Deposition Testimony of:

Craig Gardner

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Page 9:08 to 10:02

00009:08 CRAIG ALAN GARDNER
09 was called as a witness by the Plaintiffs and,
10 being first duly sworn, testified as follows:
11 DIRECT EXAMINATION
12 QUESTIONS BY MR. THORNHILL:
13 Q. Good morning, Mr. Gardner. I'm Tom
14 Thornhill, with Emily Gebhardt, my associate.
15 We're with the PSC.
16 You and I met moments ago, and I thank
17 you for being here this morning. It's our
18 understanding that we'll be taking the Corporate
19 Representative deposition of Chevron and your
20 individual deposition at the same time. To make
21 it easy any time I ask a question that I intend
22 to be a representation by the company, I'll try
23 to make that clear.
24 A. (Nodding.)
25 Q. Otherwise, it will generally be what you
00010:01 know.
02 A. Yes, sir.

Page 10:14 to 10:20

00010:14 Q. Tell me a little bit about your
15 educational background beginning past high
16 school.
17 A. I have a Bachelor of Science in Chemistry
18 from the University of Houston, 1977.
19 Q. Okay.
20 A. And no post-grad work.

Page 10:25 to 11:25

00010:25 Q. All right. Did you take company training
00011:01 courses at Chevron?
02 A. Cement related, I learned -- I learned
03 from Team Members when I joined the Team in 1981.
04 Q. I assumed that you left the University of
05 Houston and went directly for your employment at
06 Chevron, but apparently, there was a little stint
07 of about four years where you worked elsewhere?
08 A. I -- it wasn't quite four years. In
09 1978, I went to work for a major mud company,
10 Milchem, at the time. I was with them until
11 1980.
12 In 1980, I joined Gulf Oil as a fluid
13 specialist. In 1981, transitioned from fluids to
14 cementing.
15 Q. Since 1981, has your work been primarily
16 in the laboratory?
17 A. Not only laboratory. The -- the Team
18 provides technical services, worldwide

operations, so it's a combination of lab and office and on-site work.
Q. Have you worked on the rigs to actually pump the cement jobs?
A. I have been on the rigs for jobs. I have not worked for a cementing company and done the actual pumping.

Page 12:07 to 12:21

Q. While you've been at Chevron, did you go to offshore rigs and work?
A. Yes, sir.
Q. And you saw the actual pumping of the job?
A. Yes, sir.
Q. Is it fair for me to say your primary responsibility is the design of the cement jobs?
A. The designs and placement recommendations, yes, sir.
Q. Okay. Now, in design, that would be the chemical design. Would that also include the modeling of the fluids to be pumped?
A. Both. The cement job is the slurry design and the placement recommendations.

Page 13:25 to 14:15

Q. All right. Did you have any other training or special education that relates to what you do?
A. I mean, I -- I attend seminars. I have experience in the American Petroleum Institute. I'm a past Chairman of the subcommittee on Well Cements. I've been Team Leader of the Cement Teams since 1999.
The only other experience, I did two years of rotational assignment in Papua, New Guinea in the late 1980s. That was mostly primarily a fluids role.
And I spent approximately two years in the early 1990s supervising the Chevron Fluids Lab. But all the intervening time otherwise is cement and Cement Team Leader.

Page 14:20 to 14:23

Notices of Deposition, and they are, in the case of Notice to Chevron, 4559, and in the case of the Notice to you, Mr. Gardner, individually is 4560.

Page 15:02 to 15:14

00015:02 Q. (By Mr. Thornhill) Mr. Gardner, I -- you
03 mentioned that you were involved in certain
04 associations. Are you a member of the SPE?
05 A. Yes, sir.
06 Q. And do you serve on any API boards or
07 Committees?
08 A. I am -- I am the Chevron voting member on
09 the Subcommittee 10 on Well Cements, and I'm the
10 Chevron Representative on the Committee on
11 Standardization in Oil Field Equipment and
12 Materials.
13 Q. Okay.
14 A. I'm also a member of ISO Work Group 2.

Page 15:19 to 15:21

00015:19 Q. All right. I've noticed you've written a
20 couple of papers on zonal isolation?
21 A. Yes, sir.

Page 16:03 to 16:12

00016:03 Q. In connection with this matter, I
04 understand that you received an assignment from
05 the company as a result of a request from the
06 National Commission on the BP DEEPWATER HORIZON
07 Investigation?
08 A. Correct.
09 Q. All right. Did the company ask you to do
10 work to respond to the request of the National
11 Commission?
12 A. Yes, sir.

Page 16:20 to 18:11

00016:20 Q. Who was the person that asked you to
21 commence your investigation?
22 A. Gary Luquette.
23 Q. Can you spell his last name, please?
24 A. L-u-q-u-e-t-t-e.
25 Q. What's his role with Chevron?
00017:01 A. He's President of Chevron North America.
02 Q. And did he explain to you what your
03 duties would be in this assignment?
04 A. He and the Vice President of Drilling,
05 Mr. Dave Payne, P-a-y-n-e. It was actually
06 Mr. Payne who called me and -- and explained that
07 they wanted us to test the -- the slurry design
08 used on the -- on the Macondo Well.
09 Q. Were you given an outline of information
10 on what the slurry design should look like, or
11 were you given samples? I know that's two
12 questions in one, but can you give us a feeling

for what you were given as a -- parameters for the work that you were to do?
A. Okay. The work we did is based on the Halliburton Lab Report of April 12th.
Q. All right.
A. The samples were supplied to us by Halliburton Laboratory in Broussard at the request of the Commission.
Q. So you were given the April 12 Lab Report; is that fair to say?
A. That's correct.
Q. And then you were provided samples by way of the National Commission requesting from Halliburton, correct?
A. Yes, correct.
Q. And then you did what? What was your next step?
A. We -- the Team, my Team, there were -- there are several other Cementing Specialists on the Team. We had a meeting with Mr. Sankar, and also the Commission's third-party Representative, Erick Nelson, and we outlined, based on the 12th Report, how we planned to go ahead with the tests with respect to schedules and test protocols.

Page 18:17 to 19:04

Q. Okay. So the work done was gratis, for no charge?
A. That's correct.
Q. Were you given by the Commission any instructions on how to perform tests that you thought might need to be performed?
A. No, they -- they did not instruct us in the methods to be used.
Q. Did they give you any instructions? "They" being the National Commission.
A. The National Commission? The -- the outline of the testing protocol was pretty much up to us.

Page 19:12 to 19:24

Q. But did you and your Team establish a procedure or protocol for the tests?
A. Right. Maybe I can make it a little plainer. We tested under appropriate API and ISO protocols.
Q. Okay.
A. Within API and ISO protocols there's a range of ways that any individual test could be run. And where we could determine from the April 12th Report, we used those protocols, those variations of the protocol. Where we could not

23 determine, then we tested acro -- a range of
24 protocols across likely scenarios.

Page 20:21 to 20:22

00020:21 MS. GEBHARDT: 4561.
22 (Exhibit No. 4561 marked.)

Page 21:01 to 21:04

00021:01 Q. (By Mr. Thornhill) Take a look at that,
02 if you don't mind. It purports to be a document
03 with a Chevron Bates No. CVX80311 and then
04 00000885.

Page 21:09 to 22:21

00021:09 before, Mr. Gardner?
10 A. Yes, sir.
11 Q. What does this represent?
12 A. This is a page out of the laboratory
13 receiving book, so samples which would arrive in
14 the laboratory are assigned a number. That's
15 what you see in the first column. There's a --
16 there's a listing in the center of the materials
17 that were received in that particular shipment.
18 The use might be listed as a well, it might be
19 listed as a Project. In this case, it says: "BP
20 Deep Water Horizon," and then the location "Cab"
21 is cabinet, so that's the location within the
22 laboratory where the materials were stored.
23 Q. Okay. Do you know if this document,
24 Exhibit No. 4561, represents the list of the
25 sampling material you received?
00022:01 A. That is the list of the materials we
02 used, plus it -- the first entry is the materials
03 from Halliburton. The third entry is the
04 five-gallon mud sample from M-I SWACO that is
05 mentioned in the Report.
06 Q. Okay. Is this a comprehensive list of
07 the materials that you used in your testing?
08 A. Correct.
09 Q. All right. Now, I understood that you
10 had available to you one of the lab tests for
11 Chevron's -- I mean, for Halliburton's work, and
12 I'll ask you to turn to Tab 81 and tell us if
13 that document represents the laboratory testing
14 results from Halliburton which you received.
15 For the record, this is a document,
16 Chevron Bates number, among others on the
17 document, CVX80311 00000314 and following, and
18 we'll give it an Exhibit No. 5 -- 4562, 4562.
19 Purports to be the "LAB RESULTS- Primary" from

20 April 12, 2010, correct?
21 (Exhibit No. 4562 marked.)

Page 23:14 to 23:18

00023:14 When -- when we see this document,
15 though, does it represent that which you had to
16 work with as the information from Halliburton's
17 testing lab?
18 A. Yes, sir.

Page 24:07 to 24:11

00024:07 an Exhibit No. 4563.
08 (Exhibit No. 4563 marked.)
09 Q. (By Mr. Thornhill) Have you seen this
10 before?
11 A. Yes, sir.

Page 24:13 to 24:15

00024:13 Spacer," dated April 6, 2010, is a document that
14 we understand you received from Halliburton, as
15 well. Are we correct?

Page 24:18 to 24:20

00024:18 Q. Yes, sir.
19 A. From Halliburton through the Commission,
20 I believe.

Page 25:19 to 25:24

00025:19 Q. (By Mr. Thornhill) Is that the lab
20 Weigh-up Sheets in front of you?
21 A. Yes.
22 Q. Have you seen those before?
23 A. I have seen this type of lab Weigh-up
24 Sheet.

Page 26:02 to 26:16

00026:02 Q. (By Mr. Thornhill) Let me ask you, sir,
03 where -- where did you see these before?
04 A. I believe they're information we received
05 from the Commission.
06 Q. And did you examine this as part of your
07 work for the Commission?
08 A. We based our tests on that original 12th
09 document. I don't know that -- I don't know we
10 had the Weigh-up Sheets on the original when we
11 began the tests.

Q. Okay. Did you receive this information later?
A. I believe it was received after we did the initial planning for how we were going to do the tests, yes.

Page 27:06 to 27:18

Q. (By Mr. Thornhill) That's the April 13, 2010 Report, correct?
A. (Reviewing document.)
Q. Should be Cement Lab Weigh-Up Sheet, April 13, 2010?
A. Oh, I'm sorry. I didn't realize you were talking to me.
Q. Is that correct?
A. That is correct.
Q. All right.
MR. THORNHILL: We'll give that a No. 4564.
(Exhibit No. 4564 marked.)

Page 28:15 to 28:24

Q. (By Mr. Thornhill) Okay. And -- and thank you for that explanation of 4564.
All I'm trying to do is find out what information you considered as part of your work.
A. Basically the April 12th's Report.
Q. All right. And -- and am I correct in saying that you did not consider the detailed information or materials for the composition of the slurry as demonstrated on this Exhibit 4564?
A. That would be correct.

Page 30:22 to 32:11

Q. All right. Now, let's see. There are documents at Tab 77 that I need to ask you about and determine if you considered them. This document under Tab 77 on its first page is CVX80311 000000001 through 22. At the top right on the first page it says, "Halliburton Foam Testing Procedures," correct"?
A. Seventy-seven?
Q. You're looking at it right there. I think that's the right number.
MS. GEBHARDT: Yes.
A. Okay. I'm sorry, upper right. "Standard Testing," yes, sir.
Q. (By Mr. Thornhill) "Halliburton Foam Testing Procedures," correct?
A. Yes, sir.

Q. All right. Did you consider the information in this document for purposes of your testing?
A. We reviewed this, but were familiar with this document as that it incorporates quite a bit of RP 10B-2, 3, 4, various documents there, so --
Q. Okay. Was this a document that you received from the Commission?
A. This is a document that came from Halliburton through the Commission.
Q. Okay. When you say that you reviewed the document, does that mean that you and others on your Team studied it and considered its contents for purposes of your conducting the tests that you were about to perform?
A. It means we looked at it to try to glean information if there were any Halliburton-specific procedures we had not accounted for in our protocol.
Q. Were there any --
A. No.
Q. -- Halliburton procedures you had not accounted for?
A. There were not.

Page 32:16 to 32:19

MR. THORNHILL: 4567 is the document number for that which we just read into the record.
(Exhibit No. 4567 marked.)

Page 33:13 to 33:14

the equiv -- this is a section out of the Halliburton Global Best Practices Manual.

Page 34:04 to 34:06

Q. And you had that document for foam testing provided to you, as well?
A. That's correct.

Page 34:14 to 36:03

MR. THORNHILL: This document we'll give a -- a number, 4568.
(Exhibit No. 4568 marked.)
Q. (By Mr. Thornhill) It's a document marked with a Chevron CVX80311, Pages 23 through 33. It says at the top, "Atmospheric Foam Slurry Preparation," correct?
A. Yes, sir.

Q. All right. Explain to us what this document says.
A. This document outlines the Halliburton test procedures for testing foam cement slurries under atmospheric conditions. The test protocols in here are -- are pretty much taken from API RP 10B-4 ISO 10426-4. It, of course, has been reformatted by Halliburton, and some notations within their document to things like their own computer systems and stuff, but the protocols are basically API RP 10B-4.
Q. May I ask you now some general questions about the API and ISO testing procedures as they relate to this document?
A. Yes, sir.
Q. Are you familiar generally with the tests that should be performed to adequately examine the suitability of a cement fluid design to comply with API and ISO requirements?
A. Yes, sir.
Q. Is it fair for me to say that the API and ISO testing requirements were established by gentlemen and ladies who serve in capacities like yours on the various Committees of API and ISO, which you earlier in today's deposition told us you serve upon?
A. That's correct.
Q. All right. Is it fair for me to say that those general testing protocols are accepted industry norms or standards to which all companies subscribing to those protocols performed their tests?

Page 36:05 to 36:21

A. They are -- they are generally accepted. They are not -- they are not restrictive. In other words, a company in a research facility may do other tests on a cement slurry outside of the RP.
Q. (By Mr. Thornhill) Okay. So --
A. But the RP's are -- the RP's are generally well-known and distributed and serve as the basis for company practices.
Q. All right. Now, when you used the letters RP, that's a Recommended Practice, correct?
A. That's correct.
Q. And are you telling us today that most companies take the API and ISO Recommended Practices and integrate those into individual company's protocols --

Page 36:24 to 36:25

00036:24 Q. (By Mr. Thornhill) -- individual
25 company's protocols for the testing procedures?

Page 37:03 to 37:09

00037:03 A. That would be correct.
04 Q. (By Mr. Thornhill) Okay. In the case of
05 Chevron, has it, like you generally described for
06 most companies, taken the API and ISO testing
07 protocols and integrated it to a Chevron testing
08 manual?
09 A. That's correct.

Page 37:11 to 37:12

00037:11 A. And we also use test protocols which are
12 not incorporated in API --

Page 37:15 to 37:15

00037:15 A. -- for other testing.

Page 38:03 to 38:15

00038:03 Q. (By Mr. Thornhill) Okay. So, then, do I
04 understand correctly that, in the case of
05 Chevron, that which we see in the document we
06 labeled as 4568, the foam cementing testing
07 protocols, 10B-4, as we might refer to it
08 shorthand, would reflect the same protocols used
09 by Chevron?
10 A. That should be correct, yes.
11 Q. All right. Are there any special foam
12 testing protocols that you would expect to be
13 used with respect to the Macondo Well,
14 particularly the DEEPWATER HORIZON's drilling of
15 the Macondo Well, as this case relates?

Page 38:18 to 39:09

00038:18 A. I have no knowledge of the particulars on
19 the Macondo Well.
20 Q. (By Mr. Thornhill) Okay. Now, would it
21 be fair for me to say that ISO 10426-4 is
22 essentially the equivalent of 10B-4?
23 A. All API and ISO documents in cementing
24 are technically equivalent documents, with the
25 exception of one clause in 10B-6, which is not
00039:01 under this discussion. So the answer to your
02 question is "Yes."
03 Q. Okay. Now, we've taken many depositions

04 involving cementing, and for the sake of those
05 who might be reading this, the Court and others
06 who are interested in this testimony, would it be
07 fair for me to refer to these API and ISO
08 documents as essentially the bible that's used by
09 cement testers?

Page 39:11 to 39:25

00039:11 A. They are a basis, but they're not
12 restrictive.
13 Q. (By Mr. Thornhill) Right. From the --
14 the point of view of those doing the work on the
15 testing of the cement slurries, those documents
16 provide categories of information that outline
17 the testing protocols, correct?
18 A. Correct.
19 Q. All right. Now, in the ISO and API
20 documents pertaining to foam cement, would it be
21 fair for me to say that you would normally expect
22 to see several tests run, and I'm going to list
23 those tests: First, the -- there would be
24 performed on the unfoamed slurry, thickening
25 time, rheology, fluid loss, and free fluid tests?

Page 40:02 to 40:07

00040:02 A. Those are all contained in -- as test
03 protocols in the documents, yes.
04 Q. (By Mr. Thornhill) And that's what you
05 would expect to see performed as tests on a
06 prospective foam slurry and its associated
07 unfoamed base slurry?

Page 40:09 to 40:18

00040:09 A. Are you asking me whether I would expect
10 every test contained in the document to be
11 performed in every situation?
12 Q. (By Mr. Thornhill) Generally, yes.
13 A. The document gives protocols so someone
14 desiring to do one of those tests would have
15 guidance on how to do one of those tests. It
16 doesn't necessarily mean, in API documentation in
17 general, that every test would be done in every
18 circumstance. An --

Page 41:11 to 41:15

00041:11 Q. Okay. Generally, do you know of any
12 facts that relate to the cement job around the
13 production casing on the Macondo 252 No. 1 Well
14 that would preclude the application of any of the

15 tests outlined in 10B-4 and the ISO 10426-4?

Page 41:17 to 42:01

00041:17 A. I do not have that detailed knowledge.
18 Q. (By Mr. Thornhill) Okay. Is it also
19 common -- or put differently -- expected by those
20 who are in the cement testing business, that
21 there would be performed on the foam cement
22 slurry, compressive strength and foam stability
23 tests before the performance or pumping of a
24 cement job?
25 A. Those two tests are commonly performed on
00042:01 foam cement, yes.

