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

JUL 09 2004

10 CFR 50.55a

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

Gentlemen:

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

WATTS BAR NUCLEAR PLANT (WBN) UNIT 1 - AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME) SECTION XI, INSERVICE INSPECTION - REQUEST FOR RELIEF 1-RR-05 - APPLICATION OF CODE CASE N-597-1, REQUIREMENTS FOR ANALYTICAL EVALUATION OF PIPE WALL THINNING - RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION (TAC NO. MC 1580)

The purpose of this letter is to respond to NRC's request for additional information which was received from the NRC Project Manager by electronic mail on June 2, 2004. The Enclosure provides the responses to NRC's requests. These responses were discussed with NRC in teleconference calls on June 9, 2004 and June 29, 2004.

If you have any questions about these responses, please contact me at (423) 365-1824.

Sincerely,

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

Enclosure
cc: See page 2

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ENCLOSURE

WATTS BAR NUCLEAR PLANT (WBN) UNIT 1
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION
REQUEST FOR RELIEF 1-RR-05

Below is TVA's response to NRC's request for additional information received by electronic mail on June 2, 2004 from the WBN NRC Project Manager. These responses were discussed with NRC in teleconference call on June 9, 2004 and June 29, 2004.

QUESTION 1

On page E1-1, the terminology is confusing. Verify that "t_{min}" is the Code required minimum wall thickness. "Minimum wall thickness" is apparently the "predicted wall thickness."

RESPONSE

The ASME Code required minimum wall thickness is "t_{min}." The sentence in the 3rd paragraph on page E1-1 is better stated as: "The predicted wall thickness is greater than ninety percent of the minimum wall thickness, t_{min}, as allowed by the provision of the Code Case."

QUESTION 2

Provide a drawing of the grid corresponding to the table on page E1A2-1. Indicate the location of the grid origin "A1." Indicate if the grid is of uniform size, 3 x 3 inches, over the entire surface. Show the direction of the fluid flow.

RESPONSE

Three drawings/sketches are attached. The first is referred to as the "Grid Sketch." It is a general view of the main grid and any upstream and/or downstream grid associated with it during the inspection. A Grid Sketch is in all of the inspection packages. The Grid Sketch is intended to provide the inspector and the evaluator a picture of the component being considered, its location, its orientation, and its upstream/downstream components. It does not have grid lines drawn on it. "View 1" and "View 2" were drawn specifically to address Questions 2, 3, and 8. The direction of fluid flow is shown in each of the drawings/sketches.

a. The grid origin ("A1") is located at the upstream (inlet) end of the elbow at the 12:00 o'clock position of the horizontal elbow. The intrados, line "E" in the sketches, is located at approximately the 3:00 o'clock position and the extrados, line "N" in the sketches, is located at approximately the 9:00 o'clock position.

b. The grid size is not uniform over the external surface of the elbow. The grid size is a maximum of 3 x 3 inches.

c. TVA's procedure for applying the grid is based on the component's diameter and specifies that for a component diameter of this size (16-inches), a 3-inch maximum grid is allowed. The grid is allowed to be smaller. Typically, the gridders would start at the origin and apply a 3-inch grid around the circumference of the component allowing the last space to "float" (be a smaller space). For instance, 3-inch x 16 spaces equals 48 inches and 3-inch x 17 spaces equals 51 inches. The circumference should measure 50.26 inches. So the last space (between "Q" and "A") will measure approximately 2.25 inches (50.26 inches - 48 inches) instead of 3 inches. This takes care of the grid lines in the longitudinal direction.

The number of "bands" (or rings) is determined procedurally by measuring the component length at the extrados. For a 45 degree elbow, this should measure 25 inches. Row 1 starts at upstream of the component at the toe of the weld (TOW). Laying out 3-inch spaces will provide 8 spaces equaling a total of 24 inches (3-inch x 8 = 24 inches) which is 9 lines. Line 10 is at the downstream end of the component at the TOW. The space between Line 9 and Line 10 is approximately 1-inch. A similar procedural requirement is followed on the intrados. The resulting bands are wedge shaped in reality.

As can be seen from the above, the grids are a maximum of 3 x 3 inches but in reality vary depending on the exact position.

QUESTION 3

Pages E1-3 and E1-6 state that the elbow was fabricated from bent pipe. However, this is called a mitered elbow. Clarify what is meant by "mitered 45 degree elbow." Provide a drawing of this elbow.

