REGULATORY INFORMATION DISTRIBUTION SYSTEM (RIDS)

ACCESSION NBR:8309190121 DOC.DATE: 83/09/12 NOTARIZED: NO DOCKET #
FACIL:50-275 Diablo Canyon Nuclear Power Plant, Unit 1, Pacific Ga 05000275
50-323 Diablo Canyon Nuclear Power Plant, Unit 2, Pacific Ga 05000323
AUTH.NAME AUTHOR AFFILIATION
SCHUYLER,J.O. Pacific Gas & Electric Co.
RECIP.NAME RECIPIENT AFFILIATION
EISENHUT,D.G. Division of Licensing

SUBJECT: Forwards addl info re 830701 submittal on testing of Superstrut matl,per NRC request.Analysis utilizing point estimate/tenth percentile criteria,provided in util 830701 submittal,gives acceptable results.

DISTRIBUTION CODE: B021S COPIES RECEIVED:LTR 1 ENCL 1 SIZE: 7
TITLE: OR/Licensing Submittal: Combined General Distribution

NOTES:J Hanchett 1cy PDR Documents. 05000275
J Hanchett 1cy PDR Documents. 05000323

	RECIPIENT ID CODE/NAME	COPIES LTTR	COPIES ENCL	RECIPIENT ID CODE/NAME	COPIES LTTR	COPIES ENCL
	NRR LB3 BC 05	1	1	NRR LB3 LA	1	0
	SCHIERLING,H 01	1	1			
INTERNAL:	ELD/HDS2	1	0	IE/DEPER/EPB	3	3
	IE/DEPER/IRB	1	1	NRR/DE/CEB 09	1	1
	NRR/DE/MTEB	1	1	NRR/DHFS DEPY12	1	1
	NRR/DHFS/HFEB16	1	1	NRR/DHFS/LQB	1	1
	NRR/DL DIR	1	0	NRR/DL/ORAB	1	0
	NRR/DL/SSPB	1	0	NRR/DSI/ADRS	1	0
	NRR/DSI/AEB 28	1	1	NRR/DSI/CPB 11	1	1
	NRR/DSI/CSB 10	1	1	NRR/DSI/ICSB 18	1	1
	NRR/DSI/METB 13	1	1	NRR/DSI/PSB 21	1	1
	NRR/DSI/RSB 25	1	1	REG FILE 04	1	1
	RGN5	1	1	RM/DDAMI/MIB	1	0
EXTERNAL:	ACRS 29	8	8	LPDR 03	2	2
	NRC PDR 02	1	1	NSIC 06	1	1
	NTIS	1	1			
NOTES:		1	1			

TOTAL NUMBER OF COPIES REQUIRED: LTTR 41 ENCL 34

PACIFIC GAS AND ELECTRIC COMPANY

PG&E 77 BEALE STREET • SAN FRANCISCO, CALIFORNIA 94106 • (415) 781-4211 • TWX 910-372-6587

J. O. SCHUYLER
VICE PRESIDENT
NUCLEAR POWER GENERATION

September 12, 1983

Mr. Darrell G. Eisenhut, Director
Division of Licensing
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

Re: Docket No. 50-275, OL-DPR-76
Docket No. 50-323
Diablo Canyon Unit 1 and 2
"Superstrut" Evaluation Additional Information

Dear Mr. Eisenhut:

The enclosed material provides additional information requested by the NRC Staff related to PGandE's July 1, 1983 submittal on the testing of "Superstrut" material.

Kindly acknowledge receipt of this material on the enclosed copy of this letter and return it in the envelope.

Sincerely,

J.O. Schuyler

Enclosures

cc: J. B. Martin, NRC (Region V)
Service List

B021
1/1

ENCLOSURE

Additional Information for "Superstrut" Evaluation

1.0 Sample Size Selection

The sampling program was based on the estimated rate of testing used for Superstrut production, namely one weld per 500 lineal feet, which represents proportionate sampling of each type of strut. In addition, based on the engineering judgment of Jack Benjamin and Associates, Inc. (JBA), a minimum sample of 30 was recommended for the smallest group of Superstrut tested. This number was to be a minimum number to be used in point estimating the variance of a large population. A sample size of 270 resulted, based on the above criteria. This number compares well with the number of samples tested for both the Midland and Grand Gulf plants. If the tolerance limit method suggested by the NRC Staff was employed, the sample size would have been based on equal numbers for each of the three types of struts (e.g. 30, 30 and 30).

After the sampling program began, it became clear that spot-welded strut types E and H were not included in as many supports as was originally estimated. The estimate was off by an order of magnitude, therefore proportionate sampling of the total population was not being achieved. The rate of sampling finally performed was two to five times greater for the E and H types than for the A type. The minimum of 30 samples was met with the E type (34 samples). Less than 30 samples of H type were tested. However, it was found both from an engineering point of view and a statistical point of view that the H type spotwelds did not appear to be significantly different from the A type spotwelds. Evidence strongly indicated that it was appropriate to combine the A and H type spot-welded struts into a single group (163 samples) for statistical evaluation and criteria development purposes. (Section 3.0 provides additional information.)

The data for the two groups were then assumed to be from a normal population whose parameters (the mean and the standard deviation) were estimated using the maximum likelihood method. The maximum likelihood method is a type of point estimation widely used for choosing those sample statistics used in estimation. The method selects sample statistics which maximize the likelihood of having observed the sample, which is intuitively appealing. These sample statistics have other desirable properties which are addressed on page 401 of the text, "Probability, Statistics and Decision for Civil Engineers", by Benjamin and Cornell.

The maximum likelihood method is one of a number of reasonable approaches (including the tolerance limit method). However, the adequacy of the sample size cannot be determined mathematically using the maximum likelihood method. Therefore, sample adequacy is based on engineering judgment and the sample sizes recommended by JBA were based on such judgment and deemed to be adequate.

2.0 Comparing the criteria based on a point estimate approach with that based on a tolerance limit approach

The Diablo Canyon criteria for spotweld shear strength was based on the point estimate, tenth percentile value, which is approximately 1.28 standard deviations below the sample average (assuming a normal distribution). The criteria based on the tolerance limit, fifteenth percentile, 80 percent confidence level (i.e., there is a probability of 0.80 that at least 85 percent of the population is greater than this limit) depends on the sample size. The relationship between sample size and the above tolerance limit for a normal distribution are shown in Figure 3-1. Figure 3-1 is a plot of the sample size versus the tolerance limit criteria which is in terms of the number of standard deviations below the sample average. In other words, if

the sample size were five, the tolerance limit criteria would be about 1.74 standard deviations below the sample average. If the sample size were 50, the tolerance limit criteria would be about 1.18 standard deviations below the sample average.

Superimposed on this plot, Figure 3-1, is the 1.28 standard deviations corresponding to the point estimate, tenth percentile value used by PGandE in the results provided in the July 1, 1983 submittal. The intersection of these two curves identifies where the two approaches yield equal criteria. The point of intersection also indicates the number of samples which would be needed to make the two criteria equal. If the actual sample size is larger than this number, the point estimate, tenth percentile criteria is more conservative than the tolerance limit, fifteenth percentile, 80 percent confidence level criteria. As shown on Figure 3-1, the critical sample size is about 20*. Both the E and combined A and H type group sample sizes are greater than this value. Therefore, the point estimate, tenth percentile criteria, is at least equal to the tolerance limit, fifteenth percentile, 80 percent confidence criteria.

In conclusion, the method of analyzing Superstrut channels (point estimate, tenth percentile criteria), provided in PGandE July 1, 1983 submittal, gives acceptable results. This is further corroborated by comparison to results obtained by the tolerance method, which was suggested by the NRC Staff. Comparison of these results is provided in Table 3.1.

* Note: This curve is based on an interpolation among four tolerance limit curves (twenty-fifth percentile, 75 percent confidence; tenth percentile, 75 percent confidence; twenty-fifth percentile, 90 percent confidence; and tenth percentile, 90 percent confidence).

3.0 Combining the A and H type data

There is significant statistical evidence that the spotweld strengths for the A and H type struts come from the same population of spotweld strengths. In addition, there is engineering evidence in the size and appearance of the welds to indicate that they are from the same population.

Three different statistical tests were performed on the A and H type data, the first was on the sample means, the second was on the sample variances, and the third was on the data distributions. The JBA report states that each hypothesis was accepted at the 0.05 significance level. However, each hypothesis may also be accepted at a much higher significance level. In fact, the equal means hypothesis can be accepted at the 0.40 significance level, the equal variances hypothesis can be accepted at the 0.20 significance level and the equal distributions hypothesis can be accepted at some significance level greater than 0.20, although the table immediately available to us only goes up to the 0.20 level.

It was therefore concluded that the A and H type data could be combined for statistical evaluation and criteria development.

