one corner and all of their supply on the other corner of the plant.

MR. MICHELSON: Where are the fans? Will they be up further in the building somewhere?

MR. MAXWELL: They are out of the building.

MR. MICHELSON: Oh, they are in the turbine building?

MR. EHLERT: That is correct.

MR. MAXWELL: This is a non-safety grade ventilation cooling system for normal plant operation. The safety grade cooling is provided for the pump rooms below, is by room coolers that are run directly off the reactor building closed cooling water system, which is a safety grade system on a divisional basis.

These rooms now, as we go on up in the building, that are safety related and have area coolers in them that are run off the emergency chilled water system. They are supplied cooling from the emergency cooled water system, again, on a divisional basis.

MR. MICHELSON: How do you decide, or under what circumstances do you isolate this non-safety ventilation system?

MR. EHLERT: It receives isolation signals for radiation, from the refueling floor and from the building. Also, that can be manually done by the operator.

MR. MICHELSON: But nothing happening in the lower parts of the building, then, would activate it unless you've enough -- well, is the radiation also off of the lower elevations, as well?

MR. EHLERT: Yes. There is a sensor in the reactor building exhaust that just measures the radiation.

MR. MICHELSON: From wherever?

MR. EHLERT: From wherever in the building.

MR. MICHELSON: So then, if you see any, you isolate all of it?

MR. EHLERT: Correct.

MR. MICHELSON: Now, if you get a steam line rupture on the RCIC, which is still steam driven in this plant, it vents up through this ventilation system, then?

MR. EHLERT: Partially. There is also a part that probably go up the --

MR. MICHELSON: The only place I see where it can go --

MR. EHLERT: There is also, if you look on 2A, there is a huge fire wall area blocked off at about the 90 degree area, where it is labeled RHR and RCIC pipe space.

MR. MICHELSON: Yes. But, that is only venting

into more blue pipe space.

MR. EHLERT: That is a huge pipe space that vents it all the way up to its penetration and containment.

MR. MICHELSON: That seems to vent into the instrument rack room above, if that is a vent. Directly above it on the next elevation, which is whatever. I cannot find a number. It appears 800, I guess. No, 4800. Excuse me. The +4800, that is a rack room at that location.

MR. EHLERT: I believe it is just to the -- it jogs up a touch, up to column line RC, essentially between the hatch and the instrument rack room.

MR. MICHELSON: But it keeps venting on out somehow?

MR. EHLERT: It is not venting on out, it gives it more space. But the main --

MR. MICHELSON: Well yes, that is expansion space. But where does the pressure finally get relieved to, and how?

MR. EHLERT: Through the HVAC.

MR. MICHELSON: Through this non-essential HVAC?

MR. EHLERT: Right.

MR. MICHELSON: Now, what prevents it from isolating and blowing out the non-essential HVAC ducting somewhere, if the pressure builds up to a pound pressure, for instance?

MR. EHLERT: Well, the one thing is it should vent. If it starts building up pressure it is going to vent into the whole blue space, eventually.

MR. MICHELSON: Hopefully, only the blue space.

MR. EHLERT: Right.

MR. MICHELSON: And it is going to build up pressure in the blue space, and it is going to vent out through the duct. But you are going to isolate the duct because you could also get radioactivity with it.

MR. EHLERT: Right.

MR MICHELSON: So, when you isolate the duct, then wha happens?

MR. EHLERT: SUTS starts up and starts depressurizing the building and treating the exhaust gasses.

MR. MICHELSON: Do you think in the meantime you have gotten the steam line out? You have done the analysis that shows that you can isolate the steam line in time so you don't over-pressurize this blue area in the process, or blow out the duct work which might now be a duct into another train of the building?

You have told me this all a common duct with just some dampers in it.

MR. EHLERT: Yes. But there is only about one small stretch that is common duct, and that is up near the top. Basically, where it comes in the building.

MR. MICHELSON: Do mean that all the other routing -- do you keep the duct in a blue area all the way up, is that it?

MR. EHLERT: Right. There is only one area.

MR. MICHELSON: He can do it. Well, you got to do some developing.

MR. WILKINS: On the next page, on drawing 8A --

MR. MICHELSON: Though by the time you get 8A it runs out of blue.

MR. WILKINS: The blue on 7A is at the upper right hand corner.

MR. MICHELSON: But all of this duct is going to be in its own division? It is not going to be in other rooms occupied by other divisions, however you do it?

MR. EHLERT: Yes. Except for possibly the one common duct that feeds in.

MR. MICHELSON: And that is downstream of the isolation dampers, or upstream?

MR. EHLERT: It is on the secondary containment side. So, into the building. Isolation dampers are on the boundary, the building boundary.

MR. MICHELSON: They are on the boundary of the building?

MR. EHLERT: Right.

MR. MICHELSON: So, it looks like, then, if I

isolate at the boundary of the building then, and if I should continue to build up pressure, then I can blow into other parts of the building to relieve the pressure, or it just blows the sheet metal duct?

MR. EHLERT: Well, if you go in further then, at the divisional split there is a set of three fire dampers.

MR. MICHELSON: These are the kinds of questions eventually I think have to be answered, though however. I don't even have flow diagram for the arrangement.

MR. CARROLL: I was wondering about the red area. We have an elevator and a duct in blue and an elevator in yellow. Where is the duct in red?

MR. MAXWELL: It doesn't show on this drawing as yet. This is one of the modifications that we have to make, but it will be in it.

MR. CARROLL: But there will be supply and exhaust ducts?

MR. EHLERT: Yes. These are basically the Japanese arrangements and we are still in the process of making the change that needs to bring them over to the GP of US.

MR. MAXWELL: There will be one in the red area, yes. That is where Division 3 is. A supply and a return.

MR. MICHELSON: I assume there will be an analysis that shows the pipe rigs of higher energy like the steam

line for the RCIC will not over pressurize the blue area.

MR. MAXWELL: You cannot take account for venting because I think you are going to isolate that vent in the process.

MR. CARROLL: It won't over-pressurize and blow walls down into areas?

MR. MAXWELL: Not walls, just blow out penetrations. If you read this english report they have found their electrical penetrations would only take about 1 pound positive, their three-hour penetrations.

So, we are talking about one pound pressure. We are not talking about blowing concrete out. Then, once you blow the penetrations then the barrier is gone and now the steam goes into train B here, or whatever. That is the kind of thing we want to be sure you have taken care of, somehow.

MR. EHLERT: We will do that.

MR. MICHELSON: We don't expect you to have all the answers today. We're just pointing out the concerns and that's the kind of concern -- one of the kinds of concerns you have to look at. You also have to look at fire in the blue area to make sure that it doesn't build up enough pressure, even if it becomes isolated, that it doesn't build up enough pressure to blow the boundary.

These boundaries apparently are quite weak compared with walls. Even the doors, the pound pressure on

the doors is a very significant load and fire doors aren't rated on pounds; they're rated on how many hours they'll survive a certain test fire, not how many pounds of pressure they can take.

MR. EHLERT: All right, we'll note it.

MR. CARROLL: The English solution to this are huge chimneys.

MR. MICHELSON: Besides that, they went to bulkhead doors. Read the English report and then answer why you don't need the things that they seem to think they need. Maybe they're just ultra, ultra conservative.

MR. CATTON: We're going to ask Westinghouse the same questions, right?

MR. MICHELSON: Yes.

MR. CATTON: Just to be fair.

MR. CARROLL: Don't feel picked on because you guys are well ahead in terms of N plus 2.

MR. MICHELSON: Go ahead.

[Slide.]

MR. MAXWELL: I'm through with this one. Let's go on to the next. Let's go up another floor then.

MR. CATTON: We don't want to leave combustion out either.

MR. CARROLL: No, no.

MR. MAXWELL: 3-A; now, this floor is where you

see something other than secondary containment showing up. Basically --

MR. CATTON: I missed something. How can I tell, looking at this diagram, that something other than secondary containment is showing up?

MR. EHLERT: It's the inner firewall.

MR. MAXWELL: I ran out of colors. I would liked to have put you a red line right around the inside here on secondary containment so you could see where it is, but I just didn't have time to do it.

Secondary containment is a fire barriers as well as secondary containment and it's this black internal line here. It goes all the way around. Then we've got to jump out here.

MR. MICHELSON: Not, in terms of elevation, is the fire -- is that secondary containment defined also as grade elevation, basically?

MR. MAXWELL: Well, it's the same way. It comes on up here.

MR. MICHELSON: Elevation, 12,000.

MR. MAXWELL: Secondary containment goes on up clear to the top of the building.

MR. EHLERT: It includes the refueling area.

MR. MAXWELL: It goes through each floor.

MR. MICHELSON: In a colored drawing, I guess

showing what secondary containment includes -- other drawings. You need elevations on this thing. Just showing us plans alone, I think, is a little short.

MR. CARROLL: Isn't the other unique thing here the fact that for the first time we find ourselves a brown area at 3:00?

MR. EHLERT: Yes.

MR. MAXWELL: That brown area is a Division 4 instrument rack room.

MR. CARROLL: Okay, now, you had Division 4 instruments at lower elevations. It's just that they haven't been rooms, right? It's been --

MR. MAXWELL: I would have to check the database to see, but I'm not aware of any Division 4 instruments at the lower elevations. There should be, though, I would think.

MR. CHAMBERS: Most of your Division 4 instruments are going to be inside containment or RPV type instruments.

MR. CARROLL: So this Division 4 instrument room are where there are penetrations into the primary containment at this elevation for instrumentation. Okay, got you.

MR. MICHELSON: What does it mean when I see the stairways and the elevator being white? How do I read that?

MR. CARROLL: He ran out of blue.

MR. MICHELSON: I think they purposely left it white.

MR. MAXWELL: It means they should be black.

MR. MICHELSON: Black box completely around them?

MR. MAXWELL: Around the elevators, yes, the elevators and the stairwells. Again, that's something we just didn't get on the drawing.

MR. MICHELSON: Okay, now, if you colored them in yellow, that means you don't intend to put a box around them; is that right? In some of the lower elevations, you just colored them in.

Now, on this elevation, you left them white. In 2-A, for instance, it's colored in.

MR. CATTON: It looks like it's the same stairwell.

MR. MICHELSON: It's the same stairwell.

MR. MAXWELL: It's the same -- now, those stairwells, we missed on that. The stairwell will be a separate fire area, top to bottom.

MR. MICHELSON: Okay, it will be a fire barrier and fire doors? Will the elevator doors be fire doors then, too?

MR. MAXWELL: Yes.

MR. MICHELSON: That's another special door to be qualified.

MR. MAXWELL: That's right. I'm sorry. These were colored over the weekend.

MR. CARROLL: What you are telling me on figure 3.A is that, for example, in the yellow area, you should have had black lines around the stairwell and around the elevator on the top there and some sort of fire door into the stairwell?

MR. EHLERT: That is correct.

MR. MICHELSON: And into the elevator?

MR. MAXWELL: Yes.

MR. MICHELSON: Are there fire rated elevator doors? Most people don't even use elevators in fires, so I just wondered if they fire-rated the doors where you do. Here you've got to worry about it as a chimney.

MR. MAXWELL: I'm told that there are. I have not seen one. If there aren't, why, then there will be a separate fire door to be closed with a shaft.

MR. CARROLL: Except that elevator is used for fairly big things, I suspect. You're going to need a big door because maintenance guys want to wheel dollies with motors and pumps on them and that sort of stuff.

MR. MAXWELL: It will be as big as the door of the elevator.

MR. CARROLL: Right.

MR. WILKINS: Will the fire door in the elevator

be designed to keep the fire out or the fire in?

MR. MICHELSON: Both because the next floor up may be a different division.

MR. MAXWELL: Or, if you get a fire in an elevator shaft, then you don't want it communicating to the floors, so it has to be both.

MR. MICHELSON: Unless you had the same division all the way to the top of the building and then I guess you wouldn't worry about it.

MR. MAXWELL: Yes, you could legally say that.

MR. CARROLL: But you don't do that. They go from blue to red on the same floor.

MR. WILKINS: Yellow to red sometimes.

MR. CARROLL: Boy, we make these things complicated.

MR. MICHELSON: Just my own firsthand observation after really trying to look at this thing a couple of days ago was that, gosh, why isn't this a lot cleaner? It could have been a lot cleaner, although I think the reason is that you would have had to start out with a clean piece of paper and you didn't want to start out with a clean piece of paper.

The other vendors that are coming in are much cleaner in this regard than what you're showing here in terms of vertical cleanliness. It's all the same division,

all the way up from basement to the attic.

You're mish-mashing. You're crossing floors, so now you need some fire barrier floors. They've also got to be leak tight and so forth. You just keep mish-mashing from floor to floor and crossing over.

Their designs seem to be much cleaner, but they're staring out with a clean piece of paper and I'm not sure you did. I think you were trying to use the Japanese nuclear steam supply island.

MR. MAXWELL: That's correct.

MR. MICHELSON: So, they don't worry about the same things we do, so they've got -- now, to patch that island up for US consumption, you've got to do this extra complication. I guess it's all right, but it's just going to be looked at very carefully to make sure it's all right. That's the price you pay for not being able to start with a clean piece of paper.

MR. CATTON: It's bailing wire; isn't it?

MR. MICHELSON: Yes, we thought we were getting out of that with standard plans. We were going to start out doing it right to begin with.

MR. CATTON: This is jury-rigged into a standard.

MR. MICHELSON: That's right, it's into somebody else's standard or somebody else's design. I don't know if it's the standard in Japan or not.

MR. CARROLL: A lot of things held together with baling wire work quite well.

MR. CATTON: Some of my older cars did that, but I gave that up.

MR. EHLERT: It may very well be that you get to a tradeoff between size and volume of the building versus how many jigs and jags in the walls you've got to do, too. It's not clear that you would -- looking at a cost/benefit thing -- you would come out with a perfectly clean building.

MR. MICHELSON: In the early days, people used to think it was important to conserve building costs. It turned out that was the least of your worries. Building costs just isn't, that's not what's making nuclear power expensive. It's all these hypothetical accidents that you can't take care of because you crowded everything up too tight.

MR. EHLERT: Certainly that's one aspect of the Japanese design where they do put a premium on space, just because of land.

MR. CARROLL: Well, also, a compact building is better from the seismic point of view.

MR. EHLERT: Right.

MR. MICHELSON: Yes. So they had their reasons for doing it their way and you try to fix it as best you can here.

I realize that you were kind of boxed in a little bit before you got started.

MR. MAXWELL: Okay. Then, outside of the secondary containment, of course, are now new areas. And they have different HVAC systems, and it's not part of the secondary containment HVAC.

Showing up then, we have again at the top of the drawing, the blue area, we have the Division 1, the electrical equipment area, emergency electrical equipment.

And the 6.9 KV switchgear, 480-volt switchgear, and the safety-related 480-volt motor control centers are in this room.

And then sitting right above the Division 1 area below, for the next two floors, so the cabling from this room down to the areas below would be risers going down into the pump rooms and corridors below.

This blue area has its own safety-related HVAC system, which it shares with other Division 1 rooms above, which have emergency electrical equipment and diesel generator control equipment. We'll see that as we go up to the next level.

Along the sides of the building here are lined up the reactor internal pump, ASDs, and power supplies. Five of them on each side of the building.

The reason the right-hand side of the building

here over along the Row 7 is Division 3, red, is that the Division 3 motor control center switchgear room is down here in the lower right corner, directly above the Division 3 areas below, and the cables that do go to the control building come out and go down this area where the red pump power supplies are to go to the control building.

MR. MICHELSON: In the red area, in the very upper right-hand corner, there's a couple of, there's some motor control centers. Do you know roughly what they're going to control?

MR. MAXWELL: They're non-safety-related motor control centers. They pick up some of the non-safety-related power for the RIPs and for other, there may be some lighting on them.

MR. MICHELSON: What bothers me, and this is one of the places where I think we've got a pinch point, directly above that area in the upper right-hand corner is the opposite division's diesel engines.

MR. MAXWELL: Yes.

MR. MICHELSON: The blue diesel engine is directly above that red area. And of all the kinds of things you worry about in a diesel compartment, that floor is going to be a very good floor. It's really going to isolate the opposite division, directly underneath it.

MR. MAXWELL: That's correct.

MR. MICHELSON: And that's an area which you can be assured will be looked at very carefully, because we've already had experiences with fuel oil on floors of diesel compartments, and so forth.

MR. CARROLL: Let's see. On 3-A we also introduce a new, two new elevators and two new stairwells, don't we?

MR. MAXWELL: That's correct. These are outside in the non-secondary containment area.

MR. CARROLL: And let's see. Do they stay yellow and red all the way up?

MR. MAXWELL: No. When they get up to the --

MR. CARROLL: Oh, they don't?

MR. MAXWELL: -- top floors, and we'll have to look and see why they --

MR. CARROLL: At 5-A --

MR. MAXWELL: -- they're turning green.

MR. CARROLL: At 5-A the red one turns blue.

MR. WILKINS: At 4-A the red one turns white.

MR. CARROLL: Well, it's in a red area.

MR. MAXWELL: They have to have fire barrier walls.

MR. CARROLL: Okay. So that was my question. They're missing fire barrier walls.

MR. MAXWELL: Any other questions on this elevation?

MR. MICHELSON: Now, as we move electrical cabling from one floor to another, and so forth, is it going to be in dedicated chases, or out in the open areas, just going through floor penetrations?

MR. MAXWELL: It'll be in risers, going through the floor. There will not be an electrical chase as such.

MR. MICHELSON: You won't have a dedicated chase for each division taking the wiring from floor to floor, and so forth.

MR. MAXWELL: No. It'll just be risers, that will be covered --

MR. MICHELSON: I mean, floor penetrations, then, have to be again something one looks at carefully, particularly if it's a watertight floor, also.

MR. MAXWELL: That's correct.

MR. MICHELSON: And the conventional ones that we've been using in the past have not necessarily been watertight, that flamastic and all that kind of stuff doesn't like water on it very long, I don't believe. Not in terms of three hours.

MR. MAXWELL: Our approach to that is to curb the penetration with a six-inch curb, so that water collecting on the floor does not --

MR. MICHELSON: And then you'll be assured a drain system that keeps any credible break from getting more than

six inches of water on the floor or any firefighting from getting more than that amount.

MR. MAXWELL: That's correct.

MR. MICHELSON: Six-inch curbs on the stairwells, too?

MR. MAXWELL: The doors there are 300 millimeters.

MR. MICHELSON: You mean they don't leak?

MR. MAXWELL: No, there's a curb.

MR. MICHELSON: Oh, 300 millimeter curb.

MR. MAXWELL: Yes.

MR. MICHELSON: Okay.

MR. CARROLL: So that's --

MR. MICHELSON: 30 centimeters. And that's --

MR. CARROLL: Six inches.

MR. MICHELSON: It's a neck-breaker, all right.

The approach now is to take care of water that way, take care of pressure buildup by qualifying the penetrations for whatever pressure, if any, builds up in the room, and take care of fire by rating it for three hours.

MR. MAXWELL: Yes. The initial approach is to prevent buildup of pressure in the room.

MR. MICHELSON: Yes. That would either have to be shown to be highly reliable or you'd have to provide some alternate. The English were never able to satisfy themselves they could really vent the room for sure, other

than with chimneys. They had smoke removal, too, but they couldn't count on that.

MR. CARROLL: Now this curb you're putting around a floor penetration area, what prevents a jet of water from a broken line or whatever from filling it up?

MR. MICHELSON: Or blowing out the penetration, except for the concrete, yes.

MR. CARROLL: The water running down --

MR. MICHELSON: Yes, from a break up higher.

MR. MAXWELL: The tray is covered.

MR. MICHELSON: That's all the better. It makes a great water conduit, then. It just fills up with water inside and it can't relieve itself. So it's got several feet of head on it and it blows itself through the floor, if the ducting surround the cable tree is stronger than the penetration.

MR. MAXWELL: Assuming the water that's inside the tray --

MR. MICHELSON: Yes. And it got inside, unless you're sure it's watertight everywhere. I'm going to bust a pipe up the ceiling, in an open tray, and it's going to get on down. You read the LERs. You know how water gets around.

MR. MAXWELL: Yes. Any other questions on this one?

MR. CARROLL: That was sort of a reluctant question about questions.

[Slide.]

MR. MAXWELL: This is 3B. This is more or less mezzanine area again of the one we just looked at.

Again there is nothing really different about this.

MR. CARROLL: I see something new. What's the full space, is it?

MR. MAXWELL: Pipe space.

MR. CARROLL: Pipe space.

MR. MAXWELL: Yes. That's some pipes coming down and I'm not -- I can't tell you what those are.

MR. CARROLL: It is something unique to the yellow division, eh?

MR. MAXWELL: Well, presently we are showing it as non-divisional.

MR. MICHELSON: Showing yellow --

MR. MAXWELL: Six o'clock in 3B.

MR. MICHELSON: Excuse me. I was looking at the pipe space over here on 3A, which is yellow. I thought that was the one you might be thinking about as well.

I assume that is only for yellow pipes.

MR. CARROLL: Where is that now?

MR. MICHELSON: It's over at about 225 degrees.

It's a pipe space there, right against the containment. I assume that's just yellow division pipe penetration.

MR. EHLERT: Those are ECCS piping coming up to their penetrations.

MR. MICHELSON: Somewhere there might be one for the blue.

MR. EHLERT: Yes, there should be three divisions' worth.

MR. MICHELSON: I don't find the blue one but maybe it's on a different --

MR. WILKINS: No, it's there. It's on line R, see just to the left of R6.

MR. CARROLL: Your pipe space disappears on 4A.

MR. MAXWELL: Yes. It does. I can't give you a straight answer on what that is. I think I know what it is but I just as soon not give it to you and it'll be a conforming --

MR. MICHELSON: It's got a fire wall around it.

MR. CARROLL: Yes, it does. That's what caught my attention.

MR. MAXWELL: There are no pipes in our electrical equipment rooms.

[Slide.]

MR. MAXWELL: Going on to the next floor, this floor now is where the character of the building really

changes is the way I perceive it anyway.

We are now at the ground elevation and we see, as Mr. Michelson pointed out, we see the diesel generators showing up out in the division 1, 3 and 2 corners of the building.

We also have the equipment hatch coming in from the outside for the trucks to bring the equipment into the building, the main access for big equipment coming into the building.

MR. CARROLL: Where is that?

MR. MAXWELL: That is down in the lower --

MR. CARROLL: Okay, okay.

MR. MAXWELL: Again, it is not labelled as such, but that's what it is -- it's reactor building entryway.

Basically the building below this elevation has been, a major portion of it has been the emergency core cooling systems. That's now switching over to other types of systems.

You also at this elevation have containment penetrations, electrical penetrations showing up and the division 2 are in this quadrant from 180 to 270. Division 3 is in the quadrant from 90 to 180. They actually are down here at about 135, around the 180. The division 1 are up here in the zero to 90 quadrant.

Also on this floor is where the piping

penetrations are and you see the valve rooms showing up, the division 1 valve room, division 3 valve room, and a division 2 valve room.

The piping has come up from the basement, the bottom floor, up through the pipe chases that you are looking at, up into this area, the isolation valves are here and then they go through penetrations into containment.

The diesel generator rooms themselves have their individual HVAC systems. For normal shutdown they are cooled by the same system that cooled the electrical equipment rooms below on a division by division basis but during operation of the diesel, the room cooling system comes on and pulls in large quantities of outside are and exhausts them for each room in three separate divisions.

MR. CARROLL: Are these radiator cooled diesels?