RESPONSE

a. The WBN construction records show the "bent pipe elbow" was procured as an elbow with seamless SA-420 WPL-6 as the material. "Bent pipe elbow" was nomenclature used by the evaluator.

b. "Mitered 45 degree elbow" - The drawing 47W401-209 (Enclosure 1, Attachment 5 to the original submittal) refers to this elbow as a "mitered ell." Based on the dimensions used in the stress calculations, this elbow is a 44 degree elbow which has been cut on one end for fit-up purposes to the steam generator.

QUESTION 4 and QUESTION 5

On page E1-3, provide the magnitude of L_{rem}, and explain the significance that "L_{rem} is a negative number." On page E1-4, provide the meaning and basis for T_{accpt} = 0.721 in.

RESPONSE

The Table on page E1A4-1 for 103BE252 reflects an L_{rem} value of (2.9) years which is a negative number. This L_{rem} value is based on a T_{accept} value of 0.721 inches which is presented on the same table. Reviewing the same table it can be seen that field measured minimum thickness during the Unit 1 Cycle 5 (U1C5) Refueling Outage is 0.639 inches. As part of the Flow Acceleration Corrosion (FAC) initial screening process the T_{accept} value was used in combination with the U1C5 minimum thickness value to produce the "Predict for ≥ U1C6" value of (2.9) years shown on page E1A4-1 using the formula shown in Cell T16. In other words, the remaining life (L_{rem}) is negative because the measured thickness of 0.639 inches was less than the T_{accept} screening thickness of 0.721 inches.

T_{accept} is the calculated wall thickness value, based on a 360 degree uniform wear assumption which will allow for the piping to remain fully qualified to Code of Record allowable. The impact on the Stress Intensification Factor is accounted for in this determination. This is an evaluation performed in accordance with the rules of the WBN ASME Code of Record where the difference between the allowable and existing stress is used to calculate a uniform reduced wall thickness (ie., 0.721 inches). For this location a value of 0.721 inches is based on stresses/moments from all load cases analyzed in the Code of Record calculations including Check Valve Slam. This is the initial screening value used for the FAC inspection of this elbow.

Referring to the bottom of page E1A4-1, in Rows 19 through 23, the acceptance for grid 103BE252 is based on further engineering evaluation. Enclosure 2 of the December 17, 2003 letter describes the engineering evaluation performed in accordance with

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Code Case N-597-1, based on the U1C5 Outage measured thickness data for the cross section in question including a projected wear (plus a ten percent safety factor) for the additional period of service until the U1C6 Refueling Outage.

QUESTION 6

On page E1-5, provide an explanation how the Feedwater Check Valve Slam Transient loading was considered in the evaluation of t_{min}.

RESPONSE

Check Valve Slam Transient Loadings were generated using the thermal hydraulic conditions (including pressures) in the feedwater system (modeled from steam generators to 32-inch header). These system conditions were modeled using the RELAP/REFORCE computer codes to produce the force time histories used as input in the piping analysis. The pressures used in the RELAP analysis do not exceed the design pressure. Additionally, the simultaneous loading from the Check Valve Slam, Safe Shutdown Earthquake, Pressure, Thermal Expansion, Thermal Anchor Motion, and Deadweight were considered in the structural evaluation of the pipe and compared to the ASME Section III allowable. The Check Valve Slam Time History loadings were considered in the results presented in the December 17, 2003 letter, page E2-3. The 0.917-inch value is based on a structural analysis, using the stress/moment loading including the Check Valve Slam Loadings.

QUESTION 7

On pages E1-8 and E2-3, discuss the determination of the "minimum required piping component wall thickness that satisfies all pertinent stress requirements."

RESPONSE

The "minimum required piping component wall thickness that satisfies all pertinent stress requirements" as stated on page E1-8, applies to the use of the ASME Equations associated with the Code of Record design calculations (In accordance with the FSAR and Design Criteria). As stated above in Questions 4 and 5 in development of the initial screening criteria for FAC evaluations the remaining difference between allowable and existing Code of Record stress is used to calculate a uniform

(360 degrees around the circumference of the pipe) reduced wall thickness.

QUESTION 8a

On page E1A1-5, provide the dimensions of the corroded region. Locate this corroded region on the drawing requested in Item 2.

RESPONSE

The thin areas/locations are identified on View 1 and View 2 as requested.

