

1 UNITED STATES PATENT AND TRADEMARK OFFICE
2
3 BEFORE THE PATENT TRIAL AND APPEAL BOARD
4 CMS CEPACOR LTD., and CMS CEPACOR AMERICAS LLC,
5 Petitioner,
6 V.
7 SANDVIK INTELLECTUAL PROPERTY AB,
8 Patent Owner.
9 Patent No. 9,827,568
10

Inter Partes Review No. IPR2024-01380

11 DEPOSITION OF: HARRI KYTOMAA, PH.D.
12

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18

19 REPORTED BY: SHOSHANA KRAMER, RPR, CRR
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A P P E A R A N C E S:

TERRY SANKS, ESQUIRE

OF: Beusse Sanks, PLLC

612 E. Colonial Dr.

Suite 250

Orlando, FL 32803

407-644-8888

tsanks@firsttiniplaw.com

Counsel for Petitioner

Mehran Arjomand, ESQUIRE

Brianna Pruite

OF: Morrison & Foerster, LLP

707 Wilshire Boulevard

Los Angeles, CA 90017-3543

marjomand@mofo.com

(213) 892-5630

MArjomand@mofo.com

Counsel for patent owner

I N D E X

TESTIMONY OF Harri Kytomaa, PHD

DIRECT EXAMINATION BY MR. SANKS.....	4
CERTIFICATE OF OATH.....	38
CERTIFICATE OF DEPOSITION TRANSCRIPT.....	39
ERRATA SHEET.....	40
NOTIFICATION LETTER.....	41

I N D E X

EXHIBITS

EXHIBIT 1031	Harless.....	8
EXHIBIT 1040	Yagi.....	12
EXHIBIT 1017	Polinski.....	15
EXHIBIT 1018	Piepho.....	23
EXHIBIT 1001	090 Patent.....	32

S T I P U L A T I O N S

It is hereby stipulated and agreed by and between
the counsel for the respective parties and the deponent
that the reading and signing of the deposition
transcript be reserved.

1 P R O C E E D I N G S

2 *****

3 THE COURT REPORTER: Would you please raise
4 your right hand?

5 Do you swear or affirm that the testimony
6 you're about to give in this case is the truth, the
7 whole truth and nothing but the truth?

8 THE WITNESS: Yes, I do.

9 THEREUPON

10 Harri Kytomaa, PHD
11 was called as a witness and, having first been duly
12 sworn, testified as follows:

13 DIRECT EXAMINATION

14 BY MR. SANKS:

15 Q. Good afternoon, Doctor Kamato; is that correct,
16 am I pronouncing it correctly?

17 A. You're not.

18 Q. Can you say it again?

19 A. Kyotmaa.

20 Q. Hold on. My apologies there. To start with, I
21 just wanted to say I viewed your CV and I thought it was
22 very impressive. So congratulations on all that you
23 have achieved so far in your career. With that said, I
24 wanted to find out, have you had any direct experience
25 working with crushers prior to being an expert in these

1 two P tab matters?

2 A. Yes, some experience with crushers, yes.

3 Q. Can you explain what the experiences were?

4 A. Yes, so generally, commonly used equipment, so
5 specifically I've worked on coal pulverizers and bore
6 mills, as well as a crusher. These were in the context
7 of two or three projects that I worked that were
8 associated with coal mines and coal fired power plants.

9 Q. And how long ago was that?

10 A. Oh, ranging from, geeze, I mean my first
11 experience at a coal fire powered plant was decades ago
12 all the way to fairly recently, you know, a year or two
13 ago.

14 Q. Okay. Would you agree that sleeve bearings are
15 commonly used in mechanical engineering?

16 MR. ARJOMAND: Objection, form.

17 A. No, that's not, I mean, that's, in fact even
18 just saying sleeve bearing is not clear, what that would
19 be outside of the context of this matter. And I, I've
20 never really thought about that and it's not something
21 that is like, for example, if you were to do a degree in
22 mechanical engineering, you probably would never hear
23 about a sleeve bearing.

24 Q. As it relates to crushers, what would be your
25 understanding of a sleeve bearing?

1 MR. ARJOMAND: Objection, form.

2 A. So, what I've -- I mean there are two concepts
3 here that you're asking me about. One is a sleeve, and
4 the other is the bearing. So what I've learned from the
5 patents that I've reviewed in the context of this case,
6 is that the sleeve is a -- that is used at the top end
7 of the shaft in the context of for example, the 090
8 patent is a wear item.

9 Q. Okay. And what about the bearings?

10 MR. ARJOMAND: Objection, form.

11 A. I mean, bearings. There are all sorts of
12 different kinds of bearings out there things like
13 journal bearings, universal bearings, ball bearings.

14 I mean just a very large range of types of
15 bearings and as a mechanical engineer, one would
16 understand what a type of bearing is. But just
17 saying a bearing doesn't really inform you as to
18 what kind of bearing.

19 Q. How about with respect to crushers and with
20 respect to a sleeve that's used in a crusher?

21 MR. ARJOMAND: Objection, form.

22 A. Even crushers have many bearings and just so
23 you telling me, you know, what is a bearing and a
24 crusher, I would have to ask for clarifying questions.

25 Q. Understood. How about with respect to a flange

1 on a crusher?

2 MR. ARJOMAND: Objection form.

3 A. What about a flange, I don't understand the
4 question.

5 Q. Let's scratch that one.

6 I'm going to direct you to patent number
7 2840399, I should be able to share on here, correct.

8 Are you familiar with this patent?

9 A. I am, I've reviewed it.

10 Q. I'm going to direct your attention to Figure 5.
11 So adjacent to number 33 there is this mechanism here
12 which appears to be a bolt. Would you agree with my, my
13 assessment of what that element is?

14 MR. ARJOMAND: Objection, form.

15 A. Yes, I mean I think, I mean I don't think the
16 bolt, I mean it's adjacent to the number 33 and based on
17 this drawing alone it looks like a bolt. I mean there
18 may be more than one bolt but that drawing is not clear
19 on that.

20 Q. And turning to Figure 7 looking at the left end
21 here, does that also appear to be a bolt or at least a
22 head of a bolt?

23 MR. ARJOMAND: Objection, form.

24 A. Yeah, Figure 7, all we see on the far left of
25 Figure 7 is the, hexagonal head. It may be more than

1 one head but that's, all we see is more than one head.

2 Q. Okay.

3 THE COURT REPORTER: Did you want to mark this
4 document?

5 MR. SANKS: Yes, and we can actually mark it
6 just so we're consistent with this Exhibit 1031 so
7 it's consistent across all our other documents and
8 pleadings.

9 MR. ARJOMAND: Just for the record, I think
10 it's marked as Exhibit 1033 in the 01381 proceeding
11 but it's fine to marked it as Exhibit 1031 in this
12 proceeding or in this deposition.

13 (Exhibit No. 1031 was marked for
14 identification.)

15 Q. So looking at figures 7 and 5, would a person
16 of ordinary skill in the art, I understand that both
17 these figures have a bolt passing through it and end cap
18 with the shoulder?

19 MR. ARJOMAND: Objection, form.

20 A. If you could show me seven again.

21 Q. Sir, excuse me, I meant to. There?

22 A. Yeah, no problem. Well, Figure 7 doesn't
23 really show you the bolt, right, you just see a head,
24 person skilled in the art would see the head, would have
25 to guess, as to whether there is indeed a bolt. And

1 what were the other two elements that you asked me about
2 in your question?

3 Q. I asked you about the passing through an end
4 cap with a shoulder, where the end cap has a shoulder?

5 MR. ARJOMAND: Objection form.

6 A. Yeah, I mean I think the exactly what different
7 components are called, is unclear, one, to a person
8 ordinary skilled in the art that person would have to
9 review the patent specifically to see how different
10 components are called so I, you know, I won't guess but
11 I think with some effort, reviewing the patent, one
12 would be able to make that determination.

13 Q. Okay. So just for clarification, I want to go
14 back to Figure 4. I'll direct you to column three,
15 starting at line 16. And I would ask if you could read
16 that paragraph?

17 A. Sure, should I read it into the record.

18 Q. Yes, please.

19 A. The arrangement of the invention is also highly
20 advantageous in facilitating removal and replacement of
21 a gear. To remove a gear, it is only necessary to back
22 off the bolts nine slightly and introduce oil under
23 pressure through the bore 16 so as to expand the gear
24 hub. Where upon the gear will slide back against the
25 washer eight with no difficulty and may then be removed.

1 Q. And then now going back to Figure 4, do you see
2 element nine in Figure 4?

3 A. I do.

4 Q. And we agree that that's the bolt?

5 MR. ARJOMAND: Objection form.

6 A. No, we actually don't, the, we, I just read the
7 paragraph that you asked me to read talks about multiple
8 bolts. Or a plurality of bolts.

9 Q. So Figure 9, I mean element nine, could that be
10 one of the plurality of bolts?

11 A. From that figure it's unclear, right and so
12 element nine in Figure 4 only shows one bolt.

13 Q. And how about element eight?

14 MR. ARJOMAND: Objection, form.

15 A. What about it?

16 Q. Does that show the washer?

17 MR. ARJOMAND: Objection form, sorry.

18 A. I believe -- I apologize, yes, I believe to the
19 extent that what I read identified element eight as the
20 washer, then it would be the washer. But I don't have
21 the text in front of me.

22 Q. Column four, starting at line 16, can you read
23 that paragraph into the record, please?

24 A. Sure. The invention may also be applied to
25 double webbed gears where both webs extend regularly and

1 such an application is shown in Figure 7. This case,
2 the hub 40 has a pair of radio webs 41, and the hub is
3 relieved by grooves 43 at each side of these webs. The
4 oil bore 44 has branches for supplying oil to both of
5 the grooves 42 as indicated. The construction and
6 operation is otherwise the same, as in the embodiments
7 previously described.

8 Q. The referring back to Figure 7.

9 So does Figure 7 show only a single groove on
10 the outside surface of the main shaft?

11 MR. ARJOMAND: Objection, form.

12 A. I don't know whether this, I mean it only shows
13 one shaft so I don't know whether it's the main shaft.
14 So I'll just speak to the shaft, the only shaft that I
15 see.

