UNITED STATES DISTRICT COURT

EASTERN DISTRICT OF LOUISIANA

IN RE: OIL SPILL BY THE OIL RIG *DEEPWATER HORIZON* IN THE GULF OF MEXICO ON APRIL 20, 2010	*	Docket 10-MD-2179 Section J
Applies to:	*	New Orleans, Louisiana
Docket 10-CV-02771, *IN RE: THE COMPLAINT AND PETITION OF TRITON ASSET LEASING GmbH, et al*	*	March 7, 2013
Docket 10-CV-4536, *UNITED STATES OF AMERICA v. BP EXPLORATION & PRODUCTION, INC., et al*	*	

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DAY 8, AFTERNOON SESSION
TRANSCRIPT OF NONJURY TRIAL
BEFORE THE HONORABLE CARL J. BARBIER
UNITED STATES DISTRICT JUDGE

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AFTERNOON SESSION

(March 7, 2013)

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01:19 **THE DEPUTY CLERK:** All rise.

01:19 **THE COURT:** All right. Please, be seated, everyone.

01:39 Before we call the next witness, do you all want to offer exhibits relating to Mr. Benge? I'm thinking we should try to do that today because -- so that Judge Shushan can get those all marshaled this afternoon.

01:39 **MR. BRIAN:** Before we get to Benge, Your Honor, I was actually going to offer some exhibits we used during the cross-examination of Mr. Heenan. They've been circulated by e-mail. We've not heard of any objections. I think there's nine exhibits. They're all individual call-outs, and there's two demonstratives. I'll give those to --

01:39 **THE COURT:** This is Transocean's exhibits relating to Mr. Heenan's examination. Any objections?

01:39 Okay. Without objection, those are admitted.

01:39 **MR. BRIAN:** And then secondly, Your Honor, in preparing for the marshaling conference yesterday, we realized -- we had a discussion about protocol to meet Your Honor's wishes to get call-outs and individual pages where it's possible. I went back and looked at what we did for Mr. Bly, and we were not specific enough. We were a little ambiguous.

So I went back and redid it to make clear that in most cases we're just offering the call-out. So I have a new list. It's been e-mailed around. I don't know if everyone's had a chance to review it yet. But I wanted to give it to the clerk. Our plan is to get it resolved prior to the marshaling conference today so Magistrate Shushan can take care of it.

THE COURT: You just reduced the number of pages, is what you did.

MR. BRIAN: I did.

THE COURT: That's good.

I'll say this one more time. I can't believe how much confusion you all have about these exhibits. Because I just had another conversation with Judge Shushan during the lunch hour. It seems like we keep saying the same thing over and over again, as far as I'm concerned.

When you all use a page from an exhibit or something, I don't want the entire document in; I want just that page and maybe a cover page to explain what the document is. I can always -- if I need context, I can always go find the entire exhibit later, if I need to. But I don't want to clutter up this trial record with voluminous documents if we're just really looking at a page or two here or there.

MR. BRIAN: That's precisely, Your Honor, the protocol that the parties discussed last night and have agreed

to and will present to Magistrate Shushan.

THE COURT: Very good.

MR. BRIAN: I'm giving the revised list to your clerk.

THE COURT: For the record, these are Transocean's revisions to the list of exhibits relating to Mr. Bly; correct?

MR. BRIAN: Correct, Your Honor.

THE COURT: Thank you.

MR. IRPINO: Anthony Irpino for the PSC, Your Honor. We received BP's list of exhibits for Ronnie Sepulvado's examination.

THE COURT: Sepulvado.

MR. IRPINO: Sepulvado, I'm sorry.

There was one exhibit that we had an issue with on the entire list. The rest of the list is fine. We e-mailed BP, and they said they would get back to us shortly.

THE COURT: Okay. Well, we need to get all these resolved this afternoon by 5:00. I'd like to get that done.

MR. IRPINO: Yes, Your Honor.

THE COURT: Anything else on exhibits?

MR. CERNICH: Your Honor, Scott Cernich for the United States. The marshaling conference, as we understand, is the exhibits that have come in through Tuesday for today's conference, and the exhibits from Mr. Benge will be handled at the marshaling conference next week. So we need to circulate

our list to the parties.

THE COURT: Wait. The marshaling conference is through Tuesday?

MR. UNDERHILL: Wednesday.

MR. NOMELLINI: Through Wednesday, I'm sorry, Your Honor.

THE COURT: Who decided that?

MR. STERBCOW: Judge Shushan.

THE COURT: It would be nice if she would tell me that or somebody would tell me that so I know what's going on.

MR. BROCK: I'm just going to hand up my list for Mr. Heenan that I discussed this morning. Your Honor has already referenced that those are admitted, but I had not handed them up.

THE DEPUTY CLERK: This is the one that PSC just said you had a problem with; right?

THE COURT: No. The PSC is talking about the PSC list. This is BP's list regarding Mr. Heenan, did you say?

MR. BROCK: Heenan. Yes, Your Honor.

THE COURT: Those are admitted.

MR. MILLER: Your Honor, Kerry Miller for Transocean. I have the exhibits I used during my cross of Mr. Benge. I've handed them out to counsel during the lunch break, and I'm prepared to circulate them to Stephanie now. All I have on mine are the specific pages that I showed.

What I did, Your Honor, because of the correction issue with the testing chart demonstrative, I attached that to my list, the one that Mr. Benge corrected in his redirect.

THE COURT: Okay.

MR. MILLER: And made the same change as Mr. Benge --

THE COURT: Any objections to these?

MR. MILLER: I indicate the one I seek to enter is the one as corrected by Mr. Benge in his redirect by DOJ.

THE COURT: Any objections to these?

MR. REGAN: Your Honor, Matt Regan on behalf of BP. I think we'll take a look at it and then Monday morning -- because we'd love to circulate our list. I think the U.S. has to circulate theirs. And we'll get all that in one package for you.

MR. IRPINO: There's no objection from the PSC, Your Honor.

I do want to make clear, for Mr. Sepulvado, that PSC's list is fine. BP gave us their list of exhibits for Sepulvado, not Heenan. There was one on the BP list of Sepulvado exhibits that we have an issue with. We'll get that resolved before the conference.

THE COURT: You all need to keep track of what lists I have ruled on and what list I have not ruled on. Remember to bring that up later if we don't admit it right away.

01:44 **MR. IRPINO:** Yes, Your Honor.

01:44 **THE COURT:** Okay. Anything else?

01:44 Okay. Our next witness.

01:44 **MR. BREIT:** Jeffrey Breit, Your Honor, for the PSC. We would call Gerry Calvert.

01:45 (WHEREUPON, **DAVID CALVERT**, having been duly sworn, testified as follows.)

01:45 **THE DEPUTY CLERK:** Please state your full name and correct spelling for the record.

01:45 **DIRECT EXAMINATION**

01:45 **BY MR. BREIT:**

01:45 **Q.** Could you tell us your name, please, for the record.

01:45 **A.** David Calvert.

01:45 **Q.** Originally in this case, after the explosion of the *Deepwater Horizon*, who were you retained by?

01:45 **A.** Weatherford.

01:45 **Q.** Weatherford, the float collar company?

01:45 **A.** Yes, sir.

01:45 **THE COURT:** I've got a question. I read Mr. Calvert's report last night. We're not going to talk about Weatherford and the float collar and all of that; right?

01:45 **MR. BREIT:** Correct, Your Honor.

01:45 **THE COURT:** What is Mr. Calvert going to talk about?

01:45 **MR. BREIT:** He's a cement expert.

01:45 **THE COURT:** I know, but we just spent a day and a

half talking about cementing with a cement expert. Why are we having a second cement expert --

MR. BREIT: Your Honor, it's a very narrow --

THE COURT: -- by the same side of the case?

MR. BREIT: It's a very narrow area of the cement involving the shoe track cement. I'm going to limit my testimony to --

THE COURT: Is that something that Mr. Benge did not testify about?

MR. BREIT: There's a difference in the testimony from Mr. Benge and Mr. Calvert as it relates to how the shoe track cement was prepared by Halliburton. It's a very narrow area, and I plan on limiting it to that narrow area.

THE COURT: You didn't answer my question.

MR. BREIT: I believe it is different, Your Honor.

THE COURT: Did Mr. Benge talk about this at all?

MR. BREIT: He did not talk about the setup of the shoe track cement. He talked about the testing for the cement that was primarily used, foam cement, and the annulus. That's why I narrowed --

THE COURT: I think Mr. Cernich wants to say something.

MR. CERNICH: Your Honor, Scott Cernich for the United States.

Mr. Benge did testify regarding the shoe track

cement. Mr. Benge's report clearly addresses the shoe track cement. Mr. Benge and Mr. Calvert both agree that the shoe track cement was not set at the time of the negative pressure test.

THE COURT: Okay. So I'm back to my original question: Why are we having another expert if -- no one -- I'm not doubting Mr. Calvert is highly qualified; in fact, I think Mr. Benge covered that. But we usually don't have two experts coming in on the same side of the case testifying about the same thing.

MR. BREIT: The very critical testimony from this expert, Your Honor, has to do with the transitioning time from the point when they put the cement in and before it hardened. There is no testimony from Mr. Benge on that topic.

THE COURT: Okay. I'm going to let him testify, but I suggest you keep this very short and very narrow. Okay?

MR. BREIT: I had planned to do that, Your Honor.

THE COURT: Okay. All right.

BY MR. BREIT:

Q. With that understanding, Mr. Calvert, could you tell the Court a little bit about your work experience?

THE COURT: You're still getting a lot of -- try moving it to your lapel or something on your coat.

So far so good.

01:48 **BY MR. BREIT:**
01:48 **Q.** Tell us about your work experience, please.
01:48 **A.** I've been involved in well cementing since --
01:49 **THE COURT:** Get a little bit closer to the microphone, sir. Yeah, about 4 or 5 inches away is perfect. Thank you.
01:49 **THE WITNESS:** -- since 1964 and presently, I'm still active. As a matter of fact, I'll be leaving here tonight and preparing to go to India this weekend working on a well there. Over that period of time, I've been involved in a number of different areas in regard to cementing. Been a member of API since 1967. Again, still active in that organization.
01:49 **BY MR. BREIT:**
01:49 **Q.** Do you hold any positions at the API?
01:49 **A.** I was committee chairman, I was Committee 10, Subcommittee 10 on well cements through the years.
01:49 **Q.** Did you work on API committees while you were at API?
01:49 **A.** I worked on a number of API committees. I chaired the API committee on the adoption of 10-3, which deals with the testing and test equipment of -- for deepwater operations. Was the technical editor for the API 65 Part 2.
01:50 **Q.** Have you been involved with foam cementing?
01:50 **A.** Yes.
01:50 **Q.** There's a rather large scholarly volume, which is TREX-31026, which is the cover called *Well Cementing: Second*

Edition. Is that pretty much the cement bible used by your profession?

A. At this particular point in time, it's a well accepted document within the industry.

Q. TREX-31026, please. And I believe I have a hard copy of it here.

Did you have anything to do with this book and its publication?

A. I was asked by the editors of the book to write the preface in this book, and I also reviewed some of the chapters that are included in the document.

Q. Are you familiar with the experts in this case: Mr. Benge, Sabins, Ravi, and Crook?

A. Yes.

Q. Have you had an opportunity to read their reports?

A. Yes.

Q. Do you also teach and consult with companies involved with drilling and cementing?

A. Yes.

Q. Have you been doing that most of your career?

A. Yes.

Q. Have you done work with Halliburton in the past?

A. Yes. I worked with Halliburton and was scheduled to teach at Halliburton after I retired and they -- in the cementing area. And they joined a company consortium called Petroskills,

01:51 which I'm now a teacher and I teach in that. And most recently
01:51 taught a course coordinated by Halliburton in Russia for
01:51 Lukoil.
01:51 **Q.** Do you have experience with deepwater drilling and
01:51 cementing of same?
01:51 **A.** I have experience in deepwater cementing operations.
01:51 **Q.** And your focus over the last 40 years has been in design,
01:52 testing, selection, and supervision of cementing services?
01:52 **A.** Yes.
01:52 **MR. BREIT:** Your Honor, at this time, I would tender
01:52 Mr. Calvert as an expert in the field of design, testing,
01:52 selection, and supervision of cementing services.
01:52 **THE COURT:** I don't believe there's been any motions
01:52 with respect to him; right?
01:52 Okay. He's accepted.
01:52 **BY MR. BREIT:**
01:52 **Q.** Have you had an opportunity to review your CV that was
01:52 presented as part of your report? That would be TREX-22573.
01:52 Is that your CV that you prepared for your report?
01:52 **A.** Yes.
01:52 **MR. BREIT:** Your Honor, at this time I would tender
01:52 his CV, TREX-22573.
01:52 **THE COURT:** All right. Without objection, that's
01:52 admitted.

01:52 **BY MR. BREIT:**
01:52 **Q.** And let me show you the cover of TREX-22761, please.
01:52 Is this a report that you prepared for this case on
01:52 October 14th, 2011?
01:53 **A.** Yes, sir.
01:53 **MR. BREIT:** Your Honor, I tender his expert report at
01:53 this time as well.
01:53 **THE COURT:** All right. It's admitted again, subject
01:53 to any -- well, there are no objections that I'm aware of, so
01:53 I'll admit that.
01:53 **MR. BREIT:** Okay, Your Honor.
01:53 **BY MR. BREIT:**
01:53 **Q.** Have you reached an opinion, Mr. Calvert, regarding the
01:53 cement that was used during the temporary abandonment procedure
01:53 at the Macondo well?
01:53 **A.** Yes.
01:53 **Q.** And do you believe that zonal isolation was achieved by
01:53 the Halliburton cement job?
01:53 **A.** I do not.
01:53 **Q.** I presume in your work experience over the last 40 years,
01:53 you're familiar with how the contractor, BP, works with a
01:53 contractor specialist in cement, like Halliburton?
01:53 **A.** Yes.
01:53 **Q.** What is the role of Halliburton as it relates to design
01:53 and recommendation of the cement slurry to be used in a casing

cement procedure?
A. The role of Halliburton in regard to --
Q. Working in this kind of fashion with a contractor like BP?
MR. DOYEN: Your Honor, I'll lodge an objection. This is something we spent several hours going over what the relationship is between Halliburton as the service contractor and BP, the operator.
MR. BREIT: And I understand we have, Your Honor. But it is the leap to my -- to his opinions.
THE COURT: All right. Go ahead and answer, sir.
THE WITNESS: The service company -- in this case, Halliburton -- is responsible for the slurry design and slurry testing at the direction of BP based on well conditions that are presented to Halliburton from BP.
BY MR. BREIT:
Q. And is the design of the cement slurry primarily with the contractor, Halliburton?
A. The actual design of the slurry is with the contractor.
Q. Do you have an opinion as to how the cement job failed to achieve zonal isolation on the Macondo well?
A. In my opinion, the --
Q. Do you have an opinion, first of all?
A. Yes.
Q. All right. Let's talk about some of your opinions as they relate to the failure of the cement to achieve zonal isolation.

01:55 And if I could, could you explain to the Court -- while we look at TREX-22761.002, which is Demonstrative 3093, could you tell the Court what this is and what is "hydrostatic head." And please feel free to use the pointer.

A. Yes. This is an illustration of the pressure transmission that is transmitted as the cement is setting. Going from the cement in the liquid phase, as the cement goes from a liquid to a semiliquid or it semi-thickens, there's a point in time that the cement will begin to lose hydrostatic head. As it goes from --

Q. I don't think we've explained what hydrostatic head is yet. Could you explain that to the Court?

A. The hydrostatic head is a pressure which is applied from the column -- that's across the zone of interest -- when we place the cement. It's the total column hydrostatic head.

Q. All right. Keep on going.

A. And as that cement begins to transition, it will begin to lose that measurable hydrostatic head because the cement slurry goes through a stage of volume shrinkage, if you will. And then as the cement continues to hydrate and as it begins to set, then it makes a hard set, if you will, and that hard set could be anywhere from 1 psi to something greater.

Q. Now, you've used the word "transitioning."

MR. BREIT: TREX-22761.003, which is Demonstrative 3094, please.

01:56 **BY MR. BREIT:**
01:56 **Q.** Now, when you talk about transitioning, what does this graph show us?
01:57 **A.** What this graph plots is the hydrostatic pressure versus time and the overburden pressure that is exerted. As the cement goes through its transmission state, it will go below -- it can go below the formation of gas pressure, as illustrated here.
01:57 And when it does so, if the formations will flow, they're allowed to flow, they drop below the pore pressure of the formation.
01:57 **Q.** And what is the effect of this transitioning hydrostatic pressure as it relates to holding back the hydrocarbons?
01:57 **A.** This will allow the formation to come in.
01:57 **Q.** Now, in your report, you indicate that there were steps that could have been taken to manage the risk during this transitioning time. What do you mean by that?
01:57 **A.** There are steps that can be taken to allow the cement to go through its transition phase; but as it goes through that transition phase, if it drops below the pore pressure of the formation, it can contain additives that will prevent that influx of hydrocarbons and prevent it from any influxing in to either the cement or a flow path that's created by that influx.
01:58 **Q.** Are these zonal areas where there's hydrocarbon, are they particularly vulnerable to allow hydrocarbons to enter the well

during this time of transition?
A. If there's hydrocarbon interval there or if there's a water interval, whatever there is present in the rock, if it drops below its pore pressure, then it can be allowed to flow.
Q. Now, is this something that contractors like Halliburton, cementers are familiar with this, this period of vulnerability during transitioning, generally in your field?
A. This is well published and well documented within the cementing industry.
Q. Now, in your report, you say there: "No steps were taken in the base slurry design in the shoe track cement to control hydrocarbon influx as the cement transitioned from liquid to solid."

What do you mean by that?
A. What I mean by that statement is that when the -- if the annular cement allows influx of fluid -- and it can move either up or down the annulus -- and if it moves down the annulus and up through the shoe track, then if that cement that is transitioning in the shoe track, if it's not designed to control gas migration or hydrocarbon influx, then there's the possibility of it forming flow paths either at the cement casing interface or through the cement itself.
Q. Cement and the shoe track?
A. Cement and the shoe track, yes, sir.
Q. On page 18 of your report, you mention the composition of

02:00 the base slurry. Did you see things in that slurry that were
02:00 helpful or harmful to manage this risk during the transition?
02:00 **A.** Can I have that question again, please?
02:00 **Q.** On page 18 of your report, you mention the composition of
02:00 the base slurry. Did you see things in your review of this
02:00 base slurry that were either helpful or harmful to manage this
02:00 risk during the transition period?
02:00 **A.** In looking at the slurry design that was used on this
02:00 particular well, it had a base slurry, it had a foam system --
02:00 in the base slurry cap, a foam system, and then a base slurry
02:00 shoe track cement.
02:00 **Q.** And where did that base slurry in the shoe track cement
02:01 sit?
02:01 **A.** That base slurry in the shoe track is in the shoe track
02:01 itself.
02:01 **Q.** And what steps could or should have been taken by
02:01 Halliburton to make that shoe track cement able to withstand
02:01 hydrocarbon influx?
02:01 **A.** The steps that could have been taken was to add an
02:01 additive of some type that controls hydrocarbon influx.
02:01 **Q.** Did you look at the design of this particular shoe track
02:01 cement slurry to see whether any additives were present?
02:01 **A.** My observation of the shoe track cement slurry, which was
02:01 the base slurry, I did not see additives in there that would
02:01 control the influx of hydrocarbons.

02:01 **Q.** And would that have been the contractor, Halliburton's, responsibility to design a slurry with those types of additives?
02:01 **A.** That would have been a cumulative, as we've been talking.
02:02 **Q.** Yes, sir.
Now, one of the issues you raised in your report with regard to hydrocarbon migration through the shoe track cement was resulted either through the reduced hydrostatic head --
THE COURT: Wait a second. I didn't understand that last answer. You said that would have been a what?
You asked -- the question was: Would that have been the contractor, Halliburton's, responsibility to design a slurry with those types of additives?
What was your answer?
THE WITNESS: I said that would have been cumulative between Halliburton and the operator to --
BY MR. BREIT:
Q. I think we're having trouble with the word that begins with C-U-M.
A. It would be an action between both the contractor and the operator.
THE COURT: Okay. What was the word you answered?
THE WITNESS: "Cumulative."
MR. BREIT: Cumulative?
THE WITNESS: That's Oklahoma.

02:02 **THE COURT:** I think we have a different word for it
02:02 down here. That means they have to work together; right?
02:03 **THE WITNESS:** Yes, sir.
02:03 **MR. BREIT:** We'll add it to the cement words we've
02:03 got.
02:03 **THE COURT:** Okay.
02:03 **BY MR. BREIT:**
02:03 **Q.** Now, one of the issues you raised in your expert report
02:03 with regard to the hydrocarbon migration through the shoe track
02:03 cement was, one, it could have resulted from the hydrostatic
02:03 head transitioning and, two, from mud contamination. And I
02:03 want to address briefly that mud contamination.
02:03 Is your opinion relative to the mud contamination
02:03 related to the cement in the shoe track?
02:03 **A.** Yes. That would be one place that we could have mud
02:03 contamination.
02:03 **Q.** Are you familiar with the drilling term "swapping" or
02:03 "inversion"?
02:03 **A.** Yes, sir.
02:03 **Q.** And where does that take place?
02:03 **MR. BREIT:** And if I could have TREX-001.025, which
02:03 is Demonstrative 2024.
02:03 **BY MR. BREIT:**
02:03 **Q.** Feel free to explain to the Court in using this diagram,
02:04 if it would help you to discuss it, where swapping or inversion

takes place. First, point that out; and then I'll ask you to explain it to the Court.

A. In the drawing that you have, we've . . .

Q. You have the reamer shoe. What's below the reamer shoe right there?

A. Below the reamer shoe is the rathole, as we refer to. Or this rathole is a hole that's drilled and the casing is not run to bottom.

Q. And so in this particular --

A. The length of the well.

Q. In this particular well, the Macondo well, there's a rathole beneath this area where we have the reamer shoe?

A. That's correct.

Q. Did you see how long that rathole was in this particular hole?

A. Approximately 56 feet.

Q. Now, tell the Court what happened -- what was in that rathole prior to the cement being pumped down the well?

A. According to the documentation that I looked at, the oil-based mud was in that rathole.

Q. Oil-based mud?

A. Oil-based mud that was used to drill the well. And that oil-based mud weighed 14 pounds to 14.1 pounds, depending on which document you look at.

Q. So the oil-based mud in the rathole is about 14.1 pounds.

And after we move from the left side of this slide to the right side of this slide, the cement inside the well after we finish pumping the train of cement down, what cement sits on top of the rathole?

A. The cement that sits on top of the rathole is the tail cement that's in the shoe track.

Q. And were you able to determine, by looking at some of the records, the weight of that tail cement?

A. The weight of that tail cement was 16.7.

Q. Now, when you have tail cement that is 16.7 and rathole oil-based mud beneath it, which is 14.1, explain to the Court what is the potential to happen with regard to swapping and inversion.

A. There is the possibility that swapping can take place. The term "swapping" in this particular case indicates that the cement that's in the shoe track, being heavier than the cement -- or the mud that's in the rathole, there's a possibility there can be some movement of those fluids.

Q. And when you say "movement," what do you mean by that?

A. It would mean the tail cement could roll through the mud that's in the shoe track.

Q. What happens to the stability of the cement that's in the tail cement if there is swapping or inversion with the oil-based mud as it relates to the ability of the tail cement to hold back hydrocarbons?

02:07 **A.** If the tail cement and the rathole mud swaps, ropes, then there's a chance, possibility of contamination and that would possibly lead to a path of flow.
02:07 **Q.** Now, in designing the cement, as a contractor, Halliburton, are they supposed to be aware of the different types of oil-based muds, locations of those oil-based muds in the rathole when designing their cement design for a contractor like BP? Is that something that you would expect the contractor to know?
02:07 **A.** I would expect the contractor and the operator to converse on that particular point also.
02:07 **Q.** And design the --
02:07 **A.** And design --
02:07 **Q.** -- the cement slurry in such a way that it would protect from that possibility?
02:07 **A.** In this particular case, the base slurry was designed at 16.7 to perform the cement job as outlined. That was a cap slurry, a foam system, and a tail slurry. And at that point, then, you would have to make a decision of what action are you going to take in regard to the fluid in the rathole.
02:08 **Q.** Now, was the cement in this shoe track designed as a good barrier to hold back hydrocarbons?
02:08 **A.** The cement slurry that's in the shoe track was designed as a barrier. It was not designed as a barrier to hold back hydrocarbon influx.

02:08 **Q.** Should it have been designed in such a way that, in the event hydrocarbons entered the shoe track, it would be able to withstand or hold back those hydrocarbons?
02:08 **A.** If the annular cement had served its purpose, then there would have been no flow in the annulus and that hydrocarbon flow would not have reached the shoe track.
02:09 **Q.** Are contractors supposed to design or prepare for that possibility when designing the cement for areas like the shoe track on the Macondo well?
02:09 **A.** Again, as I've stated once and restate now, that if this is a known fact, then you would -- you would work together -- they're a team -- and that would be a point of discussion.
02:09 **Q.** And if additives had been added to the shoe track cement, would that have made the shoe track cement capable of withstanding the hydrocarbon influx?
02:09 **A.** It the proper additives had been added to the tail slurry to control hydrocarbon influx, yes.
02:09 **MR. BREIT:** That's all the questions I have, Your Honor.
02:09 **THE COURT:** All right. Thank you.
02:09 **MR. BREIT:** That's as short and as narrow as I can make it.
02:09 **THE COURT:** Any questions for the witness by the United States?
02:09 **MR. BREIT:** Your Honor, I believe, if I'm not

mistaken -- and I apologize -- when the Court originally faced the issue of Mr. Calvert as being a former Weatherford expert, I believe the Court allowed at that time, on motion of both BP and the PSC, for Mr. Calvert to be an expert and turned over to both BP and the PSC as our joint expert for purposes of direct exam.

That's how it was understood when it first happened. I'll leave it up to the Court --

THE COURT: I have no idea what you're talking about. It wasn't this Court that did that. It must have occurred before Judge Shushan or something; right?

MR. BREIT: There was a motion when the Weatherford defendants were --

THE COURT: Not in front of me.

MR. BREIT: I believe it was in front of Judge Shushan. And there was an order entered that allowed the PSC as well as BP to adopt Calvert as our joint expert on the issue of cement. That's my memory about --

THE COURT: Mr. Regan, is that accurate?

MR. REGAN: It is. Mr. Calvert is an expert testifying for both the PSC BP and BP. In terms of the logistics here --

THE COURT: Let me ask you: Do you have any additional questions for him?

MR. REGAN: Yes. Five minutes of questions, that's

it.

THE COURT: Okay. Let's go.

DIRECT EXAMINATION

BY MR. REGAN:

Q. Good afternoon, Mr. Calvert.

A. Good afternoon.

Q. Understanding that your report is already in evidence, I just wanted to ask a couple of questions about the float collar.

Your conclusions --

THE COURT: Stephanie, we're having a lot of problems with that. Try swapping them out.

UNIDENTIFIED SPEAKER: Four minutes.

THE COURT: I think your time's up.

BY MR. REGAN:

Q. Mr. Calvert, in your report, you have some opinions about whether the float collar converted, in your view; is that correct?

A. Yes, that's correct.

Q. And it is your opinion that the float collar that was used on the well did convert; correct?

A. That's my opinion, yes.

Q. Unless I have --

MR. REGAN: Exhibit 2582, if I could put that up. And then go to the call-out. And just very briefly if we go --

I think it's the fourth or the fifth page.
BY MR. REGAN:
Q. Do you recognize this, Mr. Calvert, what's on the screen? Do you recognize the pictures that are on the screen?
A. Yes, yes.
Q. And does this depict kind of four stages of the float collar, just for the benefit of the Court? First, when it's running in the hole; second, when you're circulating; third, conversion and -- flow-activated conversion; and fourth, the converted float valve?
A. Yes.
Q. And based on your review of the evidence in this case, Mr. Calvert, it's your opinion that a surge of flow that occurred after the attempt to make -- break circulation was sufficient to convert the float collar; correct?
A. Yes, sir.
Q. And the float collar also serves as a landing place for the bottom and top plugs; is that right?
A. That's correct.
Q. And understanding that the Court has already seen animations and pictures and everything else about the top and bottom plug, it's fair to say it's just -- that's where they sit and stop when they're being pumped down a well?
A. That's correct.
Q. Did you see evidence in this case that both plugs landed

on that float collar during the cement job?
A. The evidence that I noted was from the job.
Q. And that evidence was consistent with the fact that there was a float collar there to serve as a landing spot for both the bottom and the top plug; correct?
A. That's correct.
MR. REGAN: No further questions, Your Honor.
THE COURT: Okay. Thank you.
All right. Any questions from the United States for this witness?
MR. CERNICH: No questions, Your Honor.
THE COURT: Alabama?
MR. MAZE: No questions, Your Honor.
THE COURT: Louisiana?
MR. KANNER: No questions, Your Honor.
THE COURT: All right. Let's see. Cameron?
MR. BECK: Cameron has no questions.
THE COURT: M-I?
MR. TANNER: No questions, Your Honor.
MR. HILL: Your Honor, does Halliburton get to ask questions?
THE COURT: Did I skip over you?
MR. HILL: Yes, Your Honor.
THE COURT: How did you notice that? I'm sorry about that. I didn't intend to do it. Everything got out of order

here.

CROSS-EXAMINATION

BY MR. HILL:

Q. Good afternoon, Mr. Calvert. Gavin Hill for Halliburton, and I'll be cross-examining you for just a few minutes.

A. Sure.

Q. Mr. Calvert, you would agree that one of the purposes of a shoe track is to collect contaminated cement; correct?

A. If I only run a top plug.

Q. Okay. Let me see if I -- I want to make sure we understand this. And I guess you're drawing a distinction because there was a dual plug system here; correct?

A. That's correct.

Q. And those plugs have winglets, for lack of a better term, on it that go out and touch the wellbores; right -- I'm sorry, the casing, inside the casing?

A. Yes, sir.

Q. As that is pumped down for miles below the surface, there is a film that gets scraped off of those blades that gets pushed ahead or possibly bypassed and -- well, let's just stick with the film that gets pushed ahead of the cement, their staging system that had the plugs.

After the plugs bump, that mud would end up in the shoe track; correct?

A. Only if I run the top plug.

02:16 **Q.** Well, do you have any opinion as to whether or not that is the same if these particular plugs are going through two different diameter of casing?
02:16 **A.** The plug systems that was designed for this well were designed for the 7-inch by 9-inch --
02:16 **Q.** Do you remember me asking you this question at your deposition about whether or not a shoe track is designed -- or one of the purposes of a shoe track is to intentionally collect contaminated cement?
02:16 **A.** Yes, I remember that.
02:16 **Q.** Do you not remember telling me that, yes, that's one of the purposes?
02:17 **A.** Yes.
02:17 **Q.** Is it your testimony here today that cement systems should be designed so that the shoe track cement is actually part of the primary cement barrier?
02:17 **A.** My comment is that, if the annular cement fails, then the shoe track cement is the next barrier for containment of hydrocarbon influx.
02:17 **Q.** And I understand that's the answer to the question, but just answer my question, which is: Is it your testimony today that the shoe track cement should be part of the primary cement barrier by design?
02:17 **A.** No.
02:17 **Q.** Now, you keep -- I've heard you say several times that

there are additives to be added. Are you talking about a fluid-loss additive?

A. No, sir.

Q. What kind of additive are you talking about? I just heard generic additives.

A. Would you like for me to introduce Halliburton additives or industry additives in general?

Q. I'm not asking for proprietary additives. I'm asking: What are the types of additives you are talking about so we can understand what you're suggesting?

A. Okay. I'm suggesting materials such as Halliburton's GasStop, Halliburton's Super CBL, Halliburton's Latex 3000. These are all additives that can be added to a cement slurry and they will aid in preventing hydrocarbon influx.

Q. Okay. So the point you're talking about, when you're talking about trying to restrict hydrocarbon influx, is at the very base of the reamer shoe where it connects with the rathole; correct?

A. I'm talking about in the shoe track cement.

Q. Okay. And the shoe track cement is inside separated by the reamer shoe; correct?

A. Yes, sir.

Q. Because the reamer shoe has three little diameter ports at the bottom; right?

A. That's correct.

02:18 **Q.** And so what you're suggesting is some type of roping that goes from the rathole, through those three little holes at the bottom of the reamer shoe and up into the 189 feet of shoe track cement?

02:19 **A.** No, sir, I'm not suggesting that.

02:19 **Q.** Maybe you can elaborate and tell us what you are suggesting.

02:19 **A.** I'm suggesting that the cement that's in the shoe track, with the addition of those additives that I just mentioned, can be added to that cement slurry to prevent hydrocarbon influx in that cement column that's in the shoe track. In this case, I believe it was mentioned yesterday that the shoe track is the height of approximately a 19-story building.

02:19 So the fluid from the wellbore -- the wellbore fluids have to move in, if that's the path. They have to move into that casing through that reamer shoe, then up the shoe track up to the float equipment, through the float equipment, up through the casing.

02:19 **Q.** Okay. I think we understand.

02:19 Now, let's talk about an instance where you have a density differential between the shoe track cement and mud in the rathole. I want to focus on that for a minute. Okay?

02:20 **A.** All right, sir.

02:20 **Q.** Now, you said that the mud in the rathole is a 14.0 pound per gallon; right?

02:20 **A.** Yes, sir, 14.
02:20 **Q.** But it's actually more dense than that if you account for equivalent downhole density; right?
02:20 **A.** 14.17.
02:20 **Q.** Then you add to that the fact that that mud in the rathole doesn't get circulated ahead of any job. It collects in there. That's the purpose of the rathole; right?
02:20 **A.** Yes, sir, that's true.
02:20 **Q.** So that mud is going to gel up and have additional gel strengths that aren't broken by circulation in the well; correct?
02:20 **A.** That's correct.
02:20 **Q.** So it's not true to say that the density -- the differential between -- the shoe track cement is set at 16.74 -- backup. Strike that.

It's not true to say that the density differential is the difference between the shoe track density and 14.0 mud, is it?

02:20 **A.** Sir, I would like for you to make sure that you understand what I say. I said that's a possibility. I did not say it did.
02:20 **Q.** Fair enough.

Now, sir, can you explain why it is you think the float collar converted?

02:21 **A.** Based on the -- based on a document that I had access to

and reviewed of testing that was conducted after the job, these tests were conducted on like float equipment, not the float equipment that was in the Macondo well. It was downhole, has not been retrieved as of today and probably will not be. But there were like equipment that was supplied through Weatherford to BP, and tests were conducted on that equipment to simulate what happened, to the best of their ability, in regard to the Macondo well. And those tests indicated that it converted.

Q. All right. I want to talk about one last section -- or one last piece with you.

So you have the opinion that when the float equipment -- actually, this might be helpful to the Court --

MR. HILL: If you bring up D-8015, please.

BY MR. HILL:

Q. I've put a wellbore schematic in front -- or up here. This is D-8015. Basically the idea is -- I just want the Court to get an understanding of what we're talking about when you talk about float collar shoe track.

Right there, it's identified that float collar. And the distance between there and the bottom reamer shoe is about 189 feet; right?

A. Right.

Q. And the little tiny ports that we were talking about at the bottom of the reamer shoe are depicted there in those little cutouts at the very bottom; correct?

02:23 **A.** Right.
02:23 **Q.** Do you have a laser? Who's pointing?
02:23 **A.** Me.
02:23 **Q.** Good.
02:23 **A.** I teach for a living, Gavin.
02:23 **Q.** So when this casing is actually run in the hole -- you wrote in your report that BP ran it in autofill mode; correct?
02:23 **A.** Correct.
02:23 **Q.** And what that means is the conversion -- the valves that are in that float collar are in an open position --
02:23 **A.** Unconverted, yes, sir.
02:23 **Q.** Unconverted. Thank you.
02:23 -- and as it's run, that allows mud to actually go up through the bottom of the reamer shoe and pass through the float collar equipment on up; correct?
02:23 **A.** That's correct.
02:23 **Q.** The purpose of that is just to allow fluid movement through the pipe as it's being pushed down to the bottom; correct?
02:23 **A.** That's primarily used in a well such as the Macondo, was to allow you to prevent surge effects; one of the possible reasons for it, yes.
02:24 **Q.** And there's a consequence for that; right? The consequence is any debris that's in that mud actually has the potential to go up through the reamer shoe and get into the

02:24 float equipment; correct?
02:24 **A.** It could, yes.
02:24 **Q.** In fact, you expressed the opinion that you agree that one
02:24 of the reasons they couldn't circulate mud and actually convert
02:24 the float collar was because there was a blockage somewhere.
02:24 **A.** That's right.
02:24 **Q.** Fair?
02:24 **A.** Yes, sir.
02:24 **Q.** And you opined that it was a blockage either in the float
02:24 collar or in the reamer shoe or both; correct?
02:24 **A.** Yes, sir.
02:24 **Q.** Now, before -- and you just mentioned that this type of
02:24 running casing and open -- or an autofill mode was something
02:24 that's appropriate for production interval?
02:24 **A.** Appropriate for this particular well. It's not run on
02:24 every production string.
02:24 **Q.** Have you ever looked at BP's -- their deep law, their best
02:24 practices for drilling?
02:24 **A.** I reviewed sections of it.
02:24 **Q.** All right.
02:25 **MR. HILL:** Can you bring up TREX-93, please. Please
02:25 go to page Bates ending 7308.
02:25 **BY MR. HILL:**
02:25 **Q.** I'll represent to you that this is a section entitled
02:25 "Well Control Practices."

02:25 **MR. HILL:** Can you call-out 15.2.15, please.
02:25 **BY MR. HILL:**
02:25 **Q.** In BP's best practices, it says that "autofill float
02:25 equipment shall be tripped prior to running through any
02:25 hydrocarbon-bearing zone."
02:25 Did I read that correctly?
02:25 **A.** Yes, sir.
02:25 **Q.** And "trip" means "convert"; right?
02:25 **A.** Trip means convert.
02:25 **Q.** And that's not what happened in this well, is it?
02:25 **A.** That's correct.
02:25 **MR. HILL:** No further questions, Your Honor.
02:25 **THE COURT:** Any redirect?
02:25 **MR. BREIT:** No, sir.
02:25 **THE COURT:** Thank you, Mr. Calvert. You're done.
02:25 Where are you heading off to?
02:25 **THE WITNESS:** India.
02:25 **THE COURT:** India.
02:25 **THE WITNESS:** India, yes, sir.
02:25 **THE COURT:** All right. Have a good trip.
02:26 **THE WITNESS:** Thank you.
02:26 **THE COURT:** Plaintiffs can call their next witness.
02:26 Let's take about a 10-minute recess.
02:26 **THE DEPUTY CLERK:** All rise.
02:26 (WHEREUPON, the Court took a recess.)

THE DEPUTY CLERK: All rise.

THE COURT: Please be seated, everyone.

Plaintiffs may call their next witness.

MS. CHANG: Good afternoon, Your Honor. Deanna Chang for the United States. We would like to call Dr. Rory Davis at this time. He's also the final expert witness for the United States.

(WHEREUPON, **RORY DAVIS**, having been duly sworn, testified as follows.)

THE DEPUTY CLERK: Please state your full name and correct spelling for the record.

THE WITNESS: My name is Rory Davis, R-O-R-Y, D-A-V-I-S.

DIRECT EXAMINATION

BY MS. CHANG:

Q. Good afternoon, Dr. Davis. Could you give us a brief summary of who you are and your involvement in the case.

A. Sure. My name is Rory Davis. A hold a Ph.D. in mechanical engineering from the University of California. I'm also a licensed professional mechanical engineer for over 20 years.

I was called upon to participate in the forensic examination activities at Michoud on the blowout preventer in November 2010, and I went and supported those activities for a six- or seven-month period. I did that with a group of four

other gentlemen, engineer experts.

And I was also asked by the United States after that time to submit a report concerning our opinions on the failure of the BOP in the *Deepwater Horizon* accident.

Q. And do you feel that you're qualified to offer opinions regarding the causes of the BOP failure?

A. Yes, I am. I spent a long period of time with the opportunity to look carefully at all of this hardware, and that was during Phase One activities at Michoud, where I spent about two man months of time and also in the Phase Two part of the activities there, where I spent another one and a half man months of time.

MR. MAZE: Your Honor, people in the back aren't able to hear the question. I just ask that we make sure that the microphone's on.

MS. CHANG: Is that better?

THE COURT: No. Does it shows green?

MS. CHANG: It's green.

THE COURT: Now it's on. Ooh, that's really loud.

MS. CHANG: Is that better?

THE COURT: Yeah.

THE WITNESS: All right. So continuing, yes. So I spent three and a half total man months involved in the activities at Michoud: disassembly, inspection, testing and evaluation of the BOP system.

I was a member of the technical working group. We also called that the "Twig," or the "TWG." And I was one member of that group, representing the United States; and that group also had representatives from all the other parties.

It was our job to work with DNV to make sure that all of our activities were accurate and efficient and also evidence-preserving, let's say, to go through that process carefully. So we gave recommendations to DNV, and DNV executed those recommendations in their own activities. So that was extremely important in understanding the blowout preventer and what may have happened in the accident, of course.

Now, after that time I also began formulating my opinions based on all that information and was ultimately asked to submit a report.

BY MS. CHANG:

Q. So aside from the approximately three and a half man months you spent analyzing the BOP, do you have any other experience that's relevant to your analysis of the failure of the BOP?

A. Yes. I've been working as a consulting mechanical engineer for over 25 years. I work on a lot of varied and sophisticated subjects and have over the years, and I've developed a high degree of skill in analyzing and evaluating mechanical and structural systems.

So the techniques and skills and tools that I use in

02:45 that work are also applicable here to the BOP system.
02:45 **Q.** What types of methods and skills did you use to reach your
02:45 conclusions regarding the causes of the failure of the BOP?
02:45 **A.** Well, of course, I have the firsthand observation of all
02:45 of the components, and that's very important. I also was able
02:45 to look at all of the test results and inspection results. And
02:45 then I also did some analysis of my own to further evaluate the
02:45 system. All of those things came into play using similar tools
02:46 that I usually use in my regular work.
02:46 **Q.** What types of analyses did you perform?
02:46 **A.** Oh, for example, in the BOP area, I used -- I did analysis
02:46 of drill pipe bending or buckling. I looked at friction of
02:46 blind shear ram blades and drill pipe. I looked at flow rates
02:46 in the well, flow forces that come from those flow rates and so
02:46 forth. And you can see these analyses in my reports.
02:46 **Q.** Are those the same types of analyses that you typically
02:46 perform in your work as a consulting mechanical engineer?
02:46 **A.** Yes, I do. This is the same kind of work that I normally
02:46 do. For example, I've done extensive work on top fuel race
02:46 cars and the bending and buckling of the tubes in those frames
02:46 or chassis. I do work on rocket engines where we have very
02:46 high pressure hydrocarbons being delivered, propellants to the
02:47 engine, combustion process, and a lot of other different
02:47 subjects where I use similar tools.
02:47 **Q.** During the course of your analysis of the *Deepwater*

Horizon's BOP, did you come to any conclusions regarding whether it complied with federal regulations?

A. Not exactly, no, because I'm not a lawyer or a judge, and I can't make the legal conclusion.

I did use the words "best" and "safest" in my report. I provided some technical opinions about what was best and safest to help the Court make that determination. But I do not intend to make any particular legal conclusion along those lines.

Q. Prior to your involvement in this case, had you ever worked on a BOP before?

A. No, I had not.

Q. And prior to your involvement in this case, had you ever worked in the oil and gas industry before?

A. No, I had not.

Q. Do you believe that experience with the BOP or in the oil and gas industry is necessary to arrive at your conclusions?

A. No. Actually, I think it's a good thing that we have at least one expert in this case that's from outside the industry, because I don't operate under the conventions that everyone else in the industry might; and so I might have a different look on things, and I might see things that others might not.

Q. And does physics operate on the BOP the same way it does on other mechanical systems and structures?

A. Yes. This has come up many times in the hundreds of legal

cases I've worked on. I have a saying that "physics is physics," and everything on earth obeys the same law of physics. So these things are applicable to any mechanical or structural system, whether it's a rocket engine or a race car or a blowout preventer.

MS. CHANG: Could we have TREX-22737, please.

BY MS. CHANG:

Q. Dr. Davis, do you recognize this document?

A. Yes, I do.

Q. And what is it?

A. It's the cover sheet for my first expert report.

MS. CHANG: Could we have TREX-07661, please.

BY MS. CHANG:

Q. Do you recognize this document, Dr. Davis?

A. Yes. That's the cover sheet for my rebuttal report.

Q. And are your opinions relating to the causes of the failure of the *Deepwater Horizon*'s BOP contained in these two reports?

A. Yes, they are.

MS. CHANG: Your Honor, I offer Dr. Rory Davis as an expert in mechanical engineering and failure analysis.

MS. KARIS: Your Honor, Hariklia "Carrie" Karis, on behalf of BP. We have filed a *Daubert motion*, and to be clear, our motion is limited to Dr. Davis's opinions with respect to best and safest available technology.

02:50 **THE COURT:** Whether the BOP was in compliance with the regulations; right?

02:50 **MS. KARIS:** In part, yes, whether it was in compliance. But the second part to that is he offers opinions based on that regulation regarding what other practical or feasible designs should have been incorporated. And yet he admits in his deposition -- and I assume here -- that he has never conducted any such analysis; and he himself agreed he has no prior experience with respect to BOPs.

And on that basis we move to strike any opinions with respect to his application of BASP in any capacity.

02:50 **THE COURT:** Do you plan to opine on those things here today?

02:51 **THE WITNESS:** I do plan to opine on what other technologies are out there that are better for this application, but I do not intend to make any judgments relative to the regulations.

02:51 **THE COURT:** Let me hear from the other people.

02:51 **MR. JONES:** Your Honor, David Jones on behalf of Cameron. We also have a *Daubert motion* for Dr. Davis. The issues in our motion are, first, his opinions related to alternative blind shear ram designs, whether there were feasible alternative blind shear ram designs that could have been incorporated into this BOP.

02:51 Second, his opinions regarding what are

foreseeable conditions that a BOP might see in deepwater drilling.

And lastly, opinions about whether the blind shear rams could have sheared and healed under certain assumed conditions.

We believe that Dr. Davis doesn't have the qualifications to render those opinions. We also believe that his methodology with respect to alternative ram design and ability to seal is not in compliance with *Daubert*.

THE COURT: All right. I think Transocean wants to say something.

MR. DOYEN: Your Honor, we would join in those motions. And then to the extent that we have other challenges, which we do, we would be content to illuminate those through cross-examination and reserve for the Court's judgment at a later time.

THE COURT: All right. Very well. I'm going to let this witness testify. I think he clearly has great expertise as a mechanical engineer and a lot of experience. I don't think the fact that he's not previously worked on a blowout preventer, on this particular device, means he can't give expert testimony about it from a mechanical engineering standpoint.

I understand the issue about the regulations and all, and I'll consider that. I don't know how far it will go,

but we'll see how that goes.

MR. DOYEN: Thank you.

MS. KARIS: Thank you, Your Honor.

MR. JONES: Thank you, Your Honor.

BY MS. CHANG:

Q. Dr. Davis, would you give us a brief description of the critical components of the BOP system for your analysis?

A. Sure. I think we have a video.

Here we have the BOP stack, and the upper part is called the LMRP, lower marine riser package, and it's connected to the lower BOP through a large hydraulic connector.

And if you go to the next chart, you can see where the yellow pod are and the blue pod are in the LMRP, actually. These are electrohydraulic systems, fairly complicated, that operate all the hydraulic units on the BOP stack.

Here you can see under normal operation you have signals coming down from the rig, and the control pods interpret those signals and get -- they basically get commands to do certain things in the pod -- or in the blowout preventer, such as closing certain rams and so forth.

THE COURT: Ms. Chang, I don't think you or the witness identified whatever this exhibit is for the record. Just so the record will be clear what he's describing.

MS. CHANG: My apologies, Your Honor. This is D-3550.001.

02:54 **THE COURT:** Okay. Go ahead.

02:54 **THE WITNESS:** Okay. So continuing on. Now, we're looking at the major hydraulic components in the BOP stack.

02:54 First, we have our annular preventers. We have an upper and a lower. Those are in the LMRP. Then below that, we have the blind shear ram, which is arguably the most important component we'll talk about later. And we have the casing shear ram below that, which is the ram with the heaviest force capability of everything in there.

02:55 Then we have two variable bore rams, which I'll explain in a minute, and a test ram at the bottom.

02:55 Next chart. This is how an annular preventer works. We have a big rubber doughnut, and when the blue hydraulic ram is pressurized, indicated by the yellow arrows down below, then we push upward on the rubber doughnut; and then in turn, the rubber contracts around the drill pipe, and it seals the annulus in the well.

02:55 And what I mean by "annulus" here, I want to be clear, is not the same as the annulus you were talking about during the cementing. In that case, you were looking down at the bottom of the hole, and the space outside the casing was also called the annulus. But now when I say annulus, I mean between the wellbore and the drill pipe. So it's this area here.

02:56 So an annular preventer closes off the annulus

02:56 when commanded. So both annular preventers work the same way.
02:56 Now, on the next chart, here we have a variable
02:56 bore ram. This is another way of closing the annulus, and it
02:56 does that by closing the two halfs around the pipe, and they
02:56 can actually close around different sizes of pipe. And when it
02:56 does close, there's rubber inside, and these are rubber or
02:56 elastomer packers. And the packers are able to completely seal
02:56 all the way around so that you get no annulus flow.
02:56 Now, also, these variable bore rams can carry up
02:56 and down forces. It holds the drill pipe pretty strongly up
02:56 and down.
02:57 Next chart. Here we have the blind shear ram.
02:57 This is the component that can actually seal off the entire
02:57 well. It has the ability to both close the annulus, using
02:57 these packers and seals, but it can also cut the pipe if the
02:57 pipe is present.
02:57 And if you go to the next chart. Here you have
02:57 a piece of pipe. This is a straight blade and this is an
02:57 angled blade, and they come together and shear the pipe off.
02:57 And then once the pipe is sheared off, the lower piece that you
02:57 cannot see now is actually bent over by the rams, and that
02:57 helps to seal the lower piece of pipe.
02:57 And then the packers, they're called, these
02:57 elastomer pieces, seal the annulus. So you can completely shut
02:57 off the flow both through the drill pipe and through the

annulus on the outside of the drill pipe.

Next chart.

BY MS. CHANG:

Q. What is the automatic mode, or the AMF, function?

A. AMF function is an autonomous system that does not require human intervention, and it's executed from the pods on the LMRP when communication is lost between the rig and the pods.

So if you lose communications, if you lose hydraulics, and if you lose electricity, then the AMF function will be initiated. And the intention of the AMF function is to close the blind shear ram in an emergency situation.

Q. And finally, Dr. Davis, what is the autoshear function?

A. Autoshear is another emergency mode to close the blind shear ram. It's, again, autonomous; it does not require human intervention. However, in this case, it has no electronic component at all. It only works with hydraulics.

And the autoshear takes place normally when -- if the LMRP is suddenly removed from the lower BOP stack, which is an emergency procedure. For example, if the rig drifts too far off of station, the LMRP will be released and the valve that operates the autoshear will be tripped and the blind shear ram will be closed by the autoshear function.

Q. And the autoshear function does not involve the yellow or blue control pods; is that correct?

A. That's correct. This is an entirely hydraulic system that

operates independently of all of the pod details. All the electronics are not used.

Q. Dr. Davis, were you able to reach any conclusions regarding what caused the *Deepwater Horizon*'s BOP to fail?

A. Yes, I reached several conclusions.

In order to explain them, I want to define a couple of different times. It is important to specify which time we're referring to.

Q. Okay. And this is D-3591.

A. Firstly, we have what I'll call "AMF time." This is April 20th, 2010, at the time of the explosion and just a few minutes after that. And then we have another time we're going to call "autoshear time," which is April 22nd, two days later.

Q. Let's start at AMF time, or April 20th, 2010.

Do you believe that the conditions for AMF were satisfied at the time of the explosion or shortly thereafter?

A. Yes, I believe they were. The explosion would have done a lot of damage, and the communication to the pods would have been lost -- and also electricity and hydraulics, and that would have activated the AMF.

Q. And the activation of the AMF should have caused the blind shear rams to close at that point?

A. It should have. That would be its normal mode of operation. However, we had two problems in the pods that prevented the blind shear ram from being activated at that

time.

Q. Okay. What were those two problems?

A. The first was that we had a dead battery in the blue pod; the 27-volt battery was dead, which is critical to operating the solenoids.

Then in the yellow pod, we had a miswired solenoid. Solenoid 103, it's called, which is the solenoid that tells the blind shear ram to close. So it did not function either.

So we were unable to actuate the blind shear ram from both the blue pod and the yellow pod.

Q. What's the basis for your opinion that the battery in the blue pod was dead?

A. When we checked the battery, the 27-volt battery, in our activities at Michoud, we found that it was virtually dead, very low voltage.

This was consistent with what was found when the blue pod was raised from subsea on the *Discoverer Enterprise*. So apparently the battery was not in a condition where it could have functioned the solenoids.

Q. Are you aware of other experts' opinion regarding whether the condition of the blue pod's 27-volt battery at the time of the AMF would have allowed it to function?

A. BP's and Halliburton's experts agree with me that the battery would have been insufficient to properly activate the blind shear ram in AMF. The only expert that doesn't agree

with me is Transocean's expert, Mr. Childs.

Q. Why do you disagree with Mr. Childs' opinion?

A. Mr. Childs has a completely different theory, that somehow the 27-volt battery in the blue pod was actually charged and properly functioned at the time of AMF; but then, because of a low 9-volt battery, was subsequently drained of all of its charge. So when we found later, it didn't have sufficient charge.

The problem is, is when we checked the 9-volt batteries at Michoud, we found that there was absolutely no problem with the 9-volt batteries in the blue pod. So I must discount Mr. Childs' theory.

Q. Were you able to review any of the experiments and test results that Mr. Childs bases his theory on?

A. Yes. I reviewed some materials. There were some independent tests done by Transocean for Mr. Childs that are separate from what we were doing with DNV, with peer-review and so forth, on the site. There was a report put out. It's not a very good report, unfortunately, and there are a lot of details left out.

So I was not -- I could not really use that report to any great effect.

Q. Was Transocean provided the opportunity to comment and provide feedback on the battery testing that was performed at Michoud?

03:04 **A.** Yes. The TWG included representatives from Transocean. There were lots of opportunities to weigh in and discuss methods of testing batteries and so forth.
03:04 **Q.** If the 27-volt battery in the blue pod had functioned at the time of AMF, do you believe that the blind shear ram would have closed?
03:04 **A.** Yes, I do. If that 27-volt battery had been sufficiently charged -- I know the AMF function was activated, and it should have went ahead and commanded the blind shear ram. It would have closed; it would have cut the whole pipe and bent over the top of it and sealed the well, like you saw in the video earlier.
03:05 **Q.** Is there anything that could have been done to ensure that that 27-volt battery in the blue pod was functional at AMF?
03:05 **A.** Yes, there are numerous things. Firstly, given the system that was in place, Cameron's recommended replacement schedule for those batteries should have been followed. We found that they were not. The 27-volt blue pod battery had been in use for about two and a half years, and Cameron recommends that it be used for up to one year. So that's the first thing.

And then the other thing is that the maintenance recording history is very difficult to follow. It's very difficult to tell when the batteries were last changed. So, therefore, it's difficult to know when the next change should take place. So the maintenance history system was

insufficient.
Q. What about testing? Was there testing that should have been performed that would have identified the dead 27-volt battery?
A. Yes. Well, the first thing is, whenever your pods are on the surface, you can check those battery voltages. So that would have been a wise thing to do. But there was no evidence ever found that that was done.

Then another thing that you could do while the BOP is on the surface is to run the actual AMF sequence to make sure it works. And there was also no record that that was ever done.
Q. And finally, was there hardware that could have been installed that would have detected a depleted 27-volt battery?
A. Yes. The first thing is, is that it makes a lot of sense to have a battery voltage monitoring system of some kind. And that was not in use on this rig.

And then the other thing is that rechargeable battery system could be used where you don't have to worry about your batteries ever going dead because they're continuously under charge. And that was not in use.
Q. So let's talk now about the yellow pod. Why is it that you believe that the yellow pod was unable to function the blind shear ram at the time of AMF?
A. Well, the yellow pod was brought up from subsea after the

accident, on the *Q4000*. Checks were made to the AMF function, and they found that that solenoid was not operating; the AMF function was not executing from the yellow pod.

And so they took that solenoid out, and they replaced it with a new one. And lo and behold, then the AMF function worked. So at that point, they knew there was something wrong with this original Solenoid 103Y, we call it. So back at Michoud, that was one of the solenoids that we disassembled and we looked inside. We found that the -- this solenoid that has two coils inside that work together had one of those two coils reverse-wired, and that was a big problem because that meant that the action of the two coils, instead of being complementary and adding to the force that you would get from your valve, you would get a cancelation. So the valve would not shift.

That was essentially the cause of the problem that was seen on the *Q4000*, and that's what prevented that solenoid from activating the blind shear ram during AMF.

Q. Are you aware of any tests performed by Cameron that support your opinion that a miswired solenoid would not be able to function the blind shear ram?

A. I am aware that Cameron did some tests on a similar solenoid -- on the same model solenoid with intentional reverse wiring. And they came to the same conclusion, that that solenoid used in the AMF-type process where you're activating

03:09 both coils at once, it simply would not function.
03:09 **Q.** And are you aware of other experts' opinions regarding whether a miswired solenoid could function?
03:09 **A.** Yes. BP and Halliburton experts agree with me that that solenoid would not have been functional to activate the AMF, the blind shear ram.
03:09 On the other hand, Transocean's expert, Mr. Childs, disagrees. He believes that, despite the incorrect wiring, that somehow that solenoid would have still functioned the AMF.
03:09 **Q.** And why do you disagree with Mr. Childs' opinion?
03:09 **A.** Because of the large amount of testing that we did at Michoud. In cooperation with DNV and everyone on the TWG, we clearly established that that solenoid would not properly function.
03:10 There were some other tests done independently by Transocean and Mr. Childs. The reporting on those tests is woefully inadequate. We can't rely on it, and so we discount Mr. Childs' theory in light of the large amount of other evidence that we had.
03:10 **Q.** Was Transocean provided the opportunity to comment and provide feedback on the testing that was performed on the solenoids at Michoud?
03:10 **A.** Yes. Again, they had membership on the TWG. They could weigh in and voice any concerns about how we were doing the solenoid tests.

THE COURT: Let me just interrupt you for a minute. I want to understand. You point out two different problems, one with the 27-volt battery that was in the blue pod; right?

THE WITNESS: Yes.

THE COURT: And then this separate problem. Were those problems related?

THE WITNESS: No, they really weren't, and it is very, very unfortunate that they both occurred at the same time because that essentially wiped out the redundancy that was there by having two pods.

THE COURT: That was going to be my question.

THE WITNESS: Yeah.

THE COURT: If either of these things had not occurred, if either the battery had been charged and/or the solenoid had been, in your view, in your opinion, wired correctly, the blind shear rams would have worked?

THE WITNESS: That is correct.

THE COURT: Okay.

BY MS. CHANG:

Q. Are you aware of anything that could have been done to ensure that the solenoid was properly wired?

A. Yes. Faulty wiring is very easy to detect. In fact, Cameron provides procedures -- written procedures for rebuilding or refurbishing solenoids. And once they are refurbished, you're supposed to check them with a certain set

of tests.

And those tests include exciting one coil or two coils at the same time. And if you had done two coils at the same time, you would have seen that the valve wouldn't work. So that would immediately tell you the wiring was bad.

Those same procedures are reflected in some of Transocean's required solenoid refurbish and check procedures.

So if any of that -- if either one of those procedures would have been followed, the problem with the solenoid would have been identified and it never would have been put on a blowout preventer.

Q. Okay. So that pretty much summarizes your opinions on what happened -- what failed to happen at the time of AMF.

So let's talk now about the autoshear function that was attempted on April 22nd, 2010.

Were you able it reach any conclusions regarding the functioning of the blind shear ram at that point?

A. Yes, I was. So now we're talking about two whole days later. The rig has been drifting around, things have been happening down in the BOP that I won't get into right now. So the conditions were entirely different.

Now, at this point in time is when I believe the autoshear function actually did close the blind shear ram. If you look at the hardware involved, the pieces of pipe, you will see that the pipe was attempted to be cut in an offset

position. The pipe was off to the side of the wellbore when the blind shear ram closed.

And because of this -- because of the way the ram blocks are configured, it was not possible to completely cut the pipe. Instead, it was only partially cut; and because of the fact that the ram block -- the ram blades could not center the pipe hardly at all, then the pipe -- a piece of the pipe got stuck in the side, and it kept the blind shear ram from closing.

So we wound up with a blind shear ram that wasn't completely closed and it was leaking a lot and it had not completely closed against the rubber packers, so it could not seal the well.

Q. So what is the basis for your opinion that the blind shear ram was activated at the time of autoshear?

A. Well, as I said, this was two days later, so the conditions were totally different than they were at AMF time. I did extensive analysis to consider both -- both of those times. Back at AMF time, there was really no mechanism for the pipe to be off center as it was when the blind shear ram was closed.

So later in the time of autoshear, there were lots of reasons why the blade -- why the drill pipe could have been off to the side. So it's very strong evidence that it was autoshear time when the blind shear ram did close.

Q. Are you aware of other experts' opinions regarding your conclusion -- regarding your conclusion that the blind shear ram functioned at autoshear?

A. Yes. Again, BP and Halliburton experts agree with me that it was autoshear time when the blind shear ram closed. Mr. Childs at Transocean disagrees with me again. He believes that the blind shear ram was closed at AMF time.

THE COURT: Just so I'm clear on this, the autoshear time, again, to distinguish it from the AMF time, that's what is -- what occurs or is intended to occur when the lower marine riser package separates for any reason, it disconnects from the lower part of the blowout preventer?

THE WITNESS: That's correct.

THE COURT: Okay.

THE WITNESS: That's the normal mode of operation.

THE COURT: And that should happen automatically?

THE WITNESS: It should happen automatically.

THE COURT: That's not relying on any kind of electronics?

THE WITNESS: That's right.

THE COURT: It's an hydraulic function, you said.

THE WITNESS: It's only a hydraulic function.

And in this case, it was specially initiated by an ROV going to the blowout preventer and actually cutting off a piece of the valve plunger.

THE COURT: To simulate that there had been a disconnect between the LMRP and the blowout preventer?

THE WITNESS: Exactly. Yeah.

THE COURT: Okay.

THE WITNESS: So it allowed the valve to shift without the LMRP actually being removed.

THE COURT: Okay. Thank you.

THE WITNESS: So that's how the autoshear actually took place.

And then at that time, the pipe had been all over the place with the rig drifting around. The pipe wound up very far offset, and the blind shear ram could not cut it.

BY MS. CHANG:

Q. Why do you disagree with Mr. Childs' conclusion that the blind shear ram functioned at the time of AMF rather than autoshear?

A. Well, there's just no evidence to support that theory. If you spend a lot of time studying it, you find that at AMF time there was no reason for the pipe to be significantly off center. So if we find this pipe way off to the side, this is not explained by an AMF functioning in the blind shear ram.

Q. Did Mr. Childs' opinion rely on any engineering calculations?

A. Yes. The underlying theory behind the idea that, at AMF time, the pipe was offset is based on this theory that there

was a lot of upward flow forces. So at this point, you know, the well was blowing out, and the thought was that there was some -- a lot of upward force on the pipe that would cause it to buckle or to move off to the side.

However, if you go through in detail the calculations to look at that, it turns out that -- and Stress Engineering Services, who did some calculations for Mr. Childs in this respect, made some fundamental errors when trying to figure out what the forces on the pipe was.

And I did my own calculations and I found that the forces on the pipe from upward flow were very small compared to what they thought they were.

Also, you have to recognize that when the AMF could have functioned, one of the variable bore rams had already closed, at least one. And so the pipe was being centered by that variable bore ram in the wellbore that was helping keep the pipe straight.

In addition, the hydrostatic forces, as you close the variable bore ram, would cause the pipe to be in tension, not in compression. And we also had, at that point in time, maybe a little bit of rig drift that would cause the pipe also to be in tension. And we see this -- we have corroborating data for this in the mud logger data that shows -- if you look carefully at it, the hook load and the pressure data does indicate that the pipe was in tension at this time with the BOP, not in

compression.

So that means the pipe was centered closely -- pretty close to center within the bore, maybe within an inch of the center of the bore at that point in time. And then if that was true, that the VBR was closed, you would have no flow to be concerned about, the blind shear ram could have readily cut pipe, fold it over the top, and completely sealed the well.

Q. And that time that you're talking about right now, that's at the time of AMF; correct?

A. That's right. That's right.

And so if AMF had been the time when the blind shear ram was closed, you would have seen a centered pipe cut, not an offset partial pipe cut like we really saw, which was caused by the autoshear time.

Q. And are you aware of anything that could have been done to ensure that the blind shear ram could have fully sheared the off-centered drill pipe at the time of autoshear?

A. Okay. So still talking about autoshear here, we're dealing with the unfortunate fact that we have an offset pipe, pretty heavily offset. Now, it turns out that the blind shear ram that was in use here was a -- what I call a single-V blade ram. It had a V-shaped blade and a straight blade.

It turns out that that design has very little ability to center the pipe before it cuts the pipe. It cannot deal with significant friction between the pipe and the ram block

blades. If you use double-V rams -- and there are two different models available on the market from Cameron, for example. There's the so-called DVS ram and another one called the CDVS ram. Both of these use two V-shaped blades. And it turns out that this provides drastically more centering capability. It can actually move the pipe back to the center and then cut it.

And if this kind of ram had been in use, I believe that the pipe could have been cut and the well could have been sealed even at autoshear time.

Q. Is there any difference in the amount of pressure that the double-V ram blades require versus the single ram blades -- single-V?

A. Yeah. Aside from the centering capability that's much, much better for the double-V rams, they also require less pressure to cut the same size pipe compared to the existing blind shear ram that was in use. It takes 600 to 800 psi less hydraulic pressure to cut the same size pipe. So that's also a big benefit of using that kind of a ram.

Q. And were the double-V blade rams available for use in the *Deepwater Horizon*'s BOP?

A. Yes. Both the DVS and the CDVS were on the market. They were practical to use. They were actually a plug-and-play change-out. So you didn't have to do any engineering. You could just take out the ram blocks from the old design and plug

in the new double-V ram blocks. It did require you to pull the bonnets, which is not trivial, but it's not a big deal.

Q. Do you have any other opinions regarding the adequacy of the blind shear ram on the *Deepwater Horizon*?

A. Yes, I also have some opinions about that. It turns out that the shearing capacity for this blind shear ram was marginal at best.

In the case of the 5 1/2-inch pipe, which is what was in the BOP at the time of accident, if you go through the calculations, considering the depth of the well and the pressure inside the well, the required hydraulic pressure to cut that pipe exceeded the 3,000-psi main system pressure. So you couldn't use the main system to actually cut the pipe. Also, the shearing pressure required was too close to the 4,000-psi limit which is in the high-pressure system.

And so this --

THE COURT: Explain to when what you mean by the "main system" in a high-pressure system.

THE WITNESS: Okay. Yes. 3,000 psi is supplied from the rig down piping that goes along with the riser all the way down to the blowout preventer. So we have 3,000 psi available from the rig to actuate the different hydraulics. And that would normally be the way things are actuated under normal day-to-day operations.

The normal 4,000-psi system is actually

contained on the blowout preventer itself and is used for the autonomous functions like AMF and autoshear. And -- but it can also be controlled from the rig. And that is the highest pressure you have available to you to do any of these emergency operations is 4,000 psi.

You would like to have the ability to use both. So it's not -- I don't consider it very good to even be above 3,000 psi. But when you're getting up to 4,000 or very close to it, that's a problem because now your highest pressure system might not even be able to cut the pipe.

BY MS. CHANG:

Q. So for 6 5/8-inch pipe, was the blind shear ram capable of shearing that?

A. Yes. 6 5/8 pipe was another size pipe that was used in this well. And if you go through calculations for that one, you find that the cutting pressures exceed both the 3,000 and the 4,000-psi limits. So there could be situations, if you had the 6 5/8 pipe across the BOP, you would not be able to cut it with this blind shear ram under certain conditions.

Q. And it's your understanding that BP was aware that the 6 5/8-inch pipe was in use at the Macondo well?

A. Yes. They were aware of that in the documentation, plans for drilling, and so forth, that there would be 6 5/8 pipe sometimes used and actually across the blowout preventer.