MR. MAXWELL: They are cooled --

MR. CARROLL: So it is just room heat that you are taking out.

MR. MAXWELL: That's correct. Their ducted input for combustion air to the engines.

MR. MICHELSON: The only way to get from the control building into the reactor building appears to be at this elevation, is that correct?

MR. EHLERT: Clean access is on this floor and on floor -- would it be sheet 3A is where the controlled access

is for the entry secondary containment.

MR. MICHELSON: Was there any entryway shown on 3A?

MR. EHLERT: No, excuse me. You come in on 3A for the clean access.

It's the other way around.

On 4A is the secondary containment access.

MR. CARROLL: Where is the control building again?

MR. EHLERT: To the north.

MR. MICHELSON: At zero degrees.

MR. CARROLL: So the steam lines are going under the control building.

MR. MICHELSON: Over.

MR. EL-ZEFTAWY: Over.

MR. MICHELSON: Now eventually we'll get some comparable drawings to the control building showing where the fire zones are and they would be, I assume, to be isolated in the same way as this.

MR. MAXWE' · If we get through it this afternoon we have a set right ..ere for you.

MR. MICHELSON: Oh, we will get to it all right.

MR. CARROLL: What is the area at R1, up in the left there, that's white? What is a PASS rack room? Stack 9 rack.

MR. EHLERT: That's for all monitoring in the

plant stack the main vent. It is their radiation monitors for monitoring the plant exhaust.

MR. CARROLL: What is PASS? Post Access Sampling?

MR. EHLERT: Yes.

MR. MAXWELL: Yes, that is Post Access Sampling.

MR. MICHELSON: Now in going from the reactor building to the control building, those doors are not shown as being fire doors.

Are they really fire doors?

MR. MAXWELL: Yes, they are fire doors.

MR. MICHELSON: Okay. If I read this correctly, they are not shown that way. Is that --

MR. MAXWELL: Because there is not the black on the wall. If the wall was black, then --

MR. MICHELSON: But they will be fire doors?

MR. MAXWELL: They will be. The wall will be blackened in. Yes.

MR. CARROLL: You are talking about two doors on the north side of this?

MR. EHLERT: In 4A, yes.

MR. MICHELSON: In the lower elevation, where we also have similar doorways, if we should again experience a pressure buildup from, say, an RCIC failure, that doorway to the control building will be able to withstand whatever pressure you calculate will build up in that RCIC area?

MR. EHLERT: Those doors in those areas do not have any connection, HVAC-wise or anywhere else, with the secondary containment.

MR. MICHELSON: But they go into the control building.

MR. EHLERT: Which floor now?

MR. MICHELSON: On 3A.

MR. EHLERT: No. The doors on 3A enter the electrical equipment areas, which is outside of secondary containment.

MR. MICHELSON: But they enter the control building.

MR. EHLERT: Correct.

MR. MICHELSON: Now, if steam gets into that portion of the control building, can it do any damage? That's what pressure buildup is being caused by, and we want to make sure --

MR. EHLERT: I don't understand how you could pressure buildup in that part of the reactor building.

MR. MICHELSON: If you rupture the steam line to the RCIC turbine in the basement --

MR. EHLERT: It would be also inside the secondary containment, and those doors enter into areas outside of secondary containment.

MR. MICHELSON: But the doors have got to be

strong enough so they don't blow out while you're venting whatever you're trying to vent, which presumably part of secondary containment.

MR. WILKINS: I think what he's saying is the steam has somehow got to get out of the secondary --

MR. EHLERT: Yes. You've got to cross the secondary containment boundary.

MR. WILKINS: And then, before it gets to the --

MR. EHLERT: Yes. Right. And that's above grade, up at the HVAC duct.

MR. CARROLL: This is the watertight door the maintenance guys have got propped open.

MR. EHLERT: That's on floor 4A. If you want to talk about the doors on 4A, then those, yes, would be designed for the pressure.

MR. MICHELSON: I really want to talk about the floor with the RCIC turbine, and then up at the next elevation, I think, is where you've located the doors to the control room.

MR. EHLERT: For the RCIC people to do maintenance, they would come in on elevation 4A and take the elevator down to the basement.

MR. MICHELSON: But aren't there any doors between the control building and the reactor building at that location?

MR. EHLERT: No.

MR. MICHELSON: Figure 3A shows doors.

MR. EHLERT: Those go into areas outside of secondary containment. You cannot get to the RCIC from that area. That's closed access. There's no doors.

MR. MICHELSON: Therefore, there's also a pressure-tight membrane between there and RCIC.

MR. EHLERT: Yes. It's designed to handle the secondary containment accident pressures.

MR. MICHELSON: Okay. If something -- it's actually the blue division that's got RCIC in it. If there are words that say that that pressure buildup cannot get into the area where the door is, fine, but the door is there, and there's nothing saying that it isn't a common a ventilation, because I thought it was. I thought it was ventilated with a common duct.

MR. EHLERT: Inside secondary containment.

MR. MICHELSON: Yes.

MR. EHLERT: That electrical room on the --

MR. MICHELSON: That doorway is also in that blue area inside that secondary containment.

MR. EHLERT: That room with those electrical equipment racks is part of the essential electrical HVAC system, which is outside of secondary containment.

MR. MICHELSON: And there is no common

ventilation.

MR. EHLERT: That is an essential HVAC system that is separate from the secondary containment HVAC.

MR. MICHELSON: And there is no ability to pressurize the other part of the blue area and get into there.

MR. EHLERT: Right. It would have to knock the concrete wall down.

MR. MICHELSON: No, not knock concrete walls, just blow a penetration. They blow much easier.

MR. WILKINS: Where is the control building again? I guess I got confused.

MR. MICHELSON: North.

MR. EHLERT: Zero degree, north.

MR. WILKINS: How far north? They're flush?

MR. EHLERT: Not flush. There is about a 2-meter gap.

MR. WILKINS: That's longer than I can step.

MR. EHLERT: Right.

MR. WILKINS: There's a corridor then.

MR. EHLERT: There's a small corridor, access-ways connecting the two buildings.

MR. CARROLL: Now, north is top.

MR. EHLERT: Right. North is the top of the page.

MR. CARROLL: What's the arrow up there that says

"PN" mean?

MR. EHLERT: That's the plant north. We orient this to Japan.

MR. CARROLL: Okay. I thought I understood.

So, the steam and feedwater lines go over the top of the control building.

MR. EHLERT: Yes.

MR. CARROLL: So, I break one of these.

MR. EHLERT: It's in a steam tunnel with 2-meter-thick walls, top, bottom, and sides, and vents into the turbine hall, and the -- basically, we're looking at a pressure buildup in the tunnel from the break, but eventually it will vent into the turbine hall and out.

MR. WILKINS: You call it a tunnel, but it's above the control building.

MR. EHLERT: It's not really a tunnel.

MR. MICHELSON: It's not open-air.

MR. EHLERT: No.

MR. MICHELSON: It's very large, I hope,

MR. EHLERT: It is pretty large.

MR. MICHELSON: Two meters of concrete is nothing when you talk about the kind of pressures that build up rapidly from a double-ended rupture of a steam line. You've got to have a good, big vent.

MR. CARROLL: We're not going to fill a control

room with steam then.

MR. EHLERT: Our analysis says it won't happen.

MR. MICHELSON: Are you willing to assume any type of pipe in that area, or have you got some kind of leak before break?

MR. EHLERT: We've got leak before break, so we're monitoring the leakage.

MR. MICHELSON: Now, you have to read all the fine structure about the rules you use on leak before break, because under certain circumstances, it may not apply.

I guess we're on that diesel floor, aren't we?

MR. CARROLL: Before we leave steam lines, I would -- for the guys doing those calculations, I think it would be well for them to get the California Public Utilities Commission report and the Southern Cal Edison report at what happened at Mojave to make them more conscientious.

MR. WILKINS: Is that a GE plant?

MR. CARROLL: It's a fossil plant where they killed eight guys, a steam line break that jetted into the lunchroom next to the containment.

MR. WILKINS: Wasn't there something like that out in the Gulf?

MR. MICHELSON: The Iwo Jima? Ten people killed.

[Slide.]

MR. MAXWELL: We're back at the ground floor of

the building.

MR. MICHELSON: Now, refresh my memory as to why the red areas shown cross-hatched through that one part there -- what's unique in that area?

MR. WILKINS: That means it is above an area that has a different color.

MR. MAXWELL: There's something that's division 3 that's in that area.

MR. MICHELSON: But is it part of the red environmentally? Is that right?

MR. MAXWELL: That is correct.

MR. MICHELSON: And fire-wise, it's a part of the red area.

MR. MAXWELL: Yes.

MR. MICHELSON: But there is some kind of non-safety-related equipment located in that area, either in that pipe chase or some darn thing.

MR. MAXWELL: It's primarily non-safety-related area.

MR. MICHELSON: Now, again, of course, it's got an elevator, and I assume that elevator is really going to have a fire door on it.

MR. MAXWELL: That's correct.

MR. MICHELSON: It goes on up to the blue area before long, as you go up in the building.

MR. MAXWELL: Secondary containment boundary here is the fire-barrier wall. Actually, there is a duct chase here that comes out at the division 1, the generator room, and runs down the building, the wall for the division 1 diesel generator, then down through this stairwell opening, and around the division 3 diesel generator, outside of secondary containment, and a similar wall comes down, secondary containment, on the left side, on the division 2 side, and areas outside of secondary containment have a different HVAC system or systems than inside secondary.

MR. MICHELSON: Now, which part is outside of secondary, the white part then?

MR. MAXWELL: Anything on the -- between columns R1 and R2, anything to the left of the black line coming down the fire-barrier wall, coming the full width of the plant there. So, anything off to the left is outside of secondary containment.

MR. MICHELSON: That's outside of secondary containment, but certainly it's still subject to possible fire hazards or whatever, I assume.

MR. MAXWELL: Yes.

MR. MICHELSON: What do you do relative to fires in that area as to how they may propagate and what effects they may have?

MR. MAXWELL: Again, they have fire barrier walls

around them.

MR. MICHELSON: Well, as I go up through the building though to the next higher elevation -- oh, I see, there is a cross hatch there indicating that some of that floor is going to have to be qualified.

MR. MAXWELL: That's correct.

MR. MICHELSON: You move the walls over a little bit.

MR. MAXWELL: Then you have to cross hatch some of the floor.

MR. MICHELSON: This is a wild structure, isn't it?

MR. CARROLL: What's a PP-Door leading into a diesel vault from the outside? What's PP stand for?

MR. MICHELSON: The big one and the little one. On Column CC. If you go down further, there's another one.

MR. EHLERT: They are for the equipment access during diesel maintenance. They're normally locked and sealed closed.

MR. CARROLL: I guess what I was really leading up to though is; you know, you can have a hell of an explosion in a diesel room. Are those specifically designed as blowout panels so you don't do damage all square?

MR. EHLERT: Yes, they're mostly just designed to prevent entry of unauthorized personnel.

MR. MICHELSON: Where will I read about the hazards associated with the diesel compartment and how you analyze things such as pressure buildup during various kinds of events? They're not in the fire hazard study at all. Where do I read about those kinds of events such as an explosion in the diesel compartment and whether the walls will take the penetrations or whatever?

How can I be comfortable that I won't blow the walls down or the penetrations out?

MR. CARROLL: Is this the same level as the control room?

MR. MICHELSON: I think it's a little different.

MR. MAXWELL: This is higher.

MR. MICHELSON: It's a little higher up in the control building.

MR. CARROLL: What' in the control building behind the blue diesel vault on the north side? Is that roof level?

MR. MAXWELL: No, there's one floor, HVAC that's at this elevation.

MR. EHLERT: There's the divisional HVAC, the blue divisional HVAC in the control building.

MR. CARROLL: So, if I blow that end wall out, I haven't probably done any damage to the control room?

MR. EHLERT: The control room, no, but you --

MR. MICHELSON: It looks like you're right in the battery rooms. If this out of the SAR is correct, which is the elevation of the control building relative to the steam lines and if they are where they show they are here, then directly below that is the wall common --

MR. EHLERT: You're going to be getting a new set of drawings on the control room shortly.

MR. MICHELSON: I don't believe these?

MR. EHLERT: The elevations are close, but there have been some changes. We had to shift some of the equipment around.

MR. MICHELSON: I kind of wondered because there are a lot of other things that look funny on them. Okay, we'll have to find that out at the end of the day, I guess. You said you had some drawings?

MR. EHLERT: Yes, that's the next step when we get done with the reactor building.

MR. MICHELSON: Okay.

MR. WILKINS: Did you ever get an answer to your question about what happens if you blow out the walls?

MR. EHLERT: We don't right now have the report on explosions. Each division has its own integral fire suppressant system.

MR. MICHELSON: Yes, but that's just not the answer that we need.

MR. CATTON: Are the walls designed to contain the explosion?

MR. EHLERT: No, most of the doors are basically the drop down, almost garage type.

MR. MICHELSON: How about the fire door between the red and blue division? Is that going to withstand the effects of an explosion in the blue division, or is it going to propagate right into the red division?

MR. MAXWELL: It's going to have to.

MR. MICHELSON: It depends on what kind of a door you use, of course. You could use a bulkhead door latched down with a good strong wall and it might take it. That's what you'll be telling us.

We're just saying that they have to tell us how to handle explosion, that's all, unless you prove it incredible. The same is true of any penetrations of the diesel compartment that might get into another division.

MR. MAXWELL: Are there any more questions or comments on this floor here?

MR. MICHELSON: Are there any credible missiles from the diesel generator complex? You know, crankcases? I've heard of a couple of diesel engine failures where parts went flying around the room. Are any of those credible missiles in terms of the penetrations or the walls?

MR. EHLERT: I wouldn't think so, because at least

on the external walls, they're holding out the telephone poles and whatever for the tornado. That's incredible.

MR. MICHELSON: That part should be all right. I was thinking more of the internal walls or these floor penetrations, if any, that you might have.

MR. EHLERT: I would think that the penetrations would be too small for any of the major components to come through.

MR. MICHELSON: I don't worry about the component coming through. I just worry about it damaging the penetration such that it no longer keeps fuel oil from going down to the floor below or whatever; that's all.

Fuel storage is above there somewhere. What happens in the blue diesel engine compartment, if you lose the penetrations in the floor, you're into the red compartment below. Now, you aren't into vital equipment necessarily yet, but you're spreading fire and you start talking about a new consideration.

MR. MAXWELL: There should be no penetration of the floor in the cross-hatched zone, because all that's below it is Division 3 and there's no reason to go from Division 1 to Division 3.

If they want to get to the floor, it's to go to the Division 1 and they should move over and put their penetrations in the Division 1 area of the floor.

MR. MICHELSON: There will be some kind of a criterion written that keeps them going in that direction?

MR. MAXWELL: That's correct.

MR. MICHELSON: Okay, we'll look for it. Why don't we take a break at this point.

[Brief recess.]

MR. MICHELSON: Let's get started. I think we're at 5A now.

[Slide.]

MR. MAXWELL: That's what I have on the machine. This floor -- now we 're above the diesel generators, and you can see there's a -- this is the ventilation system for the diesel engine room that shows up on this floor. There are a couple of fans that take air in. It actually comes in from above down through the fans. It goes down into the diesel room below and then comes back up the outside here and goes out through louvers through the side wall. And it's the same on all three through the side walls.

And the compressors or the air storage tanks for the diesels are shown up and then some of the diesel control panels are on this elevation.

MR. MICHELSON: There's a door between the red and the blue area up there about the middle of your drawing at the 90 degree point.

MR. MAXWELL: Yes.

MR. MICHELSON: It's shown on one side of the fire wall as a new fire door but not on the other side. Is that really -- isn't that a fire door on the other side as well?

MR. MAXWELL: Yes, it is because the wall is a fire barrier wall so that means the door has to be a fire door.

MR. MICHELSON: Okay. So we know that's already a fire door without being labeled.

MR. EHLERT: Yeah, that's not the new one. That was an original Japanese designed fire door.

MR. MAXWELL: And, see, the new fire door is in secondary containment -- the existing fire doors outside of secondary containment.

MR. MICHELSON: Now that's hard to tell from looking at this drawing, isn't it? Or is that because --

MR. MAXWELL: Yes, it is hard to tell because secondary containment boundary is not labeled as such.

MR. MICHELSON: It's not clearly indicated this way. Okay.

One of the puzzlements on this drawing is this fuel storage pool area, and I see some yellow and I see some red. I don't see any fire doors between red and yellow or fire walls or anything. And if I go down below I see some mishmash of areas. What is the philosophy in that area?

MR. MAXWELL: Well first, there is a corridor that

goes across. It's right at the "G" row of the building that goes across from the Division 2 over to the Division 3 area. And you noticed there is a new fire door added there.

MR. MICHELSON: Oh, yeah. Okay. And that's a corridor there.

MR. MAXWELL: Yes.

MR. MICHELSON: Does that mean it's enclosed?

MR. MAXWELL: Yes, it's a tunnel, in effect, through there just for personnel.

MR. MICHELSON: Okay.

MR. MAXWELL: And, of course, the fuel storage pool there is -- what? -- two meters of concrete backed up with a steel liner and water. So that's -- we consider that to be equivalent to a three-hour fire wall.

MR. MICHELSON: Well, I was thinking more, though, in terms of water releases and whatever and whether they get into the opposite division by soaking down through the floor and the floor's not indicated as being any kind of a barrier floor and yet I can go from -- I guess there is a barrier floor there, yeah.

MR. WILKINS: Well, that corridor is one and a half meters above the tunnel.

MR. MICHELSON: No, I wasn't looking at the corridor now. I was looking at other areas there that -- okay. I guess it's all okay. All right.

It's hard to tell some of these witnout elevations as well. Just hard to envision -- visualize.

MR. MAXWELL: Actually, the bottom of that fuel pool is -- what?

MR. WILKINS: 1.7 meters.

MR. MAXWELL: -- 1.7 meters above the floor on either side of it.

MR. MICHELSON: Yeah, I don't think we're worried about fire in the pool, of course.

MR. MAXWELL: Okay. Any other questions on that elevation?

[No response.]

MR. MAXWELL: I'm going to skip 5B.

MR. MICHELSON: What -- underneath the fuel pool is there any kind of a drain on that pool or anything of that sort? Or any drain piping or pumps or fuel pool cooling equipment or -- I don't see any --

MR. EHLERT: Not below.

MR. MICHELSON: Are there some below?

MR. EHLERT: On the floor?

MR. MICHELSON: Or somewhere. Somewhere under there.

MR. EHLERT: There should be a penetration on the wall of the pool for both the suction and a discharge for --

MR. MICHELSON: For cooling the pool. And on that

pool cooling piping and so forth and heat exchangers, where are they?

MR. MAXWELL: They're in the upper left corner there, Column A to C in Rows 1 to 3.

MR. MICHELSON: On that same floor?

MR. MAXWELL: Yes.

MR. MICHELSON: Okay. They're in the opposite side from the fuel pool. Okay. So the piping must go --

MR. WILKINS: A long way.

MR. MICHELSON: A long way, yeah. Okay. That's how I missed it. It's over on the other side. Okay.

MR. CARROLL: Just a point of interest, neither the pumps nor the heat exchangers have any shielding between them. If you've got to do maintenance on a pump or a heat exchanger and you've got a bunch of bad fuel in the pool, you may have an exposure problem.

MR. MICHELSON: Do they traditionally have a wall between them? A shield wall?

MR. CARROLL: I know of one boiling water reactor plant where I wished I'd had one.

MR. MICHELSON: So for the future you're saying they ought to be providing them.

MR. CARROLL: Well, we're getting cleverer in terms of portable temporary shielding, too. That may be just as good, I guess.

Just as a matter of interest, the Dutch have come up with a neat thing.

MR. EHLERT: I think they are using portable shielding, but I'm not quite sure exactly in what way and where.

MR. CARROLL: They build up a big rack, Carl, of PVC pipe and steel and then blow lead into it and then suck the lead out when they're done.

MR. WILKINS: You have two different carcinogens there.

MR. CARROLL: That's a good way to do some shielding, in any event.

MR. CATTON: Yeah, but the lead just affects your mind.

MR. CARROLL: You wouldn't be working for a nuclear power plant if you were of sound mind.

MR. MICHELSON: All right. Let's go on. Okay, we're at 6A.

[Slide.]

MR. MAXWELL: Again, now, as you come up this second containment, this fire barrier that's shown midway into the building, and at this point you'll notice all of the second containment is cross-hatched red.

MR. CATTON: There's a little bit of yellow in the middle of the red on the other side -- on the left hand

side. Is that an accident?

MR. MAXWELL: No.

MR. CATTON: That is real?

MR. MAXWELL: That's real. If I may finish my statement, then I'll come to those.

But the reason this is all Division 3 is we have this hatchway which is coming up from the floor of the ground floor elevation, and it goes on up to the operating floor. At the operating floor there is a ventilation cover on it, but it's not rated for three hour and so this is on the secondary containment and part of -- associated with the Division 3 part of the secondary containment HFAC system.

Now going to this bit of yellow that's over here, that's a stand-by gas treatment system. It's sitting up in this area that's a Division 3 area. One pump and free filter is Division 3. The other fan and free filter is Division 2.

The standby gas treatment is not required to withstand the single fire, in that you don't postulate a fire with a LOCA. And this again is one of the exceptions, special cases; if you read them in the fire hazard analysis, it will talk about that.

MR. CARROLL: And the same is true of the SLC pump?

MR. MAXWELL: That is correct.

Any questions?

MR. CARROLL: I'm still thinking about the SLC pump.

MR. MAXWELL: The standby liquid control is not a redundant system. It's single pipe. It's redundant to --

MR. CARROLL: One tank. I guess that's okay.

MR. MICHELSON: This is the elevation where the fuel is stored for the diesel engines.

MR. MAXWELL: Yes. The day tanks.

MR. MICHELSON: You call those day tanks. How many days are you talking about? How much fuel are you storing inside the building?

MR. MAXWELL: As I really, it's eight hours.

MR. MICHELSON: This is an eight-hour capacity? Do the engines themselves have a small day tank underneath them?

MR. MAXWELL: No, they do not.

MR. MICHELSON: All the fuel comes directly from this tank.

MR. MAXWELL: And it comes into this tank transfer system from the buried tanks in the yard, the seven-day tanks in the yard.

MR. MICHELSON: And the transfer pumps are on the next higher elevation?

MR. MAXWELL: Well, the transfer pumps are in a

vault at the seven-day tanks.

MR. MICHELSON: They're in where?

MR. MAXWELL: At the seven-day tanks.

MR. CARROLL: So the engine is fed by gravity?

MR. MAXWELL: That is correct. Its fuel pump is fed by gravity.

MR. CARROLL: Now, if I have something bad happen to the blue day tank, and blow out the wall over the roof of the control room, where does that burning oil go?

MR. EHLERT: The ceiling. I should say the roof, of the control building. The control building is at a lower elevation.

MR. CARROLL: And there's no way for that oil to be drawn into, that fire to be drawn into the control room ventilation systems?

MR. EHLERT: No. There's two-divisional ventilation on either end of the control building. So if the explosion happens in the blue area, you essentially switch over to the control room HVAC on the other end of the building, or the N-11 exhaust.

MR. MAXWELL: The intakes are also at a lower elevation than this.

MR. MICHELSON: That makes it maybe bad. It just depends.

MR. MAXWELL: Okay. Any further questions?

MR. MICHELSON: Now, again, we show stairwells in that blue area. And now it's a red area in this drawing, up in the right hand corner.

Are those surrounded by firewalls?