16 Q. Thank you.

17 A. And the Figure 7 only shows one groove on the
18 shaft.

19 Q. And what number are you identifying as the one
20 groove?

21 A. It is actually not numbered.

22 Q. Okay. I'd like to mark this exhibit as
23 Exhibit 1040, it was originally in the 01381 proceeding
24 under that exhibit number. So are you familiar with
25 this reference?

1 (Exhibit No. 1040 was marked for
2 identification.)

3 A. Yes, this is the Yagi reference, I am.

4 Q. On column six, starting at line 40. Yup,
5 starting at line 40, that paragraph, you mind reading
6 that into the record?

7 A. Would it be possible for to you scroll let's
8 see, actually, hang on. Line 40, no. Okay, I see the
9 whole thick thing.

10 Q. Let me make it larger. When I'm on the other
11 hand of a share, it always looks so small to me, so?

12 A. Yeah, yeah, yeah. This is a little too big,
13 I'm quite close to the monitor.

14 Q. Oh, I'm sorry I will shrink it.

15 A. Thank you though for accommodating. And so you
16 said line 40, right?

17 Q. Yes, sir.

18 A. Okay, good. And starting the tapered shaft,
19 right, that's the right paragraph.

20 Q. That's correct.

21 A. I can't see the column number. Okay the
22 tapered shaft 60 comprises a taper part, 61, and an
23 axial oil passage 62 is formed along the axial direction
24 along the tapered shaft 60 from the front end surface of
25 the taper part 61. Also in the regular direction of the

1 taper part 61 a radial oil passage 63 is formed. The
2 radial oil passage 63 communicates with the terminal end
3 of the axial oil passage 62. And both ends thereof are
4 open to the outer peripheral surface of the taper part
5 61.

6 Therefore, oil fed from a hydraulic pressure
7 source not shown flows in the axial oil passage 62
8 and the radial oil passage 63 in the order and flows
9 out to the outer peripheral surface of the taper
10 part 61.

11 Q. Okay. And looking at the next paragraph, and
12 I'm looking really at the second line, well, the second
13 sentence, would you agree that, well, if you could read
14 the line that starts with the oil flowing out of.

15 A. Yeah. The oil flowing out of the opening of
16 the radial oil passage 63 flows in the second oil groove
17 65 by which the oil is permeated in the circumferential
18 direction of the outer peripheral surface of the taper
19 part 61.

20 Q. And going to the next paragraph starting at 58,
21 could you just read that first sentence?

22 A. Sure. In the outer peripheral surface of the
23 taper part 61, there is provided a connecting oil groove
24 66, one end of the which communicates with the second,
25 second oil groove 65, and which extends in the axial

1 direction towards the front end of the tapered shaft 60.

2 Q. Okay. Could a person of ordinary skill in the
3 art understand based on what you just read in Yagi, that
4 Yagi can be configured such that fluid -- excuse me, the
5 funnel passage, 62, could feed oil through the groove 64
6 which in turn feeds oil to groove 65?

7 MR. ARJOMAND: Objection form.

8 A. Could you show me the figure that shows groove
9 64 and 65, please.

10 Q. Yes.

11 A. So somebody, a mechanical engineer of ordinary
12 skill in the art in machine components like these, would
13 understand that, that oil would flow from groove 64-4 to
14 groove -- sorry, groove 65 to groove 64.

15 Q. And are they connected through groove 66?

16 A. Yes.

17 Q. Looking at these drawings does Yagi teach a
18 plurality of groups?

19 MR. ARJOMAND: Objection, form.

20 A. The shaft of Yagi has more than one groove,
21 yes.

22 Q. This next exhibit that was, I'd like to mark it
23 as Exhibit 1017 which is the same number as used in the
24 01381 proceeding, are you familiar with this part
25 reference?

1 A. I am.

2 (Exhibit No. 1017 was marked for
3 identification.)

4 Q. Would you agree that Polinski teaches a prior
5 art arrangement with where a head nut is threaded on to
6 a main shaft and presses a mantle against the shaft?

7 MR. ARJOMAND: Objection, form.

8 A. I'm not sure I completely followed your
9 question but to the extent that you know there's
10 specific language that says what you just stated in the
11 patent, I'd be happy to take a look at it.

12 Q. You could read line 15 starting, that sentence
13 starts there and that last sentence that ends line 20?

14 A. Sure, thank you. To secure, so this is a
15 description of the prior art.

16 Q. Yes.

17 A. To secure the mantle, to the shaft, a threaded
18 section has generally been provided on the shaft,
19 immediately above the tapered portion supporting the
20 mantle for receiving a head nut which forces the mantle
21 against the tapered portion of the shaft.

22 Q. And would you agree that that's prior art in
23 the industry, or, I would say prior art?

24 MR. ARJOMAND: Objection, form.

25 A. Well, so, yes, yes, I mean I think that that's

1 the representation in this Polinski reference. It does
2 refer to that as prior art, yes.

3 Q. And this is referring to, and is this referring
4 to prior art with respects to crushers?

5 MR. ARJOMAND: Objection form.

6 A. This patent relates to gyratory crushers, yes.

7 Q. You could read into the record where you ended
8 on line 20 starting through the end of line 25 ending
9 with shaft?

10 A. While this type of arrangement has proven to be
11 satisfactory for most crusher installations, experience
12 has indicated that the relatively abrupt changes in the
13 cross sectional area of the shaft above and below the
14 threaded section have resulted in high local stress
15 concentrations in these regions of the shaft.

16 Q. So reading that, would a person of ordinary
17 skill in the art understand that stress concentrations
18 are acceptable in gyratory crushers?

19 MR. ARJOMAND: Objection form.

20 A. This paragraph about the description of the
21 prior art makes the opposite point. It says that these
22 high local stress concentrations in the shaft in the
23 presence of substantial stressors generated by the
24 cyclical bending loads applied to the shaft by the
25 mantle during operation have caused the development of

1 fatigue racks or fractures in the shredded section of
2 the shaft as well as immediately above and below it.

3 Q. So wouldn't a person of ordinary skill in the
4 art understand as long as the stresses stay within
5 acceptable limits it would be okay?

6 MR. ARJOMAND: Objection, form.

7 A. That's not what this says, it says that in the
8 presence of these high local stressors and the elevated
9 cyclic bending loads applied to the shaft that cracks
10 have occurred and can occur.

11 Q. All right, but what would a person of ordinary
12 skill in the art understand?

13 MR. ARJOMAND: Objection, form, asked and
14 answered.

15 A. So a person of ordinary skill in the art would
16 understand that, that areas of abrupt changes in the
17 cross sectional area of the shaft would be susceptible,
18 particularly in the presence of elevated cyclic bending
19 loads that are typical in gyratory crushers. These
20 would be susceptible to forming cracks and breaks, both
21 above and below the threaded region as well as in the
22 threaded region. That's what they would understand.

23 Q. If you could read the sentence that's about
24 midway in line 55? Excuse me.

25 A. Certainly, certainly. Sorry.

1 Q. Through line 67 ending at fill field, which is
2 the subsequent paragraph.

3 A. Yeah. I think you're asking me to read a
4 sentence, I think that's more than a sentence.

5 Q. Oh, my apologies.

6 A. No worries, I'll read the whole thing.

7 Q. All right.

8 A. So starting at line 66 there, the sleeve
9 arrangement which is releasably, so this is actually,
10 just for the record to be clear this is the summary of
11 the invention so we've switched away from now, prior to
12 art, to now summary of the invention, and I'm on
13 line 56, middle of the line.

14 The sleeve arrangement which is releasably
15 secured to the bearing journal, at the low stressed
16 outermost end of the shaft includes a head nut which
17 abuts the mantle to secure it to the tapered portion of
18 the shaft.

19 From the foregoing it can be seen that the
20 invention contemplates an arrangement wherein abrupt
21 structural discontinuities in the normally high
22 stress regions of the main shaft have been
23 essentially eliminated to minimize the development
24 of the fatigue fractures in the shaft while at the
25 same time providing an arrangement which can be

1 easily maintained and repaired in the field.

2 Q. Would a person of ordinary skill in the art be
3 aware that material and rock crusher main shaft
4 generally needs to remain below the allowable stress?

5 MR. ARJOMAND: Objection form.

6 A. I don't actually understand your question. I'm
7 sorry.

8 Q. Let's scratch that question.

9 Can you explain to me your understanding of the
10 term threading corrosion?

11 A. Yes, yes. So threading corrosion occurs really
12 in association with two mechanisms, threading and
13 corrosion and threading is a failure mechanism
14 associated with typically metal components rubbing
15 against one another and this is exacerbated by corrosive
16 environments. And so corrosive environments that have
17 materials that can chemically attack the metal material
18 and thereby cause the threading to accelerate.

19 Q. Is this an issue that can occur with crushers?

20 MR. ARJOMAND: Objection, form.

21 Q. So threading corrosion from a design
22 perspective, if you were to design a crusher, would that
23 be a factor that you take into consideration in your
24 design?

25 MR. ARJOMAND: Objection form.

1 A. It would be. It wouldn't be the only
2 consideration and what would be important in light of
3 the great variability associated with threading
4 corrosion is to understand the, you know, the specific
5 application and understand the experience that there has
6 been associated with threading corrosion in that
7 application.

8 Q. Looking at figure one, what would you recognize
9 as being the main shaft?

10 MR. ARJOMAND: Objection, form.

11 A. I'm not sure that it is called the main shaft
12 but the shaft that, you know, I have been focusing on in
13 this matter is item is, let's see numbered I think maybe
14 eight, but of the shaft, other parts of the shaft, like
15 the number 11 for example, yeah, so it's the vertical
16 structure that starts from where you see the number 18
17 to where you see the numbers 34 and 35.

18 Q. Okay.

19 A. I'm sorry for interrupting. I mean, there's
20 another shaft for example, that's labeled or at least in
21 association with the label 27 but I'm not sure that
22 that's the one you are asking me about.

23 Q. No it's not. Let's keep that part clear.

24 Okay, and looking at what you've identified as
25 the main shaft. Let's scratch that, hold on.

1 Considering potential -- well, considering
2 trying to abate threading corrosion, would one of
3 the components you be focused on doing that with
4 would be the main shaft?

5 MR. ARJOMAND: Objection, form.

6 A. Yes, as we discussed already in association
7 with the prior, one of the challenges has been the
8 development of the fractures on the shaft. Now, on the,
9 just you know, I apologize if I'm just repeating myself
10 here, but I don't know that the shaft is called the main
11 shaft, so I.

12 Q. I understand.

13 A. I just call it the shaft, I think you call it
14 the main shaft and you, your question represented it
15 that I called the main shaft, but I didn't and I just
16 wanted to clarify that.

17 Q. Thank you. Referring now to Figure 2, I'm
18 going to point you to 36 and I'm going to ask you some
19 questions about that but I first want to go to the spec
20 so we have a reference on what 36 is pointing towards.

21 So if you're looking in column three, I believe
22 starting here at roughly line 27 or 28, it discusses
23 the projecting -- well, let me see, an inwardly
24 projecting annular lip 36 on the upper end of the
25 sleeve. I'm not going to tell to you read it but my

1 question is, what is the purpose of element 36.

2 A. All right, it is to be secured against the
3 upper marginal edge surface of the shaft by the
4 sleeve nut 35. It is in fact to hold the sleeve in a
5 certain position, the principle, let's say securing of
6 the sleeve is done by the heat sink connection between
7 the sleeve and the cylindrical end of the shaft but this
8 is a design feature that positions the sleeve against
9 the end of the shaft.

10 Q. So would a person of the ordinary skill in the
11 art understand that element six would be used during
12 installation?

13 MR. ARJOMAND: Objection, form.

14 A. You have to remind me what element six is.

15 Q. 36, excuse me. The lip we just spoke of?

16 MR. ARJOMAND: I see, okay, objection, form.

17 A. No, I think 36 has this paragraph starting from
18 line 15 also explains is there two alignment against the
19 top of the marginal edge surface the of the shaft seven,
20 and it's always there during normal operations. So it's
21 not like it serves a function during installation and
22 then doesn't anymore. It always does, but the primary
23 manner in which the sleeve is secured is by a heat sink
24 type connection between the sleeve and the shaft.

25 Q. Hypo-patent -- I'd like to have this exhibit

1 marked as Exhibit 1018 as its marked in proceeding
2 01381.

3 (Exhibit No. 1018 was marked for
4 identification.)

5 Are you familiar with this prior art reference?

6 A. I am.

7 Q. What would you -- so looking at Figure 2 what
8 would you identify as the as the shaft or main shaft in
9 this image?

10 MR. ARJOMAND: Objection, form.

11 A. I think the entire structure in this image
12 Figure 2 is a shaft.

13 Q. From what you understand of these crushers,
14 would the shaft be subject to cyclic loading conditions
15 in operation?

16 MR. ARJOMAND: Objection, form.

17 A. Yes, these gyratory crushers which is the
18 subject of the of this dispute as I understand it, are
19 subject to cyclic bending loads on the shaft, yes.

20 Q. Are they subject to eccentric loads?

21 MR. ARJOMAND: Objection, form.

22 A. Yes, gyratory crushers are subject to bending
23 loads and eccentric bending loads that where essentially
24 the eccentric loads are the loads that then create
25 bending loads in the shaft.

1 Q. Can we go ahead and take a break right now.

2 (Discussion held off the record.)

3 Q. Can you explain from a mechanical design
4 perspective what is a stress concentration?

5 A. Sure, a stress concentration, so I'll give you
6 first a very simple example. But think of a straight
7 bar, imagine just the bar that's let's say half inch in
8 diameter, circular, so just a bar. If you were to fall
9 on that bar, the stress as defined by engineers is
10 simply the force that you pull on it, divided by the
11 area. That's the stress. That's how it's defined.

12 Q. Divided by what area?

13 A. Area of the bar.

14 Q. Okay.

15 A. So it would be, you know, πR^2 , π R squared,
16 area of the bar where R is the radius. The stress
17 concentrator, would be, for example, if you had a knot
18 in the bar or a scratch in the bar, anything that
19 actually locally reduces the cross-sectional, right, the
20 effective cross sectional area slightly decreases now
21 and the stress, because of that, is increased because
22 the bar is still carrying the same load, right, we're
23 dividing the load by the area, the area is smaller, the
24 stress goes up. And the material characteristics are
25 typically described by the stresses that a material can

1 withstand. Not the load, but the stresses. Just as I
2 have defined them. And so, so a stress concentrator is
3 for example, the knots that I described, but it could be
4 a variety of other things. For example, a stress
5 concentrator could be a design feature that is
6 inadvertently designed into a component that causes the
7 effective cross sectional area to decrease. But the --
8 another way to think about stress concentrators is also
9 for components that experience loads and stresses, if
10 you now have an imperfection. Imperfections again can
11 be -- can be scratches that it could be sort of
12 accidental or it could be design features or it could be
13 a consequence of operation, of a machine. Like, for
14 example, you can get corrosion pitting, if you have
15 corrosive materials in the vicinity of a certain metal
16 that can eat at the metal and create local pits and
17 those pits also can be stress concentrators. They're
18 well known to be stress concentrators that as a result
19 of cyclic loading now on such a component that has
20 experienced such a pit, you can begin to develop a
21 crack, a fatigue crack for example that ultimately
22 results in the failure of the component.

23 Q. And for crushers they're typically -- they're
24 mechanical design in how they're, I'll use the word
25 mechanized, they experience loads and stresses, correct?

1 MR. ARJOMAND: Objection, form.

2 A. Yeah, by design, the shaft of a gyratory
3 crusher will experience cyclic forces on the mantle that
4 is transmitted then in the form of cyclic loads on the
5 shaft.

6 Q. But if designed correctly is it possible that
7 the stress concentrations do not lead to failure?

8 MR. ARJOMAND: Objection, form.

9 A. The, as I mentioned in my prior answer it's not
10 just the design that's important. So obviously there
11 will be design characteristics, specifically the
12 geometry as designed, but then you also have issues
13 related to weather, imperfections arise during
14 manufacturing. Those arise. And also whether a
15 imperfection constitute stress concentrators in the
16 operation itself as a result of for example, corrosion.
17 And so there are many, even though you might design a
18 machine well, it might be manufactured in such a way
19 that it is a little bit different from how it was
20 designed and it might be operated in a manner that is
21 different from what is designed. And as a result in
22 each of those stages you can have situations that bring
23 forth or develop stress concentration situations.

24 Q. If a shaft had, say, multiple stress
25 concentrations, would the shaft fail simultaneously at

1 all stress concentrations?

2 MR. ARJOMAND: Objection, form.

3 A. That's actually, that's a question that I think
4 engineers struggle with to this day. The answer is
5 complicated, I'll try to keep it brief but ultimately
6 the manifestation of a failure, for example the kinds of
7 failures that the patents in suit and as well as prior
8 art talk about is really failure of a shaft and your
9 question really is also about the shafts, so I'll focus
10 on that, even if you had, let's say, two parts, or two
11 stress concentrations that nominally appear to be
12 similar where exactly the failure will happen is very
13 statistical in nature and oftentimes difficult to
14 predict and part of the reason for that is the sort of
15 last stage of failure tends to be a fatigue failure
16 phenomenon that is initiated at stress, the locations of
17 stress concentrations and the fatigue failure mechanism
18 is very difficult to predict and it's very poorly
19 understood. Generally not repeatable. And so you're
20 asking me would they fail at you know the same place or
21 the same time and the answer is no. These failures are
22 very unpredictable.

23 Q. With respects to fatigue, are you familiar with
24 the term endurance limit?

25 A. Yes.

1 Q. Can you explain what that is?

2 A. Yes, so in, you know, in a simple typical
3 fatigue test. So for example, a three point bending
4 configuration, if you expose the sample to a cyclic
5 stress of a certain magnitude, most metals although
6 they're not all the same, have a limit that is such that
7 below a certain stress the component will be able to
8 with stand in essence and infinity of cycles. So that's
9 true for example the three point bending situation where
10 you are imposing a midspan horizontal load on sort of a
11 beam, small beam component, but you could do that in a
12 similar kind of test that would bear out similar results
13 with metal samples that are load in sort of a
14 cantilevered beam configuration or simply in a pure
15 tensile stress. For example, you just sort of pull on a
16 sample in a cyclic manner, generally you would see these
17 similar phenomenon.

18 Q. So at a stress concentration, if the cyclic
19 stress is below the endurance level, will fatigue occur?

20 MR. ARJOMAND: Objection, form.

21 A. So yes, if the -- let me give you sort of a
22 full answer. So if you have a stress concentration
23 which I think that you have in your question, that you
24 just asked me, then the stresses will be higher than the
25 stresses as calculating a very simple manner with, you

1 know, load divided by the area as I've described before.
2 Because locally, the imperfection, the stress
3 concentrator will amplify the stress load. Right. And
4 so in that particular local region where there is a
5 stress concentrator, your stress might be higher. And
6 so the question really is whether now that stress that
7 the stress concentration location is higher than the
8 endurance limit, and so, you know, depends. You could
9 be doing a fatigue test, very low stressors, that in the
10 presence of a stress concentrator that still may not be
11 problematic and ultimately result in failure or the
12 stress concentrator could be such that it elevates the
13 stresses sufficiently so that ultimately with enough
14 cycles you do have a failure.

15 Q. Does either the patent that's at issue here the
16 090 or the 568 patent, does it teach that the shaft is
17 freely rotating?

