

Vepco

VIRGINIA ELECTRIC AND POWER COMPANY

January 17, 1980

Mr. James P. O'Reilly, Director
Office of Inspection & Enforcement
U. S. Nuclear Regulatory Commission
Region II
101 Marietta Street, Suite 3100
Atlanta, Georgia 30303

Serial No. 1153A
PSE&C/CES:VML:wang

Docket Nos. 50-339
50-404
50-405

Dear Mr. O'Reilly:

On December 18, 1979, NRC Region II was notified under the provisions of 10CFR50.55(e) concerning a significant breakdown in the Quality Control Program relative to verification of the calibration of the Forney Compression Testing Machine. This notification was followed by a five day report on December 20, 1979 in accordance with reporting requirements of 10CFR21.

The report stated that it has been determined that the Forney Compression Testing Machine has not been calibrated in the range from 0 to 25,000 lbs. (lower 10% of the total range of the machine). The machine has been used to determine compressive strengths of grout cylinders (2 in. diameter), grout cubes (2 in. square), concrete core samples (3 in. diameter) and full size concrete cylinders (6 in. diameter). The majority of the grout and concrete core samples broke in the 0 to 25,000 lb. range due to the smaller area to which the compressive force was applied. The concrete cylinders which broke in this range would be the 7-day breaks in the low strength (1,000 psi) backfill concrete. ASTM E4-72 provides a procedure for calibrating in the lower 10% range of the machine.

It was also stated in the report that the diameter of the suspended spherically seated blocks used on the machine for testing the various sized samples is larger than that specified in ASTM C39-72 and C109-73 for grout samples. The diameter of the blocks used on the machine is 5 1/2 in. ASTM C39-72 specifies that the diameter of the upper spherically seated bearing block shall not exceed 4 in. for a 2 in. diameter test specimen. ASTM C109-73 specifies that "The diagonal or diameter of the bearing surface shall be only slightly greater than the diagonal of the face of the 2 in. or 50 mm cube in order to facilitate accurate centering of the specimen."

Calibration runs on the Forney Compression Testing Machine in the load test range from 5,000 lbs. to 25,000 lbs. were performed by J. W. Richardson Calibration Service, Chalfont, Pa. on January 9, 1980. A copy of the calibration report is included as Attachment "A" to this report. The calibration runs performed on that date indicated the following results for the subject test load range:

1. The normal calibration run consistently demonstrated that the machine gauge conservatively understates the actual load in the subject test load range.

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2. A special calibration run, which permitted the red follower needle to be pushed by the black load indicator needle (not the usual calibration practice), demonstrated that the machine understates the actual load by an additional amount in the subject test range due to the resistance of the follower needle.
3. The machine gauge error at 25,000 lbs. satisfies the requirements of ASTM E1-72 for accuracy but conservatively understates the actual load.

Engineering investigation of the subject of this report has revealed the following additional facts:

1. Records of past calibrations show that the machine gauge has never indicated an unconservative error at the low end of the previously calibrated load range. The low end of the previously calibrated load range corresponds to a value of 25,000 lbs.
2. The machine gauge has never been known to be significantly out of calibration while in use at North Anna Power Station and all the previous calibrations were performed not subject to interaction of the red follower needle. These points of information have been confirmed by Mr. J. W. Richardson who personally performed all but two of these previous calibrations.
3. The lowest load of interest in the 0 to 25,000 lb. range is 9,000 lbs. since this load corresponds approximately to that which is required to produce 3000 psi compressive stress on the 2 in. diameter grout cylinders. At that load, the machine gauge error recorded during the January 9, 1980 calibration is -2.5 divisions (-1250 lbs.). When combined with the effect of the resistance of the follower needle, -1.0 division (-500 lbs.), the calibration corresponds to a conservative error of 19.4 percent.

From the above information presented in this report, it can be concluded with a high level of confidence that the compression test results in the 0 to 25,000 lb. range were conservative. To further reinforce this conclusion, consideration will be given to the remote event that the January 1980 calibration runs would have indicated a gauge error measured in the nonconservative direction by the same magnitude, that is, +2.5 divisions (+1250 lbs.) at a 9000 lb. test load. Combining the constantly conservative effect of the resistance of the follower needle, -1.0 division (-500 lbs.), the net effect would result in a +1.5 division (+750 lb.) error, or less than 8.5 percent error. Grout which was accepted on the basis of compression tests of 2 in. diameter cylinders, which could have included such an error had it possibly existed, would still be acceptable if tested in place today due to the additional strength gained by continuing cement hydration after the 28 day test period.

Based on the above information, it is concluded that the lack of documented calibration and the failure to satisfy the accuracy requirements of ASTM E4-72 in the 0 to 25,000 lb. load range has had no detrimental effects on compressive test reports recorded from the Forney Compression Testing Machine.