Table 3-1 Tolerance Limits, 15th Percentile, 80% Confidence

A & H Series M = 5383 lbs

S = 1458 lbs

15th percentile, 80% Confidence = M - 1.21S = 3619 lbs* (vs. 3514 lbs in JBA report)

E Series M = 3156 lbs

S = 1069 lbs

15th percentile, 80% Confidence = M - 1.21S = 1863 lbs* (vs. 1786 lbs in JBA report)

*Note that these numbers are both based on a sample size 35. In the case of the A&H series this represents a conservative approximation. In the case of the E series this represents good approximation since the sample size was 34.

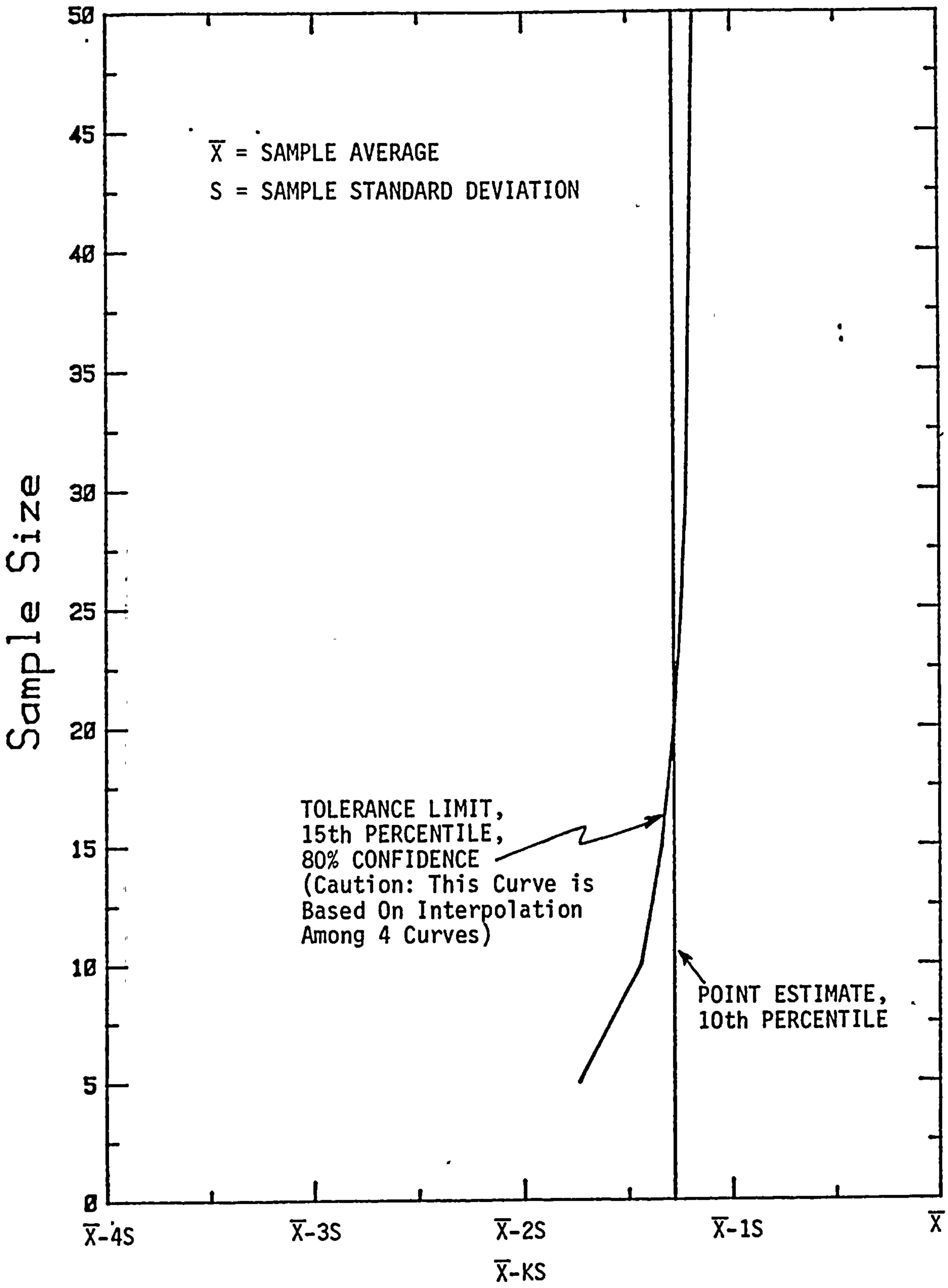

FIGURE 3-1 CRITERIA STRENGTH IN TERMS OF THE NUMBER OF STANDARD DEVIATIONS BELOW THE AVERAGE