THE COURT: But at the time this incident happened,

we're talking about the 5 1/2-inch pipe?

THE WITNESS: Yes, you are correct. That didn't come into play in this particular accident.

BY MS. CHANG:

Q. And finally, Dr. Davis, during the course of your work, did you reach any conclusions regarding the maintenance of the BOP?

A. Yes, I did. Clearly, there were problems with maintenance because we had a dead battery and a miswired solenoid, so that's just self-evident that there are maintenance problems. They weren't properly executing the maintenance, and I believe one of the big reasons why was because the recording for maintenance was not adequate. So that's number one, just the fact that those two things happened is indicative of poor maintenance, and that the history records are just not really sufficient.

Now, the other thing is that there were several rig audits performed by BP on this rig. It started in 2005, and there was another one in 2008 and then a follow-up one in 2009.

Q. And who performed these rig audits?

A. These were audits actually performed by BP personnel for BP, who was, you know, running the rig in the Gulf of Mexico. Okay? So it was all BP people.

Q. Okay.

MS. CHANG: Could we have TREX-3400, please.

BY MS. CHANG:

Q. This is page 1 of TREX-3400. Is this one of the audits that you were referring to, Dr. Davis?

A. Yes. This is the cover sheet for the 2005 audit.

Q. Okay.

MS. CHANG: And if we could go to pages 5 and then 6. Okay.

BY MS. CHANG:

Q. What is the significance of the highlighted passages?

A. Well, let's just read the first paragraph up there.

"There is a practice by maintenance personnel to close out maintenance work orders even though not all tasks are completed. Critical checks and inspections are consequently being missed. This was noted on numerous occasions during review of the maintenance history files. Maintenance work orders assigned to the" -- I don't have to read that last half-sentence there. Sorry about that.

And then if you look at the bottom paragraph there: "Maintenance history files were generally found to be unsatisfactory, although a few were exemplary. Work undertaken and measurements requested in the maintenance procedure were frequently omitted from the history files. An auditable trail of maintenance performed on equipment was often not possible from interrogation of the maintenance history."

Q. So from those two excerpts, what does that indicate to

you?
A. Well, it indicates what I just said, essentially, that the recording and tracking of maintenance was quite inadequate and there are even some things not being done concerning maintenance activities.

For example, it says, "Critical checks and inspections are consequently being missed." And a perfect example of that is the dead battery. That should have been detected.

Q. And so, clearly, BP knew that there were serious maintenance issues on the *Deepwater Horizon* at least in 2005?

A. Yes. Starting in 2005, the BP auditors found this and they reported that back to the head honchos that were operating this rig out in the Gulf of Mexico.

MS. CHANG: Could we have TREX-6166, please?

BY MS. CHANG:

Q. Is this the 2008 rig audit that you were referring to?

A. Yes, this was done in January 2008, the next rig audit by BP personnel.

MS. CHANG: If we could have page 9, please.

BY MS. CHANG:

Q. If you could read that highlighted passage for us.

A. "All too frequently, maintenance history notes do not indicate the extent of the work performed or record readings requested in the maintenance procedure and as such, they are

all too frequently inconclusive.

"Although raised during previous audits, there is still a tendency to close out maintenance routines even though not all tasks, or sometimes no tasks, have been completed. Ongoing operations are sometimes quoted as the reason for this; but in most cases, it comes down to not completing all maintenance procedure tasks. And again, critical checks and inspections are consequently being missed."

This was three years later, the same problem.

Q. And did you see evidence to confirm these statements when you reviewed the BOP?

A. Again, the lack of battery information is a perfect example.

MS. CHANG: Let's also go to TREX-3405, please.

BY MS. CHANG:

Q. Is this another one of the audit reports that you were referring to?

A. Yes. This is the so-called follow-up rig audit, September '09.

MS. CHANG: And if we could go to page 2, please.

BY MS. CHANG:

Q. And if you could read that finding for us.

A. "Closing out of the last audit recommendations had no apparent verification by BP. Consequently, a number of the recommendations that Transocean had indicated as closed out

have either deteriorated again or not been suitably addressed in the first instance."

So I think what they're referring to here is, back in the 2008 audit that wasn't too long ago, they were looking for the rectification of the problems that were seen because they were there -- three years after the 2005 audit, they were still having the same problems. So they were looking for rectification by BP to get these things on the straight and narrow and working properly.

So that's what they're referring to there, that it wasn't happening.

MS. CHANG: And if we could flip to page 11, please.

BY MS. CHANG:

Q. And, again, Dr. Davis, would you read that into the record for us?

A. "Whilst it is appreciated that attempts are being made to improve quality of maintenance reporting, based on observations during the audit period, further effort is still required. All too frequently, maintenance history was substandard with missing information and poor quality reports that lacked sufficient detail to convince the reader that the task had actually been performed in accordance with the procedure."

Q. And is that consistent with what you observed in your analysis of the BOP?

A. Yeah. Another example is that the activities involving

03:33 our bad Solenoid 103 weren't even in the record. Who had done
03:33 the refurbishment, for example, was not there.
03:34 **Q.** And all three of these audits indicates to you that BP was
03:34 aware of maintenance issues on the BOP?
03:34 **A.** Yes, they were aware of these maintenance issues for
03:34 numerous years and, apparently, the problems were not
03:34 rectified.
03:34 **Q.** Do any of the other experts in this case offer opinions on
03:34 whether the maintenance on the *Deepwater Horizon*'s BOP was
03:34 adequate?
03:34 **A.** Again, BP and Halliburton experts agree with me that the
03:34 maintenance on the BOP was inadequate and also that the
03:34 maintenance problems contributed to the BOP's failure.
03:34 **MS. CHANG:** Could we switch to the ELMO, please?
03:34 **BY MS. CHANG:**
03:34 **Q.** So in conclusion, Dr. Davis, does this chart accurately
03:35 summarize your opinions and your understanding of the opinions
03:35 of the other BOP experts in this case regarding the causes of
03:35 its failure?
03:35 **A.** Yes, I believe so. So on the left, you have all the
03:35 different opinions. A checkmark indicates an expert that
03:35 agrees with me -- "me" being U.S. -- and then the others being
03:35 BP and Halliburton. Xs indicate a disagreement or a different
03:35 theory. And then blank boxes, I guess, represent no opinion.
03:35 And I think these are accurate.

MS. CHANG: Thank you very much, Dr. Davis. I don't have any further questions.

THE COURT: Okay. Any questions by the PSC?

MR. WILLIAMSON: Yes, Your Honor.

THE COURT: Okay. Ms. Chang, I'm trying to keep the record straight here. I don't think you identified that last chart.

MS. CHANG: That was D-3592, and we had been using blowouts from it throughout his testimony.

THE COURT: Oh, it was all part of the same --

MS. CHANG: Yeah. It was just the whole chart put together.

THE COURT: Okay. Thank you.

MS. CHANG: Thank you.

MR. WILLIAMSON: May it please the Court. I'm Jimmy Williamson for the PSC.

CROSS-EXAMINATION

BY MR. WILLIAMSON:

Q. Dr. Davis, I want to start with you had three colleagues who helped you write your report and your rebuttal report. Am I right about that?

A. Yes.

Q. Could you tell the Court very briefly -- because he has your CV, so he doesn't need it extensive, but very briefly why they were qualified to contribute to your report?

A. Yes. Well, firstly, we had Dr. Neil Robinson, who is a very accomplished materials scientist and forensic engineer, who was actually a principal at a company called Exponent, Inc. at one time in the San Francisco Bay Area, who is well known as one of the foremost forensic engineering firms in the country.

Q. All right. Who else?

A. So that's Mr. Robinson.

And then we had Patrick Novak, who is an extremely experienced hydraulics mechanical engineer; and he also had good familiarity with solenoids and some electronics.

Q. Okay. And Merala, Merala?

A. And then we have Raymond Merala, who was our leader, Talas Engineering, and he has many years of experience doing forensic engineering and he's a more general mechanical engineer, like I am.

Q. Now, generally, let's turn to the subject of the BOP. The BOP is a mechanical piece of equipment; correct?

A. Yes, it is.

Q. And so -- and that was kind of how your analysis went, right, was that as a mechanical piece of equipment, what its limitations were?

A. Yes. I'm primarily a mechanical engineer. I also have experience with electronics and such, but -- so my greatest interest was: How does the pipe behave? How do the blind shear rams behave? What are the flow forces? Things like that

that are involved in a mechanical system.
Q. And one of the things that you discovered in the course of looking at the BOP was that it had various -- it was supposed to be redundant; right?
A. Yes. It had a lot of redundancy built into it.
Q. Because after we get past the cement job and after we get past the primary barrier, being the column of fluids, and after we get past the negative pressure test and the positive pressure test, you know, if the blind shear rams are needed, it will be an emergency?
A. Yes, it probably would be.
Q. Okay. And what -- as an emergency piece of equipment, would you describe it as "safety-critical"?
A. Absolutely safety-critical.
Q. Is there any doubt in your mind on that, or is there any doubt in any of the literature that BP or Transocean have on this point?
A. No. I mean, that's my opinion, it's definitely safety-critical.
Q. Sure. And I'm not going to take the time, but if I were to pull up an article by Melvyn Whitby, a Cameron director of engineering, who says the BOP, when called upon, must function without fail, would you agree with that?
A. Yes.
Q. Okay. And here we know it did not function?

A. Unfortunately, it did not.

Q. Right. Let's turn to --

MR. WILLIAMSON: And if I can have up the exhibit that I believe counsel had up, 3550.001.

Is that possible? Okay.

BY MR. WILLIAMSON:

Q. I'll just talk to you about it because they'll be a minute.

Basically, the BOP -- and the judge has been out to look at it at Michoud. It's a massive structure, isn't it?

A. Yes, it's huge.

THE COURT: It's up on the screen.

MR. WILLIAMSON: Thank you, Your Honor.

BY MR. WILLIAMSON:

Q. The BOP bottom stack has five different cavities where people can put in different things; correct?

A. That's right.

Q. And one -- these are five different valves that will shut off flow, hopefully, in a necessary situation?

MR. DOYEN: Your Honor, objection to the leading quality here throughout the examination.

MR. WILLIAMSON: I was trying to get through the undisputed portion, Your Honor, but I'll be happy to ask --

THE COURT: That's all right. Keep going.

03:41 **BY MR. WILLIAMSON:**
03:41 **Q.** It has five different cavities; correct?
03:41 **A.** Yes.
03:41 **Q.** And did you examine each of those cavities as they were taken apart at Michoud?
03:41 **A.** Yes, and the parts that were in the cavities.
03:41 **Q.** Sure. Let's take the bottom cavity. And is the purpose of the five cavities redundancy?
03:41 **A.** Yes. To a great degree, there's redundancy.
03:41 **Q.** The bottom cavity, what was the bottom cavity?
03:41 **A.** Okay. This bottom cavity right here was configured for what we call a "test ram." It was actually a variable bore ram that had been turned upside down.
03:42 **Q.** And the purpose?
03:42 **A.** And the purpose of that is, instead of sealing the well below, it can seal above.
03:42 **Q.** Okay.
03:42 **A.** And so that, that way, the people on the rig can pressurize things and see whether they have leaks or whatever.
03:42 **Q.** Okay. And that change had been made after the BOP was initially installed in 2001 where someone had converted it to a test ram?
03:42 **A.** Yes.
03:42 **Q.** Will the test ram, the bottom cavity, be effective in an emergency to help stop the flow of hydrocarbons up into the

riser?
A. The test ram cannot seal things coming from below.
Q. Okay. So they'd removed it from service as one of the redundant pieces of equipment?
A. In effect, it was no longer useful for sealing off the well. It had other purposes now.
Q. And have you seen the charts that say what the pressure was at the time that the explosion occurred and the data transmission was lost? Have you seen what the pressures were at that time, the drill pipe pressures?
A. Yes, I've seen that mud log information, if that's what you mean.
Q. They were in excess of 5,000 psi at the surface?
A. Yes, I believe they were.
Q. And without going through hydrostatic head calculations, that would mean they were even higher at the BOP, which was 5,000 feet further down?
A. Yes.
Q. Okay. I now want to turn to the lower annular preventer. Do you see that component?
A. Yes, that's this component here.
Q. Had the lower annular preventer, after the time the BOP was sold, been converted?
A. Yes, it had been changed to a new elastomer doughnut that had a limit of, I believe, 5,000 psi working pressure.

03:43 **Q.** Okay. So the lower annular preventer, who had made that
03:44 change?
03:44 **A.** I believe it was BP that requested that, and it was what
03:44 they call a "stripping annular" so that you could have some
03:44 seal on the well, but still move the pipe up and down.
03:44 **Q.** All right. So we now have a component that will not
03:44 contain -- it is not rated to contain the pressure that a well
03:44 like the Macondo can produce?
03:44 **A.** No, not that particular part.
03:44 **Q.** Okay. So that component has been removed from being a
03:44 redundant piece of equipment that's available in an emergency
03:44 that you could rely upon to seal a well?
03:44 **A.** Yes, that would be true.
03:44 **Q.** And the upper annular preventer, did you examine it at
03:44 Michoud?
03:44 **A.** Yes, that's this piece.
03:44 **Q.** Was it exceptionally seriously eroded?
03:44 **A.** Yes. It was completely destroyed.
03:44 **Q.** As a matter of fact, a piece of drill pipe -- there were
03:44 actually two pieces of drill pipe that had went up through that
03:45 annular, right, at some point in time?
03:45 **A.** Yes. At some point in time, a couple of pieces went up
03:45 through there; and then they got trapped above when the rig
03:45 sank and bent the riser over. This is the riser up here.
03:45 **MR. WILLIAMSON:** Yeah. Can I have Exhibit 1164,

page 80, PDF page 97.

BY MR. WILLIAMSON:

Q. This is page 80 out of the DNV report and it shows -- this one doesn't show it in --

MR. WILLIAMSON: Can you enlarge it any? Or do we have it in color?

BY MR. WILLIAMSON:

Q. Do you remember this showing the various positions of the pieces of pipe as they were recovered at Michoud?

A. Yes. Specifically, this diagram -- there's more than one, so I want to be clear. This is the diagram of where the pieces were actually found when we did the work at Michoud.

Q. And the 30-degree angle that's at the top -- I'm not going to go through each one of the reconstructions of the specific pieces. But the 30-degree of angle is a graphic representation of the kinked riser; correct?

A. Yes. The riser was kinked up here just above the flex joint. This is the flex joint. And this occurred when the rig sank and it bent over the riser as the rig went to the bottom.

Q. All right. Let's get a brief time line. April 20th, 9:49 p.m., the explosion occurs and data transmission on the *Horizon* was lost; correct?

A. Yes.

Q. April 22nd, 7:40 a.m., the autoshear pin is cut, simulating autoshear function; correct?

03:47 **A.** Yes. I can't tell you exactly the time, but I'm sure you know what it is.
03:47 **Q.** The record will speak for itself on it.
03:47 **A.** Yeah.
03:47 **Q.** And the rig sinks a few hours after and kinks the riser a few hours after that autoshear pin was cut?
03:47 **A.** That's correct.
03:47 **Q.** Okay. Here's my point: There's two pieces of drill pipe in that upper annular -- I'm sorry, in the riser; correct?
03:47 **A.** Yes.
03:47 **Q.** What does that tell you about -- forgetting the issue of AMF or autoshear, in that 30 hours in between the explosion and the time the rig sinks and the riser bends, what does that tell you about whether the blind shear rams fired before the rig sank?
03:47 **A.** Well, there was definitely blind shear ram cutting, I believe, at autoshear time before the rig sank because there's all these loose pieces of pipe here.
03:48 **Q.** Yeah. In other words, that piece of pipe couldn't have been cut and went up above the upper annular until after the blind shear rams fired; correct?
03:48 **A.** That's right.
03:48 **Q.** So the fact that there's two pieces of pipe in the riser pretty conclusively shows the blind shear rams fired before the rig sank?

03:48 **A.** Yes, definitely.
03:48 **Q.** Okay. And by the way, that same premise, that there's two pieces of pipe in the riser, demonstrate that the upper annular was pretty beat up by that time; correct?
03:48 **A.** Yes.
03:48 **Q.** And the upper annular, if it's a doughnut that's sealing the way you said it was supposed to, would not allow a second piece of pipe past it up above it; correct?
03:48 **MR. DOYEN:** Your Honor, objection, leading.
03:48 **MR. WILLIAMSON:** I'll rephrase.
03:48 **BY MR. WILLIAMSON:**
03:48 **Q.** How could an annular that was properly working and properly sealing around a single piece of pipe, allow a second piece of pipe to pass through it?
03:49 **A.** If there was already a piece of pipe in there, it would be pretty hard unless it was really wiped out.
03:49 **Q.** Okay. And what's your conclusion on that as to, by the time that second piece of pipe gets up through that upper annular, what kind of condition is the upper annular in?
03:49 **A.** Pretty washed away.
03:49 **Q.** Okay. All right. So we know we have severe erosion on the upper annular before the rig sinks; correct?
03:49 **A.** Yes.
03:49 **Q.** We know the lower annular wasn't rated at a high enough pressure; correct?

MR. DOYEN: Objection, leading.

THE COURT: It is leading. Try not to lead the witness now. You're getting into more important things.

I have a question for the witness.

You used the term the upper annular was "washed out." The question was whether it was eroded, and you used the term washed out.

THE WITNESS: Yes.

THE COURT: Is it something you believe happened in this accident? Or tell me what you're talking about there.

THE WITNESS: Once things started to leak -- and the upper annular actually started to leak even before the explosion -- there was high velocity flow between the pipe and the rubber doughnut. Over a long period of time, there was what I call "washing" or what other people call "erosion" -- it's the same thing -- where this flow going through that has particles in it can wear away the rubber, and it can also wear the steel of the drill pipe.

And this happened, actually, gradually over a long period of time. Not only the two days before the rig sank, but also after that, when we still had flow coming out of the well, all this washing was taking place.

THE COURT: When you say "over a long period of time," you're not talking about before April 20th?

THE WITNESS: No.

03:51 **THE COURT:** You're talking about starting with what happened on April 20th and afterwards?

03:51 **THE WITNESS:** And subsequent and however -- 70 or 75 days before the flow was stopped.

03:51 **THE COURT:** Okay.

03:51 **THE WITNESS:** So there was a certain amount of erosion there, I'm sure, at autoshear time, and then there was additional erosion after that. And when we saw it at Michoud, it was really badly damaged.

03:51 **THE COURT:** Okay.

03:51 **THE WITNESS:** There was very little of it left.

03:51 **BY MR. WILLIAMSON:**

03:51 **Q.** All right. Well, let me go back. This BOP was splashed on approximately February 6th. February 10th is when it went on the well head; right?

03:51 **A.** I don't remember the exact date, but . . .

03:51 **Q.** Okay. And had this well -- do you remember whether or not this well had experienced several loss returns and kick events in between February, when it splashed, and April 20th, when the explosion occurred?

03:51 **A.** I don't have -- I haven't studied that stuff it detail, but I do know that some of those things occurred, yes.

03:52 **Q.** Sure.

03:52 You were familiar that the upper annular had had pipes stripped through it on April 5th, 2010? Do you remember

that detail?
A. Yes, I'm specifically aware of that.
Q. And that, of course, stripping pipe through the upper annular means pulling pipe through it when it's closed?
A. Yes.
Q. Would that have an erosive effect?
A. The upper annular doughnut was not designed for stripping, and so it is possible that, if you strip pipe through it, it will damage it.
Q. Okay.
A. Probably chunk out some of the rubber.
Q. And do you remember that, on the negative pressure test that was run on the evening of April 20th, the upper annular was the BOP component that was used to shut in the well?
A. Yes, I understand that.
Q. And do you remember that the upper annular did not seal the well and initially it was leaking? Do you remember that detail?
A. Yes, I do.
Q. And, in fact, they had to up the pressure on the upper annular in order to effect the seal in order to run the negative pressure test; correct?
MR. DOYEN: Objection, Your Honor. I think we're beyond the scope of the report at this point.
MR. WILLIAMSON: I think it goes to whether or not --

THE COURT: Wait a minute. Let me ask the witness. Is this beyond what you expressed opinions about in your report?

THE WITNESS: I don't remember exactly what I said about the upper annular. I know that it didn't seal at various times. So, ultimately, it couldn't control the well. But what I'm more interested in is the blind shear ram.

THE COURT: Okay. I'll sustain the objection.

MR. WILLIAMSON: Fair enough. I'll switch to another subject.

Would you please pull up D-3096.

BY MR. WILLIAMSON:

Q. Okay. You have talked about the emergency systems that were on the *Horizon*; correct?

A. Yes.

Q. One possibility was an emergency disconnect system, blue box in the upper left-hand corner; right?

A. Yes. That's another way you can close the blind shear ram.

Q. The EDS system, emergency disconnect system, how is it operated?

A. This is one that's actually operated by pushing a button; the operator can push a button. So this is not an autonomous system like I was talking about for AMF and autoshear.

Q. Was the button pushed on the evening of April 20th?

03:54 **A.** Yes. My understanding is that it was, from the testimony.
03:54 **Q.** Okay. Was the button pushed before or after the explosions?
03:54 **A.** It was pushed after the explosions.
03:54 **Q.** What is the effect of pushing the EDS button after the explosion?
03:54 **A.** There was no action because the communication between the rig and the BOP had been lost.
03:54 **Q.** Okay. So in terms of trying to stop the fire, save the rig, seal the well, after the single event -- the explosions, EDS is no longer available?
03:55 **A.** That's correct.
03:55 **MR. DOYEN:** Objection, leading.
03:55 **THE COURT:** Try not to lead the witness.
03:55 **MR. WILLIAMSON:** Yes, Your Honor.
03:55 **BY MR. WILLIAMSON:**
03:55 **Q.** And the EDS system is activated -- what's your explanation for why the EDS system was lost? Why did we lose operational control of the BOP in the explosion?
03:55 **A.** The explosion damaged the cabling that goes down to the pods, so we had communication loss; and we also developed electricity loss and hydraulic power loss eventually --
03:55 **Q.** Okay.
03:55 **A.** -- in a few minutes after the explosion.
03:55 **Q.** I'm going to come back to AMF for you, but in a second.

But first I want to say, so your conclusion on the EDS system was what in terms of its availability to stop the flow of hydrocarbons in the well?

A. After the explosion, when the EDS button was pushed, it was too late; the EDS could not function.

Q. All right. I want to go next to the autoshear function. That's the blue box on the bottom. Okay?

What is autoshear designed to do? I believe the judge said so a while ago.

A. Yes. That is the case where, if the LMRP separates from the lower BOP, then the autoshear valve is tripped and the blind shear rams are closed to seal off the well.

Q. All right. Literally, a mechanical pin pops out, and that mechanical pins starts the hydraulic function?

A. Yes. That mechanical pin is connected to a valve and the valve shifts and the pressure goes to the blind shear ram.

Q. Okay. Since the LMRP did not separate from the BOP stack in the explosion, was the autoshear an emergency system that was available to try to seal the well in this sort of catastrophe?

A. Not at that time, no.

Q. So if we're talking about a situation where hydrocarbons are going to explode on the rig, in the moon pool, and destroy the MUX cables, how many emergency systems do we have on the BOP that will try to stop the disaster?

03:57 **A.** We have the remaining AMF function within the two pods.
03:57 **Q.** Okay. All right. Now, the AMF function is triggered by this battery solenoid system that you made reference to?
03:57 **A.** Yes. It uses a computer and electronics, and it activates the solenoid that sends pilot pressure to a larger valve, which then provides the pressurized fluid to the blind shear ram.
03:57 **Q.** Okay. Blue pod first. We have blue pod, yellow pod. We have 9-volt batteries triggering a 27-volt battery triggering a solenoid triggering a shuttle valve. That's the meaning I was trying to get through. Right?
03:58 **A.** You trigger the solenoid, the pilot pressure goes out and operates a main valve, I guess you would call it, as opposed to a shuttle valve.
03:58 **Q.** What is a solenoid?
03:58 **A.** A solenoid is an electromechanical unit that uses electricity to change the direction of flow of hydraulic fluid.
03:58 **Q.** Okay. And how many 27-volt batteries are in the blue pod?
03:58 **A.** We have one 27-volt battery in the blue pod.
03:58 **Q.** Okay. Did you ever find any evidence that the blue pod 27-volt battery was tested on the surface before they splashed the BOP in February of 2010?
03:58 **A.** No. We have not been able to find evidence of any battery voltage measurements.
03:58 **Q.** What would be your recommendation as a safety engineer -- as a mechanical engineer, would you consider the 27-volt

03:58 battery a safety-critical component?
03:59 **A.** I would consider the 27-volt battery as safety-critical, yes.
03:59 **Q.** What would be your recommendation on a safety-critical component as to whether it should be tested before being deployed subsea?
03:59 **A.** Well, if you didn't already have a voltage monitoring system, you would want to check it at every opportunity to make sure that battery was charged.
03:59 **Q.** Have you reviewed the maintenance records to see if Transocean had done that?
03:59 **A.** Yes.
03:59 **Q.** Would you be able to tell from the Transocean records whether they had done it or not?
03:59 **A.** No, I found no indication of battery voltages being checked.
03:59 **Q.** Now, once the BOP is deployed subsea and it's on the ocean floor 5,000 feet below sea level, how do you check the AMF safety-critical 27-volt battery?
03:59 **A.** There is no way to check its voltage directly.
03:59 **Q.** As a safety engineer, is that a good idea, to have a system where you have a component that you cannot test during a period of three months and you're going to maybe rely upon it in an emergency?
04:00 **A.** It just makes good engineering sense to have some way of

sensing the battery voltage at the rig.
Q. Okay. So to take the blue pod battery, one solution is absolutely scrupulous maintenance?
MR. DOYEN: Objection, leading.
BY MR. WILLIAMSON:
Q. How would you describe it?
THE COURT: Wait a minute.
MR. WILLIAMSON: I apologize, Your Honor.
THE COURT: You need to stop leading the witness. Okay?
MR. WILLIAMSON: Yes, Your Honor.
BY MR. WILLIAMSON:
Q. Describe the --
THE COURT: If you're going to do it, don't announce it, because then you definitely won't get away with it. Okay?
MR. WILLIAMSON: Thank you, Your Honor. Advice well received.
BY MR. WILLIAMSON:
Q. How would you describe the component's importance of having a maintenance system where you can track that battery?
A. It didn't take me very long to figure out that the AMF function in this system is extremely critical for safety. And if I were in charge of this system, operating it, I would make sure at all times that those batteries were ready to go. Whether that meant a lot of maintenance when the unit was on

the surface, I would do that. If I could use voltage monitoring, I would do that so I could always see on the rig what those voltages were.

But I would know that those batteries have to be sufficiently charged for the system to be safe.

Q. Thank you.

MR. WILLIAMSON: Please bring up Exhibit 3605 -- I'm sorry. Please bring up Exhibit 5155. Please give me Call-out No. 9.

BY MR. WILLIAMSON:

Q. Okay. This is an e-mail from someone at Transocean dated --

THE COURT: Excuse me. What was that number? Call-out?

MR. WILLIAMSON: I'm sorry, Your Honor. It's TREX-5155, Call-out 9.

THE COURT: 9, okay. Thank you.

BY MR. WILLIAMSON:

Q. Let me see -- let me make sure I have the date on it. This is in July 2005, okay, on deepwater.com: "Cameron have kept their recommendations for replacement exactly as the older type (1 year in use and more than 33 activations), which, incidentally, we never believed nor trusted." Okay?

This is Transocean in 2005 describing what they think about the Cameron battery system in the BOP.

Have you seen that e-mail before?

A. No, I haven't.

Q. Okay. Does that indicate to you that Transocean had any knowledge that the battery system was safety-critical?

MR. DOYEN: Your Honor, I object. I do think that goes beyond the scope of the report. The witness hasn't talked about his knowledge in this area.

THE COURT: I'll sustain that objection.

MR. WILLIAMSON: Let's see Exhibit No. 3605.

BY MR. WILLIAMSON:

Q. This is a document called "AMF/Deadman Battery Replacement." It's Engineering Bulletin EB 891 D.

MR. WILLIAMSON: Can I see Call-out No. 1. It's Exhibit TREX-3605.

BY MR. WILLIAMSON:

Q. "The AMF/Deadman feature provides a means of commanding the SEM to initiate an EDS sequence if four circumstances occur simultaneously.

"Loss of conduit pressure, loss of hydrostatic head pressure, loss of SEM power, loss of communications."

Do you agree with that description? Does that fit your description of the AMF battery system?

A. I don't know what they mean exactly there by "loss of hydrostatic head." If you're subsea, you would have hydrostatic head.

Q. Okay.
A. The important thing is that the conduit pressure becomes the same as the surrounding seawater pressure, and that's what triggers it. So it's just a little detail, but that's my understanding.
Q. Okay.
MR. WILLIAMSON: Fly-out No. 3. It's TREX-3605.
BY MR. WILLIAMSON:
Q. Cameron is making --
THE COURT: Excuse me. What is the underlying document that you're calling these out from?
MR. WILLIAMSON: Sure, Your Honor. This is an engineering bulletin by Cameron, September 8th, 2004, EB -- which stand for engineering bulletin --
THE COURT: Okay. I just need to understand where this is coming from. Okay.
BY MR. WILLIAMSON:
Q. "Cameron is making the same recommendations for battery replacement.
"It is recommended that the 9-volt and 27-volt battery packs be replaced after: one year of on-time operation."
Is that true?
A. Yes, that's what it says.
Q. Okay. Did you find that these recommendations were

followed?

A. No, they were not.

Q. Okay.

MR. WILLIAMSON: Please show me 8048, Fly-out No. 1.

BY MR. WILLIAMSON:

Q. Okay. This -- I'll tell you Mr. Gaude is an engineer -- hydraulics engineer for Cameron. This is his e-mail dated January 31st, 2005.

"The original battery pack design can no longer be supplied, as the manufacturer of the batteries discontinued the battery. It was a huge effort to get the vendor to come up with a new battery pack that had the cycle life and inrush capacity as the old batteries. Ray Jahn can expand on what and why we planned it out like we did."

My question to you is --

THE COURT: Do you want to object before he asks the question or what?

MR. DOYEN: I'll wait and hear the question.

BY MR. WILLIAMSON:

Q. Were you aware that Cameron had came up and redesigned the batteries in 2004?

THE COURT: Okay. Now what?

MR. DOYEN: Objection, Your Honor. It's beyond the scope of the report. It doesn't discuss this.

MR. WILLIAMSON: I'll change the questions.

04:07 **THE COURT:** Okay.
04:07 **BY MR. WILLIAMSON:**
04:07 **Q.** When Cameron made its decision, per Exhibit No. 8048, to
04:07 go through a huge effort to get the vendor to come up with a
04:07 new battery pack, in your opinion, should that system have
04:07 included a way of monitoring the batteries?
04:07 **MR. JONES:** Your Honor, same objection as --
04:07 **THE COURT:** I'll sustain it.
04:07 **BY MR. WILLIAMSON:**
04:07 **Q.** Was there another system available that Transocean could
04:08 have purchased that would have provided the ability to monitor
04:08 the batteries?
04:08 **A.** Yes. There was a new system called the Mark III system.
04:08 The system being used on the *Deepwater Horizon* was the Mark II.
04:08 So it was the next generation, and it included the battery
04:08 voltage monitoring.
04:08 **MR. WILLIAMSON:** Can I have TREX-4277, Fly-out 1.
04:08 **BY MR. WILLIAMSON:**
04:08 **Q.** In fact, this is a multiplex BOP control pod, Transocean
04:08 deepwater budgetary quotation?
04:08 **A.** Yes.
04:08 **MR. WILLIAMSON:** Can I have Fly-out No. 2.
04:08 **BY MR. WILLIAMSON:**
04:08 **Q.** "A one atmosphere enclosure containing the rechargeable
04:08 batteries required to power the AMF/Deadman circuits when this

option is implemented."

Does that support or defeat your opinion that rechargeable batteries were available to Transocean, had they chosen to implement them?

A. Yes, they were available.

MR. WILLIAMSON: Could I have Fly-out No. 3.

BY MR. WILLIAMSON:

Q. And was this, in fact, the quote to Transocean, as of the date of this exhibit, TREX-4277, in 2009, for obtaining a new battery that would be rechargeable and monitor-able?

A. Yes. I've seen this document. I've seen this quote.

Q. And, of course, we now know Transocean did not do it?

A. That's right.

Q. Let's turn to solenoids.

MR. WILLIAMSON: May I have Exhibit No. 599, fly-out -- let's do Fly-out 1.

BY MR. WILLIAMSON:

Q. Okay. This is a daily report sheet on May 5th, 2010, from Cameron. Have you ever seen this document?

A. Yes, I believe I have.

Q. Okay. And this is actually a Cameron document when they pulled up the pod, the yellow pod, on -- approximately 15 days post-explosion?

A. Yes.

MR. WILLIAMSON: Can I have Fly-out No. 2.

BY MR. WILLIAMSON:

Q. "21:46: Simulated deadman test with the correct Solenoid Valve No. 103. Electromagnetic pin was held against Solenoid Valve 103 was fired. No indications of the valve firing."

Did I read it correctly?

A. Yes.

Q. Okay. So the first time -- what does this document tell you in terms of whether the Solenoid 103Y that was in the yellow pod worked or didn't work? What information does this document give you on that?

A. I referred to this earlier, that when the yellow pod was brought up on the *Q4000*, they checked the functioning of the deadman, and the blind shear ram was not activated properly from the yellow pod, and it was with the -- because the solenoid valve had the miswiring. This is what we verified at Michoud later, that the miswiring was the cause.

Q. Okay. Now, do you think this document helps or hurts in supporting your argument that Mr. Childs, the Transocean BOP expert, is right or wrong?

A. Well, it's an obvious malfunction of that Solenoid Valve 103, so it hurts Mr. Childs' theory.

Q. Okay. And did you all actually look at the solenoid in question when you were out at Michoud?

A. Yes, I did.

MR. WILLIAMSON: Please pull up 7660, Figure No. 1,

page 5.
BY MR. WILLIAMSON:
Q. Is that a page out of your report where you're actually showing a photograph of the actual solenoid?
A. Yes. This is where it's been opened up and you can see the wiring connections.
Q. Sure.
MR. WILLIAMSON: Go to the next one, page 6, Figures No. 2, 3, and 4.
BY MR. WILLIAMSON:
Q. And are these your explanation in your report of why the solenoid is miswired?
A. Yes.
Q. All right. Are you aware of any -- did you determine whether or not this solenoid was OEM?
A. I've seen documentation that says there was a non-OEM connector used with it.
Q. Okay.
A. And it was also known at this -- at some point it was determined that this had been a refurbished solenoid. That's also self-evident by the fact that it was miswired.
Q. So the fact that it was a refurbished solenoid would mean that it was not original OEM new equipment?
MR. DOYEN: Objection, leading.

