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USNRC REGION II
ATLANTA, GEORGIA

VIRGINIA ELECTRIC AND POWER COMPANY, RICHMOND, VIRGINIA 23261

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May 24, 1979

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. 402
PSE&C/RHW,III:mac:wang

Docket No. 50-339

Dear Mr. O'Reilly:

I.E. Bulletin No. 79-02 emphasizes the importance of ensuring that concrete expansion anchor bolts are properly installed to withstand the loads transmitted through the baseplates and that baseplates are in conformance with the design assumptions of flexibility or rigidity. Deficiencies associated with these items were recognized on North Anna Unit 2 and reported under the provisions of 10CFR50.55(e). Our letters of November 8, 1976, Serial No. 315; March 22, 1977, Serial No. 093; May 13, 1977, Serial No. 198; and July 29, 1977, Serial No. 318 represented our final reports on these items. Extensive engineering, construction, and quality control procedures were developed and implemented during this period to ensure that North Anna Unit 2 would meet the criteria which are now being addressed by I.E. Bulletin No. 79-02. These items (339/77-12-6 and 339/77-32-01) were reviewed during an NRC inspection of North Anna Unit 2 and closed in your Report No. 50-339/78-12 transmitted to us by your letter dated May 31, 1978.

Item 6 of I.E. Bulletin No. 79-02 requests that holders of construction permits for power reactor facilities complete items 1 through 4 for installed pipe support base plates with concrete anchor bolts. These items are addressed below for North Anna Unit 2.

1. Baseplate flexibility has been accounted for in the calculation of anchor bolt loads for all Category I concrete founded pipe supports. As an out-growth of an I&E investigation conducted at North Anna in 1976, criteria were developed to evaluate baseplate flexibility and this criteria was used to evaluate those pipe supports previously installed. Baseplates which were determined to be flexible were modified by the addition of gusset plates to restore rigidity. The supporting analysis used in developing these criteria utilized a ratio of baseplate thickness to the distance between a loaded member of the baseplate and the baseplate bolts rather than the ratio between the unstiffened edge distance and the baseplate thickness which item 1 states can be used in lieu of supporting analysis.

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The field check and modification of existing supports was carried in I&E records as Item 77-12/6 and was audited and closed by NRC Region II letter 50-339/78-12 of May 31, 1978 as previously mentioned. All pipe supports installed after this time were designed using these guidelines to ensure rigidity.

2. The majority of the pipe support expansion anchor bolts are of the "Hilti-Kwik" design which are wedge and sleeve type anchor bolts with a minimum design factor of safety of four based on manufacturer's test data. During the early stages of construction, some "Phillips Self Drilling Anchors" were used. These are considered shell type anchor bolts and where used they have a design factor of safety of at least five.

The factors of safety were used to established allowable bolt loads which were not exceeded in design. The allowable loads are based on a concrete strength of 3000 psi which is the minimum used in Category I structures. Quality control records often show concrete strengths in the 4000 psi to 5000 psi range. Since anchor bolt loads did not exceed the allowable loads and since concrete strengths are often higher than the design strength, the actual factors of safety can be expected to exceed the values stated above which are the minimum factors of safety used.

3. Cyclic loading was not specifically considered as a design requirement; however, as part of the inspection program described in item 4 below, anchor bolts were torqued to a value corresponding to the allowable bolt design loads. This requirement of applying a torque to the anchor bolts was incorporated into the current anchor bolt installation procedures followed for anchor bolts installed after the implementation of the inspection program. The effect of torquing the bolts is to apply a preload which is considered to give the anchor bolts cyclic load capability since the actual design loads would not exceed the calculated preload applied to the bolt.
4. In conjunction with the correspondence mentioned in the first part of this letter, a detailed anchor bolt inspection program was instituted in 1977. All anchor bolts in Category I pipe supports installed at that time were ultrasonically measured to ensure adequate embedment depth and were torqued to a value corresponding to the allowable design loads.

The results of this field inspection verified anchor bolt size, embedment, and preloading. For "Phillips Self Drilling Anchors" the proper thread engagement was verified. Full documentation exists for this program. Anchor bolts for pipe supports added or modified after this inspection were covered by expanded construction and quality control procedures which used a sampling system for verification.

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As described above, the procedures used for North Anna Unit 2 satisfy items 1 through 4 of I.E. Bulletin No. 79-02.

Very truly yours,

S. M. Stallings
S.M.

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

cc: Mr. John G. Davis, Acting Director
Office of Inspection & Enforcement

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation