Tennessee Valley Authority, 1101 Market Street, Chattanooga, Tennessee 37402-2801

February 11, 2005

10 CFR 50.54(f)

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555-0001

Gentlemen:

In the Matter of	)	Docket No. 50-327
Tennessee Valley Authority	)	50-328
		50-390

SEQUOYAH NUCLEAR PLANT (SQN) UNITS 1 AND 2 AND WATTS BAR NUCLEAR PLANT (WBN) UNIT 1 - SUPPLEMENTAL RESPONSE TO NRC BULLETIN 2004-01, "INSPECTION OF ALLOY 82/182/600 MATERIALS USED IN THE FABRICATION OF PRESSURIZER PENETRATIONS AND STEAM SPACE PIPING CONNECTIONS AT PRESSURIZED-WATER REACTORS," DATED MAY 28, 2004

The purpose of this letter is to submit TVA's supplemental response to the subject bulletin for SQN and WBN, as discussed and committed to in TVA's 15-day response, dated June 14, 2004. Specifically, TVA's 15-day response stated that TVA committed to sending a response within 60 days addressing Items (1)(a) through (1)(d) for SQN and WBN. However, TVA's 15-day response to Item (1)(a) made it clear that the 60-day response would only include the available information (e.g., Alloy 600/82/182 locations, joint configuration and design, etc.,) retrieved from plant records. TVA committed to submitting a further response providing the balance of the Item (1)(a) information within two weeks following receipt and subsequent confirmation of the information from the original equipment manufacturer, Westinghouse Electric Company (Westinghouse).

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TVA's 60-day response was provided by letter dated July 27, 2004. TVA received the information requested from Westinghouse on January 18, 2005, and has completed its review and confirmation of the manufacturer's information. Enclosures 1 and 2 provide the aforementioned supplemental information for SQN and WBN, respectively. In order to facilitate your review, the Westinghouse information has been incorporated into the two enclosures submitted in TVA's July 27, 2004, 60-day response. The supplemental information is annotated by bold print and/or revision bars.

There are no new regulatory commitments contained in this submittal. If you have any questions concerning this matter, please contact Terry Knuettel at (423) 751-6673.

Sincerely,

Fredrick C. Mashburn
Program Manager,
Nuclear Licensing

I declare under penalty of perjury that the foregoing is true and correct. Executed on this 11th day of February, 2005.

Enclosures
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ENCLOSURE 1

TENNESSEE VALLEY AUTHORITY
SEQUOYAH NUCLEAR PLANT (SQN)
UNITS 1 AND 2

SUPPLEMENTAL RESPONSE TO NRC BULLETIN 2004-01, "INSPECTION OF ALLOY 82/182/600 MATERIALS USED IN THE FABRICATION OF PRESSURIZER PENETRATIONS AND STEAM SPACE PIPING CONNECTIONS AT PRESSURIZED-WATER REACTORS," DATED MAY 28, 2004

NRC Requested Information:

1. *All subject PWR licensees are requested to provide the following information within 60 days of the date of this bulletin.*

   NRC Question 1.(a)

   A description of the pressurizer penetrations and steam space piping connections at your plant. At a minimum, this description should include materials of construction (e.g., stainless steel piping and/or weld metal, Alloy 600 piping/sleeves, Alloy 82/182 weld metal or buttering, etc.), joint design (e.g., partial penetration welds, full penetration welds, bolted connections, etc.), and, in the case of welded joints, whether or not the weld was stress-relieved prior to being put into service. Additional information relevant with respect to determining the susceptibility of your plant's pressurizer penetrations and steam space piping connections to PWSCC should also be included.

   TVA RESPONSE:

   The SQN pressurizers were manufactured by Westinghouse Electric Company [Westinghouse] and are identified as Westinghouse Series 84 pressurizers. The size of the Westinghouse pressurizer varies with the plant thermal rating. The SQN pressurizers have an inside diameter of 84 inches (i.e., Series 84 pressurizers) with a nominal volume of 1800 cubic feet. The pressurizer is a cylindrical vessel which is installed with its longitudinal axis in a vertical position.

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The pressurizer vessel consists of the following:

1. An upper head which is hemispherical in shape and fabricated from manganese-molybdenum steel plate clad with austenitic stainless steel. The head contains ports for a 6-inch relief nozzle, three 6 inch safety nozzles, a 4-inch spray nozzle, and a 16-inch inside diameter (ID) manway. The safety, spray, and relief nozzles are welded-in forgings fabricated of SA508, Class 2A material. The nozzles are equipped with a stainless steel safe-end to provide a welding interface with the attached piping. The safe-end is a SA-182 Type 316L stainless steel forging. The nozzles are buttered with Inconel 182 weld metal and then post-weld heat treated. The safe-end is welded to the buttering with Inconel 82/182 weld metal.

2. A shell assembly which is a cylindrical barrel fabricated from manganese-molybdenum steel plate clad with austenitic stainless steel. The shell contains ports for eight ¾-inch instrumentation nozzles and a sample nozzle coupling. Instrument nozzles are provided on the pressurizer for water level, temperature, and sample measurements. The nozzles are fabricated from the same material and are the same size, making the intended application interchangeable. The nozzles are fabricated assemblies made from a stainless steel tube and a stainless steel-forged coupling for interfacing with the connecting piping. The tube is SA 213 Type 316 and the coupling is fabricated from a SA 182 Type F316 stainless steel forging.

3. A lower head which is hemispherical in shape and fabricated from manganese-molybdenum steel plate clad with austenitic stainless steel. A 14-inch surge nozzle (specifically excluded from this Bulletin) is located in the lower head along with 78 penetrations

for the immersion heaters. Heater wells are stainless steel-forged penetrations (SA-182 Grade F316) through which the immersion heaters are installed. Heater wells are inserted through holes in the lower head, expanded with mechanical rollers, and welded to the cladding on the inside of the lower head with a partial penetration weld.

Table 1 and Figures 1 - 6 provided in the Attachment to this Enclosure contain details of the pressurizer along with a summary of the penetrations and the additional information requested above.

A review of the general fabrication methods employed by Westinghouse for pressurizers has been performed to ensure the locations which utilized Alloy 600/82/182 material have been identified. These locations are shown in the Attachment and discussed below.

The steady state values for the pressurizer at 100 percent Reactor Thermal Power [RTP] are:

- Pressurizer Level - 60 percent
- Pressure - 2235 pounds per square inch guage [psig]
- Temperature - 653 degrees Fahrenheit (T_{sat} at 2235 psig)

The piping attached to the pressurizer is austenitic stainless steel.

NRC Question 1.(b)

A description of the inspection program for Alloy 82/182/600 pressurizer penetrations and steam space piping connections that has been implemented at your plant. The description should include when the inspections were performed; the areas, penetrations and steam space piping connections inspected; the extent (percentage) of coverage achieved for each location which was inspected; the inspection methods

the quality of the documentation of the inspections (e.g., written report, video record, photographs); and, the basis for concluding that your plant satisfies applicable regulatory requirements related to the integrity of pressurizer penetrations and steam space piping connections. If leaking pressurizer penetrations or steam space piping connections were found, indicate what follow-up NDE was performed to characterize flaws in the leaking penetrations.

TVA RESPONSE:

TVA performed visual examinations of the Unit 1 and Unit 2 pressurizer penetrations during the Unit 1 Cycle 11 Refueling Outage [RFO] and the Unit 2 Cycle 11 RFO due to industry operating experience. The alloy 82/182/600 penetrations examined were the spray nozzle safe-end (SE), safety valve nozzle SEs (three each), and relief valve nozzle SE, which are located on the top of the pressurizer. Mirror insulation was removed to afford access to the vessel wall around each nozzle.

The examination was performed by qualified metallurgical engineers under the TVA Borated Water Corrosion Preventative Maintenance (PM) program. A visual examination was performed at each specified location and 100 percent of the weld circumference was examined for evidence of boron leakage. No evidence of leakage was observed. The inspection results were documented either in the work order or PM package. Digital photographs were taken to document the inspection results.

The following table list the latest ASME Section XI volumetric (UT) and surface examinations (PT) performed on the pressurizer dissimilar metal welds. TVA's procedure, "Evaluation and Resolution of Ultrasonic Data," is used to resolve any ultrasonic examination indications. Surface examination indications are resolved using procedure,

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"Liquid Penetrant Examination of ASME and ANSI Code Components and Welds." These ASME Section XI examinations are documented on written reports and stored on micro-film or in an electronic data base.

