

**CP&L**

Carolina Power &amp; Light Company

Company Correspondence

Brunswick Nuclear Project  
 P. O. Box 10429  
 Southport, NC 28461-0429  
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U. S. Nuclear Regulatory Commission  
 ATTN: Document Control Desk  
 Washington, DC 20555

BRUNSWICK STEAM ELECTRIC PLANT UNITS 1 AND 2  
 DOCKET NOS. 50-32 & 50-325  
 LICENSE NOS. DPR-62 & DPR-71  
RESPONSE TO NRC IFI 50-325/88-36-03 AND 50-324/88-36-03

Gentlemen:

This review of Hilti anchor bolt allowables per IEB 79-02, NRC Information Notices No. 86-94 and 88-25 is submitted in response to NRC Inspection Report 50-325/88-36 and 50-324/88-36 dated November 3, 1988. Item 4 of the inspection report closed Pipe Support Base Plant Designs Using Concrete Expansion Anchor Bolts-IEB 79-02, and opened Inspector Follow-up Items (IFI) 50-325, 324/88-36-02 and 50-325, 324/88-36-03. IFI 50-325, 324/88-36-03, requested that the licensee review the Hilti anchor bolt allowables per IEB 79-02, NRC Information Notices No. 86-94 and 88-25. The Final Summary Report for IEB 79-02 (IFI 50-325, 324/88-36-02) was submitted by CP&L letter dated March 22, 1990, Serial Number: BSEP/90-0244. This document acts to close out the remaining open item, IFI 50-325, 324/88-36-03.

NRC Information Notice 86-94 addresses deficiencies in the published allowables for the 1/2 inch diameter Hilti Kwik anchor bolt. Information Notice 86-94 states that, "These concerns should not impact licensees with facilities that have established allowable working loads for expansion anchors based on on-site tests or facilities that establish allowable working loads based on the shorter embedment lengths." Allowable working loads at CP&L's Brunswick plant are based on testing conducted by the Abbot A. Hanks, Inc. Testing Laboratories. That testing was performed on various sizes of Hilti anchor bolts over a wide range of embedment depths.

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Our specification 9527-01-69-8; "Specification For Ready Mixed Concrete For Carolina Power & Light Brunswick Steam Electric Plant Units 1 and 2", states in Section 2.6.2.1 that the 28 day strength (f'c) of any mix design called for per design drawing will be increased by 1200 psi and placed as such. That is to say that anytime 3000 psi concrete was called out on a design drawing, 4200 psi concrete was placed. As the safety related concrete used on site was called out as 3000 psi and above, we are assured that it is of at least 4200 psi mix design.

The 1/2" Hilti anchor bolt was tested by Abbot A. Hanks, Inc. Testing Laboratory in 2000, 4000 and 6000 psi concrete at embedment depths of 2 1/4, 2 3/4, 3 1/2, 4 1/2, and 6". Note that at the Brunswick Plant we do not use 1/2" Hilti Bolts at 6" embedment. The longest 1/2" bolts purchased on this site are 7" and due to baseplate, washer, and nut thickness coupled with the depth needed to properly torque the bolt, it would not be feasible to use these bolts at 6" embedment. Typically in baseplate design at this site, when greater tensile strength is required of expansion anchors from the nominal embedment capacity (@4.5D) the next anchor size (based on diameter) is used. The Brunswick Plant allowable working loads for the 1/2" Hilti anchor bolts are based on interpolation of the Abbot A. Hanks, Inc. test data for 3000 psi concrete. A comparison of our allowable working loads for 1/2" Hilti anchor bolts for 3000 psi concrete and the allowable working loads identified in the Information Notice interpolated to 3000 psi concrete shows that for embedments of 3 1/2 and 4 1/2" our allowable working loads were higher by 3% and 7%, respectively. However, since we actually have 4200 psi concrete, our allowable working loads are conservative and are below the allowables for 4000 psi concrete as identified in the Information Notice and the Abbot A. Hanks, Inc. test data for those 1/2" anchors used at the Brunswick Plant.

Based on the above, CP&L believes the allowable working loads for 1/2" Hilti anchor bolts currently being used at our Brunswick Plant are adequate and no further action is planned.

NRC Information Notice 88-25 contains information and suggestions with respect to minimum edge distance of concrete expansion anchors. Based on our review, CP&L does not consider minimum edge distance as discussed in Information Notice 88-25 to be a safety issue. This position is based on the following rationale:

1. The test configuration is not representative of actual installations. The Hilti test results referenced in NRC Information Notice 88-25 are for single anchors in unreinforced concrete and loaded in shear only. Typically, anchors are used in groups to attach baseplates or equipment to reinforced concrete. These actual installations contain conservatism which are not accounted for in the design:

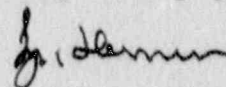


- a. Friction forces between baseplates and concrete surfaces are developed through bolt preload and externally applied loads. These friction forces will aid in resisting shear loads thus further reducing shear loads on anchors.
  - b. In a typical multi-anchor baseplate, shear forces can be redistributed to those anchors farthest from the free edge. These anchors will experience no capacity reduction due to edge effects.
  - c. In-situ concrete strengths are typically higher than the design strength.
2. Concrete expansion anchor design is typically controlled by tension rather than shear. Shear loadings are usually 25-50% of tensile loads.
  3. Design loads are typically enveloped, using the worst case in all directions acting concurrently. This is conservative due to the fact that structural components react to a seismic event at different frequencies. These frequencies are at different times during the event, therefore, three-directional loading is not concurrent as assumed. Furthermore, worst-case accelerations are typically used to develop design loads, and a four (4) to one (1) safety factor is used.
  4. There is only a small percentage (estimate < 1%) of anchors actually placed near a concrete face edge.

Based on the above CP&L believes that expansion anchor edge distances present at our existing plant facilities are adequate as is and no further action is planned. To be consistent with industry data, the edge distance criteria used for new design and installation at the Company facilities is being revised to be consistent with that contained in Information Notice 88-25.

Please refer any questions regarding this submittal to Mr. K. B. Altman at (919) 457-2404.

Very truly yours,



J. L. Harness, General Manager  
Brunswick Nuclear Project

TMJ/bw

cc: Mr. S. D. Ebnetter  
Mr. N. B. Le