Page 42:09 to 42:18

00042:09 remember, this is not a test. But is it fair for
10 me to describe the fluid loss test as being a
11 test that's designed to measure slurry
12 dehydration during and immediately after
13 placement?
14 A. It's a test to give -- okay. The fluid
15 loss tests gives comparative results between
16 different cement designs on how easily they would
17 be dehydrated. It does not translate directly to
18 a volume loss downhole.

Page 43:11 to 43:21

00043:11 Q. Okay. But those two names are used to
12 refer to fluid loss tests that are commonly run
13 on foam cement slurries in advance of pumping the
14 job, correct?
15 A. If they were run, they would be run on
16 the base.
17 Q. Okay. And when you say "the base," you
18 mean the --
19 A. The unfoam --
20 Q. -- base cement?
21 A. -- the unfoamed slurry.

Page 44:10 to 44:20

00044:10 Q. It does. All right. Free fluid. Is it
11 fair for me to say that the free fluid test
12 assesses the cement slurry for stability at
13 downhole temperature?
14 A. It's assessing it for stability. The
15 test is not necessarily conducted -- the
16 quiescent period is not necessarily conducted at
17 downhole temperature.
18 Q. Is free fluid test, like fluid loss

tests, one of those tests commonly run on foamed slurries in advance of pumping the job?

Page 44:22 to 44:22

A. It is commonly, yes.

Page 45:09 to 46:02

Q. Okay. Help us with understanding static gel strength. Is it correct for me to say that this test measures the transition of cement slurry from its liquid state to a set state under downhole slurry conditions?
A. Yes, sir.
Q. All right. With respect to the rheology test, is it generally the study of the flow and deformation of fluids under applied stress?
A. Yes.
Q. Is the foam slurry, or the base slurry, normally tested for rheology tests?
A. Normally, base.
Q. Normally the base slurry, correct?
A. Yes, sir.
Q. Now, for the foam mix and stability test, is that generally a test to determine how long the slurry takes to foam under atmospheric conditions?

Page 46:04 to 47:09

A. The test is to test the stability. How long it takes to foam is one of the parameters in the test.
Q. (By Mr. Thornhill) Okay. What are the other parameters of the foam stability test?
A. The way the foam stability test is run, is the foam is generated using atmospheric air -- using air, not nitrogen, in a blender bowl, a -- like similar -- a Waring blender bowl. And then that foam -- and so that time that you asked about, how quickly that foam is formed is one of the characteristics of the test.
And then that foam, the density is checked on it to see whether it foamed to the designed density. And then it is allowed to stand quiescent in a -- it is poured into a graduated cylinder and allowed to stand quiescent for two hours, and observed visually for signs of instability. And there are some suggestions in the document outlining what those might be.
And optionally, you could weigh aliquots of the unset foam from the graduated cylinder.

00047:01 And optionally, you can cure them in PVC tubes
02 and measure the density of sections by Archimedes
03 principle. All of that is described in 10B-4.
04 Q. Okay. Is it fair for me to say that the
05 foam stability test not only wants to determine
06 whether the slurry foams, and how long it takes
07 to foam, but also whether the nitrogen, or
08 foaming substance, will break out after pumping?
09 A. Yes.

Page 47:25 to 48:02

00047:25 Q. So the compressive strength test tests
00048:01 the strength of compression, or load, as you just
02 referred to, to break the set cement, correct?

Page 48:04 to 48:05

00048:04 A. Correct. It's a uniaxial unconfined
05 test.

Page 48:13 to 48:19

00048:13 Q. (By Mr. Thornhill) Now, the last category
14 of test I'd like to ask you about are the fluid
15 compatibility tests. Can you describe for us the
16 fluid compatibility tests normally run on a foam
17 cement job in advance of placement?
18 A. Fluid compatibility or contamination
19 testing?

Page 49:01 to 49:13

00049:01 Q. Okay. Explain both for us, then, if you
02 don't mind.
03 A. A fluid compatibility test is not
04 restricted to foam jobs, but you would be -- you
05 would be testing the effect of two fluids, say, a
06 spacer and a cement or a cement and a mud, to
07 make sure that mixing them together do not create
08 any viscous mass. So that's a compatibility
09 test.
10 A contamination test, for instance, might
11 take a cement slurry and contaminate it with a
12 portion by volume of drilling fluid to see the
13 effects.

Page 50:13 to 50:17

00050:13 Q. Okay. Now, did you examine any documents
14 to determine whether or not any of the tests that
15 we just went over were not run by Halliburton on

the foam cement or the base cement for the foam job around the production casing?

Page 50:19 to 51:01

A. The document I -- that we base the testing on was the April 12th Lab Report.
Q. (By Mr. Thornhill) Okay. And is it fair for me to say that you, therefore, did not look at and consider for purposes of your reporting to the National Commission any of the other tests that may have been run by Halliburton?
A. Correct.

Page 53:08 to 53:14

Q. Okay. Did you consider the information in the Bly Report, particularly Exhibits J and K to the Bly Report that we just went over, for purposes of your analysis of this cement?
A. As described in my Report, the document in Appendix J is the document on which we based our testing.

Page 53:16 to 53:17

A. Appendix K, we did review it, and there are some references to Appendix K in our Report.

Page 55:24 to 56:10

Does Chevron perform tests for its cement jobs in-house as opposed to sending out the cement tests for testing -- the cement for testing by third-party laboratories?
A. Our laboratory performs technical service work for Chevron operations worldwide. We do not test for every slurry that Chevron pumps. So it is a -- it is a Business Unit decision whether our services are used. I mean, we have a -- we have a broad -- we have a broad customer base, but I don't want you to think that every cement job that Chevron pumps goes through our lab.

Page 56:15 to 57:03

Q. Now, is it -- is it also true that Chevron does not perform tests for third-party companies? Generally speaking, it's not in the business of performing third-party cement tests?
A. Generally speaking, that's true.
Q. All right. In this case, this was a

unique assignment for Chevron from the National Commission, correct?
A. Correct. A request from the Commission which Chevron agreed to.
Q. But I would be fair in saying that your understanding of your assignment in this case was as a public service?
A. That's correct.

Page 60:10 to 60:17

Q. (By Mr. Thornhill) Okay. Would it be fair for me to say in sort of layman's characterization of the tests that the thickening time test measures the time from mixing to the time that the cement after pumping begins to set?
A. Under dynamic conditions.
Q. Right.
A. Yes.

Page 63:20 to 64:21

Q. If -- if you're intending to place this cement very deep in the earth, we're going to use a -- a figure of 18,300 feet from the rig floor to where you intend to place the cement, you would -- you would estimate the placement time, the time that it would take to pump from the rig floor down to that level, right?
A. Correct.
Q. And that's the estimated placement time, correct?
A. Right.
Q. All right. Now --
A. Well, the estimated placement time is the time to complete the job, not just to get it to the shoe.
Q. Okay. And -- and when you say "complete the job," that means from the time that the cement is mixed, pumped down the hole to its intended location, which generally is around the pipe or the cement, at a location different from the bottom, it may go around the shoe to a location, and that time, elapsed time that you estimate is the estimated job --
A. Is the job -- is the job placement time.
Q. -- job placement time, okay, or estimated placement time, as I referred to, correct?
A. Correct.

Page 65:02 to 66:03

Q. Now, does the temperature of that which

would be the intended placement factor into your placement time?
A. It factors into how it's tested.
Q. Okay.
A. If I need seven hours to do the job, I need seven hours to do the job. The temperature that I -- the test schedule that we use is based on well parameters such as temperature.
Q. And is it fair for me to say that, generally, the temperature of placement increases after the cement is put in place, so that the temperature, when the well is circulating, is lower than when the cement is put in place?
A. The -- the theoretical or the undisturbed formation temperature is referred to as "bottomhole static." During the course of placing the cement job, circulating the well, whatever you do with it, that temperature cools off.
The temperature, the stabilized temp -- the estimated stabilized temperature for the cool down is the bottomhole circulating temperature, and the bottomhole circulating temperature is the temperature used to run the thickening time test.
After the cement's in place, then the well will begin to return to geothermal gradient.

Page 68:25 to 70:03

Q. Do you consider in connection with your running the thickening time test and in the compressive strength test the likely increase in temperature from circulating toward static, and the time that it would take for that increase in temperature?
A. Are you asking me whether the temperature ramp on a compressive strength test is based on a modeling of the return from circulating to static?
Q. Yes.
A. We usually -- in the Chevron Lab, we usually use a four-hour heat-up. That's -- that's based on internal work on using just exactly what you're asking, heating it on thickening time, bringing it to schedule, et cetera, et cetera.
So over time, the protocols we've developed are a four-hour heat-up and a full bottomhole pressure.
Q. Okay. If you have downhole wire log information available to you to establish bottomhole static temperature, and you know from measurements while drilling the circulating temperature at bottomhole, do you compare the time that it would take to go from circulating

00070:01 temperature to static temperature based on that
02 log data?
03 A. Not generally.

Page 70:05 to 70:12

00070:05 A. And -- and the clarification on that is
06 logs do not necessarily give you static, and MWD
07 does not necessarily give you circulating.
08 Q. Okay. So what parameters do you look to
09 to establish circulating and static temperatures?
10 A. You could -- you take into account MWD
11 data, but there are reasons why it's not -- it's
12 not perfect for this use.

Page 71:11 to 72:09

00071:11 Q. Okay. So is it fair for me to say that
12 normally the Chevron wells that are drilled rely
13 upon temperature modeling software, such as the
14 Landmark software to which you made reference,
15 and I believe Landmark is a Division of
16 Halliburton?
17 A. Correct.
18 Q. So the Landmark software, as I understand
19 what you're telling me, actually calculates for
20 you, using the parameters that you gave us on
21 fluids and rock and other things --
22 A. (Nodding.)
23 Q. -- the circulating and the static
24 temperature?
25 A. No. It calculates the circulating. The
00072:01 static is an input.
02 Q. Okay. So you make an assumption for
03 static and input that?
04 A. You take your -- you take the temperature
05 data that you have, which could be these logs you
06 refer to earlier, and you would use that for your
07 static -- as -- as some of your temperature input
08 for your static. You consider all of your
09 temperature data.

Page 73:18 to 73:22

00073:18 Is it -- is it, in your experience,
19 normal or common that those who are drilling the
20 wells, conducting the testing, either in-house or
21 through the service companies, make sure that
22 this temperature model has been run?

Page 73:24 to 74:08

00073:24 A. It's not mandatory to run -- not

everywhere in the world has a temperature model run. I referred to earlier, depending on the well characteristics, you may use API schedules.
Q. (By Mr. Thornhill) With respect to the API schedules you referred to, are there requirements for when you run a temperature model?
A. There are no requirements. API RP 10B-3, deepwater cement testing, recommends a model.

Page 75:12 to 75:21

Q. Okay. May we turn to Tab 1 in your book, please. This is your Report to the National Commission. And we'll give it a -- an exhibit number, which is 4572.
(Exhibit No. 4572 marked.)
Q. (By Mr. Thornhill) This is the October 26, 2010 letter. It says on the second page at the bottom Craig Gardner and has a signature; is that your name and signature?
A. Yes, sir.

Page 75:25 to 76:12

Does this Report include all of the information that was considered and used in performing the tests at Chevron?
A. Yes.
Q. All right. Does this Report show your evaluation of any of the methodologies that were undertaken at Halliburton when it performed certain tests, such as the April 12 test, that you considered?
A. It discusses why we selected the protocols we did. As described in the Report, we do not have knowledge necessarily of the exact protocols Halliburton used.

Page 77:16 to 78:14

Q. Your modeling was intended to be based upon that which the Commission gave you for purposes of reference data, and that was the April 12 test?
A. Correct.
Q. And we've gone over the lab testing sheet and gave it an exhibit number, correct?
A. Correct.
Q. All right. Now, was it part of the purpose of your undertaking to reflect on the Halliburton work for the Commission and evaluate the competency of the people who were performing

the tests at Halliburton?
A. No.
Q. Was it your purpose at Chevron to evaluate the testing procedures used by Halliburton at each juncture for each test as distinguished from the general parameters of the API 10B-4 documents, which we -- we reviewed?
A. The purpose was not to evaluate -- was not to evaluate the Halliburton protocol.
Q. Okay.
A. Because we didn't know -- we were not supplied details of the Halliburton protocol.

Page 79:23 to 80:03

Q. (By Mr. Thornhill) Right. And for those of you in the business of drilling wells and performing tests on cement before it's pumped, the tests that we itemized as common before pumping the cement, were tests that were outlined in those documents, correct?

Page 80:05 to 80:13

A. But again, those tests are not restrictive. A company could use and could present data from a proprietary test, which, indeed, was done here with Halliburton FYSA.
Q. (By Mr. Thornhill) Okay.
A. So the API documents are commonly distributed, commonly used, but they are not restrictive in the sense that you're not allowed to do anything but.

Page 81:05 to 81:11

Is -- is it my understanding, then, that at Chevron, you did or did not consider the detailed facts that relate to the prospective placement of the cement at the production casing level on the Macondo Well.
A. We used the OptiCem simulation on one thickening time test to get a heat-up rate.

Page 81:13 to 81:23

A. That's probably the extent of anything that was not on the April 12th Report.
Q. Did you have available to you in your lab the OptiCem software to make the calculations for thickening time, or did you utilize documents provided to you through the Commission?
A. My Team -- the first part of your

question, do we have access to the software? The answer is yes. The second part of the question, we used the OptiCem Report provided by the Commission for the heat-up rate.

Page 81:25 to 81:25

A. For -- for a heat-up rate calculation.

Page 82:09 to 82:13

well, I need the -- let's start with document under Tab 80, and this has a Chevron Bates number 158 through 179. And it's a "Production Casing Design Report" of April 15, 2010, from Halliburton.

Page 82:15 to 82:16

MR. THORNHILL: Document No. 4573 will be our exhibit number.

Page 82:18 to 82:22

Q. (By Mr. Thornhill) All right. Did you consider the information in this Model or Design?
A. I believe this is the document that they made some heat-up -- we made some heat-up rate calculations from.

Page 84:04 to 84:04

there is another document, has the Chevron Bates

Page 84:07 to 84:18

Q. (By Mr. Thornhill) -- last three digits, 318 through 329. And it says it's a "HALLIBURTON" "9 7/8" X 7" Production Casing" document, has a date of "April 17, 2010, Version: 5."
Do you see that?
A. Yes.
Q. All right. Is that information information that was considered on how the job would be performed?
A. It was probably used in conjunction with the prior data to get the heat-up rate.

Page 84:20 to 84:20

00084:20 A. The second thickening time test.

Page 84:22 to 84:24

00084:22 MR. THORNHILL: This document that
23 begins with Chevron's No. 318, we're giving a
24 No. 4574 as our exhibit number.

Page 86:15 to 87:07

00086:15 Q. Okay. So just so we'll understand, the
16 assumptions made with respect to heat-up rate,
17 you were using these Reports from Halliburton to
18 give you parameters for your assumptions?
19 A. The April 12th Report has a thickening
20 time test schedule on it with an 83-minute
21 heat-up rate, I believe.
22 In addition to that test, we conducted
23 another thickening time test with a different
24 heat-up rate that was more reflective of the
25 OptiCem estimated time to bottom. And we ran
00087:01 that test to be sure that the slower heat-up rate
02 didn't greatly affect the retarder response.
03 Q. Okay. For purpo -- for purposes of my
04 being able to -- to understand the comparison of
05 the heat-up rates, do you remember the heat-up
06 rate that you used as the longer heat-up rate?
07 A. It's in the Report.

Page 87:18 to 87:19

00087:18 A. Yes, on Page 4, Section 1, 135 and 83,
19 and 135 and 230.

Page 90:04 to 90:18

00090:04 Q. Okay. Thank you. Now, let's, if we can,
05 generally talk about your lab results. I see in
06 your lab results, several references to the foam
07 cement slurry would not mix -- or was not stable,
08 let me say that; that it was not stable. Is --
09 is that a fair conclusion from the testing that
10 you did?
11 A. Yes, sir.
12 Q. So we'll go over each Section in a
13 minute. But generally speaking, did you, at
14 Chevron, feel that the foam cement design that
15 was utilized in the production casing job on the
16 Macondo Well was one that should not have been
17 pumped because the foam cement design which you
18 tested was not stable?

Page 90:22 to 91:20

00090:22 A. What you have is exactly what we tested,
23 the slurry from the April 12th, and the results
24 that they were unstable. We made no conclusions
25 about what should or should not have been pumped.
00091:01 Q. (By Mr. Thornhill) Okay. And -- and I
02 know I'm drawing conclusions, so I -- I apologize
03 for that, but is it -- is it fair for me to say
04 that, when you tested the foam cement design
05 provided for the foam cement job -- for the
06 production casing job, that is, you, at Chevron,
07 concluded that the cement would not be stable?
08 MR. HILL: Objection, form.
09 MR. SARVER: Object to form, as
10 well.
11 A. That is the sentence -- the last sentence
12 on the second page reflects that we were unable
13 to generate a stable foam.
14 Q. (By Mr. Thornhill) Okay. And -- and that
15 was true for multiple tests that you ran on
16 the -- on the foam cement design, correct?
17 A. Correct.
18 Q. Just so that the Court will understand,
19 what does it mean to you, as a tester, when you
20 see a foam cement design that is not stable?

Page 91:22 to 92:03

00091:22 A. The goal in designing a foam cement job
23 is to end up with a slurry that, after it has
24 set, has a uniform distribution of gas.
25 So an unstable system means either the
00092:01 solids are settling out of it, and/or the gas is
02 breaking out of it, so the resulting density is
03 not uniform.

Page 92:10 to 92:12

00092:10 When you find that the cement is
11 unstable, does that instability reflect the
12 prospective breakout of the gas from the cement?

Page 92:14 to 94:21

00092:14 A. That's what the test is intended to
15 indicate.
16 Q. (By Mr. Thornhill) Okay. And if you see
17 that there is the prospective breakout of the gas
18 from the cement, what does that tell you, as a
19 tester?
20 A. You would redesign the cement slurry to
21 prevent that.