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ASME Section XI Examinations

UNIT	WELD NUMBER	EXAM CATEGORY AND ITEM NUMBER	EXAM METHOD/ REPORT#	CYCLE (EXAM DATE)	EXAM COVERAGE ACHIEVED	REJECTABLE INDICATIONS
1	RCW-24-SE spray nozzle to safe-end	B-F, B5.40 B-F, B5.40	UT (R6930) PT (R6914)	U1C8 (4/97) U1C8 (3/97)	UT 100% PT 100%	NO NO
1	RCW-25-SE safety nozzle to safe-end	B-F, B5.20 B-F, B5.20	UT (R2334) PT (R5340)	U1C3 (9/85) U1C5 (10/91)	UT 80% PT 100%	NO NO
1	RCW-26-SE relief nozzle to safe-end	B-F, B5.20 B-F, B5.20	UT (R2333) PT (R5340)	U1C3 (9/85) U1C5 (10/91)	UT 80% PT 100%	NO NO
1	RCW-27-SE safety nozzle to safe-end	B-F, B5.20 B-F, B5.20	UT (R5064) PT (R5173)	U1C5 (10/91) U1C5 (10/91)	UT 75% PT 100%	NO NO
1	RCW-28-SE safety nozzle to safe-end	B-F, B5.20 B-F, B5.40	UT (R5065) PT (R7968)	U1C5 (10/91) U1C12 (3/03)	UT 75% PT 100%	NO NO - This was the third successive examination following cycle 5.
2	RCW-24-SE spray nozzle to safe-end	B-F, B5.40 B-F, B5.40	UT (R5658) PT (R5624)	U2C7 (5/96) U2C7 (5/96)	UT 100% PT 100%	NO NO
2	RCW-25-SE safety nozzle to safe-end	B-F, B5.20 B-F, B5.20	UT (R3444, R3511) PT (R3391)	U2C3 (2/89) U2C3 (2/89)	UT 70% PT 100%	NO NO

2	RCW-26-SE safety nozzle to safe-end	B-F, B5.20 B-F, B5.20	UT (R3445, R3512) PT (R3391)	U2C3 (2/89) U2C3 (2/89)	UT 70% PT 100%	NO NO
2	RCW-27-SE relief nozzle to safe-end	B-F, B5.20 B-F, B5.20	UT (R4471) PT (R4538)	U2C5 (4/92) U2C5 (3/92)	UT 80% PT 100%	NO NO
2	RCW-28-SE safety nozzle to safe-end	B-F, B5.20 B-F, B5.20	UT (R4472) PT (R4544)	U2C5 (4/92) U2C5 (3/92)	UT 80% PT 100%	NO NO

Based on these acceptable examinations and the future examinations scheduled for these areas, the integrity of the pressurizer will be maintained. As documented in the table above, no pressurizer dissimilar metal welds have been identified as leaking. Future ASME Section XI examination coverage will be based on Performance Demonstration Initiative (PDI) Appendix VIII qualifications.

NRC Question 1.(c)

A description of the Alloy 82/182/600 pressurizer penetration and steam space piping connection inspection program that will be implemented at your plant during the next and subsequent refueling outages. The description should include the areas, penetrations and steam space piping connections to be inspected; the extent (percentage) of coverage to be achieved for each location; inspection methods to be used; qualification standards for the inspection methods and personnel; the process used to resolve any inspection indications; the inspection documentation to be generated; and the basis for concluding that your plant will satisfy applicable regulatory requirements related to the structural and leakage integrity of pressurizer penetrations and steam space piping connections. If leaking pressurizer penetrations or steam

space piping connections are found, indicate what follow-up NDE will be performed to characterize flaws in the leaking penetrations. Provide your plans for expansion of the scope of NDE to be performed if circumferential flaws are found in any portion of the leaking pressurizer penetrations or steam space piping connections.

TVA RESPONSE:

In accordance with NRC Staff recommendations contained in the subject bulletin, TVA will perform a bare metal visual (BMV) inspection of the upper pressurizer Alloy 600 locations (safety, spray, and relief safe-ends) at SQN during the upcoming Unit 1 Cycle 13 RFO in the fall 2004 and the Unit 2 Cycle 13 RFO in the spring 2005. This examination will be performed utilizing "in-house" procedure titled, "Visual Inspection of Alloy 600/82/182 Pressure Boundary Components." In accordance with plant procedures personnel performing the inspection will be certified Non-Destructive Examination (NDE) inspectors qualified in the ASME Section XI, VT-2 method. The extent of the examination will be 100 percent of each weld circumference and will be documented on written reports which may include photographs or video.

These BMVs are in response to recommendations contained in the Electric Power Research Institute [EPRI] Materials Reliability Project [MRP] 2003-039, "Recommendation for Inspection of Alloy 600/82/182 Pressure Boundary Components," issued January 20, 2004. Under the purview of the Nuclear Energy Institute [NEI] 03-08, "Guideline for the Management of Materials Issues," the BMVs were categorized as "Needed" for butt welded primary pressure boundary locations containing Alloy 600/82/182 in EPRI MRP 2004-05, "Needed Action for Visual Inspection of Alloy 82/182 Butt Welds and Good Practice Recommendations for Weld Joint Configurations," issued April 2, 2004. In addition, this inspection includes obtaining "as-built" information on each

weld joint configuration and determining the available access to prepare for future volumetric examinations per ASME Section XI, Appendix VIII (PDI) and the potential stress improvement applications (e.g., Mechanical Stress Improvement Process [MSIP], weld overlay).

TVA has revised its Corrosion Control Program to require performance of BMV examinations of the Alloy 600/82/182 locations on the upper pressurizer penetrations each refueling outage until further guidance is provided by the MRP.

TVA plans to utilize the "in-house" corrective action program and corrosion control program to evaluate the findings identified during the pressurizer penetration examinations. The process includes evaluations to determine if the findings are relevant indications. The source of any leakage will be identified and reported. A volumetric examination will be performed to determine the extent of any through-wall cracking. If circumferential cracking is confirmed, the volumetric NDE would be expanded to the other upper pressurizer penetration locations based on the evaluation of the findings.

The MRP is actively working on an Inspection and Evaluation (I&E) guidelines document for Alloy 600 butt welds which it is expected to include requirements for future volumetric inspections. TVA's current plan includes volumetric inspection of the upper pressurizer Alloy 600 welds as part of the ASME Section XI augmented inspection program. The schedule for performing these volumetric inspections is pending ASME Section XI, PDI qualification and issuance of the MRP I&E document.

NRC Question 1.(d)

In light of the information discussed in this bulletin and your understanding of the relevance of recent industry operating experience to your facility, explain why the

inspection program identified in your response to item (1)(c) above is adequate for the purpose of maintaining the integrity of your facility's RCPB and for meeting all applicable regulatory requirements which pertain to your facility.

TVA RESPONSE:

TVA conducts each inspection with a questioning attitude in accordance with industry guidance and evaluates and determines the source of any boric acid deposit identified on the upper pressurizer penetrations and steam space piping. These requirements are incorporated in the visual inspection guidance contained TVA's Corrosion Control Program and Inspection procedures. Implementation of these requirements precludes a through-wall crack remaining undetected for years.

Based on the thoroughness and past performance of TVA's inspection program described above, there is reasonable assurance that the program implemented at SQN satisfies the applicable regulatory requirements related to the structural and leakage integrity of the pressurizer penetrations and steam space piping.

NRC Requested Information:

For lines attached directly to the pressurizer, with the exception of the surge line, the information requested in (1) and (2) above should be provided for any locations, including those remote from the pressurizer shell, which contain Alloy 82/182/600 materials which are exposed to conditions similar to those of the pressurizer environment.

TVA RESPONSE:

The piping attached to the pressurizer is austenitic stainless steel and does not contain the subject alloy material.

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Table 1: Sequoyah Unit 1 and 2 Pressurizer Penetrations

Penetration	Materials	Joint Design	Stress Relieved?
4" Spray Nozzle (qty. 1)	Nozzle: Low Alloy Steel Forging SA-508 Class 2a, Inconel 182 Buttering, SS 309/308 Cladding, (U-1Inconel 82 Buttering Repair)	N/A	Yes (Cladding and Buttering)
	Weld Nozzle to Safe-end: Inconel 82/182	Full penetration butt weld	No
	Safe-end: ASME SA-182, Grade 316L SS Forging	N/A	N/A
	Thermal Sleeve: ASME SA-213 Grade TP-304 SS Seamless Tubing	N/A	N/A
	Thermal Sleeve to Safe-End Weld: Inconel 82	45°, 0.12 bevel groove partial penetration butt weld 45° around	No
	Liner: ASME SA-213 Grade TP-304 SS Seamless Tubing	N/A	N/A
	Liner to safe end Weld: Inconel 82	30°, 0.12 bevel groove partial penetration butt weld all around	No
	Liner to cladding Weld: SS 309/308	0.13 x 0.31 fillet weld (blend radius) all around	No

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Table 1: Sequoyah Unit 1 and 2 Pressurizer Penetrations

Penetration	Materials	Joint Design	Stress Relieved?
14" Surge Nozzle (qty. 1)	Nozzle: Low Alloy Steel Forging SA-508 Class 2a, Inconel 182 Buttering, SS 309/308 Cladding	N/A	Yes (Cladding and Buttering)
	Weld Nozzle to Safe-end: Inconel 82/182	Full penetration butt weld all around	No
	Safe-end: SA-182, Grade 316L, SS Forging	N/A	N/A
	Thermal Sleeve: SA-240, Type 304, SS plate	N/A	N/A
	Thermal Sleeve to Safe-End weld: Inconel 82	0.19 45° V-groove partial penetration butt weld 45° around	No
6" Safety Nozzle (qty. 3) 6" Relief Nozzle (qty. 1)	Nozzle: Low Alloy Steel Forging SA-508 Class 2a, SS 308/309 cladding, Inconel 182 buttering, (U-1, Inconel 82 buttering repair)	N/A	Yes (cladding & buttering)
	Weld Nozzle to Safe-end: Inconel 82/182	Full penetration butt weld all around	No
	Safe-end: SS ASME SA-182, Grade 316L Forging	N/A	N/A
	Liner: ASME SA-213 Grade TP-304 SS Seamless Tubing	N/A	N/A
	Liner to safe end Weld: Inconel 82	30°, 0.12 bevel groove partial penetration butt weld all around	No