18 A. Yes, it does.

19 Q. What does freely rotating mean to you?

20 MR. ARJOMAND: Objection, form.

21 Q. Scratch that. What does one person of ordinary
22 skill in the art understand freely rotating to mean?

23 MR. ARJOMAND: Objection, form.

24 A. I have to answer that question in the context
25 of the patents specifically the gyratory crushers where,

1 you know, that has a very specific meaning and I would
2 say that outside of that context, you know, it would be
3 difficult to answer the question, so the --

4 Q. Let's just focus on --

5 A. Yeah, so the gyratory crushers in question
6 operate by creating an eccentric motion of the lower end
7 of the shaft, and what that does is it brings the mantle
8 in closer proximity with its opposing crushing surface
9 to then effect the act of crushing by simply, you know,
10 squeezing whatever is in between those two things and if
11 you look at the design, a person of ordinary skill
12 understanding that the design of these types of gyratory
13 crushers would see that, the only thing that is driving
14 or let's say the constraining, the shaft, from the
15 perspective of its rotating motion, are the eccentric
16 drive at the bottom of the crusher. The bearings at the
17 bottom and the top of the shaft is such that they just
18 sit in a configuration that's typically known in
19 mechanical engineering in a journal bearing
20 configuration and a journal bearing simply is a shaft in
21 a circular aperture with no restraint on the rotation of
22 the shaft. And so as a result of that configuration as
23 well as some text in the specifics, a person of ordinary
24 skill in the art would understand the shaft is freely
25 rotating.

1 Q. Would one understand as it relates to these
2 patents that freely rotating is the shaft is
3 uncontained?

4 MR. ARJOMAND: Objection, form.

5 A. The person of ordinary skill in the art would
6 understand that the shaft is unconstrained from the
7 perspective of rotating about its own axis. Now, it's
8 not entirely unconstrained, right, because it has a very
9 described motion that is constrained by the location of
10 the journal bearings that I just described as well as
11 the eccentric motion that is imposed to the lower end of
12 the shaft, right. So those are constraints on the shaft
13 but the shaft is unconstrained from the perspective of
14 rotating about its own access.

15 Q. Just from a mechanical design perspective what
16 would be the opposite, what would be the technical term
17 for the opposite of freely rotating?

18 MR. ARJOMAND: Objection, form.

19 A. Well, as I explained, freely rotating means it
20 is allowed to turn freely about its own axis. So, for
21 example, as the shaft undertakes this eccentric motion
22 and narrower parts of the crushing regents engage with
23 material, those will impose certainly a crushing force
24 on the material, but the material also as it engages
25 with the a mantle and the mantle is moving in eccentric

1 fashion will actually cause the mantle to rotate about
2 the shaft's axis, right. The end opposite of this, and
3 I think the -- there would be many examples so I cannot
4 give you a comprehensive answer, but a situation that is
5 somewhat, you know, opposed to a freely rotating
6 situation is a situation where the shaft is not allowed
7 to rotate about its own axis. So, for example, if you
8 were to look at the shaft from above, it would stay in
9 the same clock position, if you will, even while its
10 executing an eccentric motion, right. In that
11 situation, it would not be freely rotating, it would be
12 angularly constrained, prevent it from rotating about
13 its own axis, and that would now create a very
14 different, let's say, functionality for the crusher,
15 probably not a beneficial one.

16 Q. Okay, I am going to share.

17 So what I am sharing is the 090 patent marked
18 as Exhibit 1001 in the 01381 proceeding.

19 (Exhibit No. 1001 was marked for
20 identification.)

21 And I'd like this to be marked as Exhibit 1001.
22 If you could read starting at column four, line 52,
23 to the sentence that ends at line 63 into the
24 record, please.

25 A. Column four, is column four the left or the

1 right.

2 Q. The right?

3 A. And say the numbers again. 53 to.

4 Q. 52, the second paragraph there under detailed
5 description and down to line 63?

6 A. Okay, starting at a drive?

7 Q. Yes.

8 A. A drive not shown is coupled to make shaft 107
9 via a drive shaft 108, and suitable gathering 116, so as
10 to rotate shaft 107 eccentrically about a longitudinal
11 axis 126 of the crusher and to cause head 103 to perform
12 a gyratory pendulum movement and crush material
13 introduced into crushing chamber 104. A first axial
14 upper end region 113 of shaft 107 is maintained in a
15 rotatable position by a top end bearing assembly 112
16 positioned intermediate between main shaft 107 and a
17 central boss 117. Similarly, a second axial bottom end
18 118 of shaft 107 is supported by a bottom end bearing
19 assembly 119. Upper frame 101 is divided into an upper
20 frame part commonly termed a top shell 111, mounted upon
21 lower frame part 102 commonly termed a bottom shell and
22 a spider assembly 114 having arms 110 that extend from
23 top shell 111 and represents an upper portion of the
24 crusher.

25 Q. Based on this disclosure, doesn't this suggest

1 that the shaft is not freely rotatable?

2 MR. ARJOMAND: Objection, form.

3 A. It doesn't.

4 Q. Okay. So looking at 108 here, at the far left
5 end what would you describe that as?

6 A. So 108 is a shaft and then you have a gear, a
7 conical gear at the left end of the shaft.

8 Q. And what do you understand the purpose of that
9 gear to be?

10 MR. ARJOMAND: Objection, form.

11 A. So the teeth of the gear attached to shaft 108
12 engages with teeth on the structure labeled 160, and 116
13 is essentially a turntable that imposes a gyratory
14 motion to the bottom of the shaft, so essentially what
15 it does is that it, it guides the bottom of the shaft,
16 in a circular motion, but the shaft itself is free to
17 rotate about its own center and so the structure 116
18 imposes a circular, say trajectory of the center of the
19 shaft at the bottom but the shaft itself is free to
20 rotate about its own center.

21 Q. Okay. Let's go ahead and take a 15-minute
22 break and I should only be having a few questions after
23 that.

24 A. Okay.

25 (Discussion held off the record.)

1 MR. SANKS: Just have a few more questions.

2 Q. Are you familiar with any other gyratory
3 crushers where the shafts are freely rotating?

4 MR. ARJOMAND: Objection, form.

5 A. I would expect this to be a design feature that
6 exists in other gyratory crushers but I have not, let's
7 say undertaken the exercise of studying, let's say
8 gyratory crushers manufactured by other entities other
9 than the parties in this matter.

10 Q. Based on your experience with gyratory
11 crushers, typically if the shaft is not freely rotating,
12 what movements do they have?

13 MR. ARJOMAND: Objection, form.

14 A. I mean crushing can be affected by motions
15 other than sort of a gyratory motion. The gyratory
16 motion we've talked about here in some details, so if
17 your question is about specific gyratory crushers where
18 the shaft is constrained and prevented from freely
19 rotating, first of all I'm not aware that such gyratory
20 crushers exactly exist. There is a benefit to the free
21 rotation of the shaft but if it is constrained the what
22 will happen is the in the crushing action, the material
23 that is being crushed in the narrow gap of the gyratory
24 crusher will experience not only the compressive
25 squeezing forces if you will, but also a sheer force

1 that doesn't, that is -- let's say the that constitutes
2 potentially energy that is wasted in that it doesn't
3 affect crushing but requires expenditure of energy.
4 That in part is why gyratory crushers have freely
5 rotating shafts.

6 MR. SANKS: It was my last question. Mehran,
7 do you have any redirect?

8 MR. ARJOMAND: Why don't we take a two minute
9 break, let me just look at my notes and I'll get
10 right back to you, Terry.

11 MR. SANKS: All right, thank you.

12 MR. ARJOMAND: I'm going to say we don't have
13 any questions.

14 MR. SANKS: All right.

15 MR. ARJOMAND: I don't think you need the
16 camera for that.

17 MR. SANKS: All right.

18 THE COURT REPORTER: Would the witness like to
19 read or waive?

20 THE WITNESS: I'd like to read.

21 THE COURT REPORTER: And you would like the
22 same, Mr. Arjomand?

23 MR. ARJOMAND: I think we would just like the
24 rough today and then you can send us the final
25 version when its ready, when do you think you'll

have done.

(TIME NOTED: 2:00 P.M.)

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CERTIFICATE OF OATH

STATE OF FLORIDA:

COUNTY OF ORANGE:

I, SHOSHANA KRAMER, Notary Public, State of Florida,
do hereby certify that Harri Kytomaa, PHD personally
appeared before me on November 19, 2025 and was duly
sworn and produced a driver's license as identification.

Signed this 20th day of November, 2025.

A handwritten signature in blue ink that reads "Shoshana Kramer". The signature is fluid and cursive, with the first name "Shoshana" and the last name "Kramer" clearly distinguishable.

SHOSHANA KRAMER, RPR, CRR

Notary Public, State of Florida

My Commission No.: HH 321921

Expires: 11/13/2026

CERTIFICATE OF REPORTER

STATE OF FLORIDA:

COUNTY OF ORANGE:

I, SHOSHANA KRAMER, Notary Public, State of Florida, certify that I was authorized to and did stenographically report the deposition of Harri Kytomaa, PHD; that a review of the transcript was requested; and that the foregoing transcript, pages 4 through 37, is a true and accurate record of my stenographic notes.

I further certify that I am not a relative, employee, or attorney, or counsel of any of the parties, nor am I a relative or employee of any of the parties' attorneys or counsel connected with the action, nor am I financially interested in the action.

DATED this 20th day of November, 2025.



SHOSHANA KRAMER, RPR, CRR

ERRATA SHEET

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IN RE: CMS CEPKOR V SANDVIK

DATE: NOVEMBER 19, 2025

DEPONENT: HARRI KYTOMAA, PHD

Job No. FLA7755208

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Under penalties of perjury, I declare that I have read the foregoing document and that the facts stated in it are true."

DATE Harri Kytomaa, PHD

Job No. FLA7755208

NOVEMBER 20, 2025

Harri Kytomaa, PHD

C/O Morrison & Foerster, LLP

MArjomand@mofo.com

In Re: November 19, 2025, Deposition of Harri Kytomaa,
PHD

Dear Harri Kytomaa, PHD:

This letter is to advise that the transcript for the
above-referenced deposition has been completed and is
available for review. Please email signed errata
sheet to transcripts-fl@veritext.com or
sign below to waive review of this transcript.

It is suggested that the review of this transcript
be completed within 30 days of your receipt of this
letter, as considered reasonable under Federal Rules*;
however, there is no Florida Statute to this regard.

The original of this transcript has been forwarded
to the ordering party and your errata, once received,
will be forwarded to all ordering parties for inclusion
in the transcript.

Sincerely,

Shoshana Kramer, RPR, CRR

cc: TERRY SANKS, Esquire

Mehran Arjomand, Esquire

Waiver:

I, _____, hereby waive the reading and signing
of my deposition transcript.

Deponent Signature

Date

*Federal Civil Procedure Rule 30(e)/Florida Civil
Procedure Rule 1.310(e)

&	110 33:22	23 3:14	5
& 2:7 40:6 41:4	111 33:20,23	25 16:8	5 7:10 8:15
0	112 33:15	250 2:3	52 32:22 33:4
01381 8:10	113 33:14	27 20:21 21:22	53 33:3
11:23 14:24	114 33:22	28 21:22	55 17:24
23:2 32:18	116 33:9 34:12	2840399 7:7	56 18:13
090 3:15 6:7	34:17	2:00 1:14 37:2	568 29:16
29:16 32:17	117 33:17	3	58 13:20
1	118 33:18	30 41:11,24	6
1.310 41:24	119 33:19	32 3:15	60 12:22,24 14:1
1001 3:15 32:18	12 3:12	321921 38:17	61 12:22,25 13:1
32:19,21	126 33:11	32803 2:4	13:5,10,19,23
101 33:19	12:10 1:14	33 7:11,16	612 2:3
1017 3:13 14:23	15 3:13 15:12	34 20:17	62 12:23 13:3,7
15:2	22:18 34:21	35 20:17 22:4	14:5
1018 3:14 23:1,3	16 9:15,23 10:22	36 21:18,20,24	63 13:1,2,8,16
102 33:21	160 34:12	22:1,15,17	32:23 33:5
103 33:11	18 20:16	37 39:9	64 14:5,9,14
1031 3:11 8:6,11	19 1:13 38:8	38 3:4	64-4 14:13
8:13	40:3 41:5	39 3:5	65 13:17,25 14:6
1033 8:10	2	4	14:9,14
104 33:13	2 21:17 23:7,12	4 3:3 9:14 10:1,2	66 13:24 14:15
1040 3:12 11:23	20 15:13 16:8	10:12 39:9	18:8
12:1	41:2	40 3:6 11:2 12:4	67 18:1
107 33:8,10,14	2025 1:13 38:8	12:5,8,16	7
33:16,18	38:10 39:17	407-644-8888	7 7:20,24,25
108 33:9 34:4,6	40:3 41:2,5	2:4	8:15,22 11:1,8,9
34:11	20th 38:10	41 3:7 11:2	11:17
11 20:15	39:17	42 11:5	707 2:8
11/13/2026	213 2:9	43 11:3	
38:17	22745 38:15	44 11:4	
	39:20		

8	actually 8:5	anymore 22:22	36:15,22,23
8 3:11	10:6 11:21 12:8	aperture 30:21	41:19
892-5630 2:9	18:9 19:6 24:19	apologies 4:20	arms 33:22
9	27:3 32:1	18:5	arrangement
9 10:9	adjacent 7:11	apologize 10:18	9:19 15:5 16:10
9,827,568 1:9	7:16	21:9	18:9,14,20,25
90017-3543 2:8	advantageous	appeal 1:3	art 8:16,24 9:8
a	9:20	appear 7:21	14:3,12 15:5,15
ab 1:7	advise 41:8	27:11	15:22,23 16:2,4
abate 21:2	affect 36:3	appeared 38:8	16:17,21 17:4
able 7:7 9:12	affected 35:14	appears 7:12	17:12,15 18:12
28:7	affirm 4:5	application 11:1	19:2 22:11 23:5
above 15:19	afternoon 4:15	20:5,7	27:8 29:22
16:13 17:2,21	ago 5:9,11,13	applied 10:24	30:24 31:5
32:8 41:8	agree 5:14 7:12	16:24 17:9	asked 9:1,3 10:7
abrupt 16:12	10:4 13:13 15:4	area 16:13	17:13 28:24
17:16 18:20	15:22	17:17 24:11,12	asking 6:3 18:3
abuts 18:17	agreed 3:20	24:13,16,20,23	20:22 27:20
accelerate 19:18	ahead 24:1	24:23 25:7 29:1	assembly 33:15
acceptable	34:21	areas 17:16	33:19,22
16:18 17:5	alignment 22:18	arjomand 2:6	assessment 7:13
access 31:14	allowable 19:4	5:16 6:1,10,21	associated 5:8
accidental	allowed 31:20	7:2,14,23 8:9,19	19:14 20:3,6
25:12	32:6	9:5 10:5,14,17	association
accommodating	americas 1:4	11:11 14:7,19	19:12 20:21
12:15	amplify 29:3	15:7,24 16:5,19	21:6
accurate 39:10	angeles 2:8	17:6,13 19:5,20	attached 34:11
achieved 4:23	angularly 32:12	19:25 20:10	attack 19:17
act 30:9	annular 21:24	21:5 22:13,16	attention 7:10
action 35:22	answer 26:9	23:10,16,21	attorney 39:12
39:14,15	27:4,21 28:22	26:1,8 27:2	attorneys 39:14
	29:24 30:3 32:4	28:20 29:20,23	authorized 39:6
	answered 17:14	31:4,18 34:2,10	available 41:9
		35:4,13 36:8,12	

aware 19:3 35:19 axial 12:23,23 13:3,7,25 33:13 33:17 axis 31:7,20 32:2,7,13 33:11	28:3,9 beneficial 32:15 benefit 35:20 beusse 2:2 big 12:12 bit 26:19 board 1:3 bolt 7:12,16,17 7:18,21,22 8:17 8:23,25 10:4,12 bolts 9:22 10:8 10:8,10 bore 5:5 9:23 11:4 boss 33:17 bottom 30:16,17 33:17,18,21 34:14,15,19 boulevard 2:8 branches 11:4 break 24:1 34:22 36:9 breaks 17:20 brianna 2:7 brief 27:5 bring 26:22 brings 30:7	call 21:13,13 called 4:11 9:7 9:10 20:11 21:10,15 camera 36:16 cantilevered 28:14 cap 8:17 9:4,4 career 4:23 carrying 24:22 case 4:6 6:5 11:1 cause 19:18 32:1 33:11 caused 16:25 causes 25:6 cc 41:18 center 34:17,18 34:20 central 33:17 cepcor 1:4,4 cepkor 40:3 certain 22:5 25:15 28:5,7 certainly 17:25 17:25 31:23 certificate 3:4,5 38:1 39:1 certify 38:7 39:6 39:11 challenges 21:7 chamber 33:13 changes 16:12 17:16 40:2	characteristics 24:24 26:11 chemically 19:17 circular 24:8 30:21 34:16,18 circumferential 13:17 civil 41:24,24 clarification 9:13 clarify 21:16 clarifying 6:24 clear 5:18 7:18 18:10 20:23 clock 32:9 close 12:13 closer 30:8 cms 1:4,4 40:3 coal 5:5,8,8,11 colonial 2:3 column 9:14 10:22 12:4,21 21:21 32:22,25 32:25 commission 38:17 commonly 5:4 5:15 33:20,21 communicates 13:2,24 completed 41:8 41:11
b	bolt 7:12,16,17 7:18,21,22 8:17 8:23,25 10:4,12 bolts 9:22 10:8 10:8,10 bore 5:5 9:23 11:4 boss 33:17 bottom 30:16,17 33:17,18,21 34:14,15,19 boulevard 2:8 branches 11:4 break 24:1 34:22 36:9 breaks 17:20 brianna 2:7 brief 27:5 bring 26:22 brings 30:7		
	c		
back 9:14,21,24 10:1 11:8 36:10 ball 6:13 bar 24:7,7,8,9 24:13,16,18,18 24:22 based 7:16 14:3 33:25 35:10 beam 28:11,11 28:14 bear 28:12 bearing 5:18,23 5:25 6:4,16,17 6:18,23 18:15 30:19,20 33:15 33:18 bearings 5:14 6:9,11,12,13,13 6:13,15,22 30:16 31:10 believe 10:18,18 21:21 bending 16:24 17:9,18 23:19 23:22,23,25	c 2:1 4:1 41:4 ca 2:8 calculating 28:25		

completely 15:8 complicated 27:5 component 25:6 25:19,22 28:7 28:11 components 9:7 9:10 14:12 19:14 21:3 25:9 comprehensive 32:4 compressive 35:24 comprises 12:22 concentration 24:4,5 26:23 28:18,22 29:7 concentrations 16:15,17,22 26:7,25 27:1,11 27:17 concentrator 24:17 25:2,5 29:3,5,10,12 concentrators 25:8,17,18 26:15 concepts 6:2 conditions 23:14 configuration 28:4,14 30:18 30:20,22	configured 14:4 congratulations 4:22 conical 34:7 connected 14:15 39:14 connecting 13:23 connection 22:6 22:24 consequence 25:13 consideration 19:23 20:2 considered 41:12 considering 21:1,1 consistent 8:6,7 constitute 26:15 constitutes 36:1 constrained 31:9 32:12 35:18,21 constraining 30:14 constraints 31:12 construction 11:5 contemplates 18:20 context 5:6,19 6:5,7 29:24 30:2	correct 4:15 7:7 12:20 25:25 correction 40:6 correctly 4:16 26:6 corrosion 19:10 19:11,13,21 20:4,6 21:2 25:14 26:16 corrosive 19:15 19:16 25:15 counsel 2:5,10 3:21 39:12,14 county 38:4 39:3 coupled 33:8 court 4:3 8:3 36:18,21 crack 25:21,21 cracks 17:9,20 create 23:24 25:16 32:13 creating 30:6 cross 16:13 17:17 24:19,20 25:7 crr 1:17 38:15 39:20 41:17 crush 33:12 crushed 35:23 crusher 5:6 6:20 6:24 7:1 16:11 19:3,22 26:3 30:16 32:14	33:11,24 35:24 crushers 4:25 5:2,24 6:19,22 16:4,6,18 17:19 19:19 23:13,17 23:22 25:23 29:25 30:5,13 35:3,6,8,11,17 35:20 36:4 crushing 30:8,9 31:22,23 33:13 35:14,22 36:3 cv 4:21 cycles 28:8 29:14 cyclic 17:9,18 23:14,19 25:19 26:3,4 28:4,16 28:18 cyclical 16:24 cylindrical 22:7
d			
d 3:1 4:1 date 1:13 40:3 40:25 41:23 dated 39:17 day 27:4 38:10 39:17 days 41:11 dear 41:7 decades 5:11 declare 40:22			

