

June 27, 2003

Mr. James J. Sheppard  
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, UNIT 1 - REQUEST FOR RELIEF, RR-ENG-2-30, REVISION 2, FROM AMERICAN SOCIETY OF MECHANICAL ENGINEERS BOILER AND PRESSURE VESSEL CODE (ASME CODE) REQUIREMENTS FOR APPROVAL OF ASME SECTION XI CODE CASE N-516-2 FOR UNDER-WATER WELDING OF CORE BARREL LOCKING TAB (TAC NO. MB8925)

Dear Mr. Sheppard:

By letter dated May 8, 2003, as revised by letters dated June 2 and June 10, 2003, STP Nuclear Operating Company (STPNOC or the licensee), requested relief from the requirements of the 1989 Edition of ASME Code, Section XI, Article IWA-4000. The licensee has proposed to follow the guidelines of ASME Code Case N-516-2, "Underwater Welding, Section XI, Division 1."

STPNOC requested relief from the requirements of ASME Code, Section XI, Article IWA-4000 in accordance with Section 50.55a(a)(3)(i) of Title 10 of the *Code of Federal Regulations* (10 CFR) in order to perform underwater welding for repairs. ASME Code, Section XI, Article IWA-4000, the code of record at the South Texas Project (STP), does not address underwater welding. STPNOC requests the U.S. Nuclear Regulatory Commission (NRC) approval of ASME Section XI Code Case N-516-2 for use at STP, Unit 1 on the basis that it provides an acceptable level of quality and safety.

Based on its evaluation, the NRC staff concludes that the use of ASME Code Case N-516-2 with the additional requirements for a bend test, a qualification test for the depth of water, and a confirmation test, adequately assures weld integrity and provides an acceptable level of quality and safety. Therefore, the proposed relief is authorized pursuant to 10 CFR 50.55a(a)(3)(i) for

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relief request RR-ENG-2-30, Revision 2, to use Code Case N-516-2 for underwater welding of core barrel locking tabs at STP, Unit 1, during the current forced outage.

The NRC staff's evaluation and conclusions are contained in the enclosed safety evaluation.

Sincerely,

*/RA/*

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

Docket No. 50-498

Enclosure: Safety Evaluation

cc w/encl: See next page

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

THE REQUEST FOR RELIEF NO. RR-ENG-2-30, REVISION 2

USE OF AMERICAN SOCIETY OF MECHANICAL ENGINEERS CODE CASE N-516-2

SOUTH TEXAS PROJECT NUCLEAR OPERATING COMPANY

SOUTH TEXAS PROJECT, UNIT 1

DOCKET NO. 50-498

1.0 INTRODUCTION

By letter dated May 8, 2003, as revised by letters dated June 2 and June 10, 2003, STPNOC Nuclear Operating Company (STPNOC or the licensee), requested relief from the requirements of the 1989 Edition of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section XI, Article IWA-4000 in order to perform underwater welding on the South Texas Project (STP), Unit 1 reactor vessel core barrel and its Roto-Lock insert locking tabs that secure the inserts and prevent their rotation.

2.0 BACKGROUND

Pursuant to Section 50.55a(a)(3)(i) of Title 10 of the *Code of Federal Regulations* (10 CFR), STPNOC requested relief from the requirements of ASME Code, Section XI, Article IWA-4000 in order to perform underwater welding on the components noted above. STPNOC requests the U.S. Nuclear Regulatory Commission (NRC) approval of ASME Section XI Code Case N-516-2 for use at STP, Unit 1 on the basis that it provides an acceptable level of quality and safety.

ASME Code, Section XI, Article IWA-4000, the code of record at STP, does not address underwater welding. However, ASME Code Case N-516-2, "Underwater Welding, Section XI, Division 1," includes alternative procedure, performance, and filler metal qualifications, and alternative examination requirements to those contained or referenced in IWA-4000 for use when the welding is performed underwater. The licensee has proposed to follow the guidelines of ASME Code Case N-516-2, "Underwater Welding, Section XI, Division 1."

ASME Code, Section XI, Article IWA-4120(a) states that "repairs shall be performed in accordance with the Owner's Design Specification and the original Construction Code of the component or system. Later editions and addenda of the Construction Code or of Section III, either in their entirety or portions thereof, and code cases may be used."

The Footnote 6 to 10 CFR 50.55a states in part, that the licensees can use the code cases discussed in NRC Regulatory Guide (RG) 1.84, "Design and Fabrication Code Case Acceptability - ASME Section III, Division I," RG 1.85, "Materials Code Case Acceptability - ASME Section III, Division I," and RG 1.147, "Inservice Inspection Code Case Acceptability -

ASME Section XI, Division I," without additional NRC approval. The ASME Code Case N-516-2 has not been incorporated by reference into the regulation and, therefore, its use requires NRC approval.

### 3.0 EVALUATION OF RELIEF REQUEST

#### APPROVAL OF ASME SECTION XI CODE CASE N-516-2 FOR UNDERWATER WELDING OF CORE BARREL LOCKING TABS (RELIEF REQUEST RR-ENG-2-30, REVISION 2)

##### 3.1 The Items for which Relief is Requested:

STP, Unit 1 reactor vessel core barrel and its Roto-Lock insert locking tabs that secure the inserts and prevent their rotation. The locking tab is American Society for Testing and Materials (ASTM) A-240 Type 304L. The core barrel is ASME SA-182 F304H.

##### 3.2 Code Requirement:

The applicable ASME Code Edition and Addenda is ASME Code, Section XI, 1989 Edition with no Addenda. ASME Code, Section XI, Article IWA-4000 does not address underwater welding. However, Code Case N-516-2, "Underwater Welding, Section XI, Division 1," includes alternative procedure, performance, and filler metal qualifications, and alternative examination requirements to those contained or referenced in IWA-4000 for use when the welding is performed underwater.

##### 3.3 Reason for the Request (as stated):

Approval for the use of Code Case N-516-2 is requested for underwater fillet welding of a Roto-Lock insert locking tab to the reactor vessel core barrel to secure the insert and prevent its rotation.

##### 3.4 Licensee's Proposed Alternative and Basis for Use (as stated):

STP Nuclear Operating Company (STPNOC) requests relief from the requirements of IWA-4000 in accordance with 10CFR50.55a(a)(3)(i) in order to perform underwater welding for repairs. IWA-4000 of the Section XI code of record at the South Texas Project does not address underwater welding. STPNOC requests NRC approval of ASME Section XI Code Case N-516-2 for use at South Texas on the basis that it provides an acceptable level of quality and safety.

The NRC (staff) documented their (its) conditional acceptance of Code Case N-516-2 in Draft Regulatory Guide DG-1091 (Proposed Revision 13 of Regulatory Guide 1.147) published in December 2001. However, neither proposed Revision 13 nor the proposed rulemaking to reference this revision in 10CFR50.55a has been issued.

STP Nuclear Operating Company requests approval for use of Code Case N-516-2 in order to deposit three each 0.180-inch fillet welds on one locking device. These welds were made using a weld procedure specification (WPS) qualified in accordance with Code Case N-516-2 and were visually examined. The WPS was qualified with tensile and bend tests in accordance with ASME Section IX, and with an additional chemical, ferrite, and tensile test performed in accordance with Code Case N-516-2.

A confirmation weld was performed on 1/2-inch plate using the WPS and the same weld material as that to be used in the production weld. The confirmation weld was subject to the same inspection requirement as the production weld.

The subject fillet welds are to prevent the Roto-Lock insert from backing out and potentially becoming a loose part. They are not structural or pressure boundary welds. The requirements imposed on the welds is conservative with respect to the safety function of the welds.