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Table 1: Sequoyah Unit 1 and 2 Pressurizer Penetrations

Penetration	Materials	Joint Design	Stress Relieved?
	Liner to cladding Weld: SS 309/308	0.13 x 0.31 fillet weld (blend radius) all around	No
Heater Penetrations (qty. 78)	Heater: SS: SA-213, Grade TP 316 tubing	N/A	N/A
	Adaptor: SS ASME SA-182, Grade F316 Forging	N/A	N/A
	Adaptor to Heater Element Weld: SS 309/308	0.19 fillet weld all around	No
	Heater Well to Adaptor Weld: SS 309/308	U1-60°, U2 30° - 0.06 V groove butt weld all around	No
	Heater Well to Lower Head Cladding Weld: SS 309/308	0.19 R partial penetration J-groove butt weld and 0.19 fillet weld all around	No
Level & Temperature Instrumentation Taps (qty. 9)	Tubing: SS ASME SA-213, Grade TP 316 Tubing	N/A	N/A
	Coupling: SS ASME SA-182, Grade F316 Forging	N/A	N/A
	Tubing to Shell. Cladding Weld: SS 309/308	0.19 R partial penetration J-groove butt weld and 0.12 fillet weld all around	No

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Table 1: Sequoyah Unit 1 and 2 Pressurizer Penetrations

Penetration	Materials	Joint Design	Stress Relieved?
	Pipe to Coupling Weld: SS 309/308	0.25 Partial penetration J-groove butt weld and 0.25 fillet weld all around	No
Manway (qty. 1)	Forging: Low Alloy Steel Forging SA-508 Class 2a	N/A	N/A
	Insert: SS, ASME SA-240, Type 304, Plate	N/A	N/A
	Cover: MN-MO St. Plate - SA-533 Gr. A Cl. 1	N/A	N/A

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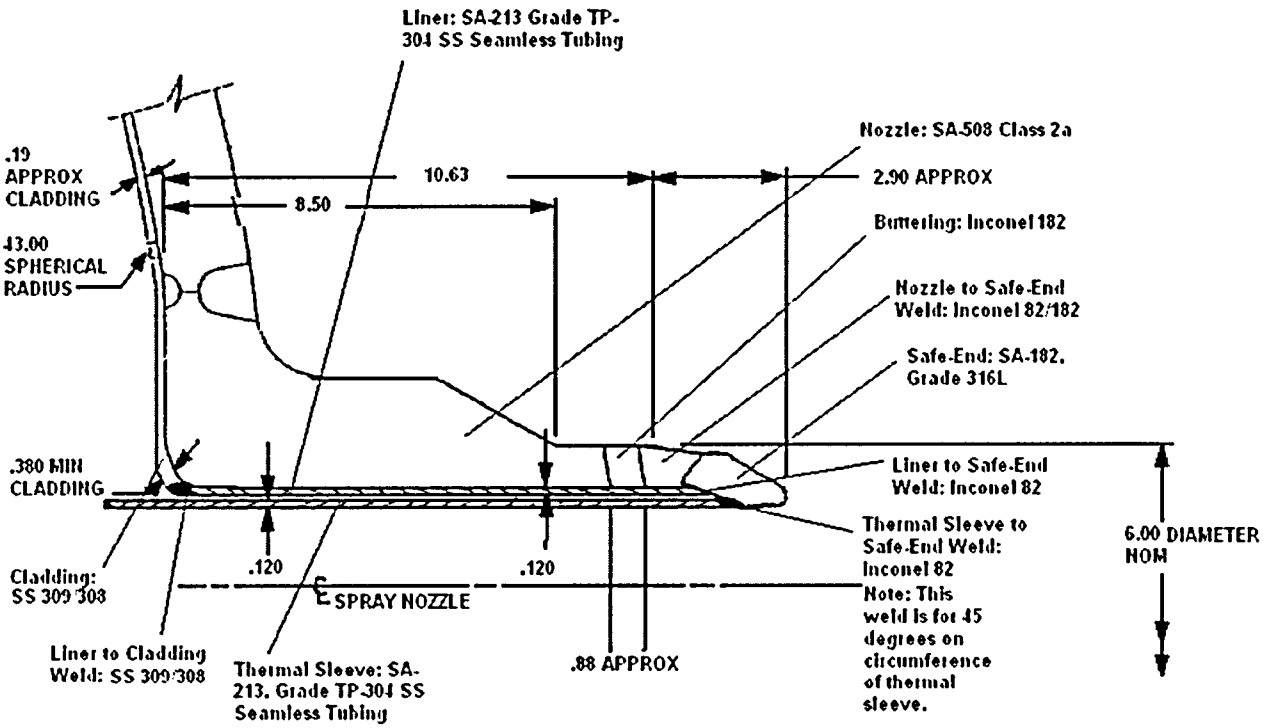

Figure 1
Sequoyah Unit 1 and 2 Pressurizer Spray Nozzle Sketch

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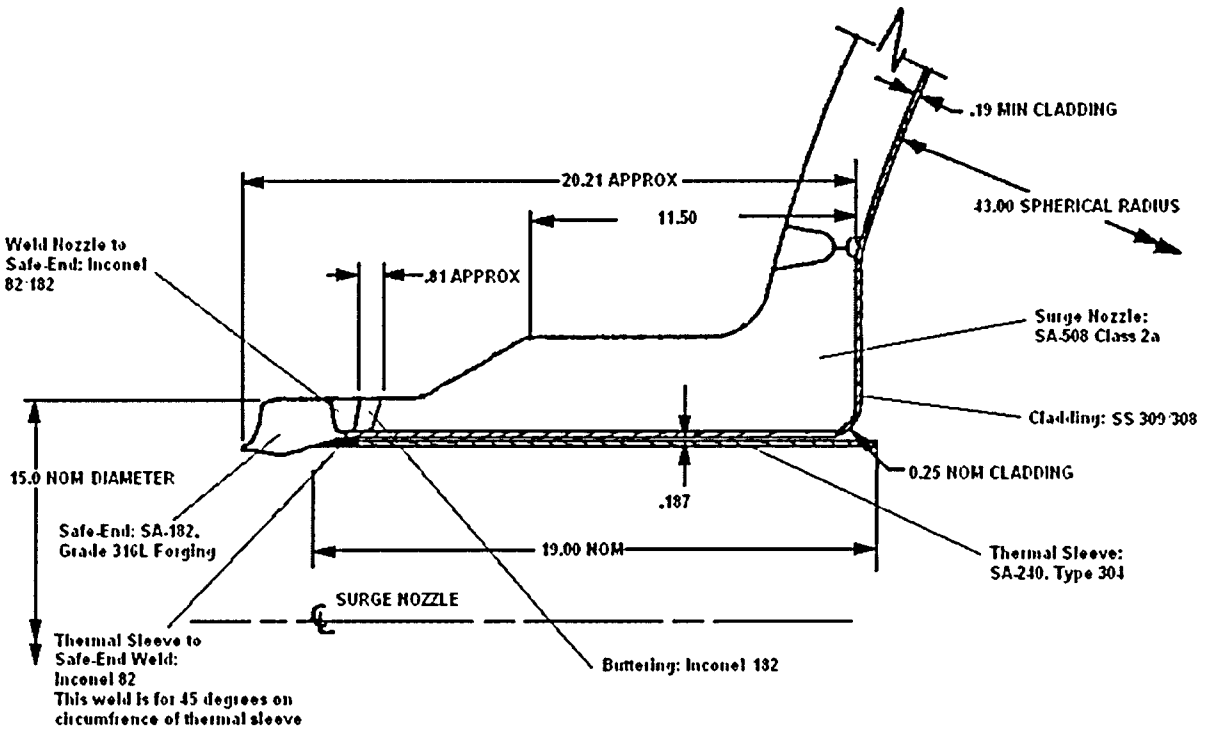