BY MR. WILLIAMSON:

Q. Was this original OEM equipment?

A. It was not original. It had been refurbished.

Q. Are you aware of any requirement that BP has regarding BOP parts regarding whether they should be OEM or not?

A. No, I don't know of those requirements.

MR. WILLIAMSON: Pull up Exhibit No. 93, Fly-out 12, TREX-0093, page D-12.15.3.7.

BY MR. WILLIAMSON:

Q. I will tell you this comes out of the BP procedures manual.

"Only original equipment manufactures' designated spares shall be used for blowout preventer equipment replacement parts."

MS. KARIS: Your Honor, I have an objection to the use of this document. The witness has already testified that he doesn't know what BP's requirements are. He has no foundation.

MR. WILLIAMSON: May I continue, your Honor?

THE COURT: Well, I don't know what the question would be. I mean, I can read it, you can read it; but if the witness says he's not aware of it otherwise, I don't know why you have to ask him a question.

MR. WILLIAMSON: I'll move on.

THE COURT: Okay.

04:14 **MR. WILLIAMSON:** All right. Pull up Exhibit 7660, Figure 5, page 12.

04:15 **BY MR. WILLIAMSON:**

04:15 **Q.** I'm changing subjects now, Mr. Davis, to the subject of off-center pipe, okay?

04:15 Do you remember this page -- it's not in color -- out of your report?

04:15 **A.** Yes. This is a representation of the laser scans of these parts that were done by DNV.

04:15 **Q.** And actually, this is a reproduction of something that the DNV did; right?

04:15 **A.** That DNV did? Is that what you said?

04:15 **Q.** Yes.

04:15 **A.** Yes, that's correct.

04:15 **Q.** Were you allowed to do your own?

04:15 **A.** I was not allowed to do my own laser scans or -- no, but I was able to look at these parts firsthand.

04:15 **Q.** Right. No one was allowed to actually test them other than DNV themselves?

04:15 **A.** Yes.

04:15 **Q.** Does this figure -- it's a very simple question: Does this figure support your opinion that, at the time the blind shear rams were activated, the drill pipe was off-center?

04:15 **MR. DOYEN:** Objection. Leading.

04:15 **MR. WILLIAMSON:** I didn't think that was leading,

Judge, but I'll rephrase.

THE COURT: I'll allow him to answer it.

MR. JONES: Your Honor, one more objection to that. It also is showing DNV analysis, which I believe violates your limine order that only underlying facts, not analysis of DNV, can come in at trial.

MR. WILLIAMSON: May I respond to that, Your Honor?

THE COURT: I think it's a different question. He's asking the witness whether this confirms his opinion.

You're not asking about DNV's opinion.

MR. WILLIAMSON: Exactly.

THE COURT: So I'll overrule the objection.

BY MR. WILLIAMSON:

Q. Why does this support or defeat your opinion, Mr. Davis?

A. Well, this is basically a depiction of measurements taken. So I don't really think this is analysis, by the way. And this shows very clearly how the piece of drill pipe that remained below the blind shear rams fits in an area -- way off to the side in the blind shear rams, where it was trapped for a long period of time.

Q. And your --

A. And I could see this on the actual pieces as well.

Q. Okay. I want to turn -- and you believed that was -- that played a part in shearing and sealing how?

A. Because of the fact that the pipe was too far to the side,

it was not possible to completely shear it; and the pipe itself blocked the rams from completely closing because of -- it was way over to the side, where there are other pieces of blocks that don't have blades.

Q. All right. I want to turn to the last subject that we'll cover, I believe, and that is capacity.

The wellbore, when it is flowing, will generate a certain amount of pressure inside the wellbore; correct?

A. Say that again.

Q. If you have a blowout and you have hydrocarbons that have overcome the pore pressure and the barrier and they're flowing to the surface, will you have some sort of pressure inside the wellbore and the drill pipe?

A. Yes. And that pressure varies depending on where you are vertically in the well.

Q. Right.

And will that wellbore pressure -- one way to express it is in terms of pounds per square inch, psi?

A. Yes.

Q. Will that wellbore pressure affect the ability of the blind shear rams to shear a piece of pipe and seal it?

A. Yes. The wellbore pressure has a certain ability to fight the action of the pressure on the piston that actuates the ram. We know what that ratio is. That's part of the calculations that are done.

04:19 **Q.** And there's actually two different methodologies that you looked at that can calculate that; correct? Maybe more, but at least two?
04:19 **A.** Yes.
04:19 **Q.** Which one did you use?
04:19 **A.** I think you're referring to the West Engineering's formulas --
04:19 **Q.** Correct.
04:19 **A.** -- that I used in my initial calculations. You can also use Cameron's recommended formulas in what they call 702-D document.
04:19 **Q.** I know. You've anticipated correctly my question.
04:19 **MR. WILLIAMSON:** Please pull up Exhibit 1199, Fly-out 1.
04:19 **BY MR. WILLIAMSON:**
04:19 **Q.** This is an engineering bulletin put out by Cameron in January 2008 called "Shearing Ability [verbatim] of Cameron Shear Rams"; correct?
04:19 **A.** Yes, shearing capabilities.
04:20 **MR. WILLIAMSON:** Pull out Fly-out 6.
04:20 **BY MR. WILLIAMSON:**
04:20 **Q.** And this is actually -- I'm not going to take you through the math because the math is contained within your report and within the other expert reports on this subject. Right?
04:20 **A.** Yes. I'm not the only one that's looked at these

formulas. Others have actually reported numbers they got out of these formulas.

Q. Tell the Court what this formula is. What is this formula designed to do?

A. The quantity "P shear" on the left is the pressure in the ram in question required to shear a certain size of pipe. And then the terms inside represent the strength of the pipe, which is the first term, "C3 ppf," sigma yield. And the second term represents the effect of the wellbore pressure and how much it can influence the required pressure to shear that.

Q. Okay. Did you use this formula when you were calculating the capacity for this particular BOP?

A. I have used these formulas and looked at the numbers, yes, I have.

Q. Okay. I'm about to turn to your report. Can you remember what your report says in terms of the pressure you thought it would take to shear the pipe? We'll take the pipe that was actually in the string at the time, 5 1/2-inch, 21.9 -- or 24.7 pounds per foot, S135.

A. I don't know if I can remember the exact number.

Q. Sure.

MR. WILLIAMSON: Please turn to Exhibit 7660, page 37, second paragraph.

Actually, before we do that, turn to page 36, the bottom of the paragraph on page 36.

BY MR. WILLIAMSON:

Q. I will represent to you, this is out of your report.

MR. WILLIAMSON: Can you blow up the second-to-last paragraph or the next-to-last paragraph.

BY MR. WILLIAMSON:

Q. "Note this value is based on West Engineering's work based on actual testing, not Cameron's shearing formula. BP quotes that Cameron's formula results in 2840 psi cutting pressure at surface or 2410 psi at sea bed, which both would be substantially worse than the West prediction."

Right?

A. Yes.

Q. Do you agree with that, that if you use the West number, you'll get one number; if you use the Cameron number, you'll get an even higher number?

A. Yes.

Q. You used the West number?

A. Yes.

MR. WILLIAMSON: Go to page 37, second paragraph, TREX-7660.

BY MR. WILLIAMSON:

Q. "We then add the 2183 psi design requirement to the 1493 psi worst case wellbore pressure" --

THE COURT: Slow down. Slow down.

MR. WILLIAMSON: I apologize.

BY MR. WILLIAMSON:

Q. -- "for a required pipe cut to the pressure of 3676 psi."

Is that what you calculated as the shear pressure?

A. Yes. This is out of my report.

Q. And out of your report, what type of ram configuration did you use for this?

A. Well, it turns out that the West Engineering data was representative of double-V rams, not single-V rams. So I was being charitable somewhat in the pressure requirements because a single-V ram is worse.

Q. Right.

A. Would have higher pressures.

Q. Okay. You have a wellbore pressure -- what wellbore pressure were you assuming?

A. That 1493 psi wellbore pressure effect was for 10,000 psi in the wellbore relative to seawater.

Q. Which is what you thought was worst case?

A. Which I thought was worst case, yes.

Q. All right. Now, wellbore pressure is only one factor in calculating the shear force needed?

A. That's correct. The other main one is the strength of the pipe.

Q. And it's also -- okay.

When we use wellbore pressure, strength of pipe, type of ram blocks, type of BOP and apply a formula, we come up with

another number, which is the number of force that will be needed to apply to the pistons. Is that a fair way to say it, or is that an unfair way?

A. The force or the pressure that you apply to the pistons, yes.

Q. Okay. If you use Cameron's formula -- the people who manufactured this and put out the engineering bulletin in 2008 -- are you going to come up with a number -- if you're correct, for DVS rams to SBR rams, are you going to come up with a number higher than 3676?

A. Yes, it will be substantially higher. The last time I did the calculation, I got about 4200 psi.

Q. Okay. Now, tell the Court, in the AMF system that was deployed on this rig on April 20th -- what does that mean, 4200 psi?

A. Well, unfortunately, you only have 4,000 available in the high-pressure regulated system. So if the formula comes out at 4200 -- and those formulas, by the way, are based on what you would expect for a maximum -- there are some times when it's not going to be able to cut the pipe.

Q. Okay.

A. Even with a higher-pressure system.

Q. So you have 4,000 psi available for the piston. And that's it; right?

A. Yes, it's regulated --

MR. DOYEN: Objection, leading.

MR. WILLIAMSON: I was trying to work through it, Judge.

THE COURT: It was leading. I'll sustain the objection.

We had, apparently, an e-mail message from somebody that was listening somewhere that when people are objecting, they're not able to hear. So if you-all could make sure you try speaking into one of microphones when you do object. Okay?

MR. DOYEN: Thank you, Your Honor.

BY MR. WILLIAMSON:

Q. Mr. Davis, how many pounds per square inch pressure can this system deliver to that piston in an emergency when the AMF is needed?

A. It can deliver 4,000 psi, which is regulated from the accumulator stack.

Q. And even with 5 1/2-inch pipe, how many pounds per square inch does Cameron tell BP and TO, Transocean, that they're going to need to shear the pipe?

A. Well, they don't really tell them; they provide the formulas so that they can figure it out. And it's up around 4200 psi, above the 4,000 number.

Q. So if you get that type of wellbore pressure, you simply do not have a big enough blowout preventer?

MR. DOYEN: Objection, Your Honor.

BY MR. WILLIAMSON:

Q. What is your opinion on that?

MR. DOYEN: My fault, Your Honor. I withdraw that objection.

THE COURT: Okay.

THE WITNESS: You would not be able to reliably cut the pipe every time. There is scatter in the ability or the pressure required to cut pipe, so only a certain percentage of the time would you be able to cut the pipe. Other times you could not finish cutting the pipe.

BY MR. WILLIAMSON:

Q. And what type -- if we're going to do that -- we have 4,000 available and we're going to need 4200 shear 5 1/2-inch, if we let the Court look at all the numbers for 6 5/8-inch pipe, is this analysis going to get worse or better?

A. It will get substantially worse.

Q. And what did BP and Transocean drill this well with, 6 5/8-inch pipe every day from February 6th to April 9th? Or did they drill it with 5 1/2? Or do you know?

MS. KARIS: Your Honor, I have an objection to relevance of this because this witness, in his report, specifically stated that in this instance, on April 20th, this was not a limitation that played any role in the outcome of what happened.

04:27 **THE COURT:** Is that correct?
04:28 **THE WITNESS:** In this particular accident, this
04:28 inadequacy did not have an effect.
04:28 **THE COURT:** Okay. I sustain the objection.
04:28 **MS. KARIS:** Thank you, Your Honor.
04:28 **MR. WILLIAMSON:** I think I'm done, Your Honor. I'm
04:28 trying to make sure I haven't thought of another question.
04:28 **BY MR. WILLIAMSON:**
04:28 **Q.** One last question to follow.
04:28 Would you recommend that you design a safety-critical
04:28 system that goes to the blind shear rams?
04:28 Under this system, what was the safety margin? What
04:28 is the safety margin that was on this system for shearing pipe?
04:29 **A.** Well, if you use the 4200 number, like I was talking
04:29 about, you would only be able to cut the pipe maybe 90 percent
04:29 of the time instead of 100 percent of the time, which is not
04:29 good for a safety-critical system.
04:29 **Q.** Okay. Which means -- and that leaves you with, what,
04:29 basically a zero safety margin if you need 4200 and you've got
04:29 4,000?
04:29 **A.** Well, it's clearly not sufficient. You're going to be
04:29 unable to shear the pipe and seal the well a substantial
04:29 portion of the time. In contrast, when engineers design
04:29 things, they try to design them to succeed 99.9 percent of the
04:29 time, not 90 percent of the time. So 10 percent is a big, big

problem.
Q. Had they put DVS rams, the plug-and-play you referred to, on this, would that have increased the efficiency of the cutting blades?
A. Yes. The double-V blade rams like DVS require about 600 to 800 psi less pressure to cut the same pipe. So that would be a substantially safer system, and you would be able to cut the pipe almost 100 percent of the time.
Q. And would DVS rams, the double-Vs, have provided a greater chance of centering the pipe and bringing it within the ram blades?
A. The double-V rams have a much, much greater capacity to push the drill pipe back to the center before it cuts. It's a major advantage of using the double-V blades.
Q. And I'm not going to do it because I already went longer than I should have; but is there actually an analysis in your rebuttal report, TREX-07661, page 17, that deals with the fact that the DVS rams are -- their centering ability compared to the SBR rams? Is there such a chart?
A. Yes. I went through a straightforward engineering analysis, and I presented a chart showing a drastically increased ability to center the pipe.
MR. WILLIAMSON: Okay. Thank you, Your Honor.
THE COURT: All right. Alabama, do you have any questions?

04:31 **MR. MAZE:** No questions, Your Honor.
04:31 **THE COURT:** Louisiana?
04:31 **MR. KRAUS:** No questions, Your Honor.
04:31 **THE COURT:** All right. Transocean is up next.
04:31 **CROSS-EXAMINATION**
04:31 **BY MR. DOYEN:**
04:33 **Q.** Mike Doyen for Transocean. Dr. Davis, good afternoon.
04:33 **MR. DOYEN:** Your Honor, I have quite a bit to cover. I'm going to start with some quick topics to finish off the afternoon.
04:33 **THE COURT:** That's fine. We'll go for about another 30 minutes.
04:33 **MR. DOYEN:** Thank you, Your Honor. I might need a biology break before that. The fortitude of this room stuns me.
04:33 **THE COURT:** It all has to do with planning.
04:33 **MR. DOYEN:** Not my strong suit maybe.
04:33 **BY MR. DOYEN:**
04:33 **Q.** Dr. Davis, you performed a finite element analysis --
04:33 **MR. DOYEN:** Is this too close? I feel like I'm booming and echoing a little bit.
04:33 **BY MR. DOYEN:**
04:33 **Q.** You performed a finite element analysis of a pipe cutting and crushing in the blind shear rams; correct?
04:33 **A.** Cutting and crushing in a blind shear ram? I did analysis

but using other people's models. I didn't do my own FEA.
Q. You were looking at somebody else's nonlinear finite element analysis of pipe crushing and cutting?
A. Yes.
Q. Would you agree that shows --
MR. JONES: Your Honor, I need to object. This is discussing the DNV finite element analysis, which is not underlying facts in the data. It is their expert analysis.
THE COURT: Is that what you --
THE WITNESS: That is not what I was talking about. I was talking about models that came from other experts, not DNV.
THE COURT: Okay. Go ahead.
BY MR. DOYEN:
Q. And that analysis showed you that the blind shear rams had sufficient pressure to cut the pipe had the pipe been centered; correct?
A. They did, but I had independent verification of that.
Q. In fact, from your forensic examination, you concluded that the pressure available to the blind shear rams was clearly sufficient to cut the pipe had it been centered, didn't you?
A. Yes, I did. I saw the crush marks on the pipe.
Q. In fact, it was your opinion that had the pipe been centered, the pressure available to the BSR -- I'm sorry, I'm looking at the same one again.

Had the pipe been centered, it was your conclusion that the BSR almost certainly would have cut the pipe and sealed the well; correct?

A. You need to refer to which time we're talking about. In the case of autoshear, because we were using the single-V blade blind shear ram, it could not center the pipe. But it had enough pressure to do so, but it failed for another reason.

Q. That wasn't my question.

A. I'm sorry.

Q. That's all right. I may have made it unclear.

If the pipe was centered --

A. I'm sorry.

Q. -- it is your opinion that the BSR almost certainly would have cut the pipe and sealed the well; correct?

A. Yes, absolutely.

Q. Now, I have just a quick question on your qualification.

It's true, is it not, that of the other members of your team, when we look over their CVs, we likewise see no experience listed with blowout preventers; correct?