decrease 25:7 decreases 24:20 defined 24:9,11 25:2 degree 5:21 depends 29:8 deponent 3:21 40:4 41:23 deposition 1:12 3:5,22 8:12 39:7 41:5,8,21 describe 34:5 described 11:7 24:25 25:3 29:1 31:9,10 description 15:15 16:20 33:5 design 19:21,22 19:24 22:8 24:3 25:5,12,24 26:2 26:10,11,17 30:11,12 31:15 35:5 designed 25:6 26:6,12,20,21 detailed 33:4 details 35:16 determination 9:12 develop 25:20 26:23 development 16:25 18:23	21:8 diameter 24:8 different 6:12 9:6,9 26:19,21 32:14 difficult 27:13 27:18 30:3 difficulty 9:25 direct 3:3 4:13 4:24 7:6,10 9:14 direction 12:23 12:25 13:18 14:1 disclosure 33:25 discontinuities 18:21 discussed 21:6 discusses 21:22 discussion 24:2 34:25 dispute 23:18 divided 24:10 24:12 29:1 33:19 dividing 24:23 doctor 4:15 document 8:4 40:22 documents 8:7 doing 21:3 29:9 double 10:25 dr 2:3 drawing 7:17,18	drawings 14:17 drive 30:16 33:6 33:8,9 driver's 38:9 driving 30:13 duly 4:11 38:8 e e 2:1,1,3 3:1 4:1 4:1 41:24,24 easily 19:1 eat 25:16 eccentric 23:20 23:23,24 30:6 30:15 31:11,21 31:25 32:10 eccentrically 33:10 edge 22:3,19 effect 30:9 effective 24:20 25:7 effort 9:11 eight 9:25 10:13 10:19 20:14 either 29:15 element 7:13 10:2,9,12,13,19 22:1,11,14 elements 9:1 elevated 17:8,18 elevates 29:12 eliminated 18:23	email 41:9 embodiments 11:6 employee 39:12 39:13 ended 16:7 ends 13:3 15:13 32:23 endurance 27:24 28:19 29:8 energy 36:2,3 engage 31:22 engages 31:24 34:12 engineer 6:15 14:11 engineering 5:15,22 30:19 engineers 24:9 27:4 enter 40:2 entire 23:11 entirely 31:8 entities 35:8 environments 19:16,16 equipment 5:4 errata 3:6 40:1 41:9,14 esquire 2:2,6 41:18,19 essence 28:8
--	---	---	--

essentially 18:23 23:23 34:13,14 exacerbated 19:15 exactly 9:6 27:12 35:20 examination 3:3 4:13 example 5:21 6:7 20:15,20 24:6,17 25:3,4 25:14,21 26:16 27:6 28:3,9,15 31:21 32:7 examples 32:3 excuse 8:21 14:4 17:24 22:15 executing 32:10 exercise 35:7 exhibit 3:11,12 3:13,14,15 8:6 8:10,11,13 11:22,23,24 12:1 14:22,23 15:2 22:25 23:1 23:3 32:18,19 32:21 exhibits 3:9,10 exist 35:20 exists 35:6 expand 9:23 expect 35:5	expenditure 36:3 experience 4:24 5:2,11 16:11 20:5 25:9,25 26:3 35:10,24 experienced 25:20 experiences 5:3 expert 4:25 expires 38:17 explain 5:3 19:9 24:3 28:1 explained 31:19 explains 22:18 expose 28:4 extend 10:25 33:22 extends 13:25 extent 10:19 15:9 f facilitating 9:20 fact 5:17 22:4 factor 19:23 facts 40:22 fail 26:25 27:20 failure 19:13 25:22 26:7 27:6 27:8,12,15,15 27:17 29:11,14 failures 27:7,21	fairly 5:12 fall 24:8 familiar 7:8 11:24 14:24 23:5 27:23 35:2 far 4:23 7:24 34:4 fashion 32:1 fatigue 17:1 18:24 25:21 27:15,17,23 28:3,19 29:9 feature 22:8 25:5 35:5 features 25:12 fed 13:6 federal 41:12,24 feed 14:5 feeds 14:6 field 18:1 19:1 figure 7:10,20 7:24,25 8:22 9:14 10:1,2,9,11 10:12 11:1,8,9 11:17 14:8 20:8 21:17 23:7,12 figures 8:15,17 fill 18:1 final 36:24 financially 39:15 find 4:24 fine 8:11	fire 5:11 fired 5:8 first 4:11 5:10 13:21 21:19 24:6 33:13 35:19 firstiniplaw.c... 2:5 fl 2:4 41:9 fla7755208 40:4 41:1 flange 6:25 7:3 florida 38:3,6 38:16 39:2,5 41:12,24 flow 14:13 flowing 13:14 13:15 flows 13:7,8,16 fluid 14:4 focus 27:9 30:4 focused 21:3 focusing 20:12 foerster 2:7 41:4 followed 15:8 follows 4:12 force 24:10 31:23 35:25 forces 15:20 26:3 35:25 foregoing 18:19 39:9 40:22
---	--	---	---

form 5:16 6:1 6:10,21 7:2,14 7:23 8:19 9:5 10:5,14,17 11:11 14:7,19 15:7,24 16:5,19 17:6,13 19:5,20 19:25 20:10 21:5 22:13,16 23:10,16,21 26:1,4,8 27:2 28:20 29:20,23 31:4,18 34:2,10 35:4,13 formed 12:23 13:1 forming 17:20 forth 26:23 forwarded 41:13,14 four 10:22 32:22,25,25 fractures 17:1 18:24 21:8 frame 33:19,20 33:21 free 34:16,19 35:20 freely 29:17,19 29:22 30:24 31:2,17,19,20 32:5,11 34:1 35:3,11,18 36:4	front 10:21 12:24 14:1 full 28:22 function 22:21 functionality 32:14 funnel 14:5 further 39:11 g g 4:1 gap 35:23 gathering 33:9 gear 9:21,21,23 9:24 34:6,7,9,11 gears 10:25 geeze 5:10 generally 5:4 15:18 19:4 27:19 28:16 generated 16:23 geometry 26:12 give 4:6 24:5 28:21 32:4 go 9:13 21:19 24:1 34:21 goes 24:24 going 7:6,10 10:1 13:20 21:18,18,25 32:16 36:12 good 4:15 12:18 great 20:3	groove 11:9,17 11:20 13:16,23 13:25 14:5,6,8 14:13,14,14,14 14:15,20 grooves 11:3,5 groups 14:18 guess 8:25 9:10 guides 34:15 gyratory 16:6 16:18 17:19 23:17,22 26:2 29:25 30:5,12 33:12 34:13 35:2,6,8,10,15 35:15,17,19,23 36:4 h half 24:7 hand 4:4 12:11 hang 12:8 happen 27:12 35:22 happy 15:11 harless 3:11 harri 1:12 3:2 4:10 38:7 39:7 40:4,25 41:3,5,7 head 7:22,25 8:1,1,23,24 15:5 15:20 18:16 33:11	hear 5:22 heat 22:6,23 held 24:2 34:25 hexagonal 7:25 hh 38:17 high 16:14,22 17:8 18:21 higher 28:24 29:5,7 highly 9:19 hold 4:20 20:25 22:4 horizontal 28:10 hub 9:24 11:2,2 hydraulic 13:6 hypo 22:25 i identification 8:14 12:2 15:3 23:4 32:20 38:9 identified 10:19 20:24 identify 23:8 identifying 11:19 image 23:9,11 imagine 24:7 immediately 15:19 17:2 imperfection 25:10 26:15 29:2
--	--	--	--

imperfections 25:10 26:13 important 20:2 26:10 impose 31:23 imposed 31:11 imposes 34:13 34:18 imposing 28:10 impressive 4:22 inadvertently 25:6 inch 24:7 includes 18:16 inclusion 41:14 increased 24:21 index 3:9 indicated 11:5 16:12 industry 15:23 infinity 28:8 inform 6:17 initiated 27:16 installation 22:12,21 installations 16:11 intellectual 1:7 inter 1:10 interested 39:15 intermediate 33:16 interrupting 20:19	introduce 9:22 introduced 33:13 invention 9:19 10:24 18:11,12 18:20 inwardly 21:23 ipr2024-01380 1:10 issue 19:19 29:15 issues 26:12 item 6:8 20:13 j job 40:4 41:1 journal 6:13 18:15 30:19,20 31:10 k kamato 4:15 keep 20:23 27:5 kind 6:18 28:12 kinds 6:12 27:6 knot 24:17 knots 25:3 know 5:12 6:23 9:10 11:12,13 15:9 20:4,12 21:9,10 24:15 27:20 28:2 29:1 29:8 30:1,2,9 32:5	known 25:18 30:18 kramer 1:17 38:6,15 39:5,20 41:17 kyotmaa 4:19 kytomaa 1:12 3:2 4:10 38:7 39:7 40:4,25 41:3,5,7 l l 3:19 label 20:21 labeled 20:20 34:12 language 15:10 large 6:14 larger 12:10 lead 26:7 learned 6:4 left 7:20,24 32:25 34:4,7 letter 3:7 41:8 41:12 level 28:19 license 38:9 light 20:2 limit 27:24 28:6 29:8 limits 17:5 line 9:15 10:22 12:4,5,8,16 13:12,14 15:12	15:13 16:8,8 17:24 18:1,8,13 18:13 21:22 22:18 32:22,23 33:5 40:6 lip 21:24 22:15 little 12:12 26:19 llc 1:4 llp 2:7 41:4 load 24:22,23 25:1 28:10,13 29:1,3 loading 23:14 25:19 loads 16:24 17:9 17:19 23:19,20 23:23,23,24,24 23:25 25:9,25 26:4 local 16:14,22 17:8 25:16 29:4 locally 24:19 29:2 location 29:7 31:9 locations 27:16 long 5:9 17:4 longitudinal 33:10 look 15:11 30:11 32:8 36:9 looking 7:20 8:15 13:11,12
--	---	---	--

14:17 20:8,24 21:21 23:7 34:4 looks 7:17 12:11 los 2:8 low 18:15 29:9 lower 30:6 31:11 33:21	manufacturing 26:14 marginal 22:19 marjomand 2:9 2:10 41:4 mark 8:3,5 11:22 14:22 marked 8:10,11 8:13 12:1 15:2 23:1,1,3 32:17 32:19,21 material 19:3 19:17 24:24,25 31:23,24,24 33:12 35:22 materials 19:17 25:15 matter 5:19 20:13 35:9 matters 5:1 mean 5:10,17 6:2,11,14 7:15 7:15,16,17 9:6 10:9 11:12 15:25 20:19 29:19,22 35:14 meaning 30:1 means 31:19 meant 8:21 mechanical 5:15 5:22 6:15 14:11 24:3 25:24 30:19 31:15	mechanism 7:11 19:13 27:17 mechanisms 19:12 mechanized 25:25 mehran 2:6 36:6 41:19 mentioned 26:9 metal 19:14,17 25:15,16 28:13 metals 28:5 middle 18:13 midspan 28:10 midway 17:24 mills 5:6 mind 12:5 mines 5:8 minimize 18:23 minute 34:21 36:8 mofo.com 2:9 2:10 41:4 monitor 12:13 morrison 2:7 41:4 motion 30:6,15 31:9,11,21 32:10 34:14,16 35:15,16 motions 35:14 mounted 33:20 movement 33:12	movements 35:12 moving 31:25 multiple 10:7 26:24
m			n
machine 14:12 25:13 26:18 magnitude 28:5 main 11:10,13 15:6 18:22 19:3 20:9,11,25 21:4 21:10,14,15 23:8 33:16 maintained 19:1 33:14 make 9:12 12:10 33:8 makes 16:21 manager 22:3 manifestation 27:6 manner 22:23 26:20 28:16,25 mantle 15:6,17 15:20,20 16:25 18:17 26:3 30:7 31:25,25 32:1 manufactured 26:18 35:8			n 2:1 3:1,19 4:1 narrow 35:23 narrower 31:22 national 22:3 nature 27:13 necessary 9:21 need 36:15 needs 19:4 never 5:20,22 nine 9:22 10:2,9 10:12 nominally 27:11 normal 22:20 normally 18:21 notary 38:6,16 39:5 noted 37:2 notes 36:9 39:10 notification 3:7 november 1:13 38:8,10 39:17 40:3 41:2,5 number 7:6,11 7:16 11:19,24 12:21 14:23 20:15,16

numbered 11:21 20:13 numbers 20:17 33:3 nut 15:5,20 18:16 22:4	oil 9:22 11:4,4 12:23 13:1,2,3,6 13:7,8,14,15,16 13:16,17,23,25 14:5,6,13 okay 5:14 6:9 8:2 9:13 11:22 12:8,18,21 13:11 14:2 17:5 20:18,24 22:16 24:14 32:16 33:6 34:4,21,24 once 41:14 open 13:4 opening 13:15 operate 30:6 operated 26:20 operation 11:6 16:25 23:15 25:13 26:16 operations 22:20 opposed 32:5 opposing 30:8 opposite 16:21 31:16,17 32:2 orange 38:4 39:3 order 13:8 ordering 41:14 41:14 ordinary 8:16 9:8 14:2,11 16:16 17:3,11	17:15 19:2 22:10 29:21 30:11,23 31:5 original 41:13 originally 11:23 orlando 2:4 outer 13:4,9,18 13:22 outermost 18:16 outside 5:19 11:10 30:2 own 31:7,14,20 32:7,13 34:17 34:20 owner 1:8 2:10	partes 1:10 particular 29:4 particularly 17:18 parties 3:21 35:9 39:12,13 41:14 parts 20:14 27:10 31:22 party 41:14 passage 12:23 13:1,2,3,7,8,16 14:5 passing 8:17 9:3 patent 1:1,3,8,9 2:10 3:15 6:8 7:6,8 9:9,11 15:11 16:6 22:25 29:15,16 32:17 patents 6:5 27:7 29:25 31:2 penalties 40:22 pendulum 33:12 perform 33:11 peripheral 13:4 13:9,18,22 perjury 40:22 permeated 13:17 person 8:15,24 9:7,8 14:2 16:16 17:3,11,15 19:2 22:10 29:21
o	o 3:19 4:1 41:4 oath 3:4 38:1 objection 5:16 6:1,10,21 7:2,14 7:23 8:19 9:5 10:5,14,17 11:11 14:7,19 15:7,24 16:5,19 17:6,13 19:5,20 19:25 20:10 21:5 22:13,16 23:10,16,21 26:1,8 27:2 28:20 29:20,23 31:4,18 34:2,10 35:4,13 obviously 26:10 occur 17:10 19:19 28:19 occurred 17:10 occurs 19:11 office 1:1 oftentimes 27:13 oh 5:10 12:14 18:5	p	p 2:1,1 3:19 4:1 5:1 p.m. 1:14,14 37:2 page 40:6 pages 39:9 pair 11:2 paragraph 9:16 10:7,23 12:5,19 13:11,20 16:20 18:2 22:17 33:4 part 12:22,25 13:1,4,10,19,23 14:24 20:23 27:14 33:20,21 36:4

30:11,23 31:5 personally 38:7 perspective 19:22 24:4 30:15 31:7,13 31:15 petitioner 1:5 2:5 ph.d. 1:12 phd 3:2 4:10 38:7 39:8 40:4 40:25 41:3,6,7 phenomenon 27:16 28:17 pie 24:15,15 piepho 3:14 pit 25:20 pits 25:16,17 pitting 25:14 place 1:15 27:20 plant 5:11 plants 5:8 pleadings 8:8 please 4:3 9:18 10:23 14:9 32:24 41:9 pllc 2:2 plurality 10:8 10:10 14:18 point 16:21 21:18 28:3,9 pointing 21:20 polinski 3:13 15:4 16:1	poorly 27:18 portion 15:19 15:21 18:17 33:23 position 22:5 32:9 33:15 positioned 33:16 positions 22:8 possible 12:7 26:6 potential 21:1 potentially 36:2 power 5:8 powered 5:11 predict 27:14,18 presence 16:23 17:8,18 29:10 presses 15:6 pressure 9:23 13:6 prevent 32:12 prevented 35:18 previously 11:7 primary 22:22 principle 22:5 prior 4:25 15:4 15:15,22,23 16:2,4,21 18:11 21:7 23:5 26:9 27:7 probably 5:22 32:15	problem 8:22 problematic 29:11 procedure 41:24,24 proceeding 8:10 8:12 11:23 14:24 23:1 32:18 produced 38:9 projecting 21:23,24 projects 5:7 pronouncing 4:16 property 1:7 proven 16:10 provided 13:23 15:18 providing 18:25 proximity 30:8 pruite 2:7 public 38:6,16 39:5 pull 24:10 28:15 pulverizers 5:5 pure 28:14 purpose 22:1 34:8	27:9 28:23 29:6 29:24 30:3,5 35:17 36:6 questions 6:24 21:19 34:22 35:1 36:13 quite 12:13
			r
			r 2:1 4:1 24:15 24:16 racks 17:1 radial 13:1,2,8 13:16 radio 11:2 radius 24:16 raise 4:3 range 6:14 ranging 5:10 read 9:15,17 10:6,7,19,22 13:13,21 14:3 15:12 16:7 17:23 18:3,6 21:25 32:22 36:19,20 40:22 reading 3:22 12:5 16:16 41:21 ready 36:25 really 5:20 6:17 8:23 13:12 19:11 27:8,9 29:6
		q	
		question 7:4 9:2 15:9 19:6,8 21:14 22:1 27:3	

reason 27:14 40:6 reasonable 41:12 receipt 41:11 received 41:14 receiving 15:20 recently 5:12 recognize 20:8 record 8:9 9:17 10:23 12:6 16:7 18:10 24:2 32:24 34:25 39:10 redirect 36:7 reduces 24:19 refer 16:2 reference 11:25 12:3 14:25 16:1 21:20 23:5 referenced 41:8 referring 11:8 16:3,3 21:17 regard 41:12 regents 31:22 region 17:21,22 29:4 33:14 regions 16:15 18:22 regular 12:25 regularly 10:25 related 26:13 relates 5:24 16:6 31:1	relative 39:11 39:13 relatively 16:12 releasably 18:9 18:14 relieved 11:3 remain 19:4 remind 22:14 removal 9:20 remove 9:21 removed 9:25 repaired 19:1 repeatable 27:19 repeating 21:9 replacement 9:20 report 39:7 reported 1:17 reporter 4:3 8:3 36:18,21 39:1 representation 16:1 represented 21:14 represents 33:23 requested 39:8 requires 36:3 reserved 3:23 respect 6:19,20 6:25 respective 3:21	respects 16:4 27:23 restraint 30:21 result 25:18 26:16,21 29:11 30:22 resulted 16:14 results 25:22 28:12 review 1:10 9:9 39:8 41:9,10,11 reviewed 6:5 7:9 reviewing 9:11 right 4:4 8:23 10:11 12:16,19 12:19 17:11 18:7 22:2 24:1 24:19,22 29:3 31:8,12 32:2,10 33:1,2 36:10,11 36:14,17 rink 22:6,23 rock 19:3 rotatable 33:15 34:1 rotate 32:1,7 33:10 34:17,20 rotating 29:17 29:19,22 30:15 30:25 31:2,7,14 31:17,19 32:5 32:11,12 35:3 35:11,19 36:5	rotation 30:21 35:21 rough 36:24 roughly 21:22 rpr 1:17 38:15 39:20 41:17 rubbing 19:14 rule 41:24,24 rules 41:12
			s
			s 2:1 3:19,19 4:1 sample 28:4,16 samples 28:13 sandvik 1:7 40:3 sanks 2:2,2 3:3 4:14 8:5 35:1 36:6,11,14,17 41:18 satisfactory 16:11 saying 5:18 6:17 says 15:10 16:21 17:7,7 scratch 7:5 19:8 20:25 24:18 29:21 scratches 25:11 scroll 12:7 second 13:12,12 13:16,24,25 33:4,17