Figure 2
Sequoyah Unit 1 and 2 Pressurizer Surge Nozzle Sketch

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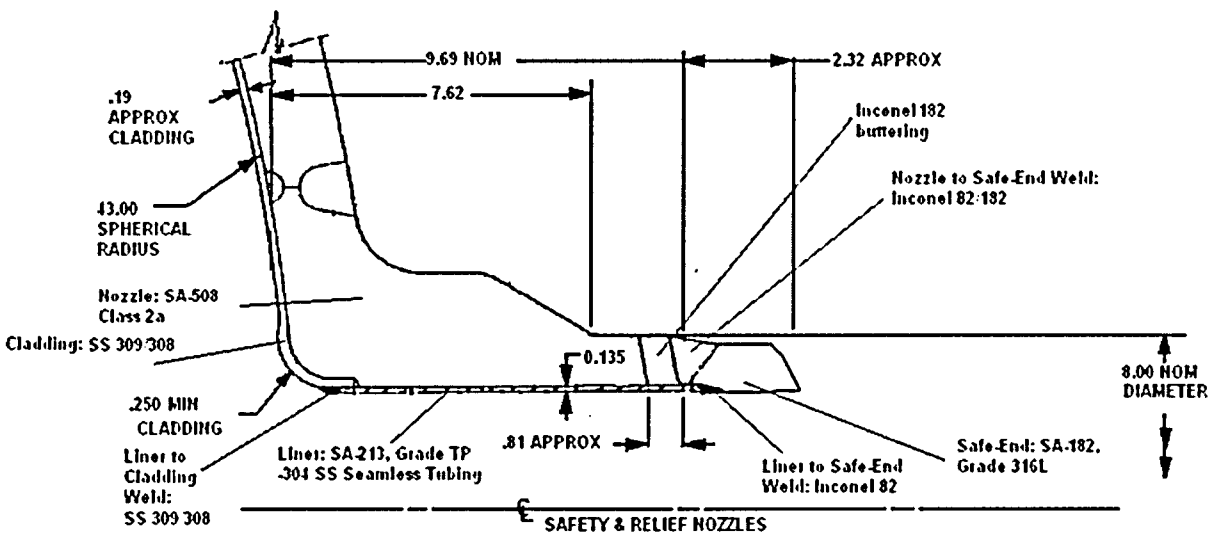

Figure 3
Sequoyah Unit 1 and 2 Pressurizer Safety & Relief Nozzle Sketch

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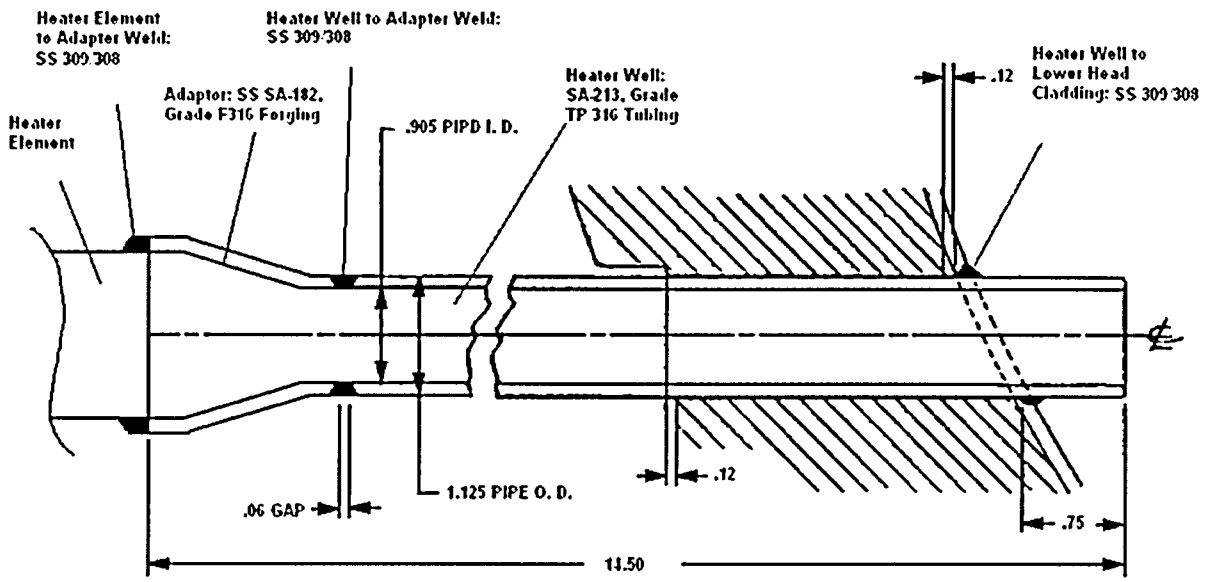

Figure 4
Sequoyah Unit 1 and 2 Pressurizer Heater Penetration Sketch

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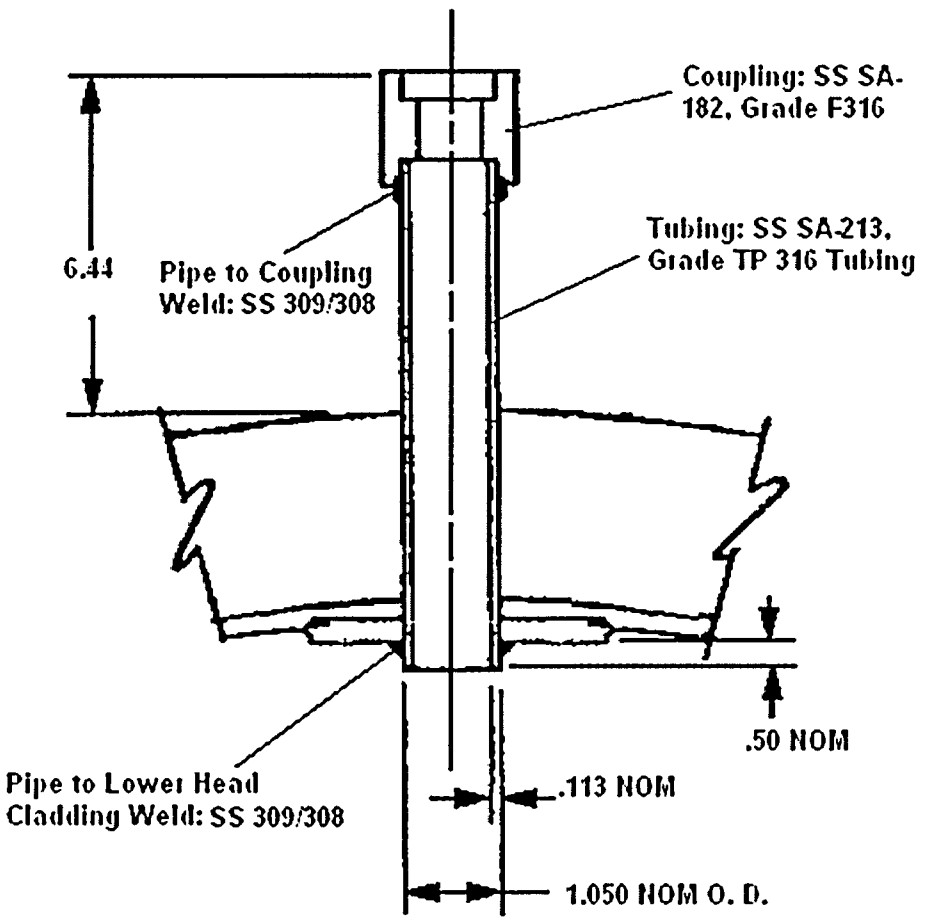

Figure 5
Sequoyah Unit 1 and 2 Pressurizer Level & Temperature Instrumentation Tap Sketch

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SEQUOYAH NUCLEAR PLANT (SQN)
UNITS 1 AND 2

SUPPLEMENTAL RESPONSE TO NRC BULLETIN 2004-01, "INSPECTION OF ALLOY 82/182/600 MATERIALS USED IN THE FABRICATION OF PRESSURIZER PENETRATIONS AND STEAM SPACE PIPING CONNECTIONS AT PRESSURIZED-WATER REACTORS," DATED MAY 28, 2004

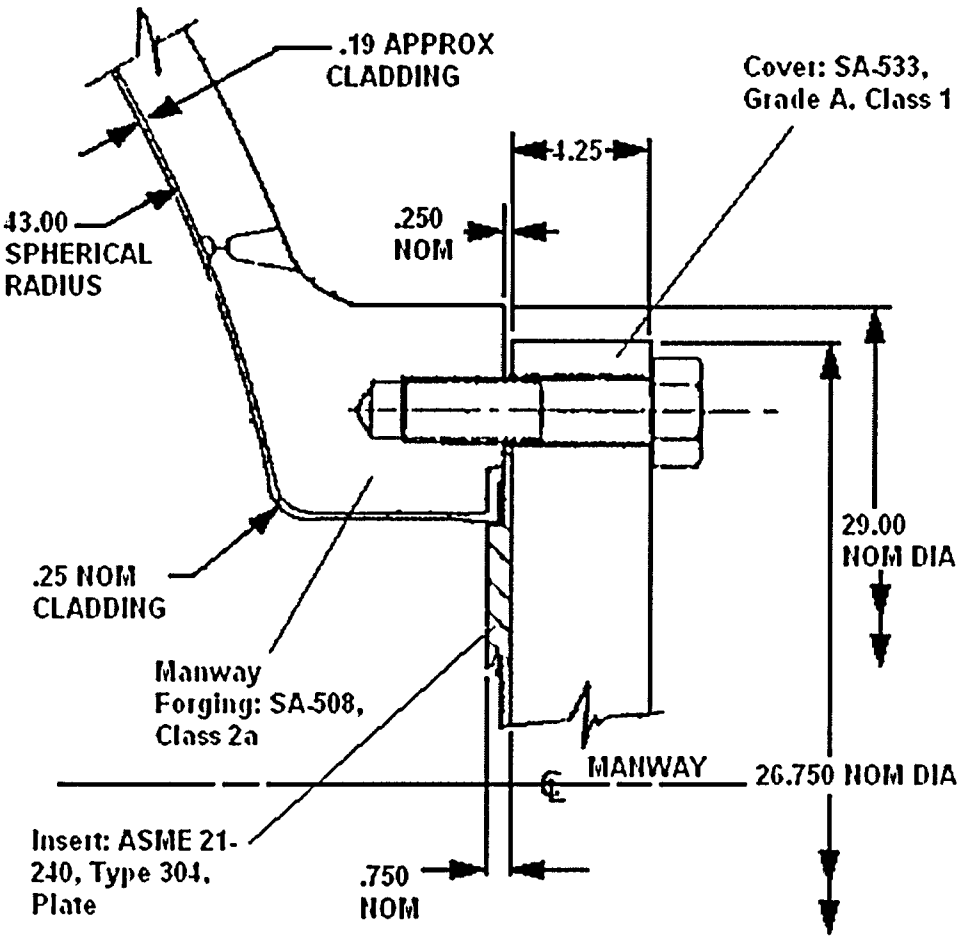

Figure 6
Sequoyah Unit 1 and 2 Pressurizer Manway Sketch

ENCLOSURE 2

TENNESSEE VALLEY AUTHORITY (TVA)
WATTS BAR NUCLEAR PLANT (WBN) UNIT 1

SUPPLEMENTAL RESPONSE TO NRC BULLETIN 2004-01, "INSPECTION OF ALLOY 82/182/600 MATERIALS USED IN THE FABRICATION OF PRESSURIZER PENETRATIONS AND STEAM SPACE PIPING CONNECTIONS AT PRESSURIZED-WATER REACTORS," DATED MAY 28, 2004

NRC Requested Information:

1. *All subject PWR licensees are requested to provide the following information within 60 days of the date of this bulletin.*

   NRC Question 1.(a)

   A description of the pressurizer penetrations and steam space piping connections at your plant. At a minimum, this description should include materials of construction (e.g., stainless steel piping and/or weld metal, Alloy 600 piping/sleeves, Alloy 82/182 weld metal or buttering, etc.), joint design (e.g., partial penetration welds, full penetration welds, bolted connections, etc.), and, in the case of welded joints, whether or not the weld was stress-relieved prior to being put into service. Additional information relevant with respect to determining the susceptibility of your plant's pressurizer penetrations and steam space piping connections to PWSCC should also be included.

   TVA RESPONSE:

   WBN's pressurizer was manufactured by Westinghouse Electric Company [Westinghouse] and is identified as a Westinghouse Series 84 pressurizer. The size of the Westinghouse pressurizer varies with the plant thermal rating. The WBN pressurizer has an inside diameter of 84 inches (i.e., Series 84 pressurizers) with a nominal volume of 1800 cubic feet. The pressurizer is a cylindrical vessel which is installed with its longitudinal axis in a vertical position.

   The pressurizer vessel consists of the following:

   1. An upper head which is hemispherical in shape and fabricated from manganese-molybdenum steel plate clad with austenitic stainless steel. The head contains ports for a 6-inch relief nozzle, three 6-

inch safety nozzles, a 4-inch spray nozzle, and a 16-inch inside diameter manway. The safety, spray, and relief nozzles are welded-in forgings fabricated of SA508, Class 2A material. The nozzles are equipped with a stainless steel safe-end to provide a welding interface with the attached piping. The safe-end is a SA-182 Type 316L stainless steel forging. The nozzles are buttered with Inconel 182 weld metal and then post-weld heat treated. The safe-end is welded to the buttering with Inconel 82/182 weld metal.

2. A shell assembly which is a cylindrical barrel fabricated from manganese-molybdenum steel plate clad with austenitic stainless steel. The shell contains ports for eight ¾-inch instrumentation nozzles and a sample nozzle coupling. Instrument nozzles are provided on the pressurizer for water level, temperature, and sample measurements. The nozzles are fabricated from the same material and are the same size, making the intended application interchangeable. The nozzles are fabricated assemblies made from a stainless steel tube and a stainless steel-forged coupling for interfacing with the connecting piping. The tube is SA 213 Type 316 and the coupling is fabricated from a SA 182 Type F316 stainless steel forging.

3. A lower head which is hemispherical in shape and fabricated from manganese-molybdenum steel plate clad with austenitic stainless steel. A 14-inch surge nozzle (specifically excluded from this Bulletin) is located in the lower head along with 78 penetrations for the immersion heaters. Heater wells are stainless steel-forged penetrations (SA-182 Grade F316) through which the immersion heaters are installed. Heater wells are inserted through holes in the lower head, expanded with mechanical rollers, and welded to the cladding on the inside of the lower head with a partial penetration weld.

Table 1 and Figures 1 - 6 provided in the Attachment to this Enclosure contain details of the pressurizer along with a summary of the penetrations and the additional information requested above.

A review of the general fabrication methods employed by Westinghouse for pressurizers has been performed to ensure the locations which utilized Alloy 600/82/182 material have been identified. These locations are shown in the Attachment and discussed below.

The steady state values for the pressurizer at 100 percent Reactor Thermal Power are:

- Pressurizer Level - 60 percent
- Pressure - 2235 pounds per square inch gauge [psig]
- Temperature - 653 degrees Fahrenheit (T_{sat} at 2235 psig)

The piping attached to the pressurizer is austenitic stainless steel.

NRC Question 1.(b)

A description of the inspection program for Alloy 82/182/600 pressurizer penetrations and steam space piping connections that has been implemented at your plant. The description should include when the inspections were performed; the areas, penetrations and steam space piping connections inspected; the extent (percentage) of coverage achieved for each location which was inspected; the inspection methods used; the process used to resolve any inspection findings; the quality of the documentation of the inspections (e.g., written report, video record, photographs); and, the basis for concluding that your plant satisfies applicable

regulatory requirements related to the integrity of pressurizer penetrations and steam space piping connections. If leaking pressurizer penetrations or steam space piping connections were found, indicate what follow-up NDE was performed to characterize flaws in the leaking penetrations.

TVA RESPONSE:

TVA performed visual examinations of the Unit 1 pressurizer penetrations during the Cycle 5 Refueling Outage (RFO). The Alloy 600/82/182 penetrations examined were the spray nozzle safe-end (SE), safety valve nozzle SEs (three each), and relief valve nozzle SE which are located on the top of the pressurizer. Mirror insulation was removed to afford access to the vessel wall around each nozzle.

The examination was performed by certified Level II Non-Destructive Examination (NDE) inspectors. A visual examination was performed at each specified location and 100 percent of the weld circumference was examined for evidence of boron leakage. In addition, visual examinations (VT-1) of the welds were performed. No evidence of leakage or cracking was observed. The inspection results are documented in NDE Examination reports. In addition, this inspection included obtaining "as-built" information on each weld joint configuration and determining the available access to prepare for future volumetric examinations per ASME Section XI, Appendix VIII, Performance Demonstration Initiative (PDI), and the potential stress improvement applications (e.g., Mechanical Stress Improvement Process [MSIP], weld overlay).

Based on these acceptable examinations and the future examinations scheduled for these areas, the integrity of the pressurizer will be maintained. No leaking pressurizer dissimilar metal welds have been identified. Future ASME Section XI examination coverage will be based on PDI Appendix VIII qualifications.

ENCLOSURE 2

TENNESSEE VALLEY AUTHORITY (TVA)
WATTS BAR NUCLEAR PLANT (WBN) UNIT 1

SUPPLEMENTAL RESPONSE TO NRC BULLETIN 2004-01, "INSPECTION OF ALLOY 82/182/600 MATERIALS USED IN THE FABRICATION OF PRESSURIZER PENETRATIONS AND STEAM SPACE PIPING CONNECTIONS AT PRESSURIZED-WATER REACTORS," DATED MAY 28, 2004

NRC Question 1.(c)

A description of the Alloy 82/182/600 pressurizer penetration and steam space piping connection inspection program that will be implemented at your plant during the next and subsequent refueling outages. The description should include the areas, penetrations and steam space piping connections to be inspected; the extent (percentage) of coverage to be achieved for each location; inspection methods to be used; qualification standards for the inspection methods and personnel; the process used to resolve any inspection indications; the inspection documentation to be generated; and the basis for concluding that your plant will satisfy applicable regulatory requirements related to the structural and leakage integrity of pressurizer penetrations and steam space piping connections. If leaking pressurizer penetrations or steam space piping connections are found, indicate what follow-up NDE will be performed to characterize flaws in the leaking penetrations. Provide your plans for expansion of the scope of NDE to be performed if circumferential flaws are found in any portion of the leaking pressurizer penetrations or steam space piping connections.

TVA RESPONSE:

In accordance with NRC Staff recommendations contained in the subject bulletin, TVA will perform a bare metal visual (BMV) inspection of the upper pressurizer Alloy 600 locations (safety, spray, and relief safe-ends) during the upcoming Unit 1 Cycle 6 RFO in the spring 2005. This examination will be performed utilizing "in-house" procedure titled, "Visual Inspection of Alloy 600/82/182 Pressure Boundary Components." In accordance with plant procedures personnel performing the inspection will be certified NDE inspectors qualified in the ASME Section XI, VT-2 method. The extent of the examination

will be 100 percent of each weld circumference and will be documented on written reports which may include photographs or video.

