

January 31, 2001

Mr. William T. Cottle  
President and Chief Executive Officer  
STP Nuclear Operating Company  
South Texas Project Electric  
Generating Station  
P. O. Box 289  
Wadsworth, TX 77483

SUBJECT: SOUTH TEXAS PROJECT, UNITS 1 AND 2 - REQUEST FOR RELIEF  
(RR-ENG-2-15) FROM ASME CODE, SECTION XI REQUIREMENTS  
(TAC NOS. MA6850 AND MA6851)

Dear Mr. Cottle:

By letter dated October 7, 1999, as supplemented July 17, 2000, the STP Nuclear Operating Company (STPNOC) submitted a request (RR-ENG-2-15) seeking partial relief from the visual examination requirements specified in Paragraph IWA-5242(a) of the American Society of Mechanical Engineers (ASME) Code, Section XI, for the second 10-year inservice inspection (ISI) interval at the South Texas Project (STP), Units 1 and 2. This request was made in accordance with the provisions of 10 CFR 50.55a(a)(3)(ii) with the contention that full compliance with IWA-5242(a) will result in a hardship or unusual difficulty without a compensating increase in the level of quality and safety. The STPNOC proposed adopting ASME Section XI Code Case N-616 as an alternative to IWA-5242(a).

Based on our review of your request, we have concluded that full compliance with IWA-5242(a) will result in a hardship or unusual difficulty without a compensating increase in the level of quality and safety. We have also concluded that the proposed alternative requirements specified in Code Case N-616 will provide reasonable assurance of structural integrity of the components examined. Therefore, pursuant to 10 CFR 50.55a(a)(3)(ii), Relief Request RR-ENG-2-15 is hereby authorized for the second 10-year ISI interval at STP, Units 1 and 2.

The staff's evaluation and conclusions are contained in the enclosed safety evaluation. Should you have questions regarding this safety evaluation, please contact Mr. Mohan Thadani, of my staff at (301) 415-1476.

Sincerely,

*/RA/*

Robert A. Gramm, Chief, Section 1  
Project Directorate IV & Decommissioning  
Division of Licensing Project Management  
Office of Nuclear Reactor Regulation

Docket Nos. 50-498 and 50-499

Enclosure: Safety Evaluation

cc w/encl: See next page

South Texas, Units 1 & 2

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February 2000

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION  
REQUEST FOR RELIEF (RR-ENG-2-15) FROM ASME CODE REQUIREMENTS FOR  
SECOND 10-YEAR INSERVICE INSPECTION PROGRAM  
SOUTH TEXAS PROJECT, UNITS 1 AND 2  
SOUTH TEXAS PROJECT NUCLEAR OPERATING COMPANY  
DOCKET NOS. 50-498 AND 50-499

## 1.0 INTRODUCTION

By letter dated October 7, 1999, as supplemented July 17, 2000, the STP Nuclear Operating Company (the licensee) submitted a request (RR-ENG-2-15) seeking partial relief from the visual examination requirements specified in Paragraph IWA-5242(a) of the American Society of Mechanical Engineers (ASME) Code, Section XI, for the second 10-year inservice inspection (ISI) interval at the South Texas Project (STP), Units 1 and 2. This request was made in accordance with the provisions of 10 CFR 50.55a(a)(3)(ii) with the contention that full compliance with IWA-5242(a) will result in a hardship or unusual difficulty without a compensating increase in the level of quality and safety. The licensee proposed adopting Code Case N-616 as an alternative to IWA-5242(a).

