Tennessee Valley Authority, Post Office Box 2000, Spring City, Tennessee 37381-2000

December 5, 2005

WBN-TS-04-18

10 CFR 50.90

U. S. Nuclear Regulatory Commission
Mail Stop: OFWN P1-35
ATTN: Document Control Desk
Washington, D.C. 20555-0001

Gentlemen:

In the Matter of) Docket No. 50-390
Tennessee Valley authority)

WATTS BAR NUCLEAR PLANT (WBN) UNIT 1 - LICENSE AMENDMENT (WBN-TS-04-18) USE OF BAR LOCK MECHANICAL COUPLERS FOR SPLICING REINFORCING BARS IN THE SHIELD BUILDING RESTORATION - TEST RESULTS REVISION 1 (TAC NO. MC5368)

The purpose of this letter is to provide Revision 1 of the test results for the Bar-Lock Mechanical Couplers. This letter supersedes TVA's letter which submitted Revision 0 of the Engineering Test Results, 24900-ETR-001, on November 18, 2005. A typographical error in the unit measurements was identified in Sections 4.3.3.C, 4.4.3.C, 4.4.6.C and 4.7.3.C where "psi" was used in lieu of "ksi." Revision bars identify the areas that were changed.

NRC requested TVA to submit a summary of the Bar-Lock Mechanical Coupler test report in a letter dated March 7, 2005. The qualification testing was performed on the remaining couplers used at TVA's Sequoyah Nuclear Plant during Shield Building restoration from the steam generator replacement, as well as the newly manufactured couplers. Enclosed are the excerpts from Revision 1 of the Engineering Test Report. These test results show that the remaining Sequoyah Nuclear Plant couplers as well as the new Bar-Lock Mechanical Couplers are qualified for use to repair the opening in the dome of the WBN Shield Building.

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There are no regulatory commitments associated with this submittal. If you have any questions concerning this matter, please call me at (423) 365-1824.

I declare under penalty of perjury that the foregoing is true and correct. Executed on this 5th day of December, 2005.

Sincerely,

Rebecca N Mays

for P. L. Pace
Manager, Site Licensing
and Industry Affairs

Enclosure
cc (Enclosure):
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ENCLOSURE

WATTS BAR NUCLEAR PLANT (WBN) UNIT 1
EXCERPTS FROM THE
ENGINEERING TEST REPORT 24900-ETR-001, REVISION 1
FOR
BAR-LOCK MECHANICAL COUPLER QUALIFICATION

ENGINEERING TEST REPORT
FOR
BAR-LOCK QUALIFICATION

1.0 GENERAL

1.1 Watts Bar Nuclear Power Plant is a two-unit power plant located approximately 50 miles northeast of Chattanooga at the Watts Bar Site in Rhea County, Tennessee, which is operated by Tennessee Valley Authority (TVA, hereafter referred to as 'OWNER'). Bechtel (hereafter referred to as the CONTRACTOR) has the overall responsibility for execution of the Unit 1 Steam Generator Replacement (SGR) Project. The SGR project requires that openings be created in the concrete dome of the Shield Building to remove the generators. The Bar-lock couplers are to be used in the repair of these openings.

1.2 This test report documents the qualification of the Bar-lock couplers to be used in the repair of the opening in the Unit 1 Shield Building dome made during the steam generator replacement project.

1.3 The purpose of these tests is to provide the required documentation for the qualification of the Barlock couplers to the requirements of ASME Section III Division 2 Article CC 4330, "Splicing of Reinforcing Bars" for use in the repair of the construction opening in the concrete Shield Building Dome made during the steam generator replacement project outage.

2.0 CODES, STANDARDS AND REFERENCE DOCUMENTS

2.1 General

The edition of the codes and standards referred to in this report are those noted below.

2.2 American Society for Testing and Materials (ASTM)

A 370 – 97a	Standard Test Methods and Definitions for Mechanical Testing of Steel Products
A 615 – 96a	Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement

2.3 American Society of Mechanical Engineers

Boiler and Pressure Vessel Code, 1992, Section III, Division 2

2.4 American National Standards Institute (ANSI)

N45.2-1977	Quality Assurance Program Requirements for Nuclear Facilities
ANSI N45.2.2-72	Packaging, Shipping, Receiving, Storage, and Handling of Items for Nuclear Power Plants
ANSI N45.2.5-74	Supplementary Quality Assurance Requirements for Installation, Inspection, and Testing of Structural Concrete and Structural Steel During the Construction Phase of Nuclear Power Plants
N45.2.6-1978	Qualifications of Inspection, Examination, and Testing Personnel for Nuclear Power Plants

2.5 Reference Documents

24900-C-312, "Technical Specification for Installation of Bar-Lock Rebar Splices"

24900-BL, "Bar-Lock Installation Guidelines"

24900-C-602, "Testing of Bar-lock Splices"

Satec Test Machine Operation Manual

3.0 TESTING

3.1 The testing of the couplers (remaining Sequoyah couplers as well as the newly manufactured couplers) was per the requirements of Specification 24900-C-602, "Technical Specification for Qualification Testing of Bar-Lock Mechanical Rebar Splices." The testing occurred during the week of August 29th, 2005. The testing was performed using Bechtel's SATEC machine located at Palo Verde Nuclear Station in Arizona. The calibration data is attached to this report.

3.2 Rebar from the same lot was used in the tests.

3.3 Six 36" long sections of rebar were prepared for static tensile testing for each rebar size (spares were also prepared).