Q. Okay. Maintaining uniformity of the gas mixed in the cement is an objective for purposes of making the cement perform its job, fair to say?
A. Yes.
Q. And if the gas is not uniformly distributed and it breaks out, does it have, then, the prospect of creating Well Control issues?
MR. SARVER: Object to form.
MR. HILL: Object to form.
A. I imagine it could.
Q. (By Mr. Thornhill) Okay. In your experience, is that one of the hazards or risks which you attempt to eliminate through your testing to determine whether or not a foam cement is stable?
A. One of the design criterias is stable foam.
Q. And those risks of gas breakout with the prospective risks of lack of Well Control are risks that you are seeking to identify and avoid in your testing, correct?
MR. HILL: Object to form.
A. It -- it could be one. Zo -- maintaining zonal isolation might be another. But the point is, the slurry -- the desire is for the slurry to maintain its characteristics.
Q. (By Mr. Thornhill) Now, did you have available to you any of the testing that was done by Halliburton that showed that the cement slurry intended for the production casing job was not stable?
MR. HILL: Objection, form.
A. The only Halliburton data we had was what was published in the Bly Report, the April 12th, the line item indicating the two specific gravity values.
Q. (By Mr. Thornhill) And did that indicate to you instability of the foam cement job?
MR. HILL: Object --
A. The two values were equal, but they were higher than the design, than the intended design density. So it was an indicator that it may not, even if it was uniform, it was not at 14 and a half pound per gallon.
Q. (By Mr. Thornhill) And did that indicate instability to you?
A. That would -- that could be an indicator of instability.

Page 95:18 to 95:23

Q. (By Mr. Thornhill) In your practice, generally speaking, it would be common under

those circumstances when there's made a determination that the foam cement is not stable to redesign the cement slurry before the job is pumped, correct?

Page 95:25 to 95:25

A. Yes.

Page 96:02 to 96:12

May we look more at your Report now. I see that under Section 1 on Page 4 of your Report there is a reference to the "Thickening Time" test, right?
A. Yes, sir.
Q. All right. And -- and did -- did your lab perform the thickening time tests in a -- in a fashion that would allow you to draw any conclusions from the test?
A. We ran the tests and -- and got the thickening times that are noted here.

Page 96:23 to 97:15

Q. Okay. Do you find significant the difference of, in the case of Halliburton, 7 hours and 25 minutes for the first example compared to the Chevron 8 hours and 11 minutes or 8 hours and 14 minutes?
A. Well, normally the value that is used as the thickening time would be the 70 Bc number.
Q. Okay.
A. So your numbers there would be 7:37 versus 8:18 and 8:20. Those are reasonably agreeing numbers.
Q. So is it fair for me to say that the time for the prospective setting of the cement or thickening that was found in the Halliburton test at 7 hours and 37 minutes compares reasonably well with that which Chevron found of 8 hours and about 20 minutes, correct?
A. Correct.

Page 97:23 to 98:15

Q. Put differently, and what I'll say is layman's parlance, is it fair to say that in addition to the -- the time that you estimate for placement, the thickening time tests information which we're just looking at, at about 7 and a half to 8 hours, one has to conclude, "Well, how long would it take for the cement to develop

compressive strength before the negative pressure test is actually performed," right?
A. You would think that would be one thing to take into account.
Q. And that time period is actually longer than the thickening time, correct?
A. Again, they are two different tests. So the job placement time, the cement's in place, and the cement begins to develop compressive strength. So it would be longer than the job placement.

Page 98:20 to 98:23

Under the next section that I'd like for us to look at, Section 5, the "UCA compressive strength" test. And this is on Page 5 of your Report, and it wraps over to Page 6.

Page 99:05 to 100:02

Q. (By Mr. Thornhill) And did that data that was presented on Page 6 in Table 4 demonstrate any significant difference from the tests run by Chevron than those run by Halliburton?
A. Generally speaking, they're -- they're in the same range.
Q. Okay. Now, the "Crush compressive strength" test on the next page under Section 6 that's on Page 7, do you see that?
A. Yes, sir.
Q. There's a reference in the third paragraph to the following: "After 48 hours curing, the samples were removed from the molds and were" reserved -- "were observed to have lost approximately one-half inch of their original two-inch height (photographs in Appendix)," period. Did I read that correctly?
A. Yes, sir.
Q. Did -- did you at Chevron mean to say that there was a -- a -- an observed change in the -- the cement that was important enough to make you believe that the cement would not be suitable?

Page 100:04 to 100:10

A. We observed that it lost height, and so we were not able to crush the samples because they were no longer two by two by two cubes.
Q. (By Mr. Thornhill) Okay. And that's why you say in the next sentence: "Therefore, no further tests were conducted," correct?

A. Correct.

Page 101:02 to 102:13

Q. And then the "Mixability" under Section 3, I'm going to refer you to the third paragraph that actually moves on to Page 5. And I'll read to you what I think is the sentence I want to ask you a question about. It says: "However, sedimentation was noted in the blender bowl." Did I read that correctly?
A. Yes, sir.
Q. All right. Explain to us what sedimentation in the blender bowl reflects when you're performing the mixability test.
A. It would be an indication of instability of the base slurry because the solids are not being uniformly suspended in the mixed slurry.
Q. Okay. And would that also indicate to you the need to redesign the cement slurry?
A. Not -- it is an indicator. It's not hard and fast.
Q. Is it fair for me to say in common parlance it's like a caution signal instead of a stop sign?
A. I imagine that would be fair.
Q. Okay. So the sedimentation is an indication of a potential problem that should make you question whether or not the design is suitable, correct?
A. Yes.
Q. Let's go to Section 4 on "Fluid Loss and Free Fluid Testing." The first sentence under that section reads: "Halliburton did not report these tests." Did I -- did I read that correctly?
A. Yes, sir.
Q. You make a point of indicating that these tests were not reported. Are these tests, tests that were expected from the point of view of someone in the business of testing cement?

Page 102:15 to 102:17

A. The second sentence tells why they were included in the Report because there were un-foamed cap and shoe slurries.

Page 102:21 to 103:07

Q. Okay. Your second sentence reads: "They were included in the present testing program because un-foamed cap and shoe track slurries

were pumped on the job." Did I read that correctly?
A. Yes, sir.
Q. And as I appreciate it, that's an identification of the implementation of a cap and a tail cement that is not foamed?
A. Correct.
Q. And so one would expect these tests to have been performed, correct?

Page 103:09 to 103:10

A. I have no idea what was requested of Halliburton for these tests.

Page 105:07 to 105:18

Q. Nor do I understand that your assignment included determining whether one or the other, BP or Halliburton, should or should not have done certain tests in this case, correct?
A. That's correct.
Q. Although you do point out that certain tests were not run, and you point out that the API and ISO Standards require that -- or recommend that certain tests should be performed, correct?
A. That there are other tests in the -- in the data that could have been run, yes.

Page 105:20 to 106:11

A. Or in the standards that could have been run.
Q. And what I characterized as your undertaking in those last questions was correct, right, that you weren't undertaking to try to --
A. That's correct.
Q. Okay.
A. We were not -- we were not attempting to say what was or wasn't done between Halliburton and BP, or what should or shouldn't have been done, if that was your -- if that was your question.
Q. Well, it was. And -- and that generally your undertaking was simply to observe that the tests that are standard under the API and the ISO norms that you might have expected to see were or were not seen --

Page 106:13 to 106:13

Q. (By Mr. Thornhill) -- correct?

Page 106:15 to 106:18

00106:15 A. We observed in Section 4 that Halliburton
16 didn't report the fluid loss, and it was a test
17 that could have been run, so we -- or fluid loss
18 and free fluid, and so we ran them --

Page 106:20 to 106:20

00106:20 A. -- in this April 12th Report.

Page 106:22 to 106:23

00106:22 A. We had no idea any other data that may
23 have been presented or generated for BP.

Page 108:03 to 108:19

00108:03 Q. (By Mr. Thornhill) Now, the next section
04 that you have in your Report which we haven't yet
05 reviewed is Section 7. And this is the FYSA
06 Viscosity Profile and Gel Strength Test, right?
07 A. Yes, sir.
08 Q. In the second paragraph, you reflect as
09 follows, tell me if I read this correctly: "This
10 test was not performed during the present study
11 because a stable foam could not be obtained as
12 described in Section 9 on foamed stability
13 testing"?
14 A. Correct.
15 Q. All right. Now, when you see in this
16 case that there was not a stable foam, are you
17 saying that you are unable to perform the
18 Viscosity Profile and Gel Strength Test?
19 A. Correct.

Page 109:03 to 109:08

00109:03 Q. All right. What does that indicate to
04 you? Does that indicate that you don't know what
05 Halliburton assumed as the slurry condition?
06 A. Correct. We can -- we could not tell
07 from the results listed in the April 12th Report
08 if and how conditioning was done.

Page 109:16 to 110:24

00109:16 Q. All right. So when you performed
17 rheological profile measurements, were you able
18 to, as you demonstrated in Table 6 on this
19 Page 8, characterize the Halliburton tests versus

the Chevron tests?
A. We didn't -- we presented the data. We did not present any analysis.
Q. And in the section that's in bold for Halliburton, you took that data from the lab test results provided to you, correct?
A. Correct.
Q. Under that, I see the Chevron results. Are they, comparatively speaking, very similar?
A. To the Halliburton results?
Q. Yes.
A. They're in reasonable agreement.
Q. Okay. Under "Section 9, Foam Mixing and Stability," I believe this is the last section of your test, and then we're going to need to take a little break. There's a reference to the foam mixing and stability. Already we've identified that the -- the foam slurry was not stable, and in this particular section you say as follows: "API RP10B-4 and ISO 10426-4 are silent on the matter of slurry conditioning so several conditioning methods were used. None of the tests produced a stable foam." Did I read that correctly?
A. Yes, sir.
MR. HILL: Objection, form.
Q. (By Mr. Thornhill) All right. And -- and would that, in -- in the case of testing cement for a prospective job, indicate to you the need to consider redesigning the foam cement --

Page 111:01 to 111:03

Q. (By Mr. Thornhill) -- slurry?
MR. HILL: (Indicating.)
A. It would be an indicator, yes.

Page 112:07 to 113:16

Q. Well, and we're going to go through each one --
A. Okay. So the --
Q. -- and then maybe the general --
A. The general procedure, is the base slurry is prepared according to API RP 10B-2. A portion of slurry is placed in a mixing blender that has a -- a stacked blade assembly, as specified here, as described in the Report.
The mixing bowl has a known volume, so depending on what you -- depending on your target foam density, and what the base slurry density is, you calculate how much slurry needs to be in the blender. You close the blender up, and you spin it at 12,000 RPM, and -- for the purpose of

generating a foam.
Now, what you get from that foam, you know, this is the -- the -- the observation of how long it takes to generate the foam that you mentioned earlier this morning. And you take what's generated, and you check the density, using a -- a receptacle of known volume. And you also place the foam cement -- we've also placed the foam cement in a glass-graduated cylinder, and allowed it to stand for the two hours, and made visual observations of that.
In addition to that, we sampled slurry from that graduated cylinder after the two hours, and determined the density of it. And finally, some of that slurry that was prepared was also placed in PVC molds, which were sealed and placed in water baths, and when those samples were cured, they were sectioned, and the sections were -- the density of the sections were determined using Archimedes principle.

Page 113:25 to 114:05

Q. So in general, would it be fair for me to say that from the information provided to you by the Commission, you were not able to determine exactly what Halliburton did as a testing protocol for foam mixing and -- and stability?
A. That's correct.

Page 114:13 to 114:23

begins -- or fourth it is: "A density check of a sample of the foamed cement in a plastic cube of known volume showed the density to be below the designed density."
Did I read that correctly?
A. Yes, sir.
Q. And are you saying that the design density information of fourteen and a half pounds per gallon we read at first, was higher than that which was reflected when you checked the density in Test 1?

Page 114:25 to 115:10

Q. All right. Now, the next sentence reads: "Settling was noted in both the base slurry and the foam so the stability tests in the graduated cylinder and the PVC tubes were not performed."
Did I read that correctly?
A. Yes, sir.
Q. Is it fair for me to say, then, a portion

of the test that you would normally perform for foam mixing and stability, could not be performed because of the absence of stability of the slurry?

Page 115:12 to 115:13

A. We did not do it in Test 1. It was performed subsequent in some of the other tests.

Page 115:15 to 116:04

A. But at this step, based on what we saw, we stopped.
Q. Okay. Now, I know we have a Table 7 that we can point to later, but it's my understanding that Table 7 tries to summarize these foam mixing and stability test results, correct?
A. Correct.
Q. Let's look at Test 2, generally. Again, you began with a -- a target design density of fourteen and a half pounds per gallon, and you say in the text: "Settling was again noted in both the base slurry and the foam, so...stability tests in the graduated cylinder and the PVC tubes were not performed," correct?
A. Correct.

Page 117:02 to 117:11

Q. Okay. Now, do I understand correctly that normally when one is performing these tests according to the API and the ISO Standards that are set out in 10B-2 and 10B-4, one would see an unstable foam slurry, and -- and recognize that the slurry design should be tweaked or redesigned, correct?
A. You could -- you could see that, and -- and perhaps the -- your next path would be a redesign.

Page 118:07 to 118:21

Q. In the section on Test 4, you point out that "Settling was observed in the base and foamed slurry," correct? It's like the fourth sentence there.
A. Yes. Slurry' condition foamed, density low, yes, settling is observed in both the base and the foam system. Yes, sir, that's right.
Q. You say the density was found to be low and settling was observed, correct?
Now, what did those observations indicate

to you -- when you have a low density, that's lower than the target, right?
A. Yes, sir.
Q. And also settling, did that indicate to you potential problems with the design?

Page 118:23 to 119:05

A. They are negative indicators.
Q. (By Mr. Thornhill) Of the design, right? An indicator --
A. Performed --
MR. HILL: Objection.
A. -- for the slurry performance.
Q. (By Mr. Thornhill) Correct?
A. Yes.

Page 119:25 to 120:04

Q. Okay. And then in Test 6, you -- you indicate, once again, that you did some conditioning, the -- the slurry was found to show -- you say "slight settling," correct?
A. Right.

Page 121:01 to 122:16

Q. I -- I am. I think that's a nice segue into 7. Let's -- let's move to that, where you also see settling, right?
A. Right. The main thing -- the main thing that was different in 7 is that we did again see the graduated cylinder samples densities high, so the stuff that made us want to re-test it, but when we looked carefully at the 250 ml graduated cylinder, we saw that we did have a -- a reduction in the height of the slurry. And that reduction -- that 10 ml reduction, if you make the calculations, does account for -- it -- it was a -- a possible explanation for what was observed in 6.
Q. What -- what do you think was the -- was the cause of the reduction in the -- in the --
A. It would be normally attributed to breakout of the air --
Q. Okay.
A. -- from the foam.
Q. So just so that I understand it, if you don't mind, and -- and maybe the Court appreciates this a little better, if you have a slurry, and the slurry is measured to have one particular volume, when the -- the gas breaks out, the volume of the slurry reduces?

A. The liquid -- the liquid top would -- might drop.
Q. And that, according to what you saw, perhaps accounted for the 10 milliliter reduction in volume?
A. We did observe a 10 ml reduction, and that reduction was sufficient to account for the data that we reviewed in 6 --
Q. And --
A. -- which caused us to repeat 7.
Q. Right. And the data that you refer to is the increase in density from 14.7 --
A. Correct.
Q. -- pounds per gallon to 15.3?
A. Correct.

Page 123:02 to 123:16

Q. So in Test 8, is it fair for me to say that you were trying to compare what you expected to have been similar cement to that which was provided by the Commission?
A. To make -- to try to eliminate the possibility we had a nonrepresentative sample.
Q. Now, you conclude in the last sentence: "The performance was not improved by the change in cement sample."
A. Correct.
Q. Explain that to us.
A. The results were similar to what we'd seen on the prior tests.
Q. Unstable cement?
A. Yes.

Page 123:20 to 124:05

Q. Now, you talk about similar results. Obviously, you see slight settling, just as you did in 6 and 7. But you say that: The -- "The slurry was foamed with the multi-blade assembly for 15 seconds @ 12,000 rpm."
Right?
A. That's similar to what it says in all the tests.
Q. Okay. So you use the same assembly in all the tests?
A. Correct.

Page 124:10 to 125:04

Q. Let's look at Table 7, which is on the next page, Page 12. And I see in the first two lines, 1 and 2, a reference to "NR," which in

your footnotes you say was "Not Run." Correct?
A. Correct.
Q. Well, what do you mean by "NR" under the "Density From" gra -- "Graduated Cylinder," and I see that, and it's also under the "Density From PVC Molds." When you say "NR," what does that mean?
A. This corresponds to the line and the description of the tests where it says -- where it says: "Settling was noted...foam...stability tests in the graduated cylinder and PVC tubes were not performed." So not performed and not run.
Q. Okay. Do -- were you able to draw from these tests that we just reviewed and as demonstrated on this Table 7 any general conclusions about this slurry?

Page 125:06 to 125:16

A. These are the data -- this is the data on which we base the statement in -- on Page 2 that said: "...we were unable to generate stable foam..."
Q. (By Mr. Thornhill) Okay. So if -- if someone wanted to know the general conclusion with respect to these series of tests, it's fair for me to say that the tests, looking at all the parameters that you could conceive would be pertinent for testing, indicated that the slurry was not stable?

Page 125:18 to 125:18

A. Section 9, correct.

Page 126:03 to 126:12

Q. Thank you. But then in your Section 10, you -- you state on Page 13 a couple of things that I -- I need to ask you to explain.
You say that: "The 30 percent contamination test was repeated 3 times because it was difficult to maintain a homogeneous mixture of" the "drilling fluid and" the "cement slurry at" that "contamination level."
Did I read that correctly?
A. Yes, sir.

Page 128:05 to 128:21

So we were -- so we were stirring together various contamination percentages up to

30 percent, which was an arbitrary range based on experience. And at the 30 percent level, we had to reload the test three times because we weren't getting good sonic signal through the sample.

And when we had -- when we -- and when we would disassemble it, we would see that the -- that the mixture, the -- the cement and drilling fluid had tended to segregate, and we attributed the signal problems to that.

So on the third attempt, we got some -- we got some numbers, but we felt it was important to point out the difficulty, you know, the fact that, you know, why might they look a little different and -- and why might they not follow the trend.

Page 130:06 to 130:08

Q. (By Mr. Thornhill) And you would agree with my suggestion that the design parameters called for the test?

Page 130:12 to 131:21

Q. (By Mr. Thornhill) Is that correct?

A. Yes.

Q. Okay. Section 11 on "Stability of Foamed Cement with" the "Mud or" the "Spacer Contamination," you say in the last sentence that: "Neither test...was conducted due to the inability to generate stable foams."