These additional requirements, combined with the alternative requirements of Code Case N-516-2, provide an acceptable level of quality and safety for underwater welding.

### 3.5 Duration of Proposed Alternative (as stated):

This relief request will be implemented during the current forced outage for repairing bottom mounted instrument guide tubes.

### 3.6 Evaluation:

The NRC staff has reviewed Code Case N-516-2 for inclusion in RG 1.147, Revision 13, however, this revision of RG 1.147 has not been issued. Therefore, STPNOC requested NRC approval of ASME Section XI Code Case N-516-2 for use at STP, Unit 1 for the subject underwater welding.

The ASME Code Case N-516-2 provides requirements for underwater welding of P-1, P-8, and P-4X materials. The materials to be welded with this relief request are ASTM A-240 Type 304L and ASME SA-182 F304H which are P-8 base metals and ASME SFA 5.4, E316L-17 as the filler metal.

Draft RG (DG)-1091 imposes the following condition on Code Case N-516-2: "When welding is to be performed on ASME Code Class 1 material that has been exposed to high neutron fluence, a mockup, using material exposed to similar fluence neutron levels, must be welded to verify that adequate crack prevention measures were used." This condition has been imposed because in high neutron fluence regions, weld repair is complicated by the presence of insoluble helium in the irradiated base metal. The release of the helium when the metal melts during welding, can produce porosity and cracking in the weld. In response to this condition on ASME Code Case N-516-2, the licensee provided a neutron fluence evaluation which supported the conclusion that helium generation was not an issue for this application. Based on this evaluation, the NRC staff agrees that a mockup that has been exposed to high neutron fluence is not necessary.

The NRC staff has taken the position in ASME Code meetings that the requirements of ASME Code Case N-516-2 may not be complete since the code case has allowed testing of welders and welding procedures to be done without the performance of bend tests as required by ASME Code Section IX, Paragraph QW-160. Bend tests are a measure of the ductility and soundness of a weld and without these tests a weld could be very hard and brittle. The NRC staff has concluded that the bend tests are very important to ensuring the integrity of welds made underwater. Therefore, the NRC staff requires that all underwater welding procedure qualifications and welder performance qualifications shall include the bend tests required by paragraph QW-160 in ASME Section IX. STPNOC has performed these tests in addition to all of the other tests required by ASME Section XI Code Case N-516-2, including ASME Section IX procedure qualifications, ASME Code Case N-516-2 qualifications for the depth of water at which the welding is to be performed in production, and a confirmation test performed underwater, prior to commencement of the production work. In response to specific informal Question Number 15, in the relief request, the licensee states that "The Procedure Qualification Record for the tensile test was performed at a depth of 35 feet, which qualifies the welding procedure to a depth range of from 2 feet to 45 feet. The weld filler material weld pad was welded at a depth of 20 feet, which qualifies the filler material to a depth of from 0 feet to 30 feet. The replacement weld was performed at a depth of 29 feet. The combination of tests performed, meet the qualification requirements of Code Case N-516-2 for welding at a depth of 29 feet."

Therefore, the NRC staff has determined that the use of Code Case N-516-2, with the additional requirements for a bend test, a qualification test for the depth of water, and a confirmation test, adequately assure weld integrity and provide an acceptable level of quality and safety for the subject welding during the current forced outage.

#### 4.0 CONCLUSION

Based on its evaluation, the NRC staff concludes that the use of ASME Section XI Code Case N-516-2 with the additional requirements for a bend test, a qualification test for the depth of water and a confirmation test, adequately assures weld integrity and provides an acceptable level of quality and safety. Therefore, pursuant to 10 CFR 50.55a(a)(3)(i), the licensee's proposed alternative described in Relief Request RR-ENG-2-30, Revision 2, to use Code Case N-516-2 for underwater welding of core barrel locking tabs at STP, Unit 1, during the current forced outage is authorized.



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Date: June 27, 2003

South Texas, Unit 1

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