## 2.0 APPLICABLE REQUIREMENTS

Section 50.55a(g) of Title 10 of the *Code of Federal Regulations* (10 CFR) requires that ISI of ASME Code Class 1, 2, and 3 components shall be performed in accordance with Section XI of the ASME Boiler and Pressure Vessel Code (hereinafter called ASME Code) and the applicable addenda, except where specific written relief has been granted by the Commission pursuant to 10 CFR 50.55a(g)(6)(i). The regulation at 10 CFR 50.55a(a)(3) states in part that alternatives to the requirements of paragraph (g) may be used, when authorized by the NRC, if (i) the proposed alternatives would provide an acceptable level of quality and safety or (ii) compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

Pursuant to 10 CFR 50.55a(g)(4), ASME Code Class 1, 2, and 3 components (including supports) shall meet the requirements set forth in the ASME Code, Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," to the extent practical within the limitations of design, geometry, and materials of construction of the components. The regulations require that ISI of components conducted during the first 10-year interval and subsequent intervals comply with the requirements in the latest edition and addenda of Section XI of the ASME Code incorporated by reference in 10 CFR 50.55a(b) 12 months prior to the start of the 120-month interval, subject to the limitations and modifications listed therein.

For STP Units 1 and 2, the applicable edition of Section XI of the ASME Code for the second 10-year ISI interval, which begins on September 25, 2000, and October 19, 2000, for Units 1 and 2, respectively, is the 1989 edition.

### 3.0 EVALUATION

#### 3.1 Licensee's Evaluation

**Components for which relief is requested** - ASME Code Class 1, 2, and 3 pressure-retaining bolted connections in systems borated for the purpose of controlling reactivity.

**Code requirement from which relief is requested** - ASME Code, Section XI, Paragraph IWA-5242(a), "For systems borated for the purpose of controlling reactivity, insulation shall be removed from pressure retaining bolted connections for visual examination VT-2."

**Licensee's basis for requesting relief** - The licensee contends that full compliance with IWA-5242(a) will result in a hardship or unusual difficulty without a compensating increase in the level of quality and safety. This relief request is filed pursuant to the provisions of 10 CFR 50.55a(a)(3)(ii).

The licensee acknowledges that all systems containing borated water could be susceptible to boric acid corrosion. There are areas in the plant that are difficult to inspect and in many cases scaffolding or a ladder is required that could result in significant personnel radiation exposure during installation and removal. Also, removal and reinstallation of insulation increases the risk of personal injury. The licensee considers the removal of insulation to inspect for corrosion on corrosion resistant bolting material unnecessary. The licensee also stated that the requirement to remove insulation to perform visual inspection of bolted connections places an undue burden without a compensating increase in the level of quality and safety.

**Alternative examination** - The licensee proposed, as an alternative to IWA-5242(a), to conduct VT-2 visual inspections of bolted connections with the insulation in place, provided that the bolting material has a chromium content greater than or equal to 10%. This is consistent with Code Case N-616, "Alternative Requirements for VT-2 Visual Examination of Class 1, 2, and 3 Insulated Pressure-Retaining Bolted Connections." If evidence of leakage is detected, either by discovery of active leakage or observation of boric acid crystals, then the bolted connection will be reexamined (with the insulation removed) and evaluated in accordance with the corrective measures of Paragraph IWA-5250.

#### 3.2 Staff Evaluation

The Code requires the removal of all insulation from pressure-retaining bolted connections in systems borated for the purpose of controlling reactivity when performing VT-2 visual examinations during system pressure tests. The Code requires this examination to be performed each refueling outage for Class 1 systems, and each inspection period for Class 2 and 3 systems. The licensee has requested relief from the Code requirements to use Code Case N-616. This code case was approved by the ASME on May 7, 1999, but has not yet been reviewed by the NRC staff for general applicability.

The staff has developed a position over the years on the use of AISI Type 17-4 PH stainless steel (SA-564 Grade 630), AISI Type 410 stainless steel (SA-193 Grade 6), and A-286 stainless steel (SA-453 Grade 660) fasteners. The 17-4 PH stainless steel and the 410 stainless steel are suitable for use in contact with the primary coolant in reactors if they were aged at a temperature of 1100 °F or higher. If they were aged at a lower temperature, they become susceptible to primary water stress corrosion cracking. The hardness of these alloys should be below  $R_c$  30 if they were properly heat treated. A-286 stainless steel is susceptible to stress corrosion cracking in the primary coolant environment, particularly if preloaded above 100 ksi. NUREG/CR-3604, "Bolting Applications," states that A-286 stainless steel is not suitable for use as a reactor structural material because much safer materials are available. However, there are a large number of A-286 bolting currently in nuclear service, both in boiling water reactors (BWRs) and pressurized-water reactors (PWRs).