Did I read it correctly?

A. That's correct.

Q. Now, I know you also tested the mud, and you have documents in your reports showing that you compared the M-I SWACO mud tests to the tests that you did in your lab, right?

A. Right.

Q. Was the mud weight and the mud characteristics found to be the same as reported by M-I SWACO?

A. They were -- there was good agreement between those two tests and -- and a mud check from the rig.

Q. Okay. But in connection with the stability of the foam cement, when mixed with the mud or the spacer for contamination tests, you weren't able to perform those tests, because of the unstable foam, right?

A. The foam was unstable to begin with, correct.

Q. All right. "Static Gel Strength Development," you say in Section 12, was tested, and you point out the two methods that you used

with the ultrasonic and the MACS II, right?
A. Yes.
Q. Did those tests show you anything different from what Halliburton tested?
A. Halliburton didn't supply that data.

Page 134:12 to 135:07

Q. (By Mr. Thornhill) All right. Let's turn to the next tab, which is Tab 3. It reflects similar Lab Test Sheets, and there's a Bates number for Chevron at 720. Does that also reflect the tests that were run by Chevron?
A. Yes, sir.
Q. There -- there's an indication of a retarder concentration of .09O. Is that gallons per sack?
A. Yes, sir.
Q. And does that concentration reflect one of the iterations of the tests that you performed to determine if the concentration of retarder was suitable -- suitably designed?
A. That retarder concentration is the retarder concentration in the Halliburton Report of April 12th.
Q. Okay. And --
A. So all the tests we did are at that concentration.
Q. All right.

Page 144:01 to 144:15

Q. And the materials that you're weighing out are those materials that we identified at the beginning of this deposition as having been shipped to Chevron by the Commission, correct?
A. Correct.
Q. And, of course, you assumed that that material came from Halliburton, right?
A. Correct.
Q. And is it -- was it part of your assumption --
A. Okay. Okay. Let me make it --
Q. Sure.
A. It was requested by the Commission. It was shipped directly -- directly to us from the Halliburton lab in Broussard.

Page 145:03 to 145:09

So the -- the information given to you for purposes of comparison is that Halliburton tested that which was the same type of materials,

perhaps from the same lot or the same bulk plant, but you were not asked to identify them as having been precisely the same materials tested by Halliburton, correct?

Page 145:11 to 145:11

A. Correct.

Page 145:16 to 146:02

Q. Okay. For purposes of chain of custody, you received the information in -- in the shipment and used that information and the test materials shipped for purposes of conducting your tests, correct?
A. Correct. The only piece of inf -- the Commission went to Halliburton and said, "Please send Chevron samples." We have an E-mail communication from the Halliburton lab Manager informing us that they were on the way, I believe via Hot Shot, and then we have our receiving book where they came in.

Page 148:25 to 149:07

Q. Do you know if someone in your group undertook to compare that which was in the Halliburton lab test results as a constituent additive or a base cement and its -- and its volume or weight to that which was presented in these reports?
A. It would be -- this should represent the concentration values in the April 9th Report --

Page 149:09 to 149:09

A. -- April 12th Report.

Page 149:11 to 150:03

Q. (By Mr. Thornhill) That's fine. So what you're telling me is if I were to look at the April 12th Report and the ferrous Class HC met and the SSA-1 and the SSA-2, et cetera, the DAIR-3000, I would find that all of those particular constituents of the blend that was tested by Halliburton were the same and generally in the same concentration by weight of cement, as you see in this particular Report?
A. It would be in the same concentration by the weight of cement. The gram -- the actual

grams could vary because everything is based on the weight of the cement. So if you don't start -- you know, if somebody starts with 670 grams instead of 654, then the rest of the actual values would be different. But in both cases, they should be 15 percent silica or something like that.

Page 153:01 to 153:19

Q. All right. Now, let's see. Let me skip forward, if I can, to Tab 52 and have you explain this chart to us. This is a Chevron document. It's ending in No. 806. We'll give it an exhibit number of 4584.

(Exhibit No. 4584 marked.)

Q. (By Mr. Thornhill) It says at the top left, "Instrument:SGSA #2," and then a bottom -- "BHST" or bottomhole static temperature of 210 degrees, "Density: 14.5 ppg Foam," correct?

A. Correct.

Q. Now, on the far right there's an indication of "Curve Type: Foam Cement Strength," correct?

A. Right.

Q. Is this display of data in -- intended to be Halliburton's testing lab display of the test data in a graphical form?

A. This is Chevron data.

Page 154:25 to 155:14

This algorithm is a foam cement strength algorithm, which is a -- an option -- an optional algorithm available from the Chandler instruments, which this is a Chandler Engineering instrument.

Q. Okay. This data then reflects what conclusions in your Report?

A. This is the data we -- where it's described in the chart that has all of the UCA data on it. There are three notations that say foam cement algorithm, and it says in the Report we ran the foam cement algorithm initially to compare it with what the crush foam cubes would say. But as we discussed earlier, the crush cubes came out of the machine a half inch short.

Page 155:24 to 156:15

Q. Now, in your "Comments" section, you talk about "Schedule Protocol #1: Ramp to 135" degrees Fahrenheit "In 83 minutes." Do you see

that?
A. Yes, sir.
Q. All right. And then you -- you talk about a little later in the comments: Condition for a total elapsed time of 3 hours from the initial application of" temperature and pressure, correct?
A. Correct.
Q. And is that three-hour conditioning time standard?
A. No.
Q. Why would you use three hours?
A. Because in the April 12th Report, there are some indications of three-hour conditioning.

Page 158:02 to 158:14

Q. Okay. And you just, as a protocol, normally use four hours, although the heat-up might otherwise reflect a -- a different rate of -- of increase?
A. We use the -- we use the four hours and full bottomhole pressure, and that goes back to an internal study where we did some comparisons of heating on consistometers and longer return temperatures, and which is important pressure, which is important temperature, and -- and so this is what we have arrived at. The four-hour in our lab is what we arrived at as the -- as the protocol.

Page 163:13 to 165:03

Q. (By Mr. Thornhill) Mr. Gardner, I have a couple other tests I want -- a couple other questions I want to ask you about the testing. Let me ask you to turn in your book to Tab 76, please, sir. This is a Chevron document. It ends in a Bates number 1034 and runs through 36. We'll give it Exhibit No. 4586.
(Exhibit No. 4586 marked.)
Q. (By Mr. Thornhill) This appears to me to be an E-mail exchange between you and Mr. Sankar --
A. That's correct.
Q. -- on about the 26th of October of 2010, correct?
A. That's correct.
Q. Please help me understand the exchange of information between you. It appears to me as if Mr. Sankar had misunderstood the reporting of the results to think that perhaps the testing of the cement showed a stable foam, and you corrected that. Do I understand that right?

A. That's correct. His original E-mail was a -- was a summary or a -- his "takeaways," as he puts it, of a -- a review Draft of the Report, and it says: "...the...foam was stable but...not" a "proper density." And I corrected him -- corrected him in saying that was not a -- that was not the proper wording.
Q. And is it fair for me to say that your testing indicating an unstable foam, in your opinion, made for the variations in density that we see?
A. That's the interpretation of the variations in density, is that it is -- it was an unstable foam. That was one of indicators.
Q. Now -- right. And -- and -- and put differently, in sort of common parlance, when the foam slurry is unstable, it will oftentimes make for differences in density, because the breakout of the gas?
A. Correct.

Page 165:20 to 166:18

Q. Okay. Now, in Test 2, for instance, I see the following language: "Adjusted base slurry volume to mix and foam in the same blender jar due to settling." Is that correct?
A. Okay. We're looking on --
Q. Page 707 --
A. -- 708?
Q. -- 707, and it says: "Test #2."
A. Oh, okay. I'm sorry. Yes.
Q. See it in bold?
A. Right.
Q. Says: "Adjusted based slurry volume to mix and foam in the same blender jar due to settling."
A. Right. That's the header. If you -- if you looked at Test No. 2 in the body of the document --
Q. Uh-huh.
A. -- this is where we said rather than preparing the slurry in a separate blender and pouring it into the foamer blender, we did everything in one blender bowl in order to minimize what might -- what settling might be occurring.

Page 167:03 to 167:19

Q. Is that unusual to have the top of the slurry denser than the middle of the dense -- middle of the slurry?
A. Remember you're taking -- you're taking

aliquots from the top and the bottom and the middle, so it's not as if you're grabbing all the slurry. So depending on how the gas is distributed within it, you could get different numbers.
Q. Okay. So these measurements more clearly indicate in detailed measurement figures the lack of homogeneity, or the lack of a homogenous slurry?
A. Right. These are the numbers that are summarized in the body of the Report in the table.
Q. Okay. Let's turn back to Tab 81, talk a

Page 167:21 to 167:21

primary slurry. This was previously exhibit

Page 167:23 to 167:23

MS. GEBHARDT: 4562.

Page 169:15 to 170:18

Q. The next thing on this Report, that I see in a box, is "Slurry not pumpable at this point," within what appears to be an arrow to the 70 Bc, right?
A. Correct.
Q. And then below that 70 Bc is the -- the time for thickening of 7 hours and 37 minutes, correct?
A. Correct.
Q. Do you know why that box and information was placed on this Report?
A. Again, I imagine it was for the purposes of Commission explaining, but these numbers are also -- the -- the complete suite of numbers are the numbers included in the table -- thickening timetable in the Report.
Q. Okay. And you --
A. It's just to explain that the lab would be considering it unpumpable at the 70 B sub C, which is similar to what you and I talked about earlier today.
Q. Right. So somebody receiving this Report from Halliburton would know it's normal industry practice that this information on 7 hours and 37 minutes --
A. Correct.
Q. -- is the time that you have to pump the slurry?
A. Correct.

Page 171:03 to 171:17

00171:03 Q. (By Mr. Thornhill) These are the Chevron
04 Bates numbers beginning with 182 and running
05 through 215. Particularly ask you to look at the
06 chart on Page 189. All right? I believe you
07 told me earlier that you looked at the Bly
08 Report, particularly these appendices, J, M, K,
09 correct?
10 A. We looked over these Appendices. This is
11 not -- this is the CSI Report, it's not
12 incorporated in -- there was no intention of
13 duplicating this data in the work that we did.
14 Q. Okay. Did you look at this data, though,
15 and consider the constituent parts of the blend?
16 A. No, sir, because this test does not
17 use -- it uses proxy chemicals.

Page 174:10 to 174:10

00174:10 QUESTIONS BY MR. CHEN:

Page 174:15 to 174:16

00174:15 Q. And this is my associate, Betty Yang,
16 who's also here on behalf of BP.

Page 174:21 to 176:05

00174:21 I'd like to start out with your
22 background some more. What is your -- what do
23 you do in your current role? And what is your
24 title, first of all?
25 A. I'm Team Leader for the Cement Team,
00175:01 Chevron Energy Technology Company.
02 Q. And what are your responsibilities?
03 A. The Team provides technical service to
04 worldwide -- Chevron worldwide operations. We
05 also -- that's about 70 percent of our portfolio
06 probably.
07 We do some technology development work,
08 and we also provide cementing training as part of
09 the Chevron/BP Drilling Training Alliance.
10 Q. And what do you personally do as -- as
11 the Team Leader? What do you supervise or
12 personally perform yourself?
13 A. Okay. About half of my time,
14 approximately, is administrative, performance
15 reviews, career development plans, things of that
16 nature.
17 And then under our other model, at least
18 half of my time is in technical work, outlined in
19 the three categories. And as I explained this

morning, the lab that -- the Chevron Lab that the technical staff are in, they're not on my head count. They're a different Team.
Q. M-h'm.
A. But they take -- but they take work direction from my Team.
Q. Okay. And you mentioned three areas of work. What are your three areas of technical work?
A. Technical Services, Technology Development, and Technical Training.

Page 176:20 to 178:17

Q. Okay. Now, focus on -- focusing on cement testing, what is your background and experience in -- in testing cement?
A. Okay. I joined -- as I said, I joined Chevron -- well, Gulf Oil at the time, in 1980, as a Fluid Specialist, a Drilling Fluid Specialist. So I joined the Technology Company as a fluids person.
In 1981, I transitioned on to the -- the Cementing Team, and, of course, it had another Team Leader at the time. So in the ensuing years, until I became Team Leader in 1999, then I would perform work in those areas, Technology Development, Technical Services, and -- and Technical Training, as part of our worldwide operations.
So is that what you wanted to know?
Q. Yeah, absolutely.
A. Okay.
Q. So from 1981 till today, that's 30 years of experience in cement?
A. Correct.
Q. And have you been working, at least part of that time, in cement testing all of those years?
A. The work that we do, all of the Tech Service that we do is built on cementing testing results.
Q. M-h'm.
A. So, yes, all of those years, with the exception, as I outlined this morning, two years in the Papua, New Guinea in the late 1980s --
Q. M-h'm.
A. -- and approximately two years in the early '90s, where my predominant role was Lab Supervisor for fluid -- for the Chevron Fluids Lab.
Q. Okay. So roughly, if my math is right, about 26 years where you've been primarily involved in cement with the basis of cement testing?

A. Right.
Q. What about testing foamed cements, how many years of experience do you have testing foam cements or working with foam cements?
A. Working with foam cements, the first work that I did with foam cement would have been approximately 1994.

Page 179:18 to 181:02

Q. For -- for foam cements, when -- when did your experience testing foam cements begin?
A. The -- the main -- the main use would be in 1994 --
Q. Okay.
A. -- in the course of developing foam cementing for shallow water flows offshore.
Q. Okay. And in -- in those years, in, I guess, it would be about 17 years --
A. Okay.
Q. -- how many different projects or cement jobs have you worked on that are foam cement?
A. That are foam cement?
Q. Roughly.
A. Virtually the -- the top hole sections of all of our deepwater exploration work, so you're numbering it 40, 50.
Q. Okay. Okay. And -- and this continues to be a part of your normal work at Chevron?
A. Correct.
Q. Okay. And would you consider the work that you performed for the Presidential Commission to be related to this cement testing work that you've performed over the last 30 years?
A. The Commission asked us to do that testing because we're experienced in that kind of work, yes, if that's your question.
Q. Yes. And -- and then specifically whether or not this is something different from what you do every day, or this is, you know --
A. No.
Q. -- sort of the same type of work you've done over the last 30 years?
A. It's the same type of work.

Page 181:09 to 182:02

Q. (By Mr. Chen) Okay. Now, when -- when Chevron has a cement job, I -- I believe you testified that sometimes that your -- your Cement Team is involved and sometimes it's not involved?
A. That's correct.
Q. And --

A. At Chevron Worldwide.
Q. At Chevron Worldwide.
And how many other operators have an internal cement laboratory like -- like Chevron?
A. In the United States, one other. Worldwide, the number would be less than a dozen. I'd -- I'd have to make an exact count but --
Q. In -- in the U.S. is the other Operator that you're thinking of a super major, or is it a smaller?
A. Super major.
Q. Okay. Which company is that?
A. Shell.

Page 185:23 to 186:25

Q. (By Mr. Chen) Now, did you render -- are -- are all the opinions that you've reached contained in your Report?
A. The results of all of our testing are in the Report.
Q. And the results of your analysis of the testing results are in the Report, also?
A. I think you would probably agree that this is basically just the results, that there's not -- there's not a lot of interpretation.
Q. But -- but -- and fair enough. But there is some interpretation, because you -- you indicate that you were unable to generate a stable foam with any of the tests described in Section 9 of this Report?
A. Correct.
Q. So you do interpret the foam test -- foam stability testing data as resulting in unstable cement?
A. Right.
Q. Okay. Now, did you reach any opinions that are not included in this Report or this cover letter?
A. Everything associated with the testing is contained in the Report.
Q. Was Chevron asked to perform any other analysis, other than this lab testing?
A. No.

Page 189:06 to 190:03

Q. And have you analyzed or reached any opinions on whether BP, my client, made any mistakes at the Macondo Well?
A. I've made no such analysis.
Q. Okay. And if you wanted to reach an opinion on these things, you would have to analyze materials and have to, you know, do some

research and thinking to reach these opinions, right?
A. Correct.
Q. And so if someone today showed you one or two documents and asked you to speculate as to whether one of the Parties did something wrong, that wouldn't be sufficient for you to reach an opinion?
A. That's probably correct.
Q. Okay. Now, you indicated that the two documents you relied upon in forming the testing protocol were Halliburton's -- what -- what's dated as an April 12th, 2010 Lab Results, right? That's one of the documents?
A. Correct.
Q. And -- and the other --

Page 190:05 to 190:08

Q. (By Mr. Chen) And --
A. In the April --
Q. -- and what was the other --
A. -- an April 18th OptiCem run.

Page 191:02 to 191:12

Now, when you ran -- when Chevron ran its cement tests, did it -- did it form the slurry with -- how -- how much retarder did it put in the slurry?
A. .09 gallons per sack, as shown on the Report.
Q. Okay. And -- and sort of moving over to -- to the right side of that Cement Information column, that there's a "Foam Quality" there that says 12.98 percent, correct?
A. Correct.

Page 192:07 to 192:24

Q. Okay. And do you know if it would require higher foam quality or less foam quality or the same amount of foam quality to form a 14.5 percent -- 14.5 pound per gallon foam cement under -- under downhole conditions, under pressure?
A. The foam is a volume -- the foam quality is a volume relationship. I would have to put more nitrogen for a given density.
Q. M-h'm.
A. The slurry at the bottom of the well would have to contain more nitrogen than slurries farther up the hole.

Q. M-h'm.
A. They would have to be injected with that, but the foam qualit -- the bubbles -- the -- the -- the compression of the -- of the gas depends on temperature and pressure.

Page 194:10 to 194:18

Q. Okay. Other than testing the foam at the intended density, would it also be appropriate to test the foam at the injection density?
A. We only tested it as it was outlined in the April 12th Report.
Q. Right. But in addition to the tests that Halliburton run, would it also have been appropriate, in your opinion, to have run it at the surface injection density?

Page 194:20 to 195:13

A. That's -- that is a test that is not usually run.
Q. (By Mr. Chen) M-h'm. So in your -- in your work, I -- I believe you -- you testified this morning, you also sit on several Committees, right?
A. Correct.
Q. Including some Committee 10 of the API?
A. Correct. And I'm a Steering -- I'm a Steering Committee Member on that, as well.
Q. Okay. Fair enough. And were you at the meeting a -- a month ago, when -- in San Francisco?
A. Yes.
Q. And did you sit in at the -- at -- at the discussion about revising 10B-4?
A. Yes.
Q. And what were some of the points that people raised for revising 10B-4?

