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VICE PRESIDENT - NUCLEAR

March 4, 1991  
PY-CEI/NRR-1323 L

U.S. Nuclear Regulatory Commission  
Document Control Desk  
Washington, D. C. 20555

Perry Nuclear Power Plant  
Docket No. 50-440  
Request for Additional Information on  
Bulletin 88-05 Product Forms Other Than  
Fittings and Flanges (TAC No. 68808)

Gentlemen:

By letter PY-CEI/NRR-1262L, dated December 11, 1990 we notified you that Bulletin 88-05 product forms in service at Perry had been determined acceptable by reanalysis using an assumed minimum ultimate strength of 45 ksi, and in one application (drywell penetration) hardness testing was also performed to verify adequate strength for calculated loads. This letter justified a use-as-is disposition for all product forms except Item 8, shoulder screws used to assemble drywell and containment purge valve flanges (valves M14F040, F065, F070 and F090). Additional testing and analysis was planned to be completed on the shoulder screws by February 15, 1991.

The attachment to this letter describes the testing and analysis performed to demonstrate adequate shoulder screw strength to perform desired function, based on USAR load combinations.

The engineering evaluations reported here and in our December 11 letter demonstrate Bulletin 88-05 product forms installed at Perry have adequate strength for their respective applications, at conservative load combinations described in USAR Section 3.9. We therefore conclude that subject product forms are acceptable for use as installed. As noted in our previous letter, future safety-related application of this material will remain subject to engineering review prior to installation.

Please feel free to call if you have any further questions.

Sincerely,

Michael D. Lyster

MDL:WJE:njc

Attachment

cc: NRC Project Manager  
NRC Resident Inspector Office  
NRC Region III

Operating Companies  
Cleveland Electric Illuminating  
Toledo Edison

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PDR ADOCK 05000440  
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EVALUATION OF DRYWELL AND CONTAINMENT  
PURGE VALVE BODY FLANGE SHOULDER SCREWS

The subject shoulder screws hold valve body halves together by threading into the flange (not a through-bolt connection). The valves provide containment and drywell isolation and are Safety Class 2. This evaluation recalculated the highest bolt stresses for load combinations specified in the USAR, and strength tested installed screws to verify that stresses under all licensed conditions remain below minimum yield strength.

Stress Analysis

Evaluations of Bulletin 88-05 carbon steel product forms were originally based on the assumption of 45 ksi minimum ultimate material strength, consistent with the conclusions of NUREG 1402 and the NUMARC report submittal in October 1988 (NUMARC 88-01) regarding plate material for blind flange applications. For the subject shoulder screws, maximum stress of 47 ksi was calculated, which necessitated physical testing to verify actual material strength. These calculations utilized pipe moments at the bolted joints which were combined with 150% of nominal installation bolt torque and hydrostatic test pressure loads, consistent with Section 3.9.3.2.4.2 of the USAR.

Sample Plan for Physical Testing

A sample plan was determined in order to provide a 90% confidence level of acceptability, which is consistent with the Perry Commercial Grade Dedication Program. Quality Assurance review of procurement documents supported the assumption of homogeneity of the entire population of screws, since all the screws were purchased under one purchase order and were subsequently supplied and delivered in one shipment under one heat number. Thus Unit 2 screws were tested as a representative sample for those installed in the operating Unit 1.

Test Results

The results of physical testing revealed that the chemical requirements met ASME SA-193B7 (original specification) but that tensile strength was lower than specified (minimum 106,000 vs. 125,000 psi) and elongation and reduction of area were higher. Based upon the test results it is suspected that the material is AISI-4140 (specified minimum yield strength 60 ksi, versus the 65 ksi measured in the tests), and that the screws were not heat treated as required by SA-193B7.

Specified minimum yield strength for AISI-4140 is more than 25% greater than the calculated stress under the worst-case loading combination described above.

### Periodic Leak Tests

The integrity of these flanged joints is verified by periodic leak testing at design-basis accident pressure (Pa) of 11.3 psig; normal operating pressure is less than 0.2 psig. The containment isolation valves (M14F040, F090) are subject to quarterly local leak rate testing, and the flanged joint of concern is also soap bubble tested every 40 months. The drywell isolation valves (M14F065, F070) are tested during the drywell leak test (2.5 psig) every refueling.

### Conclusions

The subject shoulder screws will experience no yielding under worst-case loading, assuring the integrity of associated containment penetrations. Leak tightness to applicable USAR Chapter 6 and 15 criteria will be periodically reverified.

NJC/CODED/4450