MR. MAXWELL: Yes, they are.

MR. MICHELSON: They will be in future editions?

MR. MAXWELL: Yes.

MR. MICHELSON: Yes.

MR. MAXWELL: Fire barrier walls.

MR. MICHELSON: All right.

[Slide.]

MR. MAXWELL: Going up another floor. 7-A.

Now, we've gotten up to the area where the supply fans and air filters are for the DG and electrical equipment areas. This, for instance, the blue area here, this is the HVAC supply for the blue areas outside of secondary containment. And there's an air intake up here, filters, and then the supply fans.

The supply fans supply air to the various rooms, and there's an exhaust that comes back from those rooms, and it's a recirc. system with the controlled makeup, or exhaustive atmosphere --

MR. MICHELSON: Now, where does that air go to? What kind of areas does it serve? That's the air inlet; is that right?

MR. MAXWELL: That's right. And it comes through the filters there, in the air handling unit, the cooling or heating coils, and then it goes, these two fans, it goes through those and into a duct, and then it goes down, and it goes down and supplies air to the blue areas below on the floors below, and goes down as far as the electrical equipment rooms.

MR. MICHELSON: Well, on my drawing it says that that's the diesel generator "A" supply fan that you pointed to.

MR. MAXWELL: That's what it says. And the total that it supplies is all of the blue area.

MR. MICHELSON: Okay. It's more than just diesel generator "A," then --

MR. EHLERT: Yes. It's the electrical division "A."

MR. MICHELSON: Okay.

MR. MAXWELL: It should really be Division 1 reactor building cooling supply, is what it really should be.

MR. MICHELSON: Now, what happens if we get an electrical fire up in that area; does that air move on and smoke up the other areas that are getting their air intake from that, or how do you stop it?

MR. MAXWELL: The way we envision is, in a smoke

removal mode, why we take suction out of the area, and --

MR. MICHELSON: Out of which area?

MR. MAXWELL: We switch over, and the exhaust, instead of being recirculated, goes to the atmosphere. And so smoke that comes out of any room that's on that circuit will be drawn into the discharge duct and mixed with the cooler air coming in from the other rooms and discharged out of the building.

MR. MICHELSON: Now, is that true for the essential air circulation?

MR. MAXWELL: Yes.

MR. MICHELSON: Now, is there also a nonessential air circulation in these areas?

MR. MAXWELL: No.

MR. MICHELSON: Just the essential.

MR. MAXWELL: Just the essential.

MR. CATTON: Is that done by suction through a fan or is it blown through?

MR. MAXWELL: Yes. It's by suction.

MR. CATTON: Aren't you a little worried that maybe some of the noxious gases will be combustible, when you suck fresh air into it and then run it through the fan?

MR. MAXWELL: Well, that's possible. But when you have a fire going, if you don't get complete combustion, the combustion products can be combustible and can ignite.

Temperatures get up. Flashover is ignition of the non-combusted combustible gases that have collected. And the experience has been, it is best to take those things out of the room, the combustion products as quickly as you can and keep the, if you can get enough fresh air coming in, you keep the temperature of the air that's accumulating in the top of the room to below the flashover point, and then you don't spread the fire.

MR. MICHELSON: Aren't you using CO2, though, for firefighting in the diesel compartment?

MR. MAXWELL: In the diesel compartment we're using AFFF foam.

MR. MICHELSON: So you're shutting off the ventilation at least to that area.

MR. MAXWELL: No.

MR. MICHELSON: With foam you wouldn't have to.

MR. MAXWELL: No.

MR. COSTNER: So the section in the SAR that describes the CO2 is out of date?

MR. MAXWELL: That's correct.

MR. MICHELSON: I was thinking that it was CO2.

MR. MAXWELL: It was and we've changed over to AFFF.

MR. CARROLL: AFFF meaning?

MR. MAXWELL: AFFF, aqueous film forming foam.

MR. MICHELSON: That's your preferable mitigant to CO2?

MR. MAXWELL: Yes, plus, it's the EPRI requirement, too.

MR. MICHELSON: Does EPRI require that you not use CO2?

MR. MAXWELL: They require foam, yes.

MR. MICHELSON: Now the exhaust fans shown on elevation 23-500; is that exhausting by just drawing out of that area and thereby drawing air up through the open grates and so forth, or is there a ducting system?

MR. MAXWELL: There's a ducting system for it.

MR. MICHELSON: It's actually drawing on the diesel compartment and drawing on these other compartments; is that the idea through ducts?

MR. MAXWELL: Yes. It's not drawing on all compartments. Right now, it's pulling out of the -- well, indirectly, it is. It's taking it out of the return on the reserve which is ducted to the compartments. There may be some cases where there are compartments that are in series where you introduce your supply air in one room and then there's a subroom and it goes into that room and then goes into the exhaust return duct.

MR. MICHELSON: In view of the fact that you need to leave at 4:30, why don't you give us a very quick run

through of the rest of the slides so we can at least talk about the control building a little bit since we haven't seen it at all yet. Apparently there are drawings that we haven't seen.

MR. CARROLL: Before you jump off of this one though, I was a little concerned about the main steam tunnel, HVAC, if I'm reading it right, and the stairway down into it. It looks like it could communicate into other parts of the building, no?

MR. MAXWELL: Yes, that steam tunnel --

MR. CARROLL: Up at the top, way up at the top.

MR. MAXWELL: Okay, this floor is TMSL-27-200. This TMSL-2600, so this is a pit here and this stairway is coming down --

MR. CARROLL: Oh, into the --

MR. MAXWELL: Into the pit.

MR. EHLERT: The HVAC is connected up then to the steam tunnel.

MR. MAXWELL: Then this HVAC has an opening through that floor or openings to the steam tunnel.

MR. CARROLL: Okay, and you're not going to blow that apart if you have a steam line break?

MR. EHLERT: It probably will, but the question is; you don't need HVAC anymore in the steam tunnel.

MR. CATTON: Where does the steam go?

MR. MICHELSON: Does the steam come up in these upper areas of the building and is that okay? It's right in that area shown in the drawing, elevation 27-200.

MR. WILKINSON: Are there walls that separate that from the white?

MR. MICHELSON: No, I gather not.

MR. WILKINS: Is that open?

MR. MICHELSON: I gather it's open, but is that true, or are those walls there?

MR. MAXWELL: These are walls here, but --

MR. EHLERT: There's one stairwell.

MR. MAXWELL: There's a doorway through there and I don't see a door on it.

MR. MICHELSON: Is there a wall between the striped area and the white area?

MR. MAXWELL: Yes.

MR. MICHELSON: That's not clear from the drawing. In fact, it's not drawn that way.

MR. EHLERT: That stairwell goes up and enters in that -- I should say it's going down into 6-A below, the stairwell shown in the striped area in 6-A.

MR. MICHELSON: Okay.

[Slide.]

MR. MAXWELL: We will --

MR. CATTON: Did that answer the question?

MR. EHLERT: We will have to find out. We don't really know the answer right here.

MR. MAXWELL: Now, we're up to the operating floor --

MR. MICHELSON: Once a suggestion is made, and I still think it's a real good one, and that is, any standard design ought -- there ought to be a requirement that there be a 1/32nds model for it. Then you could begin to visualize all of this stuff and begin to see where we're at.

For a standard plant costing a half a billion dollars in design effort, a model is a trivial expense. We'll just fumble around without it.

MR. WILKINS: It has to have cutaways.

MR. MICHELSON: A model is really the only way you really know and you learn a lot from the mistakes you make on the model that get back properly onto the drawings then. It's like building a --

MR. CATTON: We saw a really nice model in Germany of one of their plants.

MR. MICHELSON: There's no requirement to model this thing. Charlie and tried once to get a requirement in that there be, but I don't think EPRI ever went along with it, either.

MR. CATTON: I guess you could argue that your visualization capabilities are good enough. Some people's

might be.

MR. CARROLL: They've got 3-D CAD systems.

MR. MICHELSON: I've seen all kinds of visualization errors. Go ahead.

MR. MAXWELL: Okay, where we are now is at the reactor operating floor. We've finally running out of Division 1 and 2 areas in the corner. The Division 2 area up here is because here's where the reactor building closed cooling water system surge tank is for the Division 2.

There is still some of the Division 3 HVAC shown up on this floor. This floor is where I said there was a hatch cover on that hatch. This is the elevation where the hatch cover is.

Again, it's a ventilation cover that can be tipped up to open it when they need to use the hatch. This then, the majority of this floor is secondary containment except, again, this wall down through here is a boundary and there's a portion of the left top quadrant cut out as not in secondary containment.

Are there any questions?

[No response.]

MR. MAXWELL: If you don't mind now, I'd like to just move on into the control building.

MR. MICHELSON: Just for curiosity, why are the colored drawings for the plant proprietary when the black

and white ones aren't? What are you protecting here from the critical viewpoint?

MR. MAXWELL: Well, strictly speaking the black and white ones probably should be proprietary also.

MR. MICHELSON: Well, yes, I guess some of them are and some of them aren't. The fire protection for some reason was. But not the --

MR. EHLERT: The Hitachi drawings, or the Japanese drawings a lot of times are the proprietary ones.

MR. MICHELSON: I see. And they happen to be Japanese drawings. But your drawings in Chapter 1 weren't proprietary, as I recall. I don't think I brought any with me. But I don't recall any proprietary. And this is a duplicate of the Chapter 1 drawings, except there may be a little more information. I just wondered why they have to be proprietary.

MR. MAXWELL: They are a slightly later Revision 2.

MR. MICHELSON: But proprietary means there is some kind of commercial interest that you are trying to protect. And what are you trying to protect?

MR. EHLERT: Hitachi/Toshiba wanted them proprietary.

MR. MICHELSON: That's not necessarily a good enough reason. I think that we would ask for a non-

proprietary version of this, then, and then we'll see what they try to remove.

[Laughter.]

[Slide.]

MR. MAXWELL: We have up now the basement floor of the control building. And this control building really has several functions in it with the control complex being up on about the fourth and fifth floors of the building.

These lower elevations are associated with the reactor building closed cooling water system and then as we go up, the divisional batteries and DC power supplies.

So on the basement floor, it's divided into three divisions. Going left to right, Division 1, or 2, 1, and 3, reactor building closed cooling water heat exchangers.

Also, the pumps are down at this elevation.

MR. WILKINS: Is there any correlation between the colors on this set of drawings and the colors on the other set?

MR. MAXWELL: They're the same. It's one to one.

MR. WILKINS: I was about to infer that, but I thought I better ask.

MR. CARROLL: Green means control room.

MR. MAXWELL: Yes. And there's a new color, green, which will show up this control room. So you can see what the control room, I call it the control room complex,

is.

MR. MICHELSON: Now, I'm a little puzzled. I'm trying to compare what's on the reactor building -- that's elevation minus 8,200 and this is minus 13 -- this is a lot lower.

MR. EHLERT: The GE-based drawings are based on the vessel zero, which is the inside surface of the bottom head, which is the GE standard for all their drawings. And the Japanese documents are based on the Tokyo mean sea level.

MR. MICHELSON: I don't know what corresponds here.

MR. EHLERT: There's a 4.9 -- 4950 millimeter difference.

MR. CARROLL: What's that again?

MR. EHLERT: There's a 4950 millimeter difference.

MR. CARROLL: So if I subtract 4950 from the GE number, --

MR. EHLERT: You add 4950.

MR. WILKINS: I'd prefer to add it to the Tokyo.

MR. MICHELSON: Well, I'd prefer not to -- I can't do arithmetic too well. Drawing 1-A, the reactor building, is it at the same elevation as Drawing 1-A?

MR. EHLERT: Yes. That is your correlation. After that, they're different, because of floor heights.

MR. MICHELSON: I'm looking at the exact same floor elevation.

MR. CARROLL: You said the floors are slightly off --

MR. EHLERT: As you go up, they start shifting a little bit.

MR. MICHELSON: A lot or just a little bit?