Page 195:16 to 196:23

A. Well, then, if you know about that, you know generally who leads it. You probably know that I'm a Task -- a Member of that Task Commit -- Task Group. The discussions ranged around alternate methods of generating foam. Aside from the -- the way I described it this morning, there was a Presentation made by another Operator on some effects of varying pressure on foam quality.
There was some discussion around whether to -- whether it would be appropriate to test at

the surface injector conditions. And there was some discussion as to whether that was appropriate due to the lifetime that the cement existed at that condition.
Q. (By Mr. Chen) M-h'm. And --
A. So in -- in basis, that, as you probably also know, was an organizational meeting of that Subcommittee, pretty much. And so it's a pretty wide-ranging scope at the moment.
Q. And -- and so --
A. Or a Subcommittee Task Group. I'm sorry.
Q. And so is it fair to say that one of the topics discussed is whether or not foam cement should be tested at injection conditions?
A. That was a Topic, yes.
Q. And were -- were you a proponent of that or were you against that?
A. I tend to lean toward the -- the latter, that it's -- that it's very short-lived on surface. But, again, before any RPs would be revised, there would be significant lab work done in that area.

Page 198:07 to 198:10

Q. And do -- do you -- would you agree with me that if the -- if foam is not generated at the injection point, where nitrogen is injected, it's not going to foam as it travels down the well?

Page 198:12 to 198:17

A. I mean, if you're designed to -- to form the foam at the foam T or the foam cross, yes.
Q. (By Mr. Chen) So -- so there is insufficient, let's say shear -- shear stresses as it's traveling and just being pumped down the well, to actually create foam?

Page 198:22 to 199:06

A. Yeah, that's a -- that is a -- that is a likely explanation, or description.
Q. (By Mr. Chen) Okay. And is that your understanding, and do you agree with that?
A. I hadn't really -- I hadn't really ever considered the idea that it would be foaming up downstream of the foam generator.
Q. Right. That doesn't --
A. Okay.
Q. -- that doesn't make sense.

Page 199:08 to 199:10

00199:08 Q. (By Mr. Chen) Do -- do you think it makes
09 sense?
10 A. No.

Page 199:14 to 200:13

00199:14 Q. -- 81, Exhibit 4562, I think
15 Mr. Thornhill asked you about thickening time,
16 and -- and you indicated that the 70 Bc time
17 would be the -- sort of the pump time that's
18 recommended by this -- this document.
19 A. When that -- when -- when -- if you were
20 to ask somebody based on this document what was
21 the thickening time of the slurry, the number
22 that would usually be referred to would be the 70
23 Bc time.
24 Q. All right. And is that also commonly
25 known as the pump time?
00200:01 A. Yes.
02 Q. Okay. Now, looking at the back, the
03 first test is the UCA compressive strength test,
04 right?
05 A. Correct.
06 Q. And what does that tell us about -- I
07 mean, why -- why does -- why do people run a UCA
08 compressive strength test?
09 A. To get an indication of the compressive
10 strength development of the cement.
11 Q. Okay. And why is that important?
12 A. So that you know when the cement is no
13 longer fluid.

Page 202:14 to 203:15

00202:14 Q. Okay. So looking at the next test, crush
15 compressive strength test, this is a crush
16 compressive strength test on the foam cement,
17 correct?
18 A. Yes.
19 Q. And what is the purpose of this test?
20 Because it seems like, you know, it doesn't
21 develop strength until further -- later on.
22 MR. HILL: Object to form.
23 A. I have no idea the purpose it was
24 corrected -- I mean, the purpose of the test in
25 general is to see when you would get strength.
00203:01 This is a test with the slurry foamed. The UCA
02 is run on the base slurry. They're both intended
03 to give an indication of compressive strength
04 development. The one is on the foam -- on the
05 slurry after it's been foamed, and the UCA is on
06 the base.
07 Q. (By Mr. Chen) Now, this test was -- this

slurry was conditioned for an hour and a half, right?
A. That's what it says.
Q. And do you have any idea why this slurry would be conditioned for an hour and a half, and the slurry for the prior test conditioned for three hours?
A. No.

Page 204:05 to 205:17

Q. Okay. Is there a yield point that is considered too thin to be used for foaming cement?
A. There's no hard threshold that I'm aware of.
Q. Okay. So if a -- if -- if a cement slurry, an unfoamed cement slurry had a yield point of 1, which is the same as water, you would not say that that's too thin?
A. I would say it's impossible to say just from the rheology --
Q. Okay.
A. -- whether it would be too thin.
Q. Are there any --
A. Rheology is an indicator, but it's -- there's no hard threshold.
Q. Okay. All right. What are the indications? Are there any rule of thumb indications based on yield point?
A. Not to my knowledge.
Q. Okay. Now, the final test is a foam mix and stability test, correct?
A. Correct.
Q. And it lists time to foam, specific gravity top, specific gravity bottom, and conditioning time?
A. Correct.
Q. Now, when it says specific gravity top 1.8, specific gravity bottom 1.8, what does that tell you about the slurry? It tells you, one, that it's uniform, right?
A. That where they measured top and bottom gave the same value, yes.
Q. Right. And now, 1.8 is actually heavier than the target density?
A. Correct.
Q. Now, would you, as the user of this Report, consider that a successful test?

Page 205:19 to 206:03

A. You can't -- you can't get everything off of this. You would have to discuss -- you have

to discuss the results.
Q. (By Mr. Chen) Okay. So -- so because it's heavier than the target, you would want to discuss the results?
A. Correct.
Q. And so if -- if your cementing contractor had these results in hand, you would expect them to -- to discuss them with you?

Page 206:05 to 206:10

A. Yes.
Q. (By Mr. Chen) Okay. Now, in your opinion, based on these numbers alone, would you call this successful or not successful or it needs further discussion?
A. It needs further discussion.

Page 207:04 to 207:16

Q. (By Mr. Chen) Right. So you selected a conditioning temperature, correct --
A. Correct.
Q. -- in -- in your tests?
A. (Nodding.)
Q. And what was the conditioning temperature that you selected?
A. Bottomhole circulating.
Q. And why is bottomhole circulating the temperature you selected?
A. Because that's a reasonable -- that's a reasonable temperature to use for a conditioning period.

Page 207:23 to 208:01

Q. So if -- if you conditioned that temperature, you would want to use bottomhole circulating temperature?
A. Usually, yes.

Page 208:10 to 208:20

Q. Right. Fair enough. But given that you've worked in foam cement testing for 17 years and have seen 40 or 50 different foam cements, I mean, is that the way that it's done, it's conditioned at bottomhole circulating temperature if it's conditioned at any temperature at all?
A. I would say it's probably more common not to condition.
Q. Okay. And do you know why three hours was selected as the conditioning time?

20 A. No.

Page 209:15 to 209:17

00209:15 Q. Okay. And then this is -- let me, just
16 for the record, also say that this is
17 Exhibit 4575 previously marked.

Page 210:12 to 210:21

00210:12 Q. So at the firs -- the first column is
13 various measured depths of the simulation?
14 A. Correct.
15 Q. And the second column is the density of
16 the fluid at that depth?
17 A. Okay. Right.
18 Q. Do you -- do you agree?
19 A. Final annular fluid density, yes.
20 Q. And the third column is the quality --
21 the foam quality at that depth?

Page 210:23 to 210:23

00210:23 A. Correct.

Page 212:11 to 213:03

00212:11 Q. (By Mr. Chen) Okay. And so looking at
12 the second column, the density that they're
13 trying to achieve here is 14.44 pounds per
14 gallon, correct? For example, in the third row
15 from the bottom, looking at 18,107 feet?
16 A. It's predicting a 14.44, yes, in this
17 simulation.
18 Q. And it requires an 18.61 foam quality to
19 achieve that?
20 A. You remember that the testing that we did
21 is based on the April 12th Report, targeting
22 a 14.5, and so what we did was calculate a 14.5.
23 Q. Fair -- fair enough. But I'm -- I'm just
24 pointing out that Halliburton's own documents --
25 model shows that it -- it was actually 18.6
00213:01 percent under downhole conditions --
02 A. Okay.
03 Q. -- will require it?

Page 213:07 to 213:08

00213:07 Q. (By Mr. Chen) I mean, is that your
08 reading of this document?

Page 213:11 to 214:04

A. That's what the simulation appears to show.
Q. (By Mr. Chen) Okay. Now, since completing your Report, you've reviewed some other materials, correct, you know, that have been released by other investigative bodies -- well, let me just start over.
A. I reviewed -- I reviewed the Commission's Report when it came out.
Q. And did you review anything else after your Report came out, after your August -- October Report?
A. Not that I can recall.
Q. Was there anything that you reviewed since -- since sending your Report to the Presidential Commission that would make you change any of your opinions in the Report?
A. What's in the Report are the data that were produced. So nothing would change.

Page 214:08 to 214:17

Q. If you could look at the back side of it, can you tell me what concentration of retarder Halliburton is using in this foam mix and stability test?
A. The only retarder concentration mentioned in the entire Report is on the face, the .09 gallons per sack.
Q. So, you as the reader of this Report would assume that they are using .09 for that test?

Page 214:19 to 215:04

A. Correct.
Q. (By Mr. Chen) And .09 was what Chevron used in its tests?
A. Correct.
Q. Now, did you seek Halliburton's input when running -- when conducting your tests, when designing your protocol or running your tests?
A. We -- we submitted a series of questions to them through the Commission.
Q. Okay. And were those questions answered?
A. No, sir.

Page 215:23 to 215:25

Q. And do you know why Halliburton did not, for example, respond to your questions?

25 A. No.

Page 216:23 to 217:25

00216:23 Q. And you also stated that you reviewed the
24 CSI Report that was an appendix to the Bly
25 Report, correct?
00217:01 A. Correct.
02 Q. Now, you said that you reviewed the
03 methodology of the CSI Report but not necessarily
04 the test results.
05 A. As I say, we -- we -- we read through it
06 to see what was done, correct.
07 Q. Okay. And did you agree with the
08 methodology, used in the CSI Report?
09 A. We didn't give it a lot of -- we didn't
10 give -- we didn't decide one way or the other.
11 Q. Okay.
12 A. We just -- we were -- we were looking to
13 see what it was they did.
14 Q. Okay. Did you personally disagree with
15 any of the methodology in the CSI Report?
16 A. The CSI Report was not tested with --
17 with Halliburton materials. So we just read it
18 for what they did.
19 Q. Right. Separate and apart from their
20 test results, you reviewed their methodology.
21 Did you disagree with any of their methodology?
22 A. I would say we just didn't give -- we
23 just didn't give it a lot of weight except to
24 read what was -- you know, just to read their
25 Report.

Page 218:02 to 218:11

00218:02 Now, turning to your Report, which is
03 under Tab 1, if we go to Section 9, let's see,
04 Page 12, we have the table summarizing -- the
05 Table 7 summarizing the results of your foam
06 stability tests, correct?
07 A. Correct.
08 Q. Now, the last one, two, three, four
09 columns represent the densities of the cured
10 cement slices that were from the testing?
11 A. Correct.

Page 218:23 to 219:01

00218:23 Q. Okay. So I have a question, which is,
24 for example, Test No. 4, if the target density
25 was 14.5, why did the four pieces all weigh less
00219:01 than 14.5?

Page 219:03 to 220:19

00219:03 A. I don't know. The fact that it's -- why
04 it should all be less.
05 Q. (By Mr. Chen) Okay. So did -- did that
06 test result call into question in your mind the
07 testing protocol, or -- or was it -- or was this
08 just an indication that the cement is not stable?
09 A. The whole -- the whole data taken as a
10 whole, the fact that you have variations in over
11 and under target was the indication of our
12 inability for the stability to -- to get a stable
13 slurry.
14 Q. M-h'm. Now, you ran nine tests here.
15 Do -- do you believe that that is sufficient
16 facts to reach the opinion that the -- that the
17 slurry did not form a stable foam?
18 MR. HILL: Object to form.
19 A. What we put in the Report was is that we
20 were unable to generate a foam in nine instances.
21 Q. (By Mr. Chen) M-h'm. You were unable to
22 generate a stable foam in nine instances?
23 A. Correct.
24 Q. Okay. Now, were your exper --
25 experiments performed in a way that others in the
00220:01 industry could reproduce them if they wanted?
02 A. Yes.
03 Q. And were they done in a transparent
04 manner so that they could be peer reviewed?
05 A. Yes.
06 Q. I mean, in fact, it was provided to the
07 Presidential Commission and -- and released
08 publicly?
09 A. Correct.
10 Q. And after that public release of your
11 test results, have -- has anyone ever contacted
12 you to say that you did something incorrect?
13 A. No.
14 Q. And you are -- you are sort of the lead
15 author. You're on this letter that transmitted
16 the Report, and you have not received any
17 comments or inputs saying that your -- there's
18 anything wrong with your Report?
19 A. That's correct.

Page 220:25 to 221:19

00220:25 Q. Okay. But -- but you are aware,
00221:01 Mr. Gardner, that your Report is publicly
02 available on the Presidential Commission website?
03 A. Yes.
04 Q. And it's out there for anyone who wants
05 to, to review and comment on?
06 A. This is true.
07 Q. So -- now, was the -- was your testing

the product -- you know, this -- your testing and this data the product of reliable principles that -- and methods that are established in the industry?
A. Yes.
Q. And, in fact, they are based on, in large part, on API 10B-4?
A. Correct.
Q. And the only part that you varied was the part that you could not determine from -- which was the conditioning time, which you could not determine from Halliburton's Lab Report?

Page 221:21 to 222:16

A. Correct, correct.
Q. (By Mr. Chen) Well, other than conditioning time, what else did you -- how else did you vary from API procedures?
A. Well, you have to remember that API procedures -- API ISO procedures allow latitude.
Q. M-h'm.
A. So I would -- I would contend that everything that was done is within the realm of 10B-4, 10426-4.
Q. Okay. Fair enough.
And to your knowledge, is -- are the protocols in 10B-4 generally accepted in the cementing community?
A. Yes.
Q. And when you were running these tests -- I -- I realize when you were walking through these various tests that sometimes when you had a result that didn't make sense, you repeated the test?
A. Correct.

Page 223:14 to 224:19

So you -- in order to ensure that your data was reliable, you did multiple runs sometimes of the same test?
A. Reliable and as complete as we could make it.
Q. Right.
And I also saw that there were calibration documents for your equipment in your production?
A. Correct.
Q. So to your knowledge, there is no reason that these -- this data is incorrect based on equipment failure?
A. Right, yes.
Q. So you eliminated that as an alternate

explanation for your data results?
A. Correct.
Q. Now, when you conducted this cement testing for the Presidential Commission, did you apply the same type of engineering rigor that you applied to all the rest of your work in the cement lab?
A. Yes.
MR. HILL: Objection, form.
Q. (By Mr. Chen) Now, the testing that you did was on lab stock, correct?
A. It was on materials supplied by Halliburton at the Commission request.
Q. And to your understanding, it was not actual cement dry blend from the rig?
A. Correct.

Page 225:08 to 225:11

Q. M-h'm. More specifically, do you believe that your testing is a reliable indication of what would have happened if you tested the rig blend?

Page 225:13 to 225:21

A. I would have to test the rig blend to answer that.
Q. (By Mr. Chen) Oh, okay. So was the purpose of your -- well, was your charge just to come to conclusions -- to test and come to conclusions on the -- on the lab stock?
A. Our charge was to test the slurry design in the April 12th Report and report the results that we got.

Page 225:24 to 226:11

Q. (By Mr. Chen) And based on your experience, is -- I mean, you've tested, in your experience, both pilot tests, which generally use lab stock, correct?
A. Correct.
Q. And then you've later tested -- done rig tests using rig samples?
A. Correct.
Q. Now, what is the variability of those? I mean, if you have something that's unsuccessful with the pilot test, do you think that magically you'll have something successful with the rig sample?

Page 226:14 to 226:17

00226:14 A. The differen -- the difference in the
15 question you're asking and normal operation is
16 I'm testing -- they should perform the same to
17 the extent that both samples are representative,

Page 227:10 to 228:02

00227:10 Q. (By Mr. Chen) Mr. Gardner, you said that
11 your testing would only be related to what's on
12 the rig if -- if you had -- if your materials
13 were representative, right?
14 A. Correct.
15 Q. Now take a look at the first page of your
16 letter to Mr. Sankar. Look at the last sentence
17 on the second paragraph.
18 A. Correct.
19 Q. Can you read that into the record?
20 A. "To our knowledge, these materials were
21 supplied by Halliburton as representative of
22 materials used on the Deepwater Horizon but are
23 neither bulk plant samples nor rig samples from
24 the actual job."
25 Q. So based on everything you understand,
00228:01 the tests that you -- the material that you did
02 your testing on was representative --

Page 228:04 to 228:05

00228:04 Q. (By Mr. Chen) -- of what was on the
05 DEEPWATER HORIZON?

Page 228:07 to 228:10

00228:07 A. To our knowledge.
08 Q. (By Mr. Chen) And is there any
09 information that you have that would indicate it
10 was not representative?

Page 228:12 to 228:18

00228:12 A. We didn't have control over the
13 collection and transport of the sample.
14 Q. (By Mr. Chen) Fair enough. But my
15 question is slightly different: Do you have any
16 information that would indicate to you that what
17 you tested was not representative of what was on
18 the rig?

Page 228:20 to 229:16

00228:20 A. No, I do not have any information.

Q. (By Mr. Chen) Okay. Now, turning to Page 12 of your Report, looking at that -- that table again, Table 7, specifically focusing on the second half, 5 -- the Test Numbers 5 through 9, now, there -- there's a range of densities coming out of the blender, would you agree? The densities run from 14.04 to 14.95 for that last set of five tests?
A. Correct.
Q. Now, none of those exactly landed on 14.5, correct?
A. Correct.
Q. But all of those five tests were unstable, would you agree?
A. We were unable to create stable foam in any of those tests, correct.
Q. And given that those five tests basically run the range of low 14s to high 14s, would you -- would -- would you understand that even if you were able to blend out a perfect 14.5 out of the blender, that slurry would also be unstable?