Measuring from a copy of the "original" tracing taken from the elbow, the dimensions requested are:

- The longest area, identified as being 0.721 inches bound, is 9 inches long x 1 5/16 inches wide.
- The next area, identified as being 0.700 inches bound, is 8 inches long x 1 9/16 inches wide.
- The area identified as 0.650 inches bound, and containing the 0.639 inches thinnest value, is 15/16 inches long x ¾ inches wide.
- The area identified as 0.650 inches bound, and containing the 0.646 inches thin area, is 1-inch long x 9/16 inches wide.

QUESTION 8b

The smallest wall thickness was measured in a pocket within the larger corrosion area, as shown on this page. Provide the cause of these two localized corrosion pockets.

RESPONSE

It should be noted that the region under discussion has not been classified by WBN as a "corroded" region. It is a region where the initial Ultrasonic Testing (UT) inspection shows certain areas/locations to be thin. As in any component where a thin area is detected during FAC UT inspection, the thin area is treated as FAC from an evaluation viewpoint.

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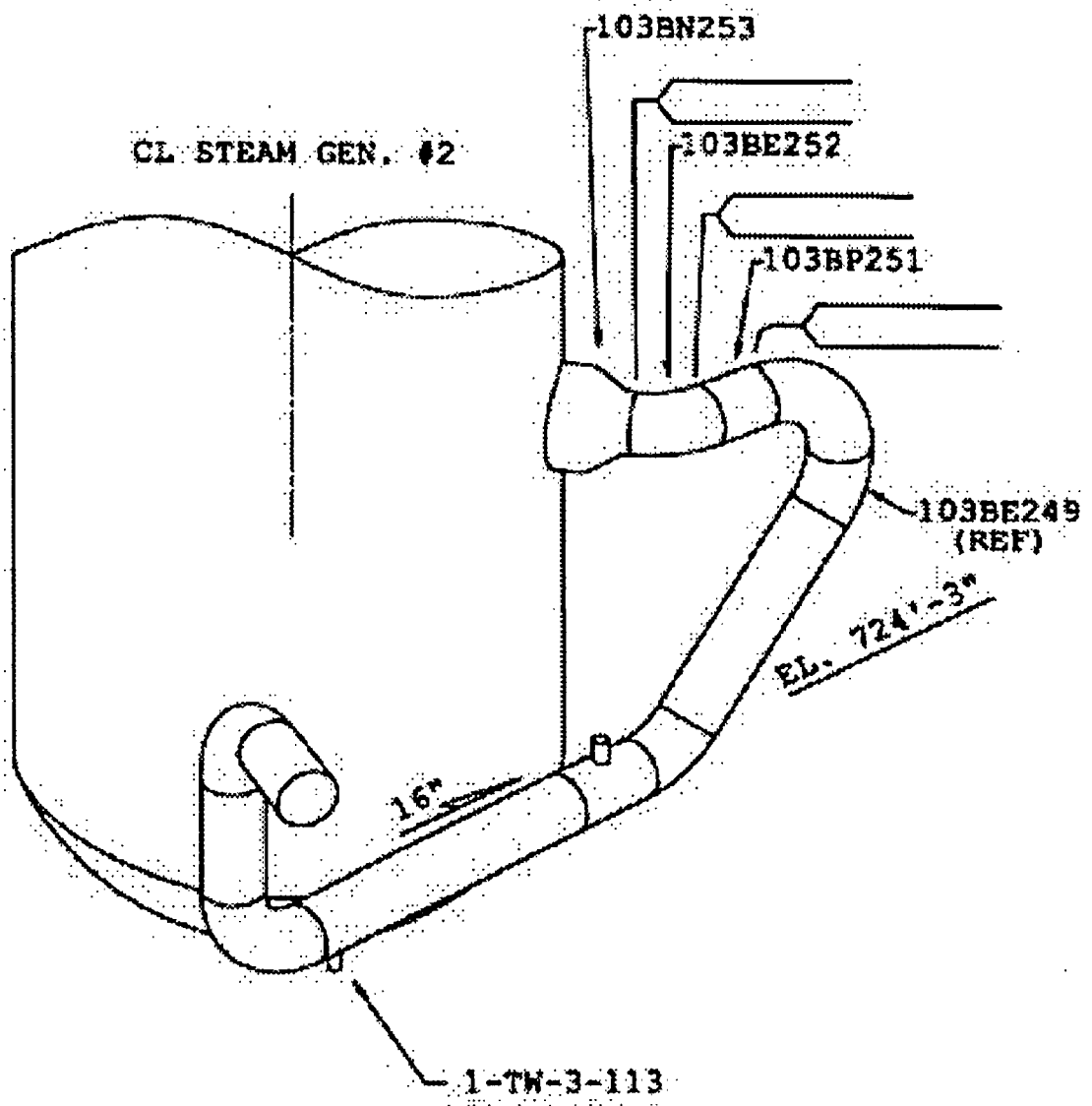
With regard to the potential cause of the thinned condition, an attempt was made to perform a boroscopic inspection of the internal condition at these thin areas when this condition was discovered during the recent U1C5 Refueling Outage. This attempt was unsuccessful due to a pipe whip restraint which prevented the removal of a gamma plug to provide access. As a result, WBN was unable to provide the definitive cause of the two thin areas as requested. As stated originally, these thin areas are not in a location or an orientation typical of FAC. It is highly suspected the areas are an artifact from construction due to internal grinding related to counterboring. Future evaluations will provide further experiential data to enable a more precise determination of the cause of the thinned areas.

WATTS BAR NUCLEAR PLANT UNIT 1

MONITORING PROGRAM FOR
FLOW-ACCELERATED CORROSION TI-31.021

GRID ID# 103BE252



LOCATION SG #2
AZ 157°

REF. DWG. E-2879-IC-2

SYSTEM 03 Feedwater

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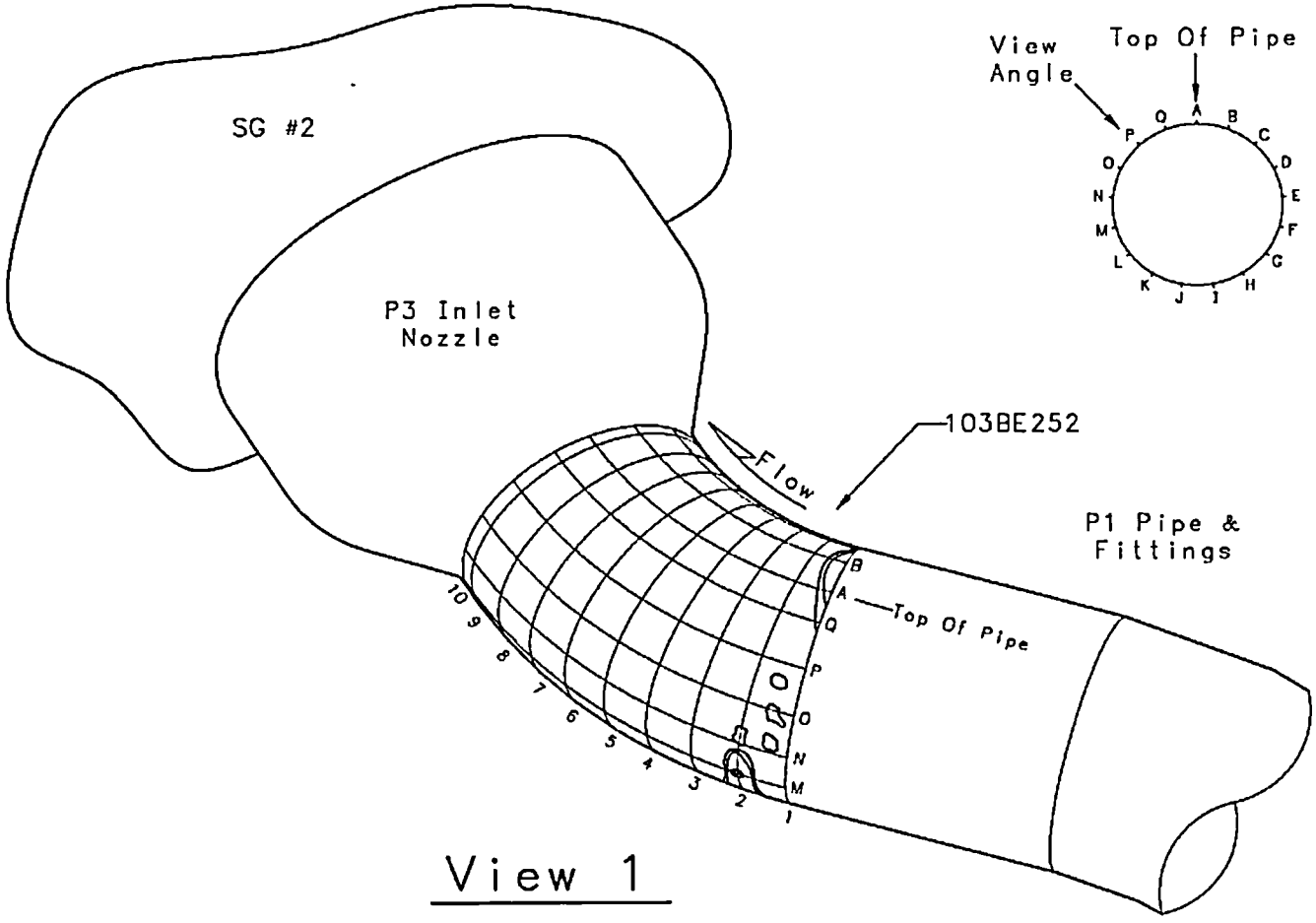