3.4 Eighteen coupler rebar assemblies were manufactured for each rebar size for testing (12 static tensile tests and 6 cyclic tensile tests). Spares were also prepared.

3.5 Static Tensile Test Acceptance Criteria

3.5.1 The average tensile strength of the splices shall not be less than 90% of the actual tensile strength of the unspliced rebar being tested, nor less than 100% of the specified minimum tensile strength of the rebar. For Grade 60 rebar, the minimum specified tensile strength is 90 ksi.

3.5.2 The tensile strength of an individual splice shall not be less than 125% of the specified minimum yield strength of the rebar. For Grade 60 rebar, the minimum specified yield strength is 60 ksi.

3.6 Cyclic Tensile Test Acceptance Criteria

3.6.1 The spliced rebar shall be able to withstand 100 cycles of stress variation from 5% to 90% of the specified minimum yield strength of the rebar. For Grade 60 rebar, 5% minimum specified yield strength is 3 ksi, and 90% minimum specified yield strength is 54 ksi.

4.0 RESULTS

4.1 Static Tensile Tests

4.2 Qualification of #6 Bar-Lock Couplers

4.2.1 The average tensile strength (stress) of the 6 rebar samples is as follows:

4.2.2 Average Ultimate Strength ($F_{u\ avg(bar)}$) of #6 Rebar: 111,901 psi

4.3 **Sequoyah Bar-Lock Couplers #6**

4.3.1 Average Ultimate Strength ($F_{u\ avg(\#6\ Barlock)}$) of #6 Bar-Lock Coupler (Sequoyah): 104,350 psi

4.3.2 Acceptance Criteria:

A. $F_{u\ avg(\#6\ Barlock)} > .9\ F_{u\ avg(bar)}$ and

B. $F_{u\ avg(\#6\ Barlock)} > F_{u(specified\ minimum)}$

C. $F_{u\ (each\ splice)} > 1.25\ Fy$

4.3.3 Test Result:

A. 104,350 psi > .9(111,901) = 100,712 psi Therefore, Pass

B. 104,350 psi > 90,000 psi Therefore, Pass

C. All individual couplers Fu > 1.25 (60 ksii) = 75 kksi (See Appendix C, "Test Checklist Summary") Therefore, Pass

4.4 **New Bar-Lock Couplers #6**

4.4.1 Average Ultimate Strength ($F_{u\ avg(\#6\ Barlock)}$) of #6 Bar-Lock Coupler (New): 107,730 psi

4.4.2 Acceptance Criteria:

A. $F_{u\ avg(\#6\ Barlock)} > .9\ F_{u\ avg(bar)}$ and

B. $F_{u\ avg(\#6\ Barlock)} > F_{u(specified\ minimum)}$

C. $F_{u\ (each\ splice)} > 1.25\ Fy$

4.4.3 Test Result:

A. 107,730 > .9(111,901) = 100,712 psi Therefore, Pass

B. 107,730 psi > 90,000 psi Therefore, Pass

C. All individual couplers Fu > 1.25 (60 kpsi) = 75 kpsi (See Appendix C, "Test Checklist Summary") Therefore, Pass

4.5 **Qualification of #8 Bar-Lock Couplers**

4.5.1 The average tensile strength (stress) of the 6 rebar samples is as follows:

4.5.2 Average Ultimate Strength ($F_{u\ avg(bar)}$) of #8 Rebar: 105,066 psi

4.6 **Sequoyah Bar-Lock Couplers #8**

4.6.1 Average Ultimate Strength ($F_{u\ avg(\#8\ Barlock)}$) of #8 Bar-Lock Coupler (Sequoyah): 102,306 psi

4.6.2 Acceptance Criteria:

A. $F_{u\ avg(\#8\ Barlock)} > .9\ F_{u\ avg(bar)}$ and

B. $F_{u\ avg(\#8\ Barlock)} > F_{u(specified\ minimum)}$

C. $F_{u\ (each\ splice)} > 1.25\ Fy$

4.6.3 Test Result

A. 102,306 psi > .9(105,066) = 94,560 psi Therefore, Pass

B. 102,306 psi > 90,000 psi Therefore, Pass

C. All individual couplers Fu > 1.25 (60 kpsi) = 75 kpsi (See Appendix C, "Test Checklist Summary") Therefore, Pass

4.7 **New Bar-Lock Couplers**

4.7.1 Average Ultimate Strength ($F_{u\ avg(\#8\ Barlock)}$) of #8 Bar-Lock Coupler (New): 99,951 psi

4.7.2 Acceptance Criteria:

A. $F_{u\ avg(\#8\ Barlock)} > .9\ F_{u\ avg(bar)}$ and

B. $F_{u\ avg(\#8\ Barlock)} > F_{u(specified\ minimum)}$

C. $F_{u\ (each\ splice)} > 1.25\ Fy$

4.7.3 Test Result:

A. 99,951 psi > .9(105,066) = 94,560 psi Therefore, Pass

B. 99,951 psi > 90,000 psi Therefore, Pass

C. All individual couplers Fu > 1.25 (60 kpsi) = 75 kpsi (See Appendix C, "Test Checklist Summary") Therefore, Pass

4.8 **Cyclic Tensile Tests**

4.8.1 All #6 and #8 rebar assembles completed the required number of cycles without failure.

5.0 CONCLUSION

5.1 The test results, as shown above and attached to this report, show that the Bar-lock couplers are qualified for use to repair the construction opening in the dome of the Shield Building at Watts Bar Nuclear Plant. This qualification applies to the new couplers manufactured in 2005 as well as the remaining Sequoyah couplers.