Page 229:20 to 230:08

A. Like I would say the -- the details of the testing protocol are de -- in all cases, we were aiming for the 14 -- where it says we were aiming for 14.5, this is just reporting what we've got with or without the --
Q. (By Mr. Chen) M-h'm.
A. So the tests are designed to test the 14.5 system.
Q. Right.
A. It's just these are the numbers that we got.
Q. Okay. So even -- so, you wouldn't expect that if you had gotten exactly on 14.5, that the results would be different?

Page 230:10 to 230:20

A. Correct.
Q. (By Mr. Chen) Now, if your -- if the density -- now -- now, API 10B-4, says to take numerous samples of the set cement, set foam cement, right?
A. Does it say "numerous"?
Q. It says -- what -- what does it say exactly?
A. We can -- we would have to check it.
Q. Well, does it say at least three slices?
A. I don't think it specifies.

Page 231:04 to 231:21

00231:04 MS. YANG: Which was previously
05 marked as Exhibit 6235.
06 THE COURT REPORTER: Thank you.
07 Q. (By Mr. Chen) And so this -- this is
08 API 10B-4, correct?
09 A. That's correct. ISO 426-4 equivalent.
10 Q. Okay.
11 A. Into at least three pieces.
12 Q. Okay. So -- and -- and that is what, in
13 fact, Chevron did in its testing, correct?
14 A. Correct.
15 Q. Now, Halliburton's results only report
16 two pieces?
17 A. Okay.
18 Q. And so you would agree that if
19 Halliburton only cut their cement into a top and
20 a bottom and weighed them, that would not be
21 consistent with API 10B-4?

Page 231:23 to 233:08

00231:23 A. Correct.
24 Q. (By Mr. Chen) Now, if -- if you -- if
25 your density measurements were uniform, or
00232:01 reasonably uniform, and -- but they were
02 different from your target density, would you
03 consider that to be a stable foam cement?
04 A. The -- there are other indicators that
05 are also mentioned in 10B-4, bubble breakout,
06 striation, solid sedimentation, free fluid. In
07 the absence of all of those, and if the numbers
08 were reasonably uniform around the target 14.5
09 value, then you would call it stable.
10 Q. Okay. And the Halliburton Lab Report
11 doesn't indicate that there's an -- doesn't have
12 any comments indicating any visual indications of
13 instability, right?
14 A. Correct.
15 Q. So if -- if we're -- so if we assumed
16 that there are no visual indications of
17 instability, how far off the target would it have
18 to be for a uniform measurement for you to
19 consider it unstable?
20 A. That's difficult to say. There's no --
21 there's no hard and fast threshold.
22 Q. M-h'm. If it were a pound per gallon
23 off, would you consider that unstable?
24 A. That would not be a good indication.
25 Q. Okay. So you would consider that
00233:01 unstable or --
02 A. I would consider that unsatisfactory
03 result.
04 Q. Okay. Have you ever seen any literature

stating that a -- that -- that -- that a one pound per gallon difference between your target density and your -- your -- your resulting density would be acceptable?

Page 233:10 to 233:13

A. No.
Q. (By Mr. Chen) What if it were a half a pound per gallon off, would that still raise questions in your mind?

Page 233:16 to 234:01

A. Half a pound is obviously better than a pound. We would have to evaluate it in light of all of the test results, rather than focusing on just one number.
Q. (By Mr. Chen) Okay. But I think earlier you said that that would raise a question and require discussion?
A. Correct.
Q. Okay. I'd like you to turn to the "Fluid Loss..." section of your Report which is Section 4.

Page 237:11 to 238:16

Q. Okay. What about free fluid, is -- is there a target in your mind that cement should satisfy in terms of free fluid?
A. I think you would prefer the base to have minimal, if any, free fluid.
Q. And so if I said 1 percent or less, would that be -- would that make sense?
A. That could -- that is a target that sometimes -- that some people have used in some instances.
Q. M-h'm. And for the second test, it says "Channel present." What does that mean?
A. That means when it's inclined at a 45 degree angle, fluid was breaking out toward the high side of the graduated cylinder and manifesting itself as a lightweight channel at the top of the test at the -- on the high side of the graduated cylinder.
Q. Of the angled cylinder?
A. Correct.
Q. Now, is that a good thing?
A. No.
Q. Okay. So you would say that if there's a channel present, that means it did not pass a free fluid test?

A. It would be something that you would -- you would look at and consider whether it was satisfactory for your application.
Q. But it would raise definitely a flag, and it -- it would require discussion?
A. Correct.

Page 238:23 to 239:04

Q. So Tab 4 is previously marked Exhibit 808. Have -- have you seen these pilot test Weigh-up Sheets previously?
A. If they're in the discovery, then it means we got them at some point. As I discussed this morning, I'm not sure we had them before our testing was completed.

Page 241:10 to 241:21

Q. But, you know, when -- when you have a pilot test, that's to understand the design of the slurry, correct?
A. Right. But I'm referring to that the retarder load is different, and the temperatures are different. Okay?
Q. Correct. But -- but, Mr. Gardner, I mean, un -- unless you disagree, and -- and -- and then we'll -- we'll skip these, I understood -- and -- and maybe you can confirm -- that pilot tests are done early on to confirm whether or not the slurry design is appropriate.

Page 241:23 to 242:14

Q. (By Mr. Chen) Is that your understanding?
A. That is the reason for doing pilot tests. What I am pointing out to you, is that the particular weigh-up sheet that you're showing here, I'm merely noting that it is not -- the retarder load is different from the testing we've been discussing so far today, as is the bottomhole static and circulating temperatures.
Q. Right.
A. Okay.
Q. So given that foam mix and stability test results, would that raise a flag in your mind for --
A. For that target, you would -- it would be something to look at.
Q. Would that be something that you would want to redesign, possibly?

Page 243:15 to 244:02

00243:15 Q. (By Mr. Chen) So, Mr. Gardner, put --
16 putting the document aside, when -- when the
17 slurry is settling, is that a good sign?
18 A. It is one of the warning indicators
19 that's contained in 10B-4.
20 Q. And if a foam slurry is settling, is that
21 a sign that it's stable or unstable?
22 A. Unstable.
23 Q. Now, if you are conducting a crush
24 compressive test on a foam cube, and you take a
25 look at the cube, and it's -- and it is hard on
00244:01 the bottom and soft on the top, is that a sign of
02 stability or instability?

Page 244:04 to 244:09

00244:04 A. Instability.
05 Q. (By Mr. Chen) And if you are
06 performing -- you are mixing a crush compressive
07 strength test, and the technician makes a note
08 that the slurry is settling out of the blender,
09 is that a sign of stability or instability?

Page 244:11 to 244:25

00244:11 A. Instability.
12 Q. (By Mr. Chen) I -- I don't think I need
13 to go through all of these.
14 Well -- and when these visual indications
15 of instability come up, do you believe that this
16 is something that should be addressed through
17 either a -- a document or reflected in the Lab
18 Report, or something that needs to be discussed?
19 A. I'd say the API recommendation is to
20 consider a redesign.
21 Q. Okay.
22 A. In the system.
23 Q. And absent a redesign, should at least
24 this issue be raised so that people are aware of
25 this potential instability?

Page 245:02 to 246:06

00245:02 A. You would think.
03 Q. (By Mr. Chen) Okay. Now, one of the
04 things that Mr. Thornhill covered with you was
05 that many of the test results in your Report have
06 good agreement with Halliburton's Test Results.
07 For example, the rheology, you stated your
08 results were in good agreement with Halliburton's
09 results, correct?
10 A. I think I said reasonable agreement, but,
11 yes.

Q. Reasonable agreement. And also the -- the UCA tests were in reasonable agreement?
A. Correct.
Q. And then also the -- the thickening time tests were in reasonable agreement?
A. Correct.
Q. And obviously, the -- the -- the -- the -- the proportions that you mixed up were the same, in the same proportions in terms of additive concentrations?
A. The slurry designs we used are -- the slurry design we used is the one in the April 12th Report.
Q. And, now, does the fact that you mixed the same slurry design, and that many of your test results for the tests that you had all the Halliburton conditions were reasonably the same, indicate that your tests are a -- the material that you tested is a good approximation of the material on the rig?

Page 246:08 to 246:08

A. Some might make that interpretation, yes.

Page 247:25 to 248:03

Q. Did -- did you understand that Halliburton conditioned its slurry for three hours befor -- for the conditioning time at 180 degrees Fahrenheit?

Page 248:05 to 248:06

A. I have no idea when -- what temperature they used.

Page 248:19 to 248:22

Q. (By Mr. Chen) Right. But assume with me that the foam stability testing is conditioned at 180. Could that be a reason why their results are different than yours?

Page 248:24 to 248:24

A. Yes.

Page 249:11 to 249:13

Q. (By Mr. Chen) But -- but would you expect it to perform reasonably the same, like all your

13 other tests?

Page 249:15 to 249:18

00249:15 A. Perhaps.
16 Q. (By Mr. Chen) Perhaps? Can't be more
17 certain than "perhaps"? I mean, all the other
18 tests performed reasonably the same.

Page 249:20 to 249:22

00249:20 A. They were in reasonable agreement, so you
21 would think that they would perform reasonably
22 the same.

Page 251:06 to 251:09

00251:06 Q. You were talking earlier, at least -- at
07 least I had noticed in your thickening time test
08 that you used the maximum pressure of 14,459 psi?
09 A. Yes, sir.

Page 251:23 to 252:03

00251:23 Q. But I'm wondering what you would normally
24 base your pressure on.
25 A. On the predicted circulating pressure.
00252:01 Q. Yeah. Well, I was going to ask you if
02 you knew why Halliburton used a much higher
03 pressure than that.

Page 252:05 to 252:15

00252:05 Q. (By Mr. Goforth) You -- do you have
06 any feel for --
07 A. I have no idea.
08 Q. Okay. You don't know, I take it, what
09 the actual circulating pressure was?
10 A. That's correct, I don't.
11 Q. What temperatures do you normally use for
12 running a thickening time test? Do you -- do you
13 use the bottom -- do you use the circulating
14 temperatures?
15 A. Correct.

Page 254:08 to 254:19

00254:08 Q. Did you -- did you attempt to run a
09 thickening time test at a higher temperature
10 than 135 degrees and below, say, the 180 degrees
11 Fahrenheit?
12 A. No, sir. We only replicated the April

12th work.
Q. Would you agree with me that higher temperatures reduce the time available to pump the cement into place?
A. As a general statement, that's true, although there are outliers, depending on the behavior of the particular additives.

Page 254:25 to 255:02

knowledge, you -- did you use different additives than -- on -- on the similar slurry, the foam slurry as that -- that -- than Halliburton did?

Page 255:05 to 256:05

A. I don't quite know how to answer that.
Q. (By Mr. Goforth) "Yes" will do just fine.
A. No. I mean, the additive -- I can't -- I can't say, because I lack the knowledge of the well design and actual parameters that led to this test, you know, we wouldn't -- we -- we may or may not use exactly the same slurry design. There's a lots -- there's lots of ways of getting to the same point.
Q. All right. Can thickening cement leave a thick film on the inside of a pipe?
A. There are -- that has been proposed, yes.
Q. Would you agree with me that that's one of the reasons that it's important to perform the thickening test at the proper temperature?
A. You would want to use the proper temperature because you want to see as closely as possible how the slurry is going to behave. Changes in viscosity, thickening time, whatever that it's going to do.
Q. Pressures, temperatures?
A. As close as you can replicate them.
Q. With regard to the -- to the amount of retarder or the percentage of retarder, do you believe that you need to base that somewhat on the bottomhole circulating temperature?

Page 256:07 to 256:12

A. The temperature will drive the retarder load, yes.
Q. (By Mr. Goforth) Yes, sir. So that's another reason that you need to know the temperature?
A. Correct.

Page 257:13 to 257:13

00257:13 Fahrenheit range.

Page 258:16 to 258:19

00258:16 Q. I'm sure you'll agree that one of the
17 most important functions of a cement job, perhaps
18 the most important, is to provide zin -- zonal
19 isolation within the wellbore?

Page 258:21 to 260:05

00258:21 A. Yes.
22 Q. (By Mr. Goforth) In fact, you've written
23 that, have you not, sir?
24 A. Yes, sir.
25 Q. You agree that one challenge in
00259:01 maintaining zonal isolation is gas migration,
02 which is basically annular flow after cementing?
03 A. Correct.
04 Q. The challenge of gas migration is
05 something that the industry has been studying for
06 a long time, since the 1970s, in particular?
07 A. Correct.
08 Q. In addressing gas migration, the industry
09 studied many aspects of slurry design?
10 A. Correct.
11 Q. Specifically your industry studied fluid
12 loss, free fluid, static gel strength
13 development?
14 A. Correct.
15 Q. Of course, fluid loss can lead to gas
16 migration, correct, sir?
17 A. That was the hy -- that's a hypothesis.
18 Q. Okay. As a result, fluid loss must be
19 controlled through the design of the slurry?
20 A. (Nodding.) Correct.
21 Q. Because you need slurry that is pumped in
22 the well to have excellent fluid loss control?
23 A. You need to have the appropriate level of
24 fluid loss control for the application.
25 Q. Okay. But you first need to test it,
00260:01 don't you?
02 A. Yes, sir.
03 Q. You're aware that fluid loss is a test
04 that Halliburton did not perform?
05 A. I'm aware --

Page 260:07 to 260:07

00260:07 A. -- it was not --

Page 260:09 to 260:09

00260:09 A. -- included in the April 12th data.

Page 262:25 to 263:01

00262:25 Q. Would you have suggested a fluid loss
00263:01 control in this slurry?

Page 263:03 to 263:11

00263:03 A. In this slurry for this particular
04 application?
05 Q. (By Mr. Goforth) Yes, sir.
06 A. I can't speak to the particular
07 application. We have -- we have used fluid loss
08 control in foam slurries within Chevron.
09 Q. Okay. Do you know enough of the subject
10 to tell me which Halliburton additive you would
11 have selected as the fluid loss control?

Page 263:15 to 263:16

00263:15 A. Possibly one of the their 34 -- HALAD 344
16 variants.

Page 263:19 to 263:23

00263:19 Q. Do you agree that temperatures warmer
20 than the design range of the slurry can increase
21 fluid loss?
22 A. Depending how they interact with the
23 fluid loss additive, yes.

Page 264:13 to 264:16

00264:13 Q. Okay. All right. I gotcha. Can an
14 increase in fluid loss interfere with proper
15 cement gelation and strength?
16 A. It could.

Page 265:13 to 265:24

00265:13 loss, can we -- am -- am I accurate to say that,
14 generally speaking, the higher the temperature,
15 the higher the fluid loss?
16 A. With everything else on the slurry design
17 being constant?
18 Q. Yes, sir.
19 A. I think you could expect that.
20 Q. Okay. Let's talk a little bit about free
21 fluid. Like fluid loss, free fluid or free water
22 is something to be controlled to avoid gas

migration, correct?
A. Yes, sir.

Page 266:15 to 266:17

Q. (By Mr. Goforth) Would you recommend in this -- with regard to this application a fru -- free fluid test have been taken?

Page 266:19 to 268:07

A. Yes.
Q. (By Mr. Goforth) And the results that you reported with one test at -- at 90 degrees, there was 1.6 percent fluid loss; is that correct, sir?
A. Yes, sir.
Q. Now, how did your pro -- protocol differ for your second test?
A. The -- the one that's marked 45 degrees?
Q. Yes, sir.
A. The -- after the conditioning period, the graduated cylinder was inclined at 45 degree angle, rather than standing upright at a 90 degree vertical.
Q. All right. And you had 2 percent at free -- free fluid at 45 degrees?
A. Yes, sir.
(Discussion off the record.)
Q. (By Mr. Goforth) Now, as I understand it, you had a second test at 90 degrees, as well. How did your protocol from the first test at 90 where you had 1.6 percent fluid loss differ from the protocol of the second test?
A. The difference is the two -- excuse me -- two thickening time schedules, the time to temperature.
Q. The Report Findings, do they indicate to you issues regarding free fluid?
A. Yes, sir.
Q. Do you agree with me that temperatures outside the design range can lead to increased free water?
A. They could.
Q. Can that result in channeling if you have enough free water?
A. It's conceivable.
Q. In those instances gas, of course, could migrate without invading the cement itself?
A. Free water is one of the proposed mechanisms for flow after cementing.

Page 268:13 to 268:17

00268:13 Q. For the UCA, do you normally look to the
14 bottomhole pressure or the -- or the maximum
15 bottomhole circulating pressure for this test?
16 A. We typically use the hydrostatic it would
17 see on placement.

Page 269:04 to 269:06

00269:04 A. The four-hour time to temperature is a
05 common time used when testing compressive
06 strength.

Page 270:08 to 270:20

00270:08 With regard to the Section 6, your crush
09 strength test --
10 A. "Crush Compressive Strength," yes, sir.
11 Q. Yes, sir. Is this a test that's usually
12 performed at atmospherically foamed cement slurry
13 at the specified foam quality in the well?
14 A. Okay. There's -- it -- it would be
15 performed at atmospheric pressure, and you would
16 try to do it at a representative foam quality.
17 Q. Which would reflect what the foam quality
18 is going to be at the bottom of the well?
19 A. That is usually how you -- well, at a
20 zone of interest.

Page 271:04 to 271:09

00271:04 Q. (By Mr. Goforth) Okay. Do you normally
05 run your crush strength test on the actual slurry
06 that is going to be pumped, or at least on the
07 actual recipe that's -- the design that's going
08 to be pumped?
09 A. Yes, sir.

Page 272:13 to 272:21

00272:13 Q. All right. Let's go to Section 8, Note
14 4. The yield point of this slurry is around 2
15 pound foot -- feet per hundred feet squared. On
16 Notes 5, 6, and 7, the yield points are in the
17 range of 6 to 8. Again, were you aware that the
18 rheological profile measurements taken by
19 Halliburton were taken on the .08 retarder
20 slurry?
21 A. No, sir.

Page 273:21 to 274:08

00273:21 Q. (By Mr. Goforth) You know that -- that

some of those tests are from two different --
A. I don't know that.
Q. Okay. Do you agree with me that temperatures warmer than the design range can reduce stability of foam?
A. It would depend on the behavior of the gas in the base slurry.
Q. Can temperatures warmer than the design range influence the -- the gas and the flu -- and -- in the slurry?
A. Different temperatures can influence the gas in the slurry, yes.

Page 274:17 to 274:19

Q. Increased temperatures, warmer than the design range, can re -- can allow both channeling and gas invasion?

Page 274:21 to 274:22

A. It could change the rheology and the stability, yes.

Page 275:03 to 276:07

Q. Okay. In Table 8 I noticed if there's zero -- when there's zero contamination, the time to 50 psi is 2 hours, 49 minutes; and, yet, in Table 4 it is between 5 hours, 57 minutes and 9 hours, 58 minutes for the same slurry formulation. Are the Table 4 results changes due to differences in slurry precondition?
A. Let's see. The 5 -- the 5:57, Protocol 1, Protocol 1 is an 83 degree minute heat-up whereas the comparison of the mud contamination tests are loaded on the machines straight cold in a four hour to temperature.
Q. So there may be some effect due to the 80-minute period for the slurry, correct?
A. Correct.
Q. With the SGSA, what is Chevron's -- what is your transit time criteria for a slurry to qualify as having good gas migration properties in respect to hydrostatic gel strength development?
A. As a general rule, we would test the gel strength development. It would not be a routine test. It's a test only in severe flow potential cases would be our general use.
Q. Okay. Do you know that there was severe flow potential --
A. No, sir.

Q. -- in this instance?
A. I -- I -- I'm not familiar with the details of the planning for this job.

Page 280:08 to 280:17

Q. Are you aware of any risks associated with using base oil as a spacer?
MR. HILL: Objection, form.
A. Whenever you design the job, any job, you have to be careful that you stay within the Well Control parameters. And base oil, if it is a lighter fluid than the mud, you have to be sure it's not inducing an underbalance.
Q. (By Mr. Goforth) It could be causing other problems?

Page 280:19 to 280:20

A. It's something you would take into account in your simulation.

Page 281:02 to 281:04

Q. (By Mr. Goforth) Assume that you know that you've got a very narrow margin. Would you recommend using base oil in that instance?

Page 281:06 to 281:11

A. We have used water for a similar purpose; but, again, I don't know the details of this job, whether it would be indicated or not indicated.
Q. (By Mr. Goforth) Bly reports that a defoamer additive in the foam sense -- cement slurry was used. You recommend against that?

Page 281:13 to 281:14

A. We don't use defoamers in foam cements, no.

Page 282:03 to 282:15

Q. (By Mr. Goforth) Use of a lightweight foam cement slurry behind a heavy cap cement slurry, as was done in the Macondo, does that increase the risk of contamination?
A. I couldn't say.
Q. Does it increase any risk that you're aware of?
A. Again, you would model by the

particular -- by the well particulars.
Q. So all of this should have been modeled, these questions that I'm asking you where you're saying, "Well, I can't tell" --
A. Yes, sir.

Page 282:20 to 282:22

Q. (By Mr. Goforth) All right. Are you aware that there was a very small slurry volume of 62 barrels used in this well?

Page 282:24 to 283:04

A. I have read that in some of the reports, in some of the media reports.
Q. (By Mr. Goforth) Does the fact that those -- does the fact itself that there's a very small volume of cement slurry used increase the risks, to you?

Page 283:06 to 283:07

A. All other things being equal for mud removal, more volume is better.

Page 284:02 to 284:03

Q. Good afternoon, Mr. Gardner. My name is Gavin Hill. I think I just introduced myself off

Page 284:19 to 285:05

The first thing I wanted to -- to ask you is I just want to clarify for the Judge who's watching, that it's your understanding that the testing you performed at the request of the National Commission was done on shelf samples essentially, correct, out of the Halliburton Laboratory?
A. Correct.
Q. Okay. And so it -- it also -- what that means is you did not test the actual cement blend as it existed on the rig, correct?
A. Correct.

Page 285:12 to 286:22

Q. Okay. I'm going to ask you -- I've got exhibit -- what's been previously marked as Exhibit 4569, and do you have a binder of these in front of you?

A. I don't know about that one.
Q. I'll tell you what. I'll find it and hand it -- hand it, and you can confirm this. I'm going to read this into the record to you, if you don't mind.
A. Okay.
Q. This is API 10B-4.
A. All right.
Q. Okay? And under Section 3.1, under "Sampling," it says: "Samples of the cement material or cement blend, solid and liquid additives, and water used for mixing are required to test a foamed cement slurry in accordance with this part of ISO 10426. Accordingly, the best available sampling technology should be employed to ensure the test materials match as closely as possible of those found at the well site."
Correct?
A. Right.
Q. Now, did I read that correctly? And you can look at.
A. At your starred section?
Q. Yeah.
A. Right.
Q. Now, to the extent you're attempting to try to match as closely as possible the rig samples that you take from the well site in this case, that would be the rig, correct?
A. You're sub -- you're trying to get as representative sample as possible.
Q. Right. And the most representative sample is the sample from the rig?

Page 286:24 to 287:05

A. Assuming it's sampled properly.
Q. (By Mr. Hill) Understood.
So assuming it's sampled properly, you want to make operational decisions about the characteristics of your cement based on testing of actual rig samples, correct?
A. That is usually your last step, yes.

Page 287:17 to 287:21

Q. (By Mr. Hill) Okay. Do you think a prudent operator -- operate -- who's trying to test cement for a case -- a production casing job would require that rig samples be brought in from the rig for testing?

Page 287:23 to 287:23

00287:23 A. Rig samples are often collected.

Page 288:05 to 288:17

00288:05 Q. All right. Well, you mentioned a phrase
06 earlier, you said -- I think the phrase was
07 "splits" --
08 A. M-h'm.
09 Q. -- or "split sampling."
10 A. M-h'm.
11 Q. And do I understand correctly, well,
12 let's say, for example, with my client, when
13 Halliburton has a cement job, Chevron will split
14 the actual rig sample, Halliburton will test it,
15 and then the other half of the split sample will
16 be confirmation tested by Chevron. Is that fair?
17 Is that true?

Page 288:19 to 288:22

00288:19 A. That has happened.
20 MR. SARVER: Go ahead.
21 Q. (By Mr. Hill) That has happened?
22 A. M-h'm.

Page 289:11 to 289:24

00289:11 Q. Okay. What I -- what I'm really trying
12 to understand is, is there a reason why there is
13 a preference for testing properly sampled rig
14 samples in your mind?
15 A. Because the advantage of testing a rig
16 sample is to look for contamination in the
17 transport to the rig.
18 Q. Okay. And do I understand by your
19 testimony that what that means is once you have a
20 dry blend that's formulated onshore and
21 transported out to the rig, there is the
22 potential for it to actually undergo minute
23 contamination such that it changes the chemistry
24 of the cement?

Page 290:01 to 290:08

00290:01 A. Correct. Correct.
02 Q. (By Mr. Hill) Thank you.
03 And there are other environmental
04 conditions, for example, in the way that it's
05 transported or blown on to the rig, the way it's
06 exposed to environmental conditions, that
07 actually could affect the chemical properties of
08 the cement blend, as well, correct?

Page 290:10 to 290:16

00290:10 A. Yes.
11 Q. (By Mr. Hill) Okay. And so what we want
12 to -- would you agree with me, that given that,
13 once a cement leaves the bulk plant, is blended
14 and leaves the bulk plant and is taken offshore,
15 that it essentially undertakes its own unique
16 characteristics?

Page 290:18 to 290:24

00290:18 A. It may not change.
19 Q. (By Mr. Hill) But it may, right?
20 A. True.
21 Q. Okay. And one of the reasons we want to
22 test that rig sample if possible, is because
23 there's the potential that it has changed its --
24 its chemical characteristics, correct?

Page 291:01 to 292:10

00291:01 A. True.
02 Q. (By Mr. Hill) Okay. So what I'd like to
03 understand is in -- you know, in your opinion,
04 this preference for testing rig samples is
05 primarily in response to a concern that there
06 could be variability between testing rig samples
07 and any other source of -- and -- of the branded
08 cement, correct?
09 A. True.
10 Q. Okay. Now, it's not just -- indeed when
11 Operators generally go offshore to get -- to go
12 to the rigs and bring back their rig samples for
13 testing, they don't just bring back one, but they
14 actually update that sample on a -- on a -- on a
15 20 or 30 calendar day basis, correct?
16 A. You -- you can get multiple samples from
17 the rig, yes.
18 Q. Okay. And -- and I -- I just want to be
19 clear. I'm not saying multiple samples. I'm
20 talking about multiple successive samples over
21 time?
22 A. Sampled multiple times.
23 Q. Right.
24 A. Correct.
25 Q. And so, for example, if we bring in a rig
00292:01 sample and test it in the lab, and 60 days later,
02 they want to -- to test again that same cement
03 blend, they might go out and get rig samples
04 again or resample the blend on the rig, correct?
05 A. Yes.
06 Q. And that's in response to a concern that

even with the duration of time, there could be chemical changes in the characteristics of the cement, correct?
A. Yes.

Page 292:12 to 294:04

Q. (By Mr. Hill) Okay. Now, is it fair for me to say or to characterize what Chevron did for its Lab Report was test -- and first of all, I -- I want to clarify for the -- for -- for the Court, when you received Halliburton shelf samples for testing, that was done at the arrangement of the National Commission, correct?
A. Correct.
Q. And did I understand you correctly that you essentially had one direct communication with Halliburton which was a -- a clerk saying the samples are on the way?
A. Correct.
Q. Okay. Other than that, did you -- did you or anyone -- member of your Team that you're aware of have communications with anybody at Halliburton?
A. No.
Q. Okay. In that communication or in any other, did anybody from Halliburton ever represent that what was being provided to you was representative of what was on the rig?
A. We had no communication with Halliburton.
Q. All right. So any communications about the representativeness as referenced in your cover letter dated October 26, 2010, to the National Commission, any representation there about representativeness of the samples, that would have come from the National Commission or somebody else?
A. The statement is as much to make plain that we didn't believe them to be rig or bulk plant samples.
Q. Very good. And perhaps we're just playing semantics, and I understand when we talk about representativeness, what you were supplied were -- was cement, as well as a dry additives that were branded the same that were used on the rig, correct?
A. Correct.
Q. But that doesn't necessarily mean that they are representative in their chemical characteristics?

Page 294:06 to 294:06

Q. (By Mr. Hill) Is that a fair statement?

Page 294:08 to 296:23

00294:08 A. They were not necessarily splits of the
09 rig samples, right, or the bulk plant materials.
10 Q. (By Mr. Hill) You performed a variety of
11 foam stability tests, and I think it was
12 Section 9 -- 7 -- Section 9, yeah. Should be
13 easy to remember because it was Section 9 and you
14 did nine tests, right?
15 A. Yes.
16 Q. If you wouldn't mind, do you have your
17 Report in front of you? It's Exhibit 4572.
18 A. Well, that's been the one we've been
19 using all day. So --
20 Q. That's fine. Just for the record,
21 it's -- you know, it's been marked as -- as
22 Exhibit 4572, and I'm going to ask you to turn to
23 that page Table 7, which is found on Page 12.
24 THE COURT REPORTER: 4572 or 4562?
25 MR. HILL: 4572 is what I have.
00295:01 THE COURT REPORTER: (Nodding.)
02 Q. (By Mr. Hill) Now, I'd like to just look
03 at a couple of the tests, not all of them.
04 Specifically, I think you would agree that Test
05 Numbers 6, 7, and 9 were foam stability tests
06 that were conducted on slurries that had been
07 conditioned for three hours, correct?
08 A. I believe that's what's stated in the
09 Report.
10 Q. Okay. And, indeed, they -- if -- if we
11 were to go back and look at it, 7 is a repeat of
12 6, 9 is a repeat of 7, so essentially, it's the
13 same test conditioned the same amount of time,
14 correct?
15 A. Correct.
16 Q. And yet -- and -- and then for, I guess,
17 the demonstrative purposes, you did Test 8. And
18 would you agree with me that there was no
19 difference at all in the testing protocol that
20 was done on Test 8 except for the source of the
21 Lafarge Class H cement?
22 A. Repeated Test 7 except using the mill
23 sample.
24 Q. Okay. And so that mill sample came from
25 someplace other than Halliburton, correct?
00296:01 A. Correct.
02 Q. Okay. And, in fact, would you agree with
03 me that when you look at the -- let's just take
04 the -- the set cement foam stability results, it
05 looks like 6, 7, and 9 have a Delta between top
06 and bottom roughly in the neighborhood of one to
07 one and half ppg, fair?
08 A. Okay.
09 Q. And Test 8, however, had a Delta between

top and bottom of -- of roughly 5 ppg?
A. Correct.
Q. Okay. And if we were to even look at the unset cement from the graduated cylinder, you would have a Delta from top and bottom of in -- in Test 6, 7, and 9 between one and one and a half ppg, correct?
A. Right.
Q. And up to 7 ppg -- I'm sorry, up to 7 ppg on Test 8, correct?
A. Correct.
Q. So as between those 4, 6, 7, 8, and 9, were 6, 7, and 9 were essentially the same tests?
A. M-h'm.

Page 297:04 to 298:12

Q. (By Mr. Hill) Where 8, the only difference is the inclusion of a mill sample from Lafarge, Test 8 is kind of an outlier in terms of the foam stability test results, correct?
A. The reason for running 8 was to make sure that the prior tests were not outliers.
Q. I understand that.
A. And usually that --
Q. I understand that. But I -- my question was: It's something of an outlier in terms if you compare all four of those test result ranges, correct?
A. In magnitude, the differences are there. The fact that there's variation across the entire sample is the same across all four.
Q. Fair enough. But that variation is --
A. Large.
Q. -- vastly different in Test 8, correct?
A. It is higher.
Q. Okay. And would you agree with me that that is -- and -- and I don't mean to cast aspersions. I'm sure the test was done fine. But doesn't -- isn't this a built-in demonstration that the source of the cement matters, that you could have different test results or variability in testing based on where the cement blend comes from?
A. Which is the reason why what you read earlier was representative samples.
Q. Right. So you would agree with my statement?
A. That where -- that you should use representative materials and that -- that different samples could be different, yes.

Page 298:19 to 301:18

Q. Yeah. You didn't include Test 8 in this test matrix here at -- to try to tell the public or whoever read this that the Lafarge Class H cement that was used from the manufacturer, the mill sample --
A. For test -- for Test 8, yeah.
Q. -- for -- for testing was representative of what was out on the rig, right?
A. That's correct.
Q. Even though what was out on the rig was branded the exact same thing?
A. Correct.
Q. Okay. Now, do you -- do you -- the type of water that you used for doing these foam stability tests, or any of the testing, the mixing water --
A. M-h'm.
Q. -- do you know the source of that water?
A. I believe, if my recollection is correct, that's Houston tap.
Q. Houston tap water?
A. M-h'm.
Q. Okay. And I -- would you agree with me that there is a preference, for representative purposes, of using rig water to -- if you're going to test rig cement?
A. If you have it, yes.
Q. Okay. If you have it.
And if you don't, you -- you may be constrained. I know you didn't have rig water provided to you, so you weren't able to use it, correct?
A. Correct.
Q. All right. And there are -- and I don't know how to say it, other than there are parts to water, or there are characteristics of water that could actually impact testing variability, correct?
A. It's conceivable, yes.
Q. In fact, if you've got -- the chlorides in water have the potential, at proper elevations, to accelerate the cement, correct?
A. Correct.
Q. pH, for example, you're looking for neutral because if you have something that's a low pH or that's acidic, it would retard cement, correct?
A. It would affect the cement, yes.
Q. And these variances of these characteristics in water have the potential to impact the variability of the test results that you use, right?
A. Correct.
Q. Okay. And -- and I would just like to ask you, do -- do you believe that the test --

the Report, the testing that was reported in the -- in this Report that we've been talking about all day, do you believe that it proves that the rig cement was unstable?
A. "Proves" is a strong word.
Q. Right.
A. It demonstrates this slurry design as tested with these materials was not stable.
Q. Right. But the -- we've already established that what you tested was something other than rig cement, right?
A. That's true.
Q. And cement being what it is, something that changes over time, changes based on environmental conditions, has a unique char -- has its own unique characteristics?
A. M-h'm.
Q. There's potential for variability in testing between what was on the rig and what you tested in the lab?

Page 301:20 to 302:11

A. That's correct.
Q. (By Mr. Hill) Thank you.
Now, you said you looked at the -- the CSI Report. You've just read through it to familiarize yourself with what they did?
A. Right.
Q. And I think you referred to what they did as using proxy chemicals, correct?
A. Correct.
Q. And they didn't use any Halliburton proprietary ingredients either of the cement or the dry ingredients or the liquid ingredients, right?
A. I believe that's what they state in their test --
Q. Okay.
A. -- in their Report, yes.

Page 302:24 to 303:11

Q. But they basically were trying to find proxy materials that were similar to form and function --
A. Correct.
Q. -- correct?
A. So how well it represented depends on how well -- what they found, and I --
Q. And --
A. -- have no idea what they used.
Q. And, of course, you couldn't really tell that unless you actually tested the rig cement,

10 correct, and compared it?
11 A. Correct.

Page 304:08 to 305:05

00304:08 There is a hydrostatic pressure downhole,
09 correct --
10 A. M-h'm.
11 Q. -- at the bottom of the well? In the
12 low --
13 A. At -- at any point in the well.
14 Q. At any point.
15 Well, let's say in the location where
16 they're going to be placing cement.
17 A. Okay.
18 Q. Okay? Does API suggest that you take the
19 downhole pressure and add to it additional
20 pressure to account for friction and to simulate
21 the additional hydrostatic pressure that a slurry
22 would experience during placement?
23 A. In the thickening time test.
24 Q. In the thickening time test.
25 A. Right.
00305:01 Q. Okay. And would you agree that that is
02 the reason why your pressure, as used in the
03 thickening time test, could be greater than the
04 downhole pressure -- or your down --
05 A. It could be -- right.

Page 305:07 to 305:07

00305:07 A. I mean, yes.

Page 306:15 to 309:15

00306:15 Q. Okay. And you understand that, given
16 your experience with -- with foam cement, that
17 foam cement, in and of itself, has fluid loss
18 properties just by virtue of the nitrified -- or
19 the nitrogens injected, correct?
20 A. Correct.
21 Q. Okay. I -- I also have -- I think people
22 have spoken in a jumbled way about UCA
23 compressive strength testing and crush
24 compressive strength testing, and kind of blended
25 it all together into compressive strength
00307:01 testing. And I'd like to try to explain to the
02 Court the differences between those two types of
03 tests.
04 A. Okay.
05 Q. My understanding that UCA compre -- UCA
06 compressive strength testing is done on the base
07 slurry, correct?

