

TENNESSEE VALLEY AUTHORITY

DESIGN SPECIFICATION

WBNP-DS-1935-4247-RO

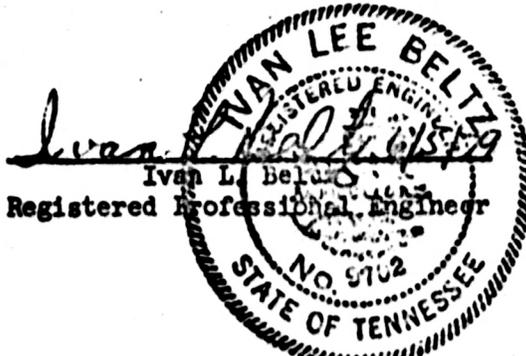
May 30, 1979

WATTS BAR NUCLEAR PLANTS UNITS 1 AND 2

FLEXIBLE INSTRUMENTATION HOSES FOR INSTRUMENTATION AND CONTROL

I certify that this design specification is correct and complete and is in compliance with Paragraph NCA-3252 of the ASME Boiler and Pressure Vessel Code, Section III, Nuclear Power Plant Components. This design specification consists of the following:

- | | <u>Revision No.</u>
<u>or Date</u> |
|---|---------------------------------------|
| 1. Schedule 2 | RO |
| 2. Attachment C, Quality Assurance Requirements for ASME Section III Components (Excluding Pumps, Valves, and Automatic Backwash Filters), Component Supports, and Piping Subassemblies | May 7, 1979 |
| 3. Attachment M, Marking and Certