TENNESSEE VALLEY AUTHORITY
CHATTANOOGA, TENNESSEE 37401
400 Chestnut Street Tower II

August 13, 1980

Director of Nuclear Reactor Regulation
Attention: Mr. A. Schwencer, Chief
Light Water Reactors Branch No. 2
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Dear Mr. Schwencer:

In the Matter of the Application of	)	Docket Nos. 50-390
Tennessee Valley Authority	)	50-391

In your letter to H. G. Parris dated June 18, 1980, TVA was requested to provide additional information on the Watts Bar Nuclear Plant unit 1 and unit 2 reactor vessels. Enclosed is the information which has been provided by Westinghouse.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

L. M. Mills, Manager
Nuclear Regulation and Safety

Enclosure

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ENCLOSURE

WATTS BAR UNITS 1 AND 2

UNDERCLAD CRACKING OF REACTOR VESSEL NOZZLES

Question Provide the nozzle base metal material type and grade, including material certification data of material used in construction.

Response The base material of all nozzles in the Watts Bar Units 1 and 2 reactor vessels is ASTM A-508 Class 2. The base material certification data is available in the Watts Bar Units 1 and 2 QA records.

Question Provide the cladding process type, electrode size and number of clad layers, including material certification data of material used in construction.

Response Nozzle Bore - Two clad layers using submerged arc strip process using a 60 mm X 0.5 mm strip.

Nozzle Radii (Inlet Nozzle) - Two layers of clad using shielded metal arc with 4 mm diameter electrodes for first layer and 3.25 mm, 4 mm or 5 mm diameter electrodes for second layer.

Nozzle Protection (Outlet Nozzle) - More than two clad layers (thickness 17 mm) using shielded metal arc cladding with 4 mm diameter electrodes for first layer and 3.25 mm, 4 mm or 5 mm diameter electrodes for subsequent layers.

Certification data for cladding material is not required and, therefore, not available. However, the following cladding material information is provided:

For shielded metal arc cladding, the first layer of cladding is ASME SA-298 E309-16 filler metal and subseuqent layers are ASME SA-298 E308L-16 filler metal.

For strip cladding, the first layer is a modified 309 filler metal with the following chemical composition:

C	0.030% max
Cr	22.0-25.0%
Ni	10.0-12.0%
Mn	1.2-2.5%
Si	0.6% max

The second layer is a modified 308L filler metal with the following chemical composition:

C	0.030% max
Cr	18.0-21.5%
Ni	8.0-11.0%
Mn	1.2-2.5%
Si	0.6% max

Question Provide the heat input (amps, volts, speed) for each clad layer.

Response Nozzle Bore

First layer: amps=600-630; volts=28-32; speed=15-16 cm/minute
Second layer: amps=600-650; volts=29-33; speed-10-12 cm/minute

Nozzle Radii and Protections

First layer: amps=90-135; volts ∿22-24; speed ∿18 cm/minute

Subsequent Layers	Electrode Diameter	Amps	Volts	Speed
	3.25	70-110	∿22-24	∿18 cm/minute
	4	90-150	∿22-24	∿18 cm/minute
	5	130-220	∿22-24	∿18 cm/minute

Question Provide the clad pre- and post-heat temperatures and interpass temperature for each clad layer.

Response Nozzle Bore - Preheat temperature of 40°C for first layer, no preheat on second layer. Post-heat of 205°-220°C for two hours after welding of first layer. Interpass temperature of 100°C maximum for first layer and 125°C maximum for second layer.

Nozzle Radii and Projections - Preheat temperature of 100°-175°C for first layer, no preheat on subsequent layers. Post-heat of 205°-220°C for two hours after welding first layer. Interpass temperature of 175°C maximum.

Question Describe the vessel stress relief treatment.

Response Intermediate Post-Weld Heat Treatment (PWHT) = 205°-220°C for two hours after welding of first layer.

Final PWHT = 595°-635°C held for a maximum of one hour per inch of weld thickness.

Question Identify the manufacturer or subcontractor who fabricated the vessel and applied the nozzle cladding.

Response The reactor vessel was manufactured and the nozzles clad by Rotterdam Nuclear of the Netherlands.