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Babcock & Wilcox

a McDermott company

Nuclear Power Generation Division

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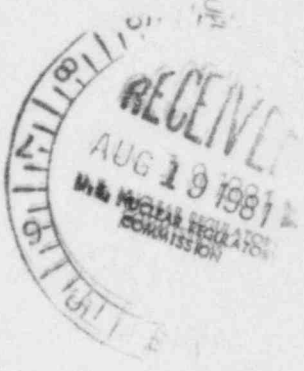
August 14, 1981



Mr. Victor Stello, Director
Office of Inspection and Enforcement
U. S. Nuclear Regulatory Commission
Washington, DC 20555

Subject: 10 CFR 21 Report

Dear Mr. Stello:

Pursuant to the requirements of 10 CFR 21, this report in three copies is made concerning the potential for stress corrosion cracking of anchor bolts. This concern is judged reportable for the Bellefonte Units 1 and 2 of TVA and the Pebble Springs Unit of PGE.

Mr. J. C. Deddens, acting for Mr. D. E. Guilbert, Vice President, Nuclear Power Generation Division, B&W, was informed of this reportable concern 1507 hours, August 13, 1981.

This letter confirms our telephonic report to Mr. W. R. Rutherford of your office on August 13, 1981 at approximately 1523 hours.

The attachment presents the necessary information relative to this concern.

Very truly yours,

J. H. Taylor
Manager, Licensing

JHT/fw
cc: Mr. R. B. Borsum - B&W Bethesda Office

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Nature of the Concern

Stress Corrosion Cracking (SCC) is a potential failure mode for high yield strength (>120 KSI) low alloy steel bolting material subjected to appreciable steady state loads (generally preload in the case of supports and restraints) and typical reactor containment corrosive environments (humid air or borated water from spills) for extended periods of time. Generally, the bolting material for the supports and restraints is specified as SA 540 Grade B -22, -23, or -24 Class 1 or 2. SA 540 Class 1 bolts have a specified minimun yield strength (YS) of 150 KSI and specified minimum ultimate tensile strength (UTS) of 165 KSI at room temperature while Class 2 bolts have a specified minimum YS of 140 KSI and specified minimum UTS of 155 KSI. These materials are therefore a concern with respect to SCC.

If significant stress corrosion cracking were to occur the anticipated mode of failure could be the sudden brittle fracture of individual bolts with or without the application of external loads to the support or restraint and/or the failure of the entire support or restraint due to failure of several or all of the attaching bolts when external loads are applied. Structural failure of supports and restraints could invalidate assumptions made in the dynamic loading analysis of reactor coolant system components and in the emergency core cooling analysis.

Plant Applicability

The applicability of the SCC concern to B&W plants under construction or in operation is in accordance with the following:

TVA: (Bellefonte 1/2)

(a) B&W designed the supports and restraints.
(b) B&W specified a bolt preload of a minimum of 70% of ultimate tensile strength in many cases.
(c) B&W provided the design of the non-embed bolts and a portion of the design of the embed bolts (material, diameter, pre-load).
(d) Bolts are in process of installation.

VEPCo: (North Anna 3)

(a) B&W designed the supports and restraints.
(b) B&W has not specified a high bolt preload in cases where preloads are specified and in most cases, preloads have not been specified.
(c) B&W has provided many of the bolts.
(d) Bolt installation is not scheduled to occur for several years.

PGE: (Pebble Springs)

(a) B&W designed the supports and restraints.
(b) B&W has specified a bolt preload by specifying "turn-of-the-nut" method (See Reference 1) in many cases, which assures that at least 70% of ultimate tensile strength is achieved.
(c) B&W has provided many of the bolts.
(d) Bolt installation is not scheduled to occur for several years.

For all these plants, the bolts of concern are both embeds (ie., embedded in concrete) and external joints.

Reference 1 - Steel Structures, Design and Behavior, C. G. Salmon and J. E. Johnson, Harper and Row, 1971, pages 92-94.

WPPSS (WNP 1/4)

(a) B&W did not design the supports and restraints.
(b) B&W specified the material for anchor bolts and other bolts, and the bolt preload (low value) for the reactor vessel supports.
(c) B&W provided the bolts for the RV supports.
(d) Bolt installation may be completed.

177 FA Plants In Operation And Under Construction

(a) B&W did not design the supports and restraints.
(b) B&W specified high preloads on Reactor Vessel support skirt embed bolts, but did not specify bolt material and did not provide the bolts.

Reportability

The concern that anchor bolts that have been specified by B&W to be torqued to a high preload may be subject to stress corrosion cracking when in the reactor containment building atmosphere is deemed to be reportable to the NRC under 10CFR21 for the TVA and PGE plants.

The concern is not reportable under Part 21 for VEPCo or WPPSS because any bolt preloads that were specified by B&W were not of a sufficiently high value to cause SCC.

In the case of the remaining B&W plants, which are the 177 FA plants in operation or under construction, B&W is unable to make a determination as to whether a reportable concern under Part 21 exists. B&W has no information on the design of the supports or restraints, on the design of the bolts or the materials used for the bolts, and is therefore unable to determine if the potential for SCC exists. For these plants, B&W will advise these utilities of the concern for their evaluation.

Corrective Action

Corrective action by B&W with respect to the various reactor plants varies because of the differing responsibility B&W has with respect to the design of the supports and restraints and the specification of bolt preloads.

1. For the three plants for which B&W has supports and restraints design responsibility, TVA, PGE, and VEPCo, the following actions have been or will be taken:

   (a) TVA was advised by B&W on January 26, 1981 that there is uncertainty as to the proper value to which the bolts should be tightened due to SCC potential; it was recommended that the high torqueing should be stopped and the bolts tightened to "snug" only pending further advice from B&W. TVA was given additional advice about the SCC concern, including the potential adverse safety consequences, on July 1, 1981.

   (b) PGE and VEPCo will also be advised on the SCC concern.

2. B&W will inform WPPSS of the potential for SCC in high yield strength low alloy steel bolts for their information.

3. B&W will advise the 177 FA plants in operation and under construction of the

concern for their evaluation and for their use in connection with their response to the NRC letter of May 19, 1980 to all Power Reactor Licensees which addressed this issue (Reference 2).

Reference 2 - NRC letter to "All Power Reactor Licensees" dated May 19, 1980, Attachment 1, Part II, Page 3.