MR. EHLERT: A couple meters, in some instances.

MR. MICHELSON: Well, that's not so bad.

MR. EHLERT: But the main area that they match up is the top of the basement --

MR. MICHELSON: Okay.

MR. EHLERT: -- at the two buildings. And at the steam lines.

MR. MAXWELL: And back at the ground grade on Sheet 5 they're within 150 millimeters of each other. So that's where you get a second almost lineup.

MR. MICHELSON: Pretty close, then.

MR. MAXWELL: Yes.

MR. MICHELSON: All right.

Are you going to supply new SAR drawings to replace the --

MR. EHLERT: Yes, they're going to be submitted, I think within a month.

MR. MICHELSON: But see, you didn't give us any

elevations of this. I wouldn't have asked the question if I'd had an elevation of the control building.

MR. EHLERT: There's a whole complete set coming in, probably within 30 days, at least tow rds the staff. And you'll eventually get it, I assume.

MR. MICHELSON: All right. Proceed.

MR. MAXWELL: Okay. Any other questions on this first elevation?

MR. MICHELSON: Now, these are big pipes. And I think you said that they come out underneath the floor of the next elevation in the reactor building? Is that the way they come out at the same, they come out in the same compartment as shown in the 1-A? I see the dotted lines there, which I assume are the pipes. And they're at some elevation below the floor, the next higher floor of the reactor building.

MR. MAXWELL: Right. That's correct.

MR. EHLERT: If I remember right, I think they're eight-inch lines.

MR. MICHELSON: They'd be very large. I'm surprised that they're that small. This is the whole reactor building closed cooling water system. Of course, these are one-third, one-third, one-third. So maybe they are eight inches.

[Slide.]

MR. MAXWELL: At this elevation, then, you see coming in the service water piping for the three divisions.

Again, it's lined up 2, 1, and 3, and they're in tunnels that drop off into the rooms of the like divisions as they go across the control building.

MR. CARROLL: The circles are heat exchangers or pumps?

MR. MAXWELL: Heat exchangers.

MR. CARROLL: Where are the pumps?

MR. MAXWELL: The pumps are the rectangles on the floor below.

MR. CARROLL: All right. Now, suppose I break a line someplace. Can't I flood all three apartments' pumps?

MR. MAXWELL: No, sir. The walls are water-tight.

MR. MICHELSON: How about the doors though?

MR. MAXWELL: The doors are water-tight.

MR. MICHELSON: He didn't show them as water-tight doors. Maybe you will.

See, inside the reactor building you showed at those elevations water-tight doors to confine the water.

MR. CARROLL: These just look like swinging doors.

MR. MAXWELL: The flood is being confined to this inner room and its walls and the door which is open to do maintenance is water-tight.

MR. MICHELSON: Which door is water-tight?

MR. MAXWELL: The door into each pump room from the corridor into the pump room.

MR. MICHELSON: Those are not shown, I guess.

MR. MAXWELL: Well, they are shown as that triple line there in the middle. There's a diagrammatic representation of the door.

MR. MICHELSON: Oh, I thought that was a removable wall. Okay.

MR. MAXWELL: That's a door.

MR. MICHELSON: Okay. The doors shown there are at the same elevation as the door into that compartment, say, for B.

MR. MAXWELL: Yes, but the piping is in this inner room, the room where the heat exchangers and the pumps --

MR. MICHELSON: But what keeps the water from coming out now?

MR. MAXWELL: That wall around that room.

MR. MICHELSON: And that door?

MR. MAXWELL: And that door are water-tight.

MR. MICHELSON: And how high is that wall?

MR. EHLERT: It goes up to the next floor.

MR. MICHELSON: Oh, it's all the way.

MR. EHLERT: Yes.

MR. MICHELSON: Okay. Of course you have to account for the pressure buildup, the hydrostatic head, if

you don't get that break isolated, and so on.

Where does the water ultimately go to?

If you are 'way below ground it just keeps filling the control building if you didn't stop it. It will just keep going. It will get all the way up to the control room unless ground -- because the control room is below ground grade yet, isn't it?

MR. CARROLL: The control room is below grade?

MR. MICHELSON: Yes. It's below ground grade.

MR. EHLERT: Yes.

MR. MICHELSON: The water just keeps coming up until it gets to the -- floods the control room and comes out at the ground.

MR. CATTON: You can see the yellow stairway over there.

MR. MAXWELL: You obviously have to shut the pumps off.

MR. MICHELSON: You've got to do something, yes, but it depends on the elevation of the source of water that the pumps are pumping from and I don't know where that is.

MR. MAXWELL: As long as they keep pumping and you don't shut them down or down close a valve --

MR. MICHELSON: No, they don't need to pump if the source of the reservoir is above the control building, for instance. If the grade of the reservoir, it's grade is the

grade of the building it can flood the whole damn building up through the control room by hydrostatic head alone.

MR. MAXWELL: I am saying if the system is that way you have to be able to shut a valve.

MR. MICHELSON: Yes. You have to have a couple of valves to be sure --

MR. CARROLL: I wouldn't rely on just one.

MR. MICHELSON: No. Not for something like that -- but I don't know where the source is relative to the control room. I think that is one thing that you would want to look at pretty close.

MR. CARROLL: You said ground water is --

MR. EHLERT: It is postulated to be two feet below the surface.

MR. MICHELSON: It's the control room that's below. It's got to be a water-tight building.

MR. CARROLL: They are going to find an awful lot of that green pumpable grout before they are done.

MR. MICHELSON: They'll stick pumps out of the yard trying to keep the ground level down.

Why did you put the control room below grade?

MR. EHLERT: Space. The standard moves most of the control room above the steam tunnel.

MR. MICHELSON: The Japanese is above ground, above grade.

MR. EHLERT: Yes, but it's off on the side in the two unit, because of your configuration.

MR. MICHELSON: So --

MR. EHLERT: Well, they also wrap their turbines around it so it's in a nice enclosed --

MR. MICHELSON: But that's all right. It's above ground. It's above grade.

Here you are putting it below grade.

You will have to show how you assure that you never flood that building out.

It's going to be interesting.

MR. WILKINS: There is no nuclear safety issue involved in flooding.

MR. MICHELSON: Oh, yes, yes, there can be. It depends on the scenario.

MR. WILKINS: It depends on the timing of course.

MR. MICHELSON: Yes, it depends on a lot of things, what is happening over in the reactor building, what has happened to the doorways between the control building and the reactor building as this water builds up in the control room -- a whole lot of things.

MR. CATTON: Just the excitement associated with the fact that it is flooding may lead you to do something.

MR. MICHELSON: You are not going to design a plant whose control room can be flooded out except as a very

rare event, but go ahead.

Is your plane earlier than their plane?

MR. CATTON: It's at National. He's further away.

MR. MICHELSON: National is easier. It's faster.

MR. CATTON: Not to California with the subway.

MR. MICHELSON: Okay. That's about the right time to leave then, if you want to be real comfortable.

Okay, that's something you'll certainly want to look into, where the water goes to.

MR. CARROLL: You are talking about a pretty good flow of service water into those heaters.

MR. EHLERT: There was a flood control analysis performed. I've got to check to see exactly the assumptions and what they ended up having.

MR. MICHELSON: It's heavily dependent upon the site relative to the reservoir.

MR. CARROLL: But this is how many feet below grade?

MR. EHLERT: The control room or the pumps?

MR. CARROLL: The pumps.

MR. EHLERT: 20 meters.

MR. CARROLL: 20 meters is like --

MR. MICHELSON: 60 feet.

MR. CARROLL: I don't know. On an ocean site, high tide is maybe 12 feet below grade or something.

MR. MICHELSON: Are the control rooms below grade, too?

MR. CARROLL: Oh, no. Never heard of any but --

MR. MICHELSON: Okay. I never had either.

MR. CARROLL: The control room is how many feet below grade?

MR. EHLERT: The ceiling of the control room is at grade.

MR. WILKINS: But the floor looks like it is about 4.4 meters.

MR. MICHELSON: They are below grade 2. Now the batteries are also below grade. That makes it even more interesting.

MR. WILKINS: There are another 4.4 meters below.

MR. MICHELSON: Those are the vital batteries, I would assume.

MR. CARROLL: Have you ever talked to a submariners about what happens to battery rooms when they blow in salt water?

MR. MICHELSON: You don't get power out them any more, that's for sure.

MR. CARROLL: Among other things.

MR. MICHELSON: Among other things. Okay, enough of that one.

[Slide.]

MR. MAXWELL: We are up to the third floor now, and this where the batteries are. On this floor, again, we are -- actually, we are four divisions, plus some non-divisional equipment.

Just taking Division 2, there is a Division 2 battery room and then a Division 2 electrical equipment room. This has got the battery chargers, the uninterruptable AC power supply, 120 volt AC power supply, and some motor control centers in this room. This is the elevation where the cables go between the control building and the reactor building, also between the control building and the turbine building.

The cables here that are primarily going between the control building and the reactor building are power cables. Because with the multiplex systems the signals that are coming here are primarily on the fiber optic cables in multiplex. So, there has been a tremendous reduction in the amount of cables going between the control building and the other buildings.

When we get up to the control room which is right above here, again the primary cables, the largest quantity of cables going up to the control room from here are the power supply cables for the equipment located in the control room. So, we go through the floor right into the control room.

MR. MICHELSON: What will be the fire protection philosophy for these areas?

MR. MAXWELL: They are separate fire zones and divisional, and the protection will be portable extinguishers and manual hoses. The manual holders will be located in the corridors external to the rooms.

MR. MICHELSON: You are going to allow water hoses in there, then?

MR. MAXWELL: Not in the room.

MR. MICHELSON: Well if they are out in the hall, what prevents them from getting in there.

MR. MAXWELL: Only during a fire.

MR. MICHELSON: During a fire, you are proposing the use of fire hoses, then, on it?

MR. MAXWELL: Yes, if the fire progresses to that.

MR. CARROLL: Given that this is immediately below the control room -- that is right, isn't it?

MR. MAXWELL: Yes.

MR. CARROLL: What is the hydrogen explosion potential here, in terms of what it could do to other control rooms?

MR. MAXWELL: The battery rooms are vented to the outside continuously. The batteries are sealed batteries. So, we don't consider a hydrogen explosion credible.

MR. CARROLL: Batteries are sealed batteries,

meaning what?

MR. MAXWELL: That they normally would not off-gas hydrogen. Still, we back it up with the fact that we vent the room continuously.

MR. CARROLL: This is with a powered ventilation system, or just natural draft?

MR. MAXWELL: Yes. No, it is powered, essential HVAC.

MR. MICHELSON: Is it dedicated just to the battery room?

MR. EHLERT: It is dedicated to the electrical equipment areas, the closed cooling water.

MR. MICHELSON: Is it common to the blue area all the way down, is that what you're saying, common to the blue area all the way down?

MR. MAXWELL: Yes. There is one common to the blue area, one to the red and one to the yellow. It's three separate systems.

MR. MICHELSON: Wait a minute. Three separate?

MR. MAXWELL: Or, it is three separate essential HVAC systems, one for each division.

MR. CARROLL: Isn't it four, because you've got a brown here.

MR. EHLERT: Division 4, being sensors, is linked up to Division 2.

MR. MICHELSON: And those ducts go up through the control room and that area where there's a blue square, I guess, as perceived on our drawing.

MR. EHLERT: That is correct.

MR. MICHELSON: That's the ventilation ducts?

MR. EHLERT: Yes.

MR. MAXWELL: Yes, they go up through the chaises from this floor to on above.

MR. CARROLL: Just one other aside. You don't have it up on the screen. I hope the instrument repair room you show there is just a control room instrument shop and not the total instrument repair facility for the site. Because if it is, it is too damn small.

MR. MAXWELL: No, that is just for the control room.

MR. EHLERT: The main one, I think -- isn't there another one in the reactor building? I believe they show another one in the service building. Yes, there is one in the service building on 3B.

MR. CARROLL: Well, that's the one I'm worried about. If that is your main instrument repair shop, you don't understand the requirements. Well --No, I don't think you understand the requirements of instruments in a power plant today.

MR. CHAMBERS: We have significantly reduced a

number of safety related instruments out of the plant, too.

MR. CARROLL: You may be okay. Before I'd lock it in, I think I'd go visit some power plants and see what they had to do. Whether they have had to build whole new buildings for instrument repair facilities, or how many triple deck trailers they've got someplace.

MR. MAXWELL: Any other questions?

MR. MICHELSON: Just one more question on the battery room area. I can't tell for sure if that's a common room or where the heck the doors are. That is not a common open space to include both the crossed hatch and the non-cross hatch blue, is it?

MR. MAXWELL: No. That 250 volt DC battery room, there is a door right next to that column, there at -- well, we don't have the --

MR. MICHELSON: Where your pointer is, is that where you think the door is?

MR. MAXWELL: Yes. The door is right there.

MR. EHLERT: Yes, there is a vertical line marking the door.

MR. MICHELSON: So, the battery room is within that portion. Then there's a door, and outside of it are a bunch of boards of various sorts associated with the battery bank, is that what that is?

MR. MAXWELL: That is correct.

MR. MICHELSON: Electrical distribution for the DC?

MR. MAXWELL: Yes. That 250 volt DC battery and those boards are non-safety.

MR. MICHELSON: Now, how do I get from that area into the apparently in a corridor down below that, if I can read this drawing worth a darn? Isn't that a corridor that's outside of that board room?

MR. MAXWELL: Yes, it is.

MR. MICHELSON: Is there a door somewhere there?

MR. MAXWELL: Yes. It is right where my pointer is.

MR. MICHELSON: That's right there. Okay. Just using a different symbol or something, I guess.

MR. MAXWELL: Yes, that is correct. A different draftsman drew this one.

MR. MICHELSON: Now, that is totally separated from the other blue area which is yet another, an essential battery. I guess that battery Division 1 is an essential battery .

MR. MAXWELL: Yes. Those are 125 volts.

MR. MICHELSON: Yes, I guess those would be 125 volts. It has distribution panels in that room and it has a doorway. Now, all of that has common ventilation.

MR. MAXWELL: Yes. The blue and the cross hatch

blue have common ventilation.

MR. MICHELSON: All the batteries are the same type?

MR. MAXWELL: Yes.

MR. MICHELSON: They are all going to be sealed batteries?

MR. MAXWELL: Yes.

MR. CARROLL: Now, when you put an equalizing charge on a sealed battery, you still don't produce hydrogen?

MR. MAXWELL: It is my understanding that you don't.

MR. EHLERT: You have to burst the case to get any leak which is, as I remember right, is only due to overcharge.

MR. MICHELSON: Which is incredible?

MR. EHLERT: It's got to be a significant overcharge, plus you're only charging one battery at a time, so it's going to be --

MR. MICHELSON: You mean one battery bank at a time.

MR. MAXWELL: Yes.

MR. MICHELSON: If you burst those batteries, then you've got an interesting event going, too. I guess that's why you moved the batteries down below the control room.

[Slide.]

MR. MAXWELL: We are now up to the next elevation, the control room complex. The first thing that I guess I would point out about this drawing is that you will notice that the entire floor, except for the stairwells, is cross-hatched so that's a fire barrier floor and also the pipe chases coming up from the lower are not cross-hatched, but the walls surrounding them are fire barriers. They go on through this floor at their various divisional designations.

MR. MICHELSON: Now, I can build a three hour fire barrier without ever building it even out of concrete. I can build it out of plaster board in the right amount of layers and some stuff in between and so forth. I don't have to build a concrete wall for a three hour rating.

MR. MAXWELL: That's correct.

MR. MICHELSON: Is this going to be a concrete chase or is it going to be something else? The reason I ask is, of course, depending on what you're going to put inside of it, I might worry about whether I can contain it.

MR. CARROLL: The hydrogen from the batteries.

MR. MAXWELL: It has not been, to my knowledge, decided, exactly what that wall will be. We tend to think in terms of concrete.

MR. MICHELSON: Before an FDA, I would think you would be able to tell us. I think you'd be required to tell

us what kind of wall you're going to use in the control room for separating something like that. It can be done --

MR. MAXWELL: This control room, we believe, has all the features that are in the EPRI requirements document.

MR. CARROLL: No, you don't have the men's room in it.

MR. WILKINS: It's off to the right, I see.

MR. MAXWELL: You'll notice that it's out in the service building.

MR. CARROLL: I get a kick out of reading these lists of exceptions to the EPRI requirements document. You're not the only bad guys, by the way. Combustion doesn't do it, either.

MR. MICHELSON: The idea that you don't have environmental control of the mens room during an accident; is that the concern?

MR. CARROLL: No, operators want a convenient restroom and they don't want other people in the plant using it. They don't want the maintenance guys making a mess in "their" restroom.

MR. MICHELSON: I see.

MR. CARROLL: That's why you've always got to put it in the control room area and it's the operators' restroom.

MR. MICHELSON: There's an extra door they've got

to go through.

MR. CARROLL: No, they can't get in. Just the operators can use it.

MR. MICHELSON: It has nothing to do with post-accident availability.

MR. CARROLL: I don't think so.

[Laughter.]

MR. CARROLL: This says it's all green, other than the things you pointed out. Now, how do I bring Divisions 1, 2, 3, 4 stuff into the control room?

MR. MAXWELL: Okay, you know, as I said earlier, the control room does have all divisions in it, and if you'll recall the floor below, starting on the left side here, we had Division 2 and so the Division 2 cables come up through the floor out of that Division 2 area and you go over and the Division 4 is below. It comes up through and out in there and you go on over to Division 1 and it is farther across the building and you communicate up from there for your Division 1 and then your Division 3 is finally over on the right of the drawing.

MR. MICHELSON: You've clearly go to go all the way across the room, because I can't say that all the red stuff is on the righthand side of the control room. It depends on what all is coming in on that Division. It isn't all going to be in one place.

MR. MAXWELL: It's our intent that it be there.

MR. MICHELSON: You mean that there's no instruments or controls or anything associated with the red train that isn't, other than the extreme right here; is that the idea?

MR. MAXWELL: Except the panels, the control panels, back row panels are on a divisional basis and they will be located in that fashion. Now, when you get to the main control panel, you will have all four divisions on it.

MR. MICHELSON: I would think so.

MR. MAXWELL: But there will be cables communicating, but again, they're fiber optic, generally.

MR. MICHELSON: That's the only thing they will be?

MR. MAXWELL: Well, there are some hardwired cables. The reactor protection system scram --

MR. MICHELSON: How will they be protected from fire in the respective areas in the rooms underneath?

MR. MAXWELL: They will be routed in conduit, and to meet their separation requirements, now, -- I can't recall exactly how that is. As I recall, it's two divisions.

Anyway, the drawing has them associated with the divisions and they will come out in conduit and go into their divisional --

MR. MICHELSON: Will they be in conduit in the room underneath, across the ceiling, or will they be in conduit within this green area?

MR. MAXWELL: No. The load drivers for them will be in these back panels so the load drivers for the Division 3 will be here. The conduit will come out of there and go through the floor of Division 3 into a Division 3 room. Then it can go into the reactor.

MR. MICHELSON: How does it get to the main control panel which is not in Division 3 underneath?

MR. CARROLL: Is that a raised floor or what?

MR. MICHELSON: Maybe the conduit is embedded in the floor; I don't know.

MR. MAXWELL: This floor is not a raised floor. It's going to have to have conduits or wire trenches embedded in the floor.

MR. MICHELSON: They will have to be such as to be rated for a three hour fire underneath that floor? It's a three hour floor, you told me.

MR. MAXWELL: No, sir, they are not required to be separated by a three hour fire barrier within the control room. They're fail-safe.

MR. MICHELSON: Is the control room protected from a three hour fire in the rooms below?

MR. MAXWELL: Yes.

MR. MICHELSON: Well, then that embedded cable in the control room is also protected from a three hour fire below?

MR. MAXWELL: Below, yes.

MR. MICHELSON: That means that you better get the thing embedded far enough up in the concrete so that it is, indeed, protected.

MR. MAXWELL: Yes, it should be embedded in the top and not the bottom of the floor.

MR. MICHELSON: Then you better make sure that it will stay cool that long embedded like that and that there's no heat loss or anything, no significant heat loss.

Those fiber optic cables, you will know what kind of temperatures they can withstand later, I guess?

MR. MAXWELL: Yes.

MR. MICHELSON: Do you know now what kind of temperature we can talk about?

MR. MAXWELL: No, I don't.

MR. CARROLL: Now a fire in a floor below and smoke and all that good stuff, can it get into the control room through these penetrations?

MR. MAXWELL: No, they are sealed to prevent the passage of smoke and flame. That's part of the requirement of the penetration.

MR. CARROLL: How about steam?

MR. MAXWELL: Well, there shouldn't be any steam down there.

MR. MICHELSON: There is auxillary steam down there to keep those -- are you going to electrically heat all these areas are you going to use building auxillary steam to heat them?

MR. EHLERT: We're using hot water.

MR. MICHELSON: Well, that hot water lets off nice water vapor, too, depending on how hot you heat your water and so forth.

MR. EHLERT: The water is only about 50 degrees C, just over 100 degrees.

MR. MICHELSON: It will flash some, yes.

MR. CARROLL: A hundred degrees F?

MR. MICHELSON: Yes. It will still flash some, not much, as long he's got gravity working the right direction here.

MR. CARROLL: You'd better not be turning on the hot-water faucet at home.

MR. MICHELSON: He hasn't told us about how much hot water he has put above the control room yet.

MR. MAXWELL: Any other questions on the control room floor?

[No response.]

MR. MICHELSON: You would use some big heat

exchangers if he's only going to use 100-degree water.

[Slide.]

MR. MAXWELL: This is the floor above the control room. The computer room is up here, and we have included it as part of the control room now.

Here is another disconnect. The cross-hatching here means that the area contains ducting and cables, HVAC ducting and electrical cables associated with the control room, and therefore, this corridor here that's yellow, cross-hatched yellow, has a duct here that's the division 2 supply duct for the control room.

MR. MICHELSON: The cables trays are not going down into the control room, are they? You don't have any electrical penetrations in this floor. Is that right?

MR. MAXWELL: No. There are electrical penetrations of the floor in that there are cables coming up these chases for the computer.

MR. MICHELSON: Okay.

MR. MAXWELL: And there are cables, then, coming up through the chases from below, for the areas below the control room.

MR. MICHELSON: Those chases are fed by dropping down underneath the panels and coming across and then going up through the chase?

MR. MAXWELL: Yes.

MR. MICHELSON: So, there is no top entry of anything in the control room, essentially.

MR. MAXWELL: That's correct.

MR. MICHELSON: Okay.

MR. CARROLL: How come you haven't provided office space for a desk and stuff?

MR. MAXWELL: Well, I guess because we didn't. That's a good thought.

MR. CARROLL: Computer jocks at my former utility would never forgive you for that.

MR. MAXWELL: Well, we'll have to take the spare off of a couple of these panels and put them a desk there.

MR. CARROLL: They have already put more computers in.

MR. MICHELSON: We'll give you 4 more minutes if you want to meet your schedule. I'd also suggest that you arrange for a cab to come and pick you up at whatever you think the time has to be. If you've got a car, that's better yet, maybe.

MR. MAXWELL: Well, I just want to point out, then, that the solid-colored areas are associated with the HVAC for the divisional areas below. For instance, this blue is the division 1 HVAC for the solid-blue areas below. The yellow is yellow because it's used as the division 2 HVAC for the yellow areas below, services this area.

There are two MG sets at this elevation of the control building. They supply the power to six of the reactor internal pumps.