These BMVs are in response to recommendations contained in Electric Power Research Institute (EPRI) Materials Reliability Project (MRP) 2003-039, "Recommendation for Inspection of Alloy 600/82/182 Pressure Boundary Components," issued January 20, 2004. Under the purview of the Nuclear Energy Institute (NEI) 03-08, "Guideline for the Management of Materials Issues," the BMVs were categorized as "Needed" for butt welded primary pressure boundary locations containing Alloy 600/82/182 in EPRI MRP 2004-05, "Needed Action for Visual Inspection of Alloy 82/182 Butt Welds and Good Practice Recommendations for Weld Joint Configurations," issued April 2, 2004. This inspection includes obtaining any additional "as-built" information on each weld joint configuration and determining the available access to prepare for future volumetric examinations per ASME Section XI, Appendix VIII (PDI), and the potential stress improvement applications (e.g., MSIP, weld overlay).

TVA has revised its Corrosion Control Program to require performance of BMV examinations of Alloy 600/82/182 locations on the upper pressurizer penetrations each RFO until further guidance is provided by the MRP.

TVA plans to utilize the "in-house" corrective action program and corrosion control program to evaluate the findings identified during the pressurizer penetration examinations. The process includes evaluations to determine if the findings are relevant indications. The source of any leakage will be identified and reported. A volumetric examination will be performed to determine the extent of any through-wall cracking. If circumferential cracking is confirmed, the volumetric NDE would be expanded to the other upper pressurizer penetration locations based on the evaluation of the findings.

The MRP is actively working on an Inspection and Evaluation (I&E) guidelines document for Alloy 600 butt

welds which it is expected to include requirements for future volumetric inspections. TVA's current plan includes volumetric inspection of the upper pressurizer Alloy 600 welds as part of the ASME Section XI augmented program. The schedule for performing these volumetric inspections is pending ASME Section XI, PDI qualification, and issuance of the MRP I&E document.

NRC Question 1.(d)

In light of the information discussed in this bulletin and your understanding of the relevance of recent industry operating experience to your facility, explain why the inspection program identified in your response to item (1)(c) above is adequate for the purpose of maintaining the integrity of your facility's RCPB and for meeting all applicable regulatory requirements which pertain to your facility.

TVA RESPONSE:

TVA conducts each inspection with a questioning attitude in accordance with existing industry guidance that includes evaluating and determining the source of any boric acid deposit identified on the upper pressurizer penetrations and steam space piping. These requirements are incorporated in the visual inspection guidance contained in TVA's Corrosion Control Program and Inspection procedures. Implementation of these requirements precludes a through-wall crack remaining undetected for years.

Based on the thoroughness and past performance of TVA's inspection program described above, there is reasonable assurance that the program implemented at WBN satisfies the applicable regulatory requirements related to the structural and leakage integrity of the pressurizer penetrations and steam space piping.

ENCLOSURE 2

TENNESSEE VALLEY AUTHORITY (TVA)
WATTS BAR NUCLEAR PLANT (WBN) UNIT 1

SUPPLEMENTAL RESPONSE TO NRC BULLETIN 2004-01, "INSPECTION OF ALLOY 82/182/600 MATERIALS USED IN THE FABRICATION OF PRESSURIZER PENETRATIONS AND STEAM SPACE PIPING CONNECTIONS AT PRESSURIZED-WATER REACTORS," DATED MAY 28, 2004

NRC Requested Information:

For lines attached directly to the pressurizer, with the exception of the surge line, the information requested in (1) and (2) above should be provided for any locations, including those remote from the pressurizer shell, which contain Alloy 82/182/600 materials which are exposed to conditions similar to those of the pressurizer environment.

TVA RESPONSE:

The piping attached to the pressurizer is austenitic stainless steel and does not contain the subject alloy material.

ENCLOSURE 2

ATTACHMENT

TENNESSEE VALLEY AUTHORITY (TVA)
WATTS BAR NUCLEAR PLANT (WBN) UNIT 1

SUPPLEMENTAL RESPONSE TO NRC BULLETIN 2004-01, "INSPECTION OF ALLOY 82/182/600 MATERIALS USED IN THE FABRICATION OF PRESSURIZER PENETRATIONS AND STEAM SPACE PIPING CONNECTIONS AT PRESSURIZED-WATER REACTORS," DATED MAY 28, 2004

Table 1: Watts Bar Unit 1 Pressurizer Penetrations

Penetration	Materials	Joint Design	Stress Relieved?
4" Spray Nozzle (qty. 1)	Nozzle: Low Alloy Steel Forging SA-508 Class 2a, Inconel 182 buttering, SS 309/308 cladding	N/A	Yes (cladding & buttering)
	Weld Nozzle to Safe-end: Inconel 82/182	Full penetration butt weld	No
	Safe-end: ASME SA-182, Grade 316L, SS Forging	N/A	N/A
	Thermal Sleeve: ASME SA-213 Grade TP-304 SS Seamless Tubing	N/A	N/A
	Thermal Sleeve to Safe-End Weld: Inconel 82	45°, 0.12 bevel groove partial penetration butt weld 45° around	No
	Liner: ASME SA-213 Grade TP-304 SS Seamless Tubing	N/A	N/A
	Liner to safe end Weld: Inconel 82	30°, 0.12 bevel groove partial penetration butt weld all around	No
	Liner to cladding Weld: SS 309/308	0.12 x 0.31 fillet weld all around	No

ENCLOSURE 2

ATTACHMENT

TENNESSEE VALLEY AUTHORITY (TVA)
WATTS BAR NUCLEAR PLANT (WBN) UNIT 1

SUPPLEMENTAL RESPONSE TO NRC BULLETIN 2004-01, "INSPECTION OF ALLOY 82/182/600 MATERIALS USED IN THE FABRICATION OF PRESSURIZER PENETRATIONS AND STEAM SPACE PIPING CONNECTIONS AT PRESSURIZED-WATER REACTORS," DATED MAY 28, 2004

Table 1: Watts Bar Unit 1 Pressurizer Penetrations

Penetration	Materials	Joint Design	Stress Relieved?
14" Surge Nozzle (qty. 1)	Nozzle: Low Alloy Steel Forging SA-508 Class 2a, SS 309/308 cladding, Inconel 182 buttering, Inconel 182 tie in	N/A	Yes (cladding & buttering)
	Weld Nozzle to Safe-end: Inconel 82/182	Full penetration butt weld all around	No
	Safe-end: SA-182, Grade 316L, SS Forging	N/A	N/A
	Thermal Sleeve: SS, SA-240, Type 304, plate	N/A	N/A
	Thermal Sleeve to Safe-End weld: Inconel 82	0.19 45° V-groove partial penetration butt weld 45° around	No
6" Safety Nozzle (qty. 3) 6" Relief Nozzle (qty. 1)	Nozzle: Low Alloy Steel Forging SA-508 Class 2a, SS 309/308 cladding, Inconel 182 buttering	N/A	Yes (cladding & buttering)
	Weld Nozzle to Safe-end: Inconel 82/182	Full penetration butt weld all around	No
	Safe-end: SS ASME SA-182, Grade 316L Forging	N/A	N/A
	Liner: ASME SA-213 Grade TP-304 SS Seamless Tubing	N/A	N/A
	Liner to safe end Weld: Inconel 82	30°, 0.12 bevel groove partial penetration butt weld all around	No
	Liner to cladding Weld: SS 309/308	0.12 x 0.31 fillet weld all around	No

ENCLOSURE 2

ATTACHMENT

TENNESSEE VALLEY AUTHORITY (TVA)
WATTS BAR NUCLEAR PLANT (WBN) UNIT 1

SUPPLEMENTAL RESPONSE TO NRC BULLETIN 2004-01, "INSPECTION OF ALLOY 82/182/600 MATERIALS USED IN THE FABRICATION OF PRESSURIZER PENETRATIONS AND STEAM SPACE PIPING CONNECTIONS AT PRESSURIZED-WATER REACTORS," DATED MAY 28, 2004

Table 1: Watts Bar Unit 1 Pressurizer Penetrations

Penetration	Materials	Joint Design	Stress Relieved?
Heater Penetrations (qty. 78)	Heater: SS: SA-213, Grade TP 316 tubing	N/A	N/A
	Heater Adaptor: SS SA-182, Grade F316 Forging	N/A	N/A
	Adapter to Heater Element Weld: SS 309/308	0.19 fillet weld all around	No
	Heater Well to Adapter Weld: SS 309/308	0.19 fillet weld all around	No
	Heater Well to Lower Head Cladding Weld: SS 309/308	0.19 R partial penetration J-groove butt weld and 0.19 fillet weld all around	No
Level & Temperature Instrumentation Taps (qty. 9)	Tubing: SS ASME SA-213, Grade TP 316 Tubing	N/A	N/A
	Coupling: SS ASME SA-182, Grade F316 Forging	N/A	N/A
	Tubing to Shell Cladding Weld: SS 309/308	0.19 R partial penetration J-groove butt weld and 0.12 fillet weld all around	No
	Pipe to Coupling Weld: SS 309/308	Partial penetration J-groove butt weld and fillet weld all around	No
Manway (qty. 1)	Forging: Low Alloy Steel Forging SA-508 Class 2a	N/A	N/A
	Insert: SS, ASME SA-240, Type 304, Plate	N/A	N/A