View 1

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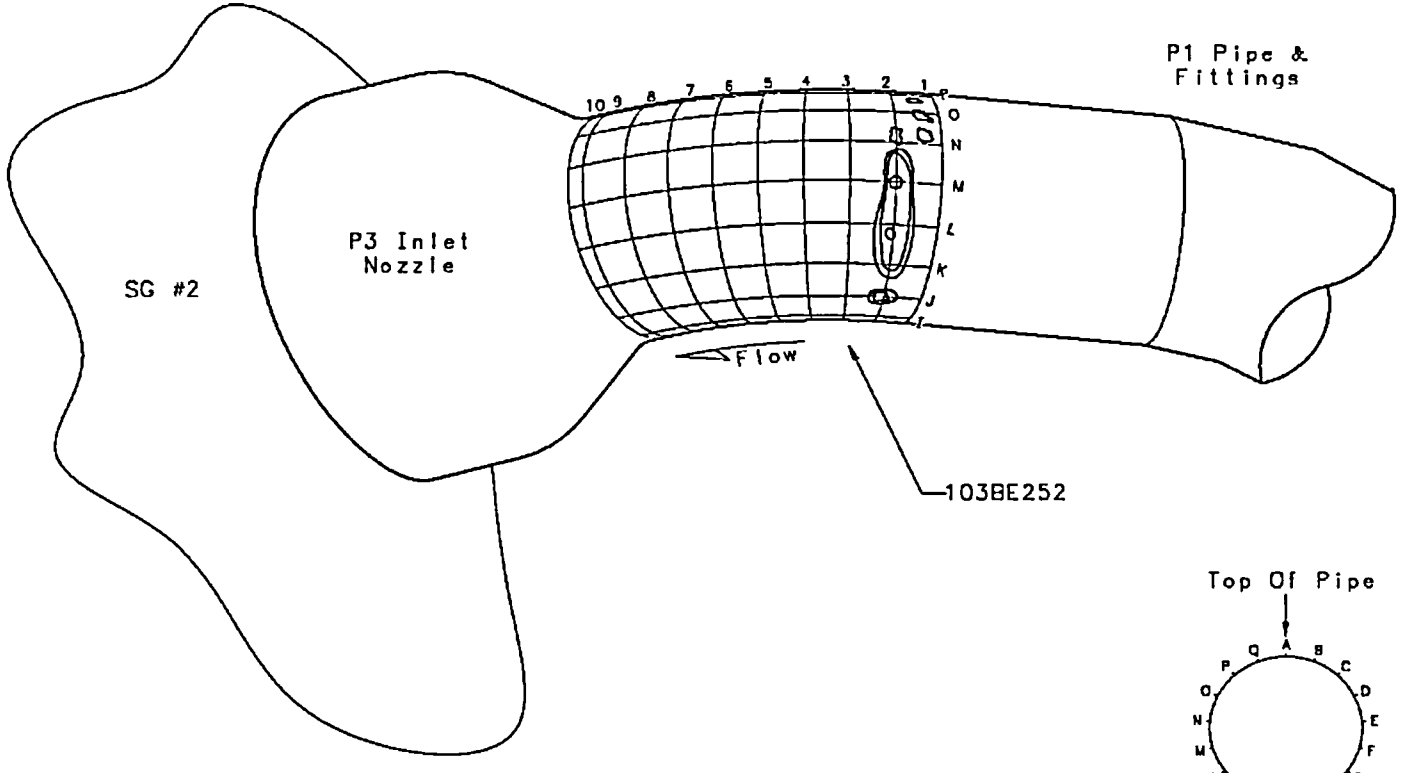

View 2