Bengtsson and Korhonen of ASEA-ATOM, Vasteras, Sweden, examined the behavior of A-286 in a BWR environment, as reported at the Proceedings of the International Symposium on Environmental Degradation of Materials in Nuclear Power Systems-Water Reactors, August 22-25, 1983, in Myrtle Beach, South Carolina, that was sponsored by the National Association of Corrosion Engineers, the Metallurgical Society of AIME, and the American Nuclear Society. They found that A-286, in comparison to other tested materials, was the most susceptible material they tested to intergranular stress corrosion cracking in BWR water. They also found that A-286 is less likely to crack as the applied stress is reduced. Piascik and Moore from Babcock & Wilcox reported a number of bolt (A-286 stainless steel) failures in Nuclear Technology, Vol. 75, December, 1986 in PWR water. They correlated the failures with bolt fillet peak stress and found that bolts preloaded below 100 ksi showed no failures.

Consistent with these experiences, the staff maintains the position that any 17-4 PH stainless steel or 410 stainless steel stud or bolt that is either aged at a temperature below 1100 °F or with hardness above  $R_c$  30 must have the thermal insulation removed for VT-2 examination during the system pressure test. For A-286 stainless steel studs or bolts, the preload must be verified to be below 100 ksi or the thermal insulation must be removed for visual inspection. For nuts conforming to SA-194, experience indicates that it is not necessary to remove the thermal insulation for visual inspection.

The staff notes that Code Case N-616 does not address the possibility that component failures (17-4 PH stainless steel, 410 stainless steel, or A-286 fasteners) could go unnoticed in service under insulation. Also, all valve bodies, pump casings, and piping must contain at least 10 percent chromium and be in the proper heat treatment condition because the insulation could create an "autoclave effect" and materials with less than 10 percent chromium could experience high corrosion rates. This corrosion could go unnoticed. The code case also does not specifically require the four-hour hold time at operating temperature and pressure prior to conduction the VT-2 examination.

The licensee addressed these concerns in a letter dated July 17, 2000. The letter stated that bolting material, used in applications at STP that could come in contact with borated water, contain at least 12 percent chromium, exceeding the 10 percent required by the code case. The licensee also reviewed records for bolting made in accordance with SA-564 Grade 330, SA-194 Grade 6, and SA-453 Grade 660. The records indicated that these materials have been heat treated at 1100°F or higher, which reduces the susceptibility to stress corrosion. The SA-194 nut material is loaded in compression, and therefore, stress corrosion is not a concern.

This is consistent with operating experience. The licensee applies the criteria of IWA-5213 when conducting tests to identify system leakage. IWA-5213 requires a four-hour hold time after attaining test pressure and temperature for insulated systems. The information provided in the July 17, 2000, letter satisfies the staff's concerns.

Based on the above evaluation, the staff finds that the proposed alternative requirements specified in Code Case N-616 (together with the 4-hour hold time after attaining test pressure and temperature) will provide reasonable assurance of structural integrity of the components examined. Also, the licensee has demonstrated that full compliance with the requirements of IWA-5242(a) will result in a hardship or unusual difficulty without a compensating increase in the level of quality and safety.

#### 4.0 CONCLUSION

The staff concludes that the proposed alternative requirements specified in Code Case N-616 for Class 1, 2, and 3 components will provide reasonable assurance of structural integrity of the components examined. The staff also concludes that full compliance with the requirements of IWA-5242(a) will result in a hardship or unusual difficulty without a compensating increase in the level of quality and safety. Therefore, pursuant to 10 CFR 50.55a(a)(3)(ii), Relief Request RR-ENG-2-15 is hereby authorized for the second 10-year ISI interval at STP, Units 1 and 2.

Principal Contributor: J. Davis

Date: January 31, 2001

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Sincerely,

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Robert A. Gramm, Chief, Section 1  
Project Directorate IV & Decommissioning  
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Docket Nos. 50-498 and 50-499

Enclosure: Safety Evaluation

cc w/encl: See next page

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