ENCLOSURE 2

ATTACHMENT

TENNESSEE VALLEY AUTHORITY (TVA)
WATTS BAR NUCLEAR PLANT (WBN) UNIT 1

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Table 1: Watts Bar Unit 1 Pressurizer Penetrations			
Penetration	Materials	Joint Design	Stress Relieved?
	Cover: MN-MO St. Plate - SA-533 Gr. A Cl. 1	N/A	N/A

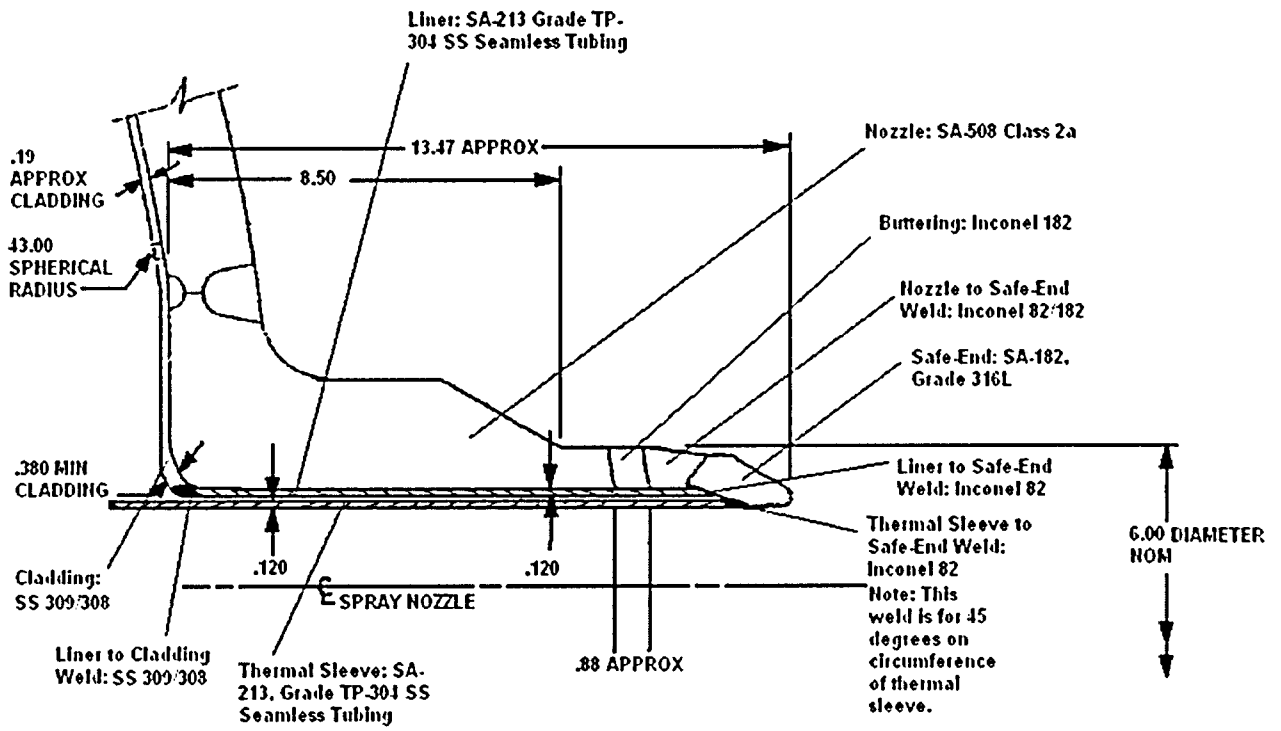

Figure 1
Watts Bar Unit 1 Pressurizer Spray Nozzle Sketch

ENCLOSURE 2

ATTACHMENT

TENNESSEE VALLEY AUTHORITY (TVA)
WATTS BAR NUCLEAR PLANT (WBN) UNIT 1

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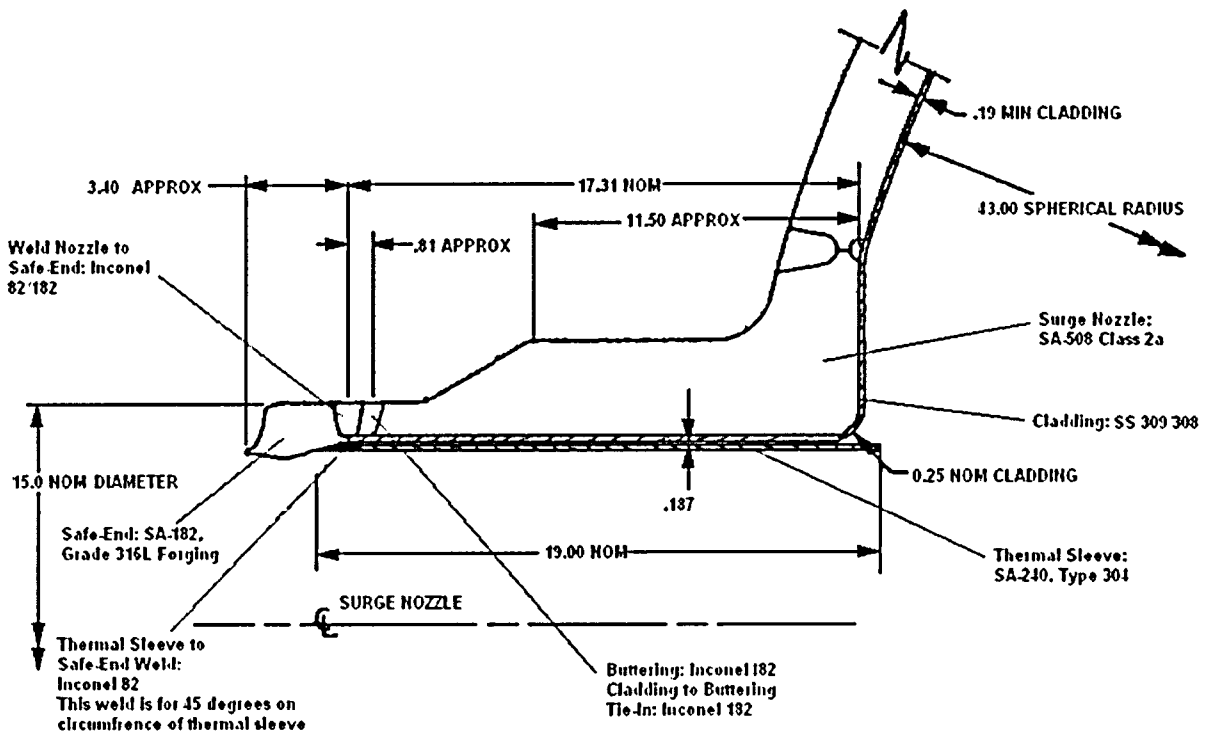

Figure 2
Watts Bar Unit 1 Pressurizer Surge Nozzle Sketch

ENCLOSURE 2

ATTACHMENT

TENNESSEE VALLEY AUTHORITY (TVA)
WATTS BAR NUCLEAR PLANT (WBN) UNIT 1

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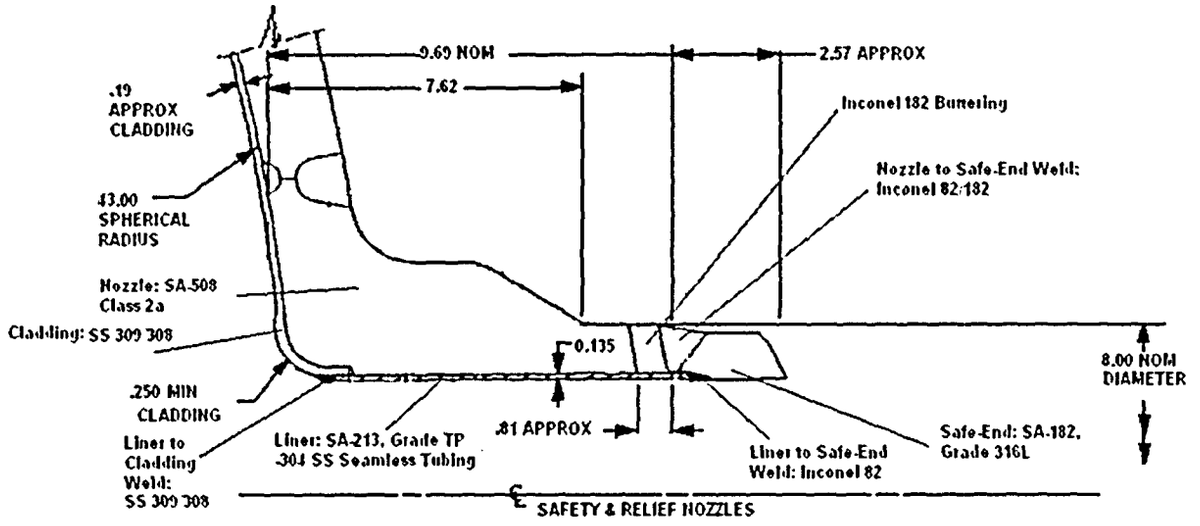