section 15:18 16:14 17:1 sectional 16:13 17:17 24:19,20 25:7 secure 15:14,17 18:17 secured 18:15 22:2,23 securing 22:5 see 7:24 8:1,23 8:24 9:9 10:1 11:15 12:8,8,21 20:13,16,17 21:23 22:16 28:16 30:13 seen 18:19 send 36:24 sentence 13:13 13:21 15:12,13 17:23 18:4,4 32:23 serves 22:21 seven 8:20 22:19 shaft 6:7 11:10 11:13,13,14,14 11:18 12:18,22 12:24 14:1,20 15:6,6,17,18,21 16:9,13,15,22 16:24 17:2,9,17 18:16,18,22,24 19:3 20:9,11,12	20:14,14,20,25 21:4,8,10,11,13 21:14,15 22:3,7 22:9,19,24 23:8 23:8,12,14,19 23:25 26:2,5,24 26:25 27:8 29:16 30:7,14 30:17,20,22,24 31:2,6,12,12,13 31:21 32:6,8 33:8,9,10,14,16 33:18 34:1,6,7 34:11,14,15,16 34:19,19 35:11 35:18,21 shaft's 32:2 shafts 27:9 35:3 36:5 share 7:7 12:11 32:16 sharing 32:17 sheer 35:25 sheet 3:6 40:1 41:9 shell 33:20,21 33:23 shoshana 1:17 38:6,15 39:5,20 41:17 shoulder 8:18 9:4,4 show 8:20,23 10:16 11:9 14:8	shown 11:1 13:7 33:8 shows 10:12 11:12,17 14:8 shredded 17:1 shrink 12:14 side 11:3 sign 41:10 signature 38:15 39:20 41:23 signed 38:10 41:9 signing 3:22 41:21 similar 27:12 28:12,12,17 similarly 33:17 simple 24:6 28:2 28:25 simply 24:10 28:14 30:9,20 simultaneously 26:25 sincerely 41:16 single 11:9 sir 8:21 12:17 sit 30:18 situation 28:9 32:4,6,6,11 situations 26:22 26:23 six 12:4 22:11 22:14	skill 8:16 14:2 14:12 16:17 17:3,12,15 19:2 22:10 29:22 30:11,24 31:5 skilled 8:24 9:8 sleeve 5:14,18 5:23,25 6:3,6,20 18:8,14 21:25 22:4,4,6,7,8,23 22:24 slide 9:24 slightly 9:22 24:20 small 12:11 28:11 smaller 24:23 somebody 14:11 somewhat 32:5 sorry 10:17 12:14 14:14 17:25 19:7 20:19 sort 25:11 27:14 28:10,13,15,21 35:15 sorts 6:11 source 13:7 speak 11:14 spec 21:19 specific 15:10 20:4 30:1 35:17 specifically 5:5 9:9 26:11 29:25
---	---	---	---

specifics 30:23 spider 33:22 spoke 22:15 squared 24:15 squeezing 30:10 35:25 stage 27:15 stages 26:22 stand 28:8 start 4:20 starting 9:15 10:22 12:4,5,18 13:20 15:12 16:8 18:8 21:22 22:17 32:22 33:6 starts 13:14 15:13 20:16 state 38:3,6,16 39:2,5 stated 15:10 40:22 states 1:1 statistical 27:13 statute 41:12 stay 17:4 32:8 stenographic 39:10 stenographica... 1:16 39:7 stipulated 3:20 straight 24:6 stress 16:14,17 16:22 18:22	19:4 24:4,5,9,11 24:16,21,24 25:2,4,8,17,18 26:7,15,23,24 27:1,11,16,17 28:5,7,15,18,19 28:22 29:2,3,5,5 29:6,7,10,12 stressed 18:15 stresses 17:4 24:25 25:1,9,25 28:24,25 29:13 stressors 16:23 17:8 29:9 structural 18:21 structure 20:16 23:11 34:12,17 struggle 27:4 studying 35:7 subject 23:14,18 23:19,20,22 subsequent 18:2 substantial 16:23 sufficiently 29:13 suggest 33:25 suggested 41:11 suit 27:7 suitable 33:9 suite 2:3 summary 18:10 18:12	supplying 11:4 supported 33:18 supporting 15:19 sure 9:17 10:24 13:22 15:8,14 20:11,21 24:5 surface 11:10 12:24 13:4,9,18 13:22 22:3,19 30:8 susceptible 17:17,20 swear 4:5 switched 18:11 sworn 4:12 38:9 t t 3:19,19 tab 5:1 take 15:11 19:23 24:1 34:21 36:8 talk 27:8 talked 35:16 talks 10:7 taper 12:22,25 13:1,4,9,18,23 tapered 12:18 12:22,24 14:1 15:19,21 18:17 teach 14:17 29:16	teaches 15:4 technical 31:16 teeth 34:11,12 tell 21:25 telling 6:23 tends 27:15 tensile 28:15 term 19:10 27:24 31:16 termed 33:20,21 terminal 13:2 terry 2:2 36:10 41:18 test 28:3,12 29:9 testified 4:12 testimony 3:2 4:5 text 10:21 30:23 thank 11:16 12:15 15:14 21:17 36:11 thereof 13:3 thick 12:9 thing 12:9 18:6 30:13 things 6:12 25:4 30:10 think 7:15,15 8:9 9:6,11 15:25 18:3,4 20:13 21:13 22:17 23:11 24:6 25:8 27:3 28:23 32:3 36:15,23,25
--	--	---	---

thought 4:21 5:20 threaded 15:5 15:17 16:14 17:21,22 threading 19:10 19:11,12,13,18 19:21 20:3,6 21:2 three 5:7 9:14 21:21 28:3,9 time 1:14 18:25 27:21 37:2 today 36:24 top 6:6 22:19 30:17 33:15,20 33:23 towards 14:1 21:20 trademark 1:1 trajectory 34:18 transcript 3:5 3:23 39:8,9 40:2 41:8,10,11,13 41:15,21 transcripts 41:9 transmitted 26:4 trial 1:3 true 28:9 39:10 40:23 truth 4:6,7,7 try 27:5	trying 21:2 tsanks 2:5 turn 14:6 31:20 turning 7:20 turntable 34:13 two 5:1,7,12 6:2 9:1 19:12 22:18 27:10,10 30:10 36:8 type 6:16 16:10 22:24 types 6:14 30:12 typical 17:19 28:2 typically 19:14 24:25 25:23 30:18 35:11	17:4,12,16,22 19:6 20:4,5 21:12 22:11 23:13,18 29:22 30:24 31:1,6 34:8 understanding 5:25 19:9 30:12 understood 6:25 27:19 undertaken 35:7 undertakes 31:21 united 1:1 universal 6:13 unpredictable 27:22 upper 21:24 22:3 33:14,19 33:19,23 use 25:24 used 5:4,15 6:6 6:20 14:23 22:11	vertical 20:15 vicinity 25:15 viewed 4:21
			w
			waive 36:19 41:10,21 waiver 41:20 want 8:3 9:13 21:19 wanted 4:21,24 21:16 washer 9:25 10:16,20,20 wasted 36:2 way 5:12 25:8 26:18 we've 18:11 35:16 wear 6:8 weather 26:13 webbed 10:25 webs 10:25 11:2 11:3 wednesday 1:13 wilshire 2:8 withstand 25:1 witness 4:8,11 36:18,20 word 25:24 worked 5:5,7 working 4:25 worries 18:6
	u		
	u 3:19 ultimately 25:21 27:5 29:11,13 unclear 9:7 10:11 unconstrained 31:6,8,13 uncontained 31:3 under 9:22 11:24 33:4 40:22 41:12 understand 6:16 7:3 8:16 14:3,13 16:17		
		v	
		v 1:6 40:3 variability 20:3 variety 25:4 veritext.com 41:9 version 36:25	

write 40:2
x
x 3:1
y
yagi 3:12 12:3 14:3,4,17,20
yeah 7:24 8:22 9:6 12:12,12,12 13:15 18:3 20:15 26:2 30:5
year 5:12
yup 12:4
z
zoom 1:15

Federal Rules of Civil Procedure

Rule 30

(e) Review By the Witness; Changes.

(1) Review; Statement of Changes. On request by the deponent or a party before the deposition is completed, the deponent must be allowed 30 days after being notified by the officer that the transcript or recording is available in which:

(A) to review the transcript or recording; and

(B) if there are changes in form or substance, to sign a statement listing the changes and the reasons for making them.

(2) Changes Indicated in the Officer's Certificate. The officer must note in the certificate prescribed by Rule 30(f)(1) whether a review was requested and, if so, must attach any changes the deponent makes during the 30-day period.

DISCLAIMER: THE FOREGOING FEDERAL PROCEDURE RULES ARE PROVIDED FOR INFORMATIONAL PURPOSES ONLY.

THE ABOVE RULES ARE CURRENT AS OF APRIL 1, 2019. PLEASE REFER TO THE APPLICABLE FEDERAL RULES OF CIVIL PROCEDURE FOR UP-TO-DATE INFORMATION.

VERITEXT LEGAL SOLUTIONS

COMPANY CERTIFICATE AND DISCLOSURE STATEMENT

Veritext Legal Solutions represents that the foregoing transcript is a true, correct and complete transcript of the colloquies, questions and answers as submitted by the court reporter. Veritext Legal Solutions further represents that the attached exhibits, if any, are true, correct and complete documents as submitted by the court reporter and/or attorneys in relation to this deposition and that the documents were processed in accordance with our litigation support and production standards.

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