A. That's correct.
Q. Crush compressive strength tests are conducted on the foam slurry?
A. Correct.
Q. Yet the crush compressive strength test does not account for the pressure that the slurry would experience downhole, correct?
A. Correct.
Q. Okay. So when you look at test results for crushed compressive strength, you can't -- it's not as simple as going to a protric -- particular value and saying, "Oh, that's the value at which it -- it -- the -- a foam slurry would achieve compressive strength," right?
A. Are you saying would there be a pressure effect?
Q. Yeah.
A. There could be.
00308:01 Q. And, in fact, pressure is a driver on -- of compressive strength, isn't it?
A. Heat and temperature.
Q. Okay. And so what is not depicted in a crush comprefid -- crush compressive strength test result is the effect of pressure?
A. For the foam slurries, because they're atmospherically cured.
Q. Right. Do you see --
A. And the only reason I clarify that is, is you can do cubes in a curing chamber, of course, under temperature and pressure.
Q. And what would that require, like a MACS analyzer?
A. No, no, no. A -- a curing chamber which you wouldn't -- you can't do it on -- you can't do it on a surface-generated foam. But I don't want to give anybody the impression that cubes are never cured under pressure.
Q. Right. And -- and just to make sure we're clear, what that requires is pressurizing the cube and transferring it for curing purposes, right?
A. No, no, no. Okay. I prob -- I probably --
00309:01 Q. Did you go off --
A. -- I probably got you off the deal. In foam cementing, the foam cubes are cured atmospherically.
Q. Right.
A. You do not put them under pressure in the curing chamber because of the compression of the fluid.
In the realm of cement testing in general, cubes can be -- if you -- if you -- say if you were testing the base, you could test that in a cube under pressure in a curing chamber.

Q. But you would not necessarily do that with a foam?
A. We would not do that with foam.

Page 310:07 to 312:04

Let me ask you -- we've been talking about -- I know that you looked at the conditioning times that you divined from the Halliburton Customer Report, which is dated April 12th --
A. Correct.
Q. -- 2010, correct?
A. Correct.
Q. I want to talk to you just about conditioning time generally. Do you -- what -- what is the purpose of conditioning a -- a base slurry?
A. The purpose of the conditioning any slurry is to try to replicate downhole conditions as best you can.
Q. And by "downhole conditions," we're talking about --
A. Temperature and pressure.
Q. Temperature and pressure.
And so if you do not condition the base slurry, you are essentially not subjecting your slurry to what you think would be the proper down -- or that, you know, exactly as possible to downhole conditions it's going to experience in placement, right?
A. Well, the discussions around that are in the case of foam, it's difficult to completely replicate the downhole. Because in foam, you generate the foam, of course, on surface, and then subject it to temperature and pressure.
Q. Right.
A. So it's difficult to completely replicate.
Q. And, in fact, API doesn't have any suggestions or recommendations about conditioning foam slurries, does it?
A. It -- as we said in the Report, they're silent on the issue.
Q. And so if a -- if a company service -- you know, a -- a cement contractor or Operator wants to condition that slurry, the base slurry before it's actually foam, for -- for example, a foam stability test, that's not prohibited by --
A. It's not --
Q. -- API, is it?
A. -- prohibited.
Q. And, in fact, there are some good reasons you might want to do it, correct?

Page 312:06 to 312:21

00312:06 A. Like I say, it's -- conditioning is -- is
07 generally a good thing.
08 Q. (By Mr. Hill) And so if we want to --
09 example, to -- to do the -- the simulate the best
10 we can, the downhole temperatures and pressures
11 that are going to be experienced by a foam
12 slurry, because of limitations on surface, we
13 necessarily have to condition the base slurry
14 before it's foamed in a lab, correct?
15 A. If you're going to condition, you would
16 have to condition it before foaming it, that's
17 correct.
18 Q. There's re -- there's really no safe or
19 effective way to do it otherwise in a field
20 laboratory, is there?
21 A. Not to my knowledge.

Page 312:25 to 314:19

00312:25 Q. (By Mr. Hill) The -- there's been some
00313:01 talk about foam quality, and I know that there
02 was a 12.98 -- I think we've rounded it to 13
03 percent foam quality reflected in the April 12th
04 Halliburton Customer Report, correct?
05 A. Correct.
06 Q. Okay. And I think BP's Counsel took you
07 through an OptiCem Report that showed that there
08 was a range of -- of foam quality predicted by
09 the OptiCem in the neighborhood of between 18 and
10 19 percent.
11 A. Okay.
12 Q. Do you recall that?
13 A. (Nodding.)
14 Q. Now, would you agree with me that when
15 you are preparing at surface, you know, slurry
16 sampling, or sur -- slurry samples for -- for
17 cement testing purposes, that the calculation for
18 calculating what foam quality is required to foam
19 to 14.5 ppg, would be different than the foam
20 quality downhole under pressure that would be
21 required to get to 14.5 ppg?
22 A. Right.
23 Q. Okay. So has anybody ever told you that
24 Halliburton had a foam quality of 18 percent at
25 surface?
00314:01 A. No.
02 Q. Okay. And I -- I just do this to clear
03 this up, but unfortunately, BP's Counsel
04 represented to you that Halliburton had
05 conditioned its foam stability slurries at 180
06 degrees. And he asked you what the effect of
07 that would be on the foam stability test, okay?

I want you to assume with me that that didn't occur, and that conditioning was actually at 135 degrees. All right?
A. (Nodding.)
Q. And I think the question he asked you, building that predicate, was whether or not you thought -- thought that the conditioning at that elevated temperature would be an explanation as to why Halliburton was able to get a foam -- a stable foam cement as reflected on the April 12th foam, but you were unable to do it in your subsequent testing of shelf samples.

Page 314:21 to 314:23

Q. (By Mr. Hill) Do you recall that? Is that fair?
A. I recall the discussion.

Page 316:13 to 316:21

Q. Do you have any knowledge of any involvement by Anadarko in making engineering decisions about the design or drilling of the Macondo Well?
A. No, ma'am.
Q. Do you have any knowledge that Anadarko played any role specific to the design, testing, or execution of the cement job?
A. No, ma'am.

Page 318:19 to 318:23

Q. Now, changing topics, since I'm jumping around here a little bit, do you consider it prudent for a Well Operator to have a successful foam stability test in hand before pumping foam cement?

Page 319:05 to 320:17

A. It would be prudent.
Q. (By Ms. Kuchler) Changing topics again, you mentioned earlier today that API RP 10B-3 talks about cement testing recommendations for a model. And I think you said that deepwater falls outside of the data set which was used to develop the API schedules; is that correct?
A. Okay. The API schedules as such are contained in RP 10B-2. The RP 10B-3 is deepwater testing. And in that document, it recommends a model or a field-developed correlation, something besides the API schedules that are in 10B-2,

because the data set used to develop the schedules in 10B-2.
Q. Okay.
A. In other words, 10B-2 schedules are predominantly shallow water straight hole type situations --
Q. So --
A. -- either land or shallow water.
Q. Okay.
A. So deepwater -- so RP 10B-3, which is the -- the deepwater testing summary document, under the part about developing schedules talks about using -- it talks about using models, it talks about using data gathered at the rig site, it talks about field-developed correlations, rather than -- than what are commonly called the API schedules.
Q. Okay. So let me just make sure that I'm clear on this. What, then, are the implications, if any, of the fact that deepwater falls outside of the data set that was used to develop those API schedules?
A. It means that when you're testing in deepwater, then you would -- you would use other methods such as modeling to develop your testing schedules.

Page 320:19 to 322:07

Changing topics again, were there any data or materials that you felt you needed to properly perform the assignment given to you by the National Commission that Halliburton did not provide you with?
MR. HILL: Objection, form.
A. As it states in the Report, we had made some specific inquiries about the actual testing protocols used, and the reason for that is, as we explained earlier, the API ISO Standards, allows some latitude in the way a given test might be performed, atmospheric conditioning, high temperature, high pressure conditioning, et cetera, et cetera.
So when we looked at the April 12th data, we formulated a series of questions to clarify for the tests what was actually done, and submitted those questions.
Q. (By Ms. Kuchler) You submitted those questions to the National Commission for the Commission to submit to Halliburton. Is that how you understood it?
A. Correct.
Q. Okay. And you're re -- referencing Page 2 of your letter which had previously been attached as Exhibit 806, and also I think

renumbered as Exhibit 4572, on Page 2, where it says: "The Halliburton report does not contain sufficient information to determine the exact test protocol used in the Halliburton lab in all cases. Halliburton elected not to provide additional information clarifying its testing protocols that was requested through the Commission." Is that correct?
A. That's correct.
Q. Okay. Do you have any knowledge as to why Halliburton chose not to provide that additional information?
A. No, ma'am.

Page 322:13 to 323:03

Q. What was the effect, if any, on your ability to properly perform your test by the fact that Halliburton elected not to provide that information?
A. It -- the tendency would be for us to test things multiple ways, test things that would be allowed under the -- that would be allowed under the RPs or the Standards, but across the range of things that might be allowed.
You know, we did conditioned tests, we did unconditioned tests, we did vertical free waters, we did 45 angle free waters. So it -- it increased the variety of testing protocols.
Q. So you had to do more work than you might otherwise have done had Halliburton provided you with that information?

Page 323:05 to 324:15

A. Possibly, yes.
Q. (By Ms. Kuchler) Okay. Was there any negative impact on the testing that you did do because Halliburton did not provide you with that information?
A. I don't think so.
Q. Okay. Your Report, you've told us earlier, and, actually, several times, mostly contained data from your testing, along with a few interpretations, such as you were unable to achieve a stable foam. Is that fair?
A. That's correct.
Q. To the extent that your Report does contain interpretations, such as the unstable foam slurry, were those interpretations reached to a reasonable degree of scientific certainty?
A. Yes.
Q. Were all of the tests conducted by your lab for the National Commission done according to

methods generally accepted in the cement testing community?
A. Yes, ma'am.
Q. Were any of the tests conducted using methods not generally accepted in the cement testing community?
A. No, ma'am.
Q. Were all of the tests interpreted according to methods generally accepted in the cement testing community where interpretation was rendered?
A. Yes, ma'am.
Q. Were any of the tests interpreted using methods not generally accepted in the cement testing community where interpretations were rendered?
A. No, ma'am.

Page 324:21 to 325:10

Q. What, if any, flaws can you identify for us in the manner in which your tests were conducted?
A. I don't think I can identify any.
Q. Okay. What, if any, flaws could you identify for us in the manner in which your tests were interpreted where they were interpreted?
A. None.
Q. If you were asked to do this assignment today, given all you've learned in the process of the testing and reporting of the data, would you do anything differently?
A. Given the same materials and the same information, we'd do it the same way.

Page 326:03 to 326:04

Q. Mr. Gardner, my name is Carmelite Bertaut and I represent Cameron and I have very few

Page 326:14 to 327:18

Q. Okay. And if we can turn now to the Section 5, the "UCA Compressive Strength" test.
A. Yes, ma'am.
Q. You talk -- you used the term "algorithm" under the "Protocols" and --
A. Right.
Q. -- my question to you, sir, is: What is the algorithm?
A. Okay. As -- as I explained earlier and -- while obviously you can see in the

chart -- but the UCA actually measures the amount of time required for a sound wave to travel across a sample. And it's expressed in microseconds per inch. So as a set -- as a cement goes from a liquid slurry to a set solid, the sound travels faster so the tran -- transit time, microseconds per inch, becomes less. So the instrument is actually measuring the sound wave.

Then the software within the instrument takes that speed of sound wave measurement and equates it to a compressive strength.

Q. Okay.

A. But it equates it according to, in this case, four algorithms: the densities of the slurries, the low density slurry, a regular density slurry, a weighted slurry; and then we have a foam algorithm. So the B algorithm is a -- a slurry density in the normal -- in the normal range.

Page 330:16 to 331:05

Q. The algorithm is proprietary to Chevron --

A. No, ma'am.

Q. -- or --

A. It's -- it was originally developed by Halliburton. I believe their -- their patented original paper is dated from the early 1980s. And then Chandler Engineering, I believe, uses the same algorithm.

Q. When you --

A. But anyhow, it's -- it's -- the algor -- the Algorithms A, B, and C came from -- came from Chandler. The Algorithm B or the alg -- the foam algorithm, I believe the patentholders on that are Chandler and CSI.

Page 336:04 to 337:18

Q. Okay. And then I had a question about the crush compressive strength, the next page, Section 6.

A. Yes.

Q. I understand that the samples were observed -- and I'm just reading -- have -- to have lost approximately one-half of their original 2-inch height. And you go on to say that, "Therefore, no further tests were conducted."

A. Correct.

Q. Why did you discontinue the testing and -- based on that observation?

A. Okay. The crush compressive strength test, the protocols for it are contained in ISO -- or in API RP 10B-2, and that document, also, the RP 10B-2 ISO 10426.2 references an ASTM document, C150, which is a -- a concrete testing document. And in that the instruction's that when you -- when you take cubes off you do -- do not test cubes which are manifestly faulty. And a test that comes out significantly lower than its original 2 inches we deemed manifestly faulty.
Q. And do you know what the range of manifestly faulty, what finding would be required to bring it in the range of manifestly faulty so as to discontinue the test per that recommendation?
A. I don't know that there is a -- I don't know that there's a hard threshold. You know, if we would have gotten 1.95 instead of 2, that would have been one thing; but a half an inch is substantial.
Q. All right. A half an inch out of the 2 inch is about a quarter of the --
A. Approximately, yes.
Q. And that puts it in the range of manifestly faulty in -- in your estimation?
A. In our interpretation, yes.

Page 338:17 to 338:21

EXAMINATION
QUESTIONS BY MR. LEMOINE:
Q. Mr. Gardner, I'll introduce myself. I'm Michael Lemoine, and I represent Weatherford in this litigation. I just have a few questions for

Page 339:08 to 339:09

A. We tested the base slurry described in the April 12th --

Page 339:20 to 339:24

Q. But you did study the base slurry?
A. The -- that's correct, in the 12th.
Q. And can you tell me very quickly, what was your conclusions regarding the conditions of the base slurry?

Page 340:01 to 340:08

A. The testing we did -- and you're talking about the contamination testing then?

Q. (By Mr. Lemoine) Whatever testing you did, I just want to leave here trying to understand and tell my client that according to what you did, this is the best conclusion you could reach regarding the condition of the base slurry that was used in the Macondo Well?

Page 340:11 to 342:10

A. We tested the slurry described in the April 12th Report.
Q. (By Mr. Lemoine) Yes. And?
A. The base slurry testing was -- there was, of course, the fluid loss, free fluid tests that were discussed earlier, and there were the contaminations with the synthetic-based -- with synthetic-based fluid that had come from M-I -- they had been supplied by M-I SWACO in the ranges of the zero to 30 percent contamination by volume levels.
Q. All right. Now I -- and in layman's terms to what I can understand, are you telling me that you concluded that the base slurry was contaminated?
A. No.
Q. No? Okay.
What -- what do you -- what did you conclude?
A. What -- all we did with the base slurry was test it to see how it would react when it was contaminated in -- if it were contaminated, in ranges --
Q. Oh, okay.
A. -- of no contamination to 30 percent. We did not make any analysis or interpretation about if it would have been contaminated, what it looked like --
Q. Okay.
A. -- how it behaved in the shoe track.
Q. So why did you use 30 percent as the upper range?
A. Just from experience, those are the kind -- you know, 25, 30 percent is -- is numbers that -- that are commonly used.
Q. And -- and if it was contaminated to that extent, would that cement have set?
A. The test showed here that this slurry and that -- and that mud sample set up to 30 percent contamination.
Q. M-h'm. In a solid form?
A. Yes.
Q. Not semisolid form?
A. No, a few hundred psi --
Q. And -- and --
A. -- at the low end.

07 Q. And if that would have been the case on
08 the Macondo Well, and I guess I'm giving you a
09 hypothet, would that have been sufficient to stop
10 the migration of oil and gas up the shoe track?

Page 342:13 to 342:21

00342:13 A. Assuming -- assuming that everything was
14 completely filled, and then that -- then a few
15 hundred psi is sufficient.
16 Q. (By Mr. Lemoine) Well, if -- if -- if the
17 evidence is supporting that the hydrocarbon flow
18 came up the shoe track, how would that affect the
19 conclusions that you reached based upon the
20 testing that you did on the contamination of base
21 slurry?

Page 342:23 to 343:03

00342:23 A. Because what we did was saying that
24 the -- the base slurry at various contamination
25 levels, what we did not do was make any analysis
00343:01 or interpretation about the state or position of
02 the fluids during or at the end of the Macondo
03 job.

Page 343:06 to 343:12

00343:06 A. I have no idea what was in the shoe
07 track.
08 Q. You don't have any idea what type of
09 cement was in the shoe track?
10 A. I have no idea in the actual job what
11 fluids ended up in what position. I have no
12 knowledge --

Page 343:14 to 343:18

00343:14 A. -- of the execution of the job.
15 Q. If -- if there were -- if there was
16 cement in the shoe track equal to what you
17 tested, even up to the 30 percent contamination
18 level, I want you to assume that hypothetically,

Page 343:20 to 343:21

00343:20 Could oil have migrated up the shoe track
21 through that cement?

Page 343:24 to 344:08

00343:24 A. The -- the contamination tests listed at

worst -- you know, the 30 percent, we had the discussion earlier about why it was repeated three times and the fact that things were segregating.

So let's go to the 25, you know, 345 psi. If you had a shoe track full of homogeneous slurry set to 345 psi, then you might expect to affect a seal. But I can't tell you based on what we did what ended up in the shoe track.

Page 344:11 to 344:13

A. Okay. The purpose of a shoe -- one of the purposes of a shoe track is to catch contaminated cement.

Page 344:15 to 344:22

A. But, you know, I don't know whether the shoe track in this case was sufficient or not. I have -- I have no idea about what actually ended up in the shoe track.

Q. Is the length of the shoe track something that was considered by an Operator with respect to having some part of it that would be without contaminants?

Page 345:01 to 345:11

A. Are you asking me would you -- would you -- would I think an Operator would hope that there would be set cement in the shoe track?

Q. Yes.

A. I think the answer to that is probably "Yes."

Q. And -- and -- and would the length of the shoe track be a factor in -- in decreasing the risk that there would be no cement in the shoe track capable of holding back the flow of hydrocarbons?

Page 345:13 to 345:13

A. The length would have an effect.