A. I believe that's the case, yes.

Q. You yourself have written a number of articles, haven't you?

A. Yes.

Q. I think you list 19 or 20 in your CV?

A. Yes.

04:36 **Q.** About half of them deal with bicycles?
04:36 **A.** I don't remember the number.
04:36 **Q.** And some deal with rockets?
04:36 **A.** A few with rockets.
04:36 **Q.** And some with turbomachinery?
04:36 **A.** Yes.
04:36 **Q.** None deal with BOPs; correct?
04:36 **A.** No.
04:36 **Q.** I'm sorry. That is correct?
04:36 **A.** That is correct.
04:36 **Q.** Thank you.
04:37 Now, you said you thought that your outside -- your view outside of the industry was of some benefit to us here in this case; is that correct?
04:37 **A.** Yes, I believe so.
04:37 **Q.** If gives you a fresh perspective?
04:37 **A.** Yes.
04:37 **Q.** But you're not coming in here with any preexisting knowledge of the way things are typically done in the industry. Is that fair?
04:37 **A.** Yes.
04:37 **Q.** And before preparing your report, you didn't go to any of the BOP manufacturers to look at the different type of blowout preventers that are available, did you?
04:37 **A.** Not physically, but I reviewed documents.

04:37 **Q.** You haven't done that at any point in your career prior to being retained in this case; correct?
04:37 **A.** Looking at actual hardware at the manufacturer, no.
04:37 **Q.** In fact, you indicated that when you got the call to work on this case after Macondo, you went online, on the Internet, to look at the BOP pictures; correct?
04:38 **A.** Yes, and I saw some of that there.
04:38 **Q.** And you indicated that was the first time you had seen those pictures; correct?
04:38 **A.** I don't recall, but that would have been true, yes.
04:38 **Q.** Okay. Now, I think you stated that the Mark III control system, had it been offered by Cameron, was available since when? Do you know that?
04:38 **A.** I think it was 2006, but I don't recall for sure.
04:38 **Q.** Okay. And you indicated you thought that would have eliminated malfunction associated with solenoids in batteries; correct?
04:38 **A.** I believe it would have, yes.
04:38 **Q.** And you do understand, don't you, that a requirement for something to be the best available and safest technology is that it be practical to use? Correct?
04:38 **A.** Well, you know, if you read the words, it says "best and safest when practical." So that's not what best and safest is. "Practical" is added to that.
04:38 **Q.** But the regulation does use the word "when practical";

correct?
A. When practical, yes.
Q. And you understood that to have -- considering the practical implications of things, it's just sensible from an engineering perspective anyways, isn't it?
A. Yes.
Q. And you agree, don't you, that you're not qualified to assess all the practical ramifications of implementing the Mark III control system on the *Deepwater Horizon*; correct?
A. Not all of them, but because this system was in use and for commercial sale, I considered it practical.
Q. And you didn't, in fact, evaluate the practical ramifications of implementing the Mark III system in forming your opinion here; isn't that true?
A. No.
Q. No, did you not do it? I'm sorry.
A. I'm sorry. I did not do any further analysis of its practicality. I saw that it was available, in commercial use, and so I considered it practical.
Q. You agree you don't have the expertise to evaluate whether replacing the Mark II system with the Mark III system would be safer; correct?
A. Would be what?
Q. Safer.
A. Safer. I do have some expertise that would come to bear

on that. I may not have all of it that would be required to make the replacement. But certainly, I believe, for example, the rechargeable battery system is safer.

MR. DOYEN: Let's look at Deposition 375, lines 13 through 19.

BY MR. DOYEN:

Q. You were asked:

"QUESTION: You would not have the full expertise to evaluate whether relacing the Mark II control system with the Mark III control system was a safer step?

"ANSWER: I would not be able to evaluate all aspects of it, no. I think it would require other expertise, as well."

Were you asked that question, and did you give that answer?

A. Yes, and that's exactly consistent with what I just said.

Q. You didn't do any analysis to see why the replacement of the Mark II system with the Mark III system would be a safer step, did you?

A. I did do analysis by default, I guess you'd call it, that monitoring of batteries is safer, and that's part of the Mark III system; therefore, the Mark III system is safer.

MR. DOYEN: Let's look at deposition page 375, lines 20 through 22.

BY MR. DOYEN:

Q. Immediately following this question and answer where you

said it would require other expertise:

"QUESTION: And you've got not done that analysis; is that correct?

"ANSWER: I have not done that analysis."

Were you asked that question, did you give that answer?

A. I think that's out of context. You should show more up above that.

Q. I'm happy to show that. Let's go back up to line 13 through 22.

"QUESTION: You would not have the full expertise to evaluate whether replacing the Mark II control system with the Mark III control system was a safer step?

"ANSWER: I would not be able to evaluate all aspects of it, no. I think it would require other expertise as well."

"QUESTION: And you've not done that analysis; is that correct?

"ANSWER: I have not done that analysis."

Were you asked those questions, did you give those answers?

A. Yes. And, again, it's talking about full expertise, other expertise; and those are the analyses that I didn't do because there are other people that would come into play, and they would do their analyses.

Q. In fact, Cameron issued a safety alert in February of 2009 about the Mark III system; isn't that correct?
A. Yes.
MR. DOYEN: Let's put up TREX-3626.18, please.
BY MR. DOYEN:
Q. Safety Alert from Cameron, dated 12 February 2009, regarding the Mark III modular drilling control pod. Do you see that?
A. Yes.
MR. DOYEN: Can we put up the following two pages, please. I believe it's TREX-3626.38, please.
BY MR. DOYEN:
Q. And the warning from Cameron notes that the issues that are being discussed with this system in February of 2009 could result in failure of the BOP to perform its intended function.
Do you see that?
A. I'd like to read the whole thing so that's in context. Give me a moment.
(Witness reviews document.)
Okay. Yes, I've read it.
Q. You did not discuss this safety alert in your report, did you, sir?
A. No, I didn't.
Q. You had some discussions earlier this afternoon about double-V shear rams. Do you recall that generally?

A. Yes.
Q. And your reports, your initial report indicated that there should have been CDVS rams. Do you recall that?
A. Yes.
Q. That stands for cable double shearing -- it stands for "cable double-V shear rams"; correct?
A. I believe that's true, yes.
Q. And you agree, don't you, that those rams were originally developed to cut cable, wire rope, and welding? Don't you?
A. Yes.
Q. They're for use in wireline operations, not drilling operations; correct?
A. No, that's not correct.
Q. Let's look at deposition pages 102, 23, to line 103-3.

"QUESTION: Is it your understanding that the Cameron CDVS blind shear ram was designed to be used in wireline operations, not drilling operation?

"ANSWER: I understand it was originally designed to cut wire rope, yes."

Were you asked that question, did you give that answer?

A. Yes. But --
Q. Did you --
A. -- the question you just asked me wasn't "designed to"; it was "used for."

04:45 **Q.** I think the question I asked you was exactly what's written on the page, but the record will reflect what the record reflects on that point. Cameron had said --

BY MR. DOYEN:

Q. You were aware at the time you prepared your report that there was a safety alert for the CDVS ram as well, weren't you?

A. Yes.

MR. DOYEN: Let's pull up 7661-A, TREX-7661-A. And then we have 1-B as well, same document.

BY MR. DOYEN:

Q. Cameron is reporting here that these rams fail to hold the rated pressure after 42 open/close cycles, including six pressure cycles.

Do you see that?

A. Yes.

Q. Cameron recommended, in fact, as a result of that, that the pressure rating of these rams be limited to 10,000 psi; correct?

A. Something to that effect.

Q. Okay. And, in fact, you didn't discuss this safety warning in your report either, did you?

A. No. Because it doesn't prevent use of CDVS rams.

Q. There is, in fact, no analysis in your report of the impact of this safety alert and the impact it might have on the rig's ability to use these type rams in the operation in which

it was engaged; isn't that true?
A. That's true, because it's not a major impact.
Q. You also talked about double-V design -- hang on one second. I'm going to see if I can do something about this wire that's creating so much trouble for the court reporter.

Let's see how that worked.

You suggested having double-V rams up at the center of pipe; correct?
A. Correct.
Q. You agreed that the blades of the DVS rams do not, however, go all the way across the wellbore; right?
A. In the case of the DVS ram, they do not.
Q. And you don't state anywhere in your report that use of DVS rams was industry practice at the time of the incident, do you?
A. I don't recall. I believe I mentioned CDVS rams only in my first report.
Q. And in your rebuttal report, there's no discussion suggesting that the use of DVS rams was standard in the industry, is there?
A. I don't believe so, no.
Q. You are aware, aren't you, that the Cameron shearing blind ram, the type of ram that was in use in this case, the blind shearing ram -- are you with me so far? Cameron calls that a shearing blind ram.

04:48 **A.** Yes, I know. They call it an SBR, yes.
04:48 **Q.** Right. That's the ram we're talking about. SBR/DSR, we're talking about the same ram. Are you with me so far?
04:48 **A.** Yes.
04:48 **Q.** Okay. You're aware that the Cameron SBR model has been used on subsea BOP stacks for many rigs that operate in the Gulf of Mexico, aren't you?
04:48 **A.** Yes, I am aware.
04:48 **Q.** And it's your understanding that the Cameron SBR, the blind shear ram model that we have on the *Deepwater Horizon* and pieces of the models in your report, is still being used by rigs that operate in the Gulf of Mexico; correct?
04:49 **A.** Yes, unfortunately, that is still true.
04:49 **Q.** Your report does not discuss the extent to which these rams are industry standard or common in the Gulf of Mexico, does it?
04:49 **A.** No, and that's not really my concern. I'm evaluating it from a technical point of view, separately.
04:49 **MR. DOYEN:** Your Honor, both in terms of the subject I'm about to get into and for biological reasons, could we go ahead and adjourn here today?
04:49 **THE COURT:** All right. It's about 10 minutes to 5:00. We'll go ahead and recess.
04:49 **MR. DOYEN:** Thank you, Your Honor.
04:49 **THE COURT:** Before we do that, let me just make a

couple quick announcements.

First of all, next week the only two overflow rooms will be B-407 in the Boggs building, which is Judge Moore's former magistrate's courtroom; and C-311, which is on the third floor, down the hall, in this courthouse.

Judge Shushan may or may not make her courtroom available at various times. That's strictly up to her. We will no longer have the fourth courtroom because crowds have been rapidly diminishing. We don't need all those courtrooms.

Judge Shushan will be over here in a few minutes. So those of you who need to admit exhibits, please stick around.

Everyone have a good weekend. We'll see everyone 8:00 Monday morning.

THE DEPUTY CLERK: All rise.

* * * * *

(The following proceedings were held before The Honorable Sally Shushan.)

THE COURT: Okay, guys. Mr. Miller. Mr. Miller.

I call us to order.

MR. MILLER: I'll get out of your way.

THE COURT: All right, guys. Let's get started. I think today is going to be very easy. The question is whether it's going to be fast and whether it's going to be expeditious. I think it's going to be both.

Mr. Nomellini, Mr. Irpino, why don't you-all come up to the podium. Let me thank both of you for spearheading this week's marshaling of the exhibits. You did a fantabulous job, that's F-A-N-T-A-B-U-L-O-U-S, in pulling together last week's list.

So we've got two lists here. One is 2/28/12. Has that been presented to Stephanie?

MR. IRPINO: No, that list has not been presented to Stephanie. We have it with us.

THE COURT: Terrific. That is a six-page exhibit list of all exhibits and demonstratives that were gathered for last week's marshaling conference on February 28th, 2013.

As I understand it, the list has been agreed to by all parties. Are there any objections whatsoever?

Good. Then that list will be admitted, and whatever is reflected on that list is the official record for that week.

Moving on from there, we have a list of agreed-upon exhibits and demonstratives for the March 7th, 2013 marshaling conference. It is a seven-page listing with the date, the witness, the exhibit or demonstrative number, the type, the party offering, and the ruling with any notes.

As I understand it, that list also has been agreed to by all parties. Does anybody have any objection to that list?

05:03 **MR. NOMELLINI:** I think, Your Honor, Carter Williams had a brief comment.

05:03 **THE COURT:** All right. Mr. Williams. And notice I'm calling you "Mr. Williams."

05:03 **MR. CARTER WILLIAMS:** Good afternoon, Your Honor. Just a note we wanted to make regarding two summary exhibits. The first exhibit number listed is 50132-37. That appeared as part of Summary Exhibit 52658 on page 5 of 7.

05:04 **THE COURT:** All right.

05:04 **MR. CARTER WILLIAMS:** I just want to be clear for the record that this is not page 37 of 50132; this is actually a range of exhibits that for the sake of saving a little ink, we put that in as a range. There are a couple others. That's the only one from 5268 [verbatim]. So that would be Exhibits 50132 consecutive to 50137.

Then on the summary chart -- exhibits admitted as underlying documents of the summary chart, 52661, there are the following ranges, which are all ranges consecutively numbered trial exhibits: Trial Exhibit 41040 to -42, 41053 to -54, 43009 to -17, 43029 to -31, 50969 to -70, 51277 to -78, and 51336 to -337.

05:05 **THE COURT:** Okay. Thank you.

05:05 **MR. CARTER WILLIAMS:** Your Honor, I believe, if I may turn it over to either Brad Brian or Kerry. They had a comment to make on the Bly exhibits.

05:05 **THE COURT:** Before you leave, Carter, let's really quickly talk about how we want to designate from here on the difference between a range of pages and a page designation. Why don't you all work on that this week and just agree to that. It doesn't matter to me -- whatever's easier for you. But I appreciate the clarification on the page ranges rather than page number.

05:06 And relative to the underlying exhibits that you just read, are we going to amend this list to show that? Or what is the group's thought with regard to that?

05:06 **MR. CARTER WILLIAMS:** Your Honor, I think the clearest thing to do would be to break them out into individual numbers. So we're going to add a few lines to the chart. That would just give us a 100 percent-no-questions-asked clear record.

05:06 **THE COURT:** That's fine. I have no problem with that. We will go ahead and agree that those revisions will be made and submitted as part of the record on Monday.

05:06 **MR. CARTER WILLIAMS:** Thank you, Your Honor.

05:06 **THE COURT:** Okay, Carter. Thank you.

05:06 Okay. Brad, you've got something you want to add?

05:06 **MR. BRIAN:** Brad Brian for Transocean, Your Honor. Actually, there's a couple things I want to subtract.

05:06 We had submitted a revised set of exhibits for

Mark Bly, consistent with the discussion with Judge Barbier the other day when he expressed a preference for, if possible, to give him individual pages and call-outs. So we did that.

BP had asked for a chance to look at that, and we sent them an e-mail indicating what the particular changes were. I think they've had a chance to look at that, and I think it's fine.

But there actually were a couple on there that we didn't use. So I would ask to remove from page 2 -- it's 001-56, 001-67. Those were not used. So they would be removed. In fact, I'm not even sure we had a call-out for those.

Then on page 3 --

MR. IRPINO: Brad, I think it's 56 --

MR. BRIAN: It's TREX-1-56 or -67.

MR. IRPINO: Both of those are out.

MR. BRIAN: They're out.

Then on page 3 of this list, it would be 295-21-A, which is a duplicate of another.

THE COURT: Okay.

MR. BRIAN: Then TREX-620-1, which is a duplicate.

THE COURT: Okay. So is that it, Brad?

MR. BRIAN: Is there one more?

That's it, Your Honor. Thank you.

THE COURT: Thank you. So subject to those

changes -- which, Carter, you'll take at lead on, please --

MR. WILLIAMS: Sure.

THE COURT: -- the list dated March 7th, 2013, will be adopted with those modifications, and they can be filed on Monday to memorialize today's marshaling conference.

Is there anything else that you guys want to cover?

I was going to talk to you all again tomorrow morning at the work group conference about some of the issues that have come up with regard to exhibits and demonstratives. Nothing big and new, but just to make sure we're on good footing. We'll modify it as we go.

But anything you all want to talk about this evening?

MR. KRAUS: Doug Kraus for Louisiana. Are we going as to go over witnesses that will be called for next week?

THE COURT: If you want to, we certainly can.

MR. KRAUS: Because I don't know that the plaintiffs are going to make it throughout the entire week.

THE COURT: They're not going to make it?

MR. KRAUS: I don't know. I looked --

MR. HERMAN: I think Transocean gave us --

MR. KRAUS: Oh, if they did, I haven't seen that.

THE COURT: Yeah. I thought we had seen Transocean.

Is that correct, Brad? Have you all sent out

your prospective list for next week?

MR. BRIAN: Your Honor, we were trying to figure out exactly when the PSC is going to rest. We've given them our first two witnesses for next week. We don't think we'll possibly get there.

We're going to try to actually give an informal list of the whole thing sometime tomorrow. It may fluctuate depending on the schedules, particularly of the CEO, whose schedule, as you probably expected, is pretty tight. We're trying to jockey around.

THE COURT: I would expect.

The first two witnesses that you disclosed are who so will Doug know?

MR. BRIAN: They are our two experts, Mr. Barnhill and Mr. Childs.

MR. KRAUS: Thank you.

THE COURT: Okay. Anything else that anybody wants to cover?

I hope our marshaling conferences will be this brief from now.

All right. Thank you very much. See you tomorrow.

(WHEREUPON, the proceedings were concluded.)

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CERTIFICATE

I, Jodi Simcox, RMR, FCRR, Official Court Reporter for the United States District Court, Eastern District of Louisiana, do hereby certify that the foregoing is a true and correct transcript, to the best of my ability and understanding, from the record of the proceedings in the above-entitled and numbered matter.

s/Jodi Simcox, RMR, FCRR
Jodi Simcox, RMR, FCRR
Official Court Reporter