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1 inspect?

2 DR. MC CARTHY: Portions of the various
3 AF piston I inspected and also Failure Analysis
4 Associates was given an AE piston
5 for material evaluation which I also had.

6 I also had an opportunity to inspect the
7 AE that we ultimately strain gaged and tested.

8 Q. When you say you personally inspected
9 those piston types, was that a visual inspection
10 with respect to the AE piston?

11 DR. MC CARTHY: Yes. Primarily involved
12 multiple visual inspections because not only did Failure
13 Analysis Associates inspect them when they arrived but as
14 they were being strain gaged I would drop in and
15 periodically inspect the placement and the workmanship on
16 gages and wiring and things of that nature.

17 Q. Do you consider yourself an expert in the
18 placement of strain gages?

19 DR. MC CARTHY: Yes, I've done hundreds and
20 hundreds.

21 Q. Were these inspections that you carried out
22 documented?

23 DR. MC CARTHY: No, in the sense they were not
24 part of our procedure. They were in addition to the normal
25 QC procedure. They were not part of our QC procedure. They
26 were, in addition to

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1 they were put into operation. We knew the character
2 of the indications in the size of the flaws, if any.

3 And they were all found to be less than
4 accepted criteria, testified to previously. We ran
5 these piston 100 hours and took them out and
6 reinspected and again found no relevant indications.

7 By testing ten pistons you essentially
8 tested 40 bosses or 80 highly stressed regions.
9 The statistical probability of 80 of these fillets in ten
10 different pistons all being substantially above the
11 specified stress and therefore not cracking is so
12 vanishingly small it just didn't happen. So in fact
13 by going to 1.35 million cycles and having not even
14 an indication of crack growth, we're very confident
15 that ten million or 100 million cycles will achieve
16 once again no indications and no crack growths.

17 I don't believe personally they will ever
18 crack. Take the stress analysis as the least
19 conservative assumption and still they aren't going to
20 grow.

21 MR. SEAMAN: If I could add one further --

22 JUDGE BRENNER: All right.

23 MR. DYNNER: Let me follow up.

24 Q. Are you an expert in statistics,
25 Dr. Mc Carthy?

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1 DR. MC CARTHY: I don't recall. I'd
2 have to look it up.

3 Q. Dr. Mc Carthy, given the fact that the
4 AE piston skirt is made out of iron, what was the
5 relevance of your answer to my question about
6 testing where you talked about 100 hours of testing
7 being substantial for a part made out of steel?

8 DR. MC CARTHY: Both have almost
9 identical forms. I thought I used the term ferrous
10 materials. If I didn't, I meant to talk about
11 ferrous materials as opposed to other materials
12 exhibiting the knee in the endurance limit curve and
13 I meant to distinguish ferrous materials, iron being
14 a ferrous material and steel. I probably used the
15 word steel. Both exhibit the phenomena, the basis
16 of the whole discussion.

17 DR. SWANGER: I can add to that.

18 We specifically referred to the iron
19 casting handbook at page 341 where the properties of
20 ductile iron are shown, that an endurance limit
21 does indeed exist at ten to the seven cycles for
22 nodular iron and in fact it was from this reference
23 that we determined the seven percent between the
24 endurance limit and the limit — the stress at which
25 cracking would be observed at 1.35 times ten to the