MR. MICHELSON: Are they all air-cooled?

MR. MAXWELL: Yes.

MR. CARROLL: How about the computers? They're air-cooled?

MR. MAXWELL: Air-cooled.

MR. MICHELSON: Now, the big water source above the control room looks like that chiller package over in the corner. You've got some big water lines going to the chillers.

MR. MAXWELL: That's correct. That's the division 3 emergency --

MR. MICHELSON: Now, how are you going to make sure that water never gets into the control room?

MR. MAXWELL: By that floor being watertight, it's a fire-barrier floor, and there should be no penetrations of that floor.

MR. MICHELSON: Now, the piping -- I guess you're using component cooling water for that. That's coming up some kind of an outside chase up through the control room to get there?

MR. MAXWELL: It should come up these chases, one of these chases here.

MR. MICHELSON: Okay, those ventilation chases that you have in there. Okay. So, indeed, then, that wall through the control room for those chases is very important, because it's got a big pipe in it that's probably at least an 8-inch water pipe, depending on what the capacity is.

MR. EHLERT: It's a one-third capacity. There's two more on the next level.

MR. MICHELSON: You got to have all the piping for all of them going up there, but each of them has one-third the capacity.

MR. EHLERT: Yes.

[Slide.]

MR. MAXWELL: Okay. Just going on up to the next floor -- then we'll maybe quit and catch our plane -- this is the remaining of the HVAC and the chiller units up here. The division 2 chiller units sit in here; the division 1 chiller units are over here.

The control room HVAC systems are also on this floor. There's the B system and the -- it's actually the A system, control room system, but it's provided power and cooling off the C, so that we have in the control room, if we lose both the divisions 1 -- or 2 and 3 cooling systems by some means, we still have the remote shutdown panel on division 1 where you can go to safely shut the plant down. So, it's give us safe-shutdown for the loss of two divisions

of cooling.

Again, the cross-hatched section here refers to the control room.

Are there any questions on this floor?

[No response.]

MR. MICHELSON: I believe that's it.

MR. MAXWELL: Okay. With your permission I'd like to go catch a plane now.

MR. MICHELSON: Sure. We appreciate very much -- you recognize this has been primarily educational for us. We were trying to understand what we had in front of us and to get some feel for it. I think you've done an excellent job of giving us the information that we've needed.

I think we now have to go back, and as we start reviewing eventually the ABWR -- where these layouts have become effective -- then we will go into more detail as needed. But right now I think this has been a good overview.

MR. CARROLL: Yeah. Except we missed one section I was particularly interested in and that's the use of solid state components. We didn't get to that.

MR. MICHELSON: Yeah. That'll be our next -- we will have, I hope, a subcommittee meeting on that subject in which GE and combustion and Westinghouse can all tell us about it.

MR. CHAMBERS: While these two guys are leaving, I can answer your question on N minus 2 that was asked earlier since I don't have a plane to catch here.

MR. CARROLL: Why don't you have a plane to catch?

MR. CHAMBERS: Because I have to stay around for a couple more days.

MR. CARROLL: Oh, okay.

MR. CHAMBERS: The one scenario where we're not N minus 2 is where we have one diesel generator out of service in either the Division 2 or Division 3, and we get a LOCA with a loss of offsite power where the line break is in the LPCI injection line or -- the low pressure on the A Division. The lower pressure on the A Division -- Division 1 is also the division that has RCIC in it.

So if you already had Division 2 or 3 diesel out of service, had a line break on Division 1, and had the other division diesel fail to start, all you'd have left is RCIC. And that's only a high pressure so eventually you'd blow down through the break and have no low pressure makeup capability because your one low pressure system left is where the line break was.

So it's a very obscure scenario. But that's strictly N minus 2. We still, you know, are there on N minus 1.

MR. MICHELSON: That's the only time, irrespective

of the state of the operation whether it's at shut down or full power, that's the only case where you are not N minus 2?

MR. CHAMBERS: Yeah. Now I also --

MR. MICHELSON: Or N plus 2.

MR. CHAMBERS: Right. I also looked into the shut down capability, and I think that's where some of the confusion comes in. We talked about needing one or two divisions of RHR to accomplish certain shutdown capability, and that has to do with how fast you can cool down.

We can get the cold shut down given no time constraints with any one division.

Now the requirement that you be below 212 degrees within 36 hours takes two divisions to get there because you have to make some worse case assumptions on your ultimate heat sync at 95 degrees F., etc.

With those assumptions we ended up calculating about 85 hours to get there versus the 36 with just one.

MR. CARROLL: As opposed to 36?

MR. CHAMBERS: Significantly less than 36 if we have two.

MR. MICHELSON: Other than that you're -- then at a two or three divisional system only one division which is needed for all but this one accident?

MR. CHAMBERS: Right.

MR. MICHELSON: I'll go back and see what I read before. It could be it was out of --

MR. CHAMBERS: You probably read the section on RHR where they're talking about getting shut down and --

MR. MICHELSON: I remember it -- right. I knew you needed two out of three for the 36. I thought it was 72 hours or --

MR. CARROLL: Tell me the scenario again just so I have it clear in my mind?

MR. CHAMBERS: The LOCA scenario, where we're not N minus 2 is a LPCI A line break --

MR. CARROLL: Okay. LPCI A line break --

MR. CHAMBERS: That's where the LOCA is, with a concurrent loss of offsite power --

MR. CARROLL: Break LOCA --

MR. CHAMBERS: Where --

MR. CARROLL: Plus loop.

MR. CHAMBERS: Okay. Where either Division 2 or Division 3 diesel is out of service --

MR. CARROLL: If 2 or 3 EDG out --

MR. CHAMBERS: -- and the other one fails to start, that's your single failure.

MR. CARROLL: -- plus other of those two --

MR. CHAMBERS: Right.

MR. CARROLL: Okay.

MR. WILKINS: That is with Division 1?

MR. CHAMBERS: Right. And only RCIC because you had the line -- your injection line on your low pressure system on Division 1 is broken. Of course, when you blow down you don't have steam to drive the RCIC turbine any more.

MR. CARROLL: What are you going to do about that?

MR. CHAMBERS: Well, N minus 2, you know.

MR. MICHELSON: He just has redundant capability to handle that event. Yeah. Instead of triplicate capability.

Any other clarifications or any other questions or comments or whatever?

MR. CARROLL: Well, your answer is, I guess, you've got your alternate AC generator capable of replacing one or --

MR. CHAMBERS: In reality, we've got several other means. Alternate AC power feeding a condensate pump or feed water pump.

MR. CARROLL: Wouldn't it feed -- is it big enough to carry Division 2 or 3?

MR. CHAMBERS: Yeah, it should be able to carry one of those pumps as well.

MR. CARROLL: Okay. So one had a diesel --

MR. CHAMBERS: Certainly one of the -- either the

high or low pressure pump of one of those systems. Yeah. I don't know if we've fully analyzed how you might have a system out of service so that you couldn't get power right back to it. But certainly after a time you could get back to it.

Plus, if you look at our alternate AC --

MR. CARROLL: No, you could have a diesel all tore up to the point that it would take you a week to put it back together.

MR. CHAMBERS: We also have our AC independent water addition system where we have the firewater system hooked into the RHR that we could get water into the vessel.

MR. CARROLL: But those aren't safety graded.

MR. CHAMBERS: That's the severe accident countermeasure.

MR. CARROLL: Okay.

MR. MICHELSON: About the only comment I would like to make at this time, and I guess it's because I wasn't thinking clearly enough, and that is that it does look like there's going to have to be an awful careful look at that control building arrangement with the control room low grade and the potential for the reservoir that's supplying all the water to the basement of the control building being at grade.

MR. CARROLL: Unless they have a thousand year.

flood?

MR. MICHELSON: Well, I haven't thought way out on this thing, but that caught me a little bit off. I didn't quite appreciate that -- you know, I didn't think about it.

I also -- in going up through the control building it certainly isn't a very -- there's an awful lot of crossing over. It isn't nice clean three divisions straight up. It's a lot of this and that and in the corners and whatever.

But it can be done. It just is not a clean arrangement. That's just an observation. But it certainly can be done. It just means you have to answer more questions probably on how you do it.

Any comments from other members?

[No response.]

MR. MICHELSON: Where we go from here is we just use this as input. We're still waiting to get going on ABWR again at such time as the staff gets its marching orders and starts turning out material and we start reviewing it. I don't know that schedule yet. The staff probably doesn't know that schedule until the Commission indicates what they want done, but it looks like it'll be a while yet.

Does the staff have anything more they want to comment on?

MR. CHAMBERS: I can't think of anything at this

time.

MR. MICHELSON: Well, I found this to be very useful. It was a different kind of meeting, but it was primarily for our edificatino, and I think we certainly got educated and I thought it was useful.

MR. CARROLL: If not edified.

MR. MICHELSON: If not edified. So if there are no other comments, then, I 'll close -- adjourn the meeting.

[Whereupon, at 4:40 p.m., the meeting was adjourned.]

REPORTER'S CERTIFICATE

This is to certify that the attached proceedings before the United States Nuclear Regulatory Commission

in the matter of:

NAME OF PROCEEDING: ACRS Advanced Boiling Water Reactors

DOCKET NUMBER:

PLACE OF PROCEEDING: Bethesda, Maryland

were held as herein appears, and that this is the original transcript thereof for the file of the United States Nuclear Regulatory Commission taken by me and thereafter reduced to typewriting by me or under the direction of the court reporting company, and that the transcript is a true and accurate record of the foregoing proceedings.

Lynn Estep

Official Reporter
Ann Riley & Associates, Ltd.

PRESENTATION TOPICS

- ULTIMATE FIRE PROTECTION DESIGN OBJECTIVE
- PASSIVE FEATURES CONTRIBUTING TO ACHIEVEMENT OF THE ULTIMATE FIRE PROTECTION GOALS
- THREE HOUR DIVISIONAL SEPARATION EXCEPTIONS
- TOUR OF THE REACTOR AND CONTROL BUILDINGS VIA COLOR-CODED BUILDING ARRANGEMENT DRAWINGS
- SECONDARY CONTAINMENT HVAC SYSTEM FIRE SEPARATION
- SUMMARY OF THE USE OF SOLID STATE CONTROLS FOR THE PLANT

ULTIMATE FIRE PROTECTION DESIGN OBJECTIVE

COMPLETE BURNOUT WITHOUT RECOVERY OF A SINGLE FIRE ZONE SHALL BE ACCEPTABLE

PASSIVE FEATURES CONTRIBUTING TO THE FIRE PROTECTION DESIGN OBJECTIVE

- THREE INDEPENDENT DIVISIONS OF WATER INJECTION AND DECAY HEAT REMOVAL FOR RPV
- THREE INDEPENDENT DIVISIONS OF SAFETY-RELATED SUPPORT SYSTEMS
- THREE-HOUR RATED FIRE BARRIERS BETWEEN REDUNDANT DIVISIONS
- ONLY EQUIPMENT OF ONE DIVISION IN A FIRE AREA (ZONE)
  - SPECIAL CASE EXCEPTIONS
- ONLY SAFETY-RELATED SERVICES (PIPING, HVAC, CABLES) OF ONE DIVISION WITHIN A FIRE AREA
- FIRE ZONES OF LIKE DIVISIONS CONTIGUOUS IF POSSIBLE
- ONLY SAFETY-RELATED SERVICES OF ONE DIVISION BETWEEN DIVISIONAL FIRE AREAS
- REDUCED CABLE QUANTITIES AND CONCENTRATIONS
- DIVERSE HIGH AND LOW PRESSURE SYSTEMS

THREE HOUR DIVISIONAL SEPARATION EXCEPTIONS

- CONTROL ROOM
- REMOTE SHUTDOWN PANEL
- PRIMARY CONTAINMENT
- SPECIAL CASES
  - SECTION 9A.5.5 OF FIRE HAZARD ANALYSIS ANALYSES EACH CASE