The incorrect use of the 5 1/2 in. diameter block for smaller diameter grout cylinders and concrete core samples could not have produced a break strength higher than that produced by use of the specified proper equipment. The requirement for using a smaller diameter block recognizes the potential for eccentric load which may be introduced if a larger block is used. This is not to infer that any error must have been introduced by use of a larger block, but only that the net result of any such error would always be conservative resulting in a lower recorded compressive strength than may have otherwise been indicated.

To assure that future tests are performed in accordance with the specifications of ASTM C39-72 and C109-73, Construction Quality Control has been instructed not to perform any further testing on the Forney Compression Testing Machine in the 0 to 25,000 lb. load range. A new compression testing machine with a load range of 5,000 to 60,000 lbs. will be procured and installed prior to the restart of the concrete program at North Anna. In order to preclude a recurrence of this type the purchase order for the calibration of the compression testing machines has been modified to specify the exact load range calibration required for each machine. Additionally, the calibration program checklists have been modified to verify the calibration of each machine within its load range of operation. Construction Quality Control and Stone & Webster Field Engineering are reviewing the ASTM requirements for the concrete production and testing program to insure full compliance. This review will be completed by February 15, 1980.

Since the lack of documented calibration and the use of improper equipment has had no detrimental effects on compressive test reports, we anticipate no further correspondence on this subject. Therefore, this letter is considered to be a final report and completes all reporting requirements under provisions of 10CFR50.55(a) and/or 10CFR50.21.

Very truly yours,

Sam C. Brown, Jr.
Senior Vice President - Power Station
Engineering and Construction

Attachment

cc: Mr. Victor Stallo, Director
Office of Inspection & Enforcement
✓ Mr. Harold A. Denton, Director
Office of Nuclear Reactor Regulation

Attachment No. F3EAC
 Serial No. 1453A
 January 17, 1980

J.W. RICHARDSON
 BOX 67, CHALFONT, PA.

JAN. 9 1980

CALIBRATION - SERVICE

Client: **Stone And Webster Eng. Corp.**
 Location: **North Anna Atomic Power Plant Conc. Lab.**
 City: **MINERAL, VA.**

Manufacturer of Testing Mach.: **TORNEY**
 Type Testing Mach.: **HYD. COMP. FT-40**
 Test Point or Serial No.: **69115**

Customer Purchase Order No.

Checked by

J.G.R.

APPLIED LOAD	1 DIV. = 5.00	1 DIV. = 5.00	1 DIV. = 5.00	1 DIV. = 5.00	1 DIV. = 5.00	1 DIV. = 5.00	1 DIV. = 5.00	1 DIV. = 5.00	1 DIV. = 5.00	1 DIV. = 5.00
0	X	X	X	X	X	X	X	X	X	X
5,000	-2.8	-2.7	-2.7	-2.7	-2.7	-2.7	-2.7	-2.7	-2.7	-2.7
6,000	-2.7	-2.7	-2.6	-2.6	-2.6	-2.6	-2.6	-2.6	-2.6	-2.6
8,000	-2.6	-2.7	-2.5	-2.5	-2.5	-2.5	-2.5	-2.5	-2.5	-2.5
9,000	-2.5	-2.5	-2.4	-2.4	-2.4	-2.4	-2.4	-2.4	-2.4	-2.4
10,000	-2.4	-2.4	-2.4	-2.4	-2.4	-2.4	-2.4	-2.4	-2.4	-2.4
12,500	-2.2	-2.2	-2.3	-2.3	-2.3	-2.3	-2.3	-2.3	-2.3	-2.3
15,000	-2.0	-2.0	-2.1	-2.1	-2.1	-2.1	-2.1	-2.1	-2.1	-2.1
16,000	-1.9	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0
17,500	-1.9	-1.8	-1.9	-1.9	-1.9	-1.9	-1.9	-1.9	-1.9	-1.9
18,000	-1.9	-1.8	-1.9	-1.9	-1.9	-1.9	-1.9	-1.9	-1.9	-1.9
20,000	-1.5	-1.4	-1.5	-1.5	-1.5	-1.5	-1.5	-1.5	-1.5	-1.5
25,000	-1.5	-1.4	-1.4	-1.4	-1.4	-1.4	-1.4	-1.4	-1.4	-1.4
RUN #1	RUN	RUN	RUN	RUN	RUN	RUN	RUN	RUN	RUN	RUN
	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10
	WITH OUR MAX. POINTER					WITH MAX. POINTER				

READINGS ARE IN DIV ERROR
 1 DIV = 500 LB.

RING NO.
 60,000 LB. NO. 4422