Figure 3
Watts Bar Unit 1 Pressurizer Safety & Relief Nozzle Sketch

ENCLOSURE 2

ATTACHMENT

TENNESSEE VALLEY AUTHORITY (TVA)
WATTS BAR NUCLEAR PLANT (WBN) UNIT 1

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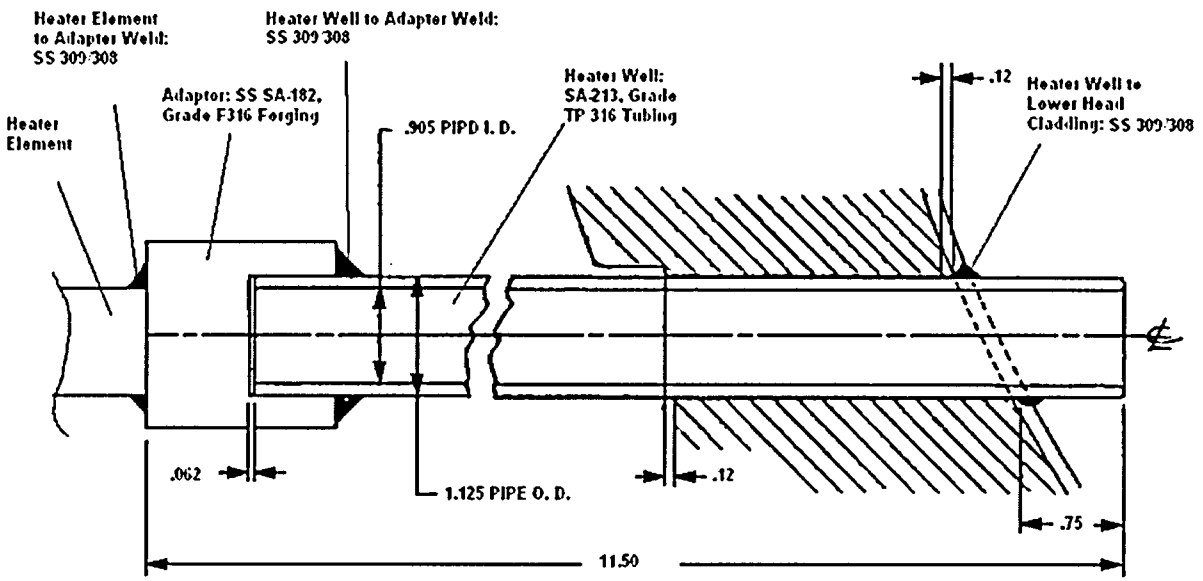

Figure 4
Watts Bar Unit 1 Pressurizer Heater Penetration Sketch

ENCLOSURE 2

ATTACHMENT

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WATTS BAR NUCLEAR PLANT (WBN) UNIT 1

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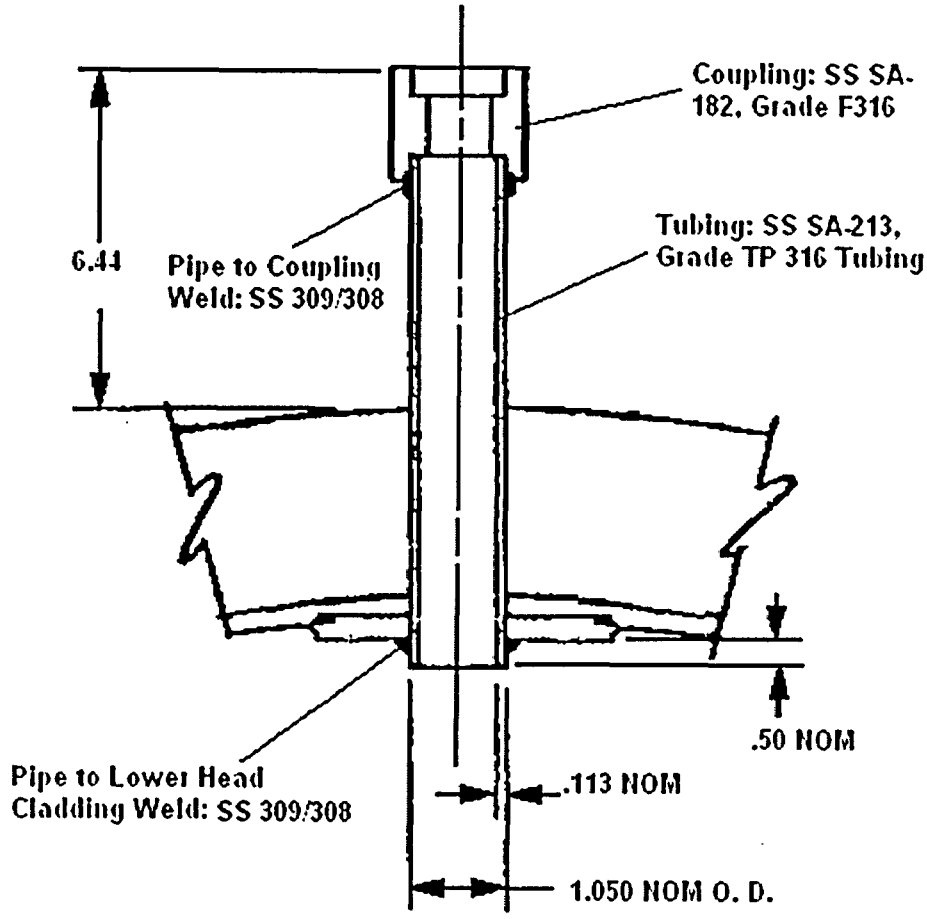

Figure 5
Watts Bar Unit 1 Pressurizer Level & Temperature Instrumentation Tap Sketch

ENCLOSURE 2

ATTACHMENT

TENNESSEE VALLEY AUTHORITY (TVA)
WATTS BAR NUCLEAR PLANT (WBN) UNIT 1

SUPPLEMENTAL RESPONSE TO NRC BULLETIN 2004-01, "INSPECTION OF ALLOY 82/182/600 MATERIALS USED IN THE FABRICATION OF PRESSURIZER PENETRATIONS AND STEAM SPACE PIPING CONNECTIONS AT PRESSURIZED-WATER REACTORS," DATED MAY 28, 2004

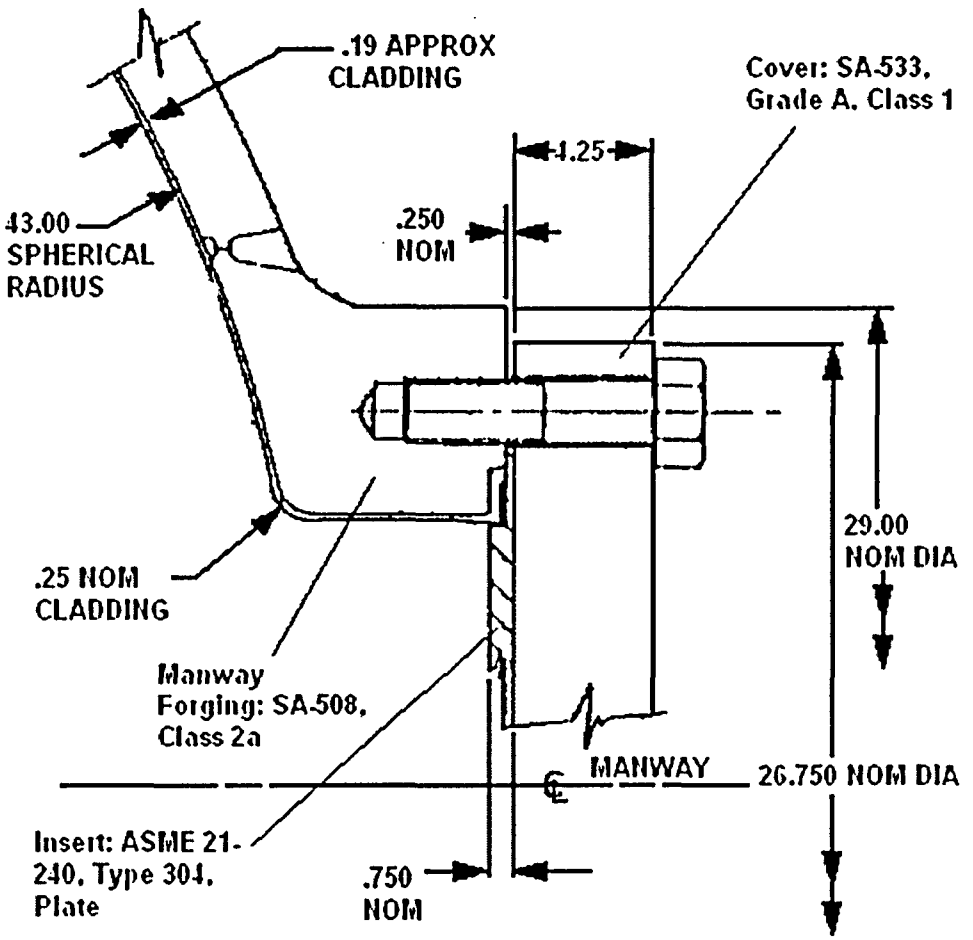

Figure 6
Watts Bar Unit 1 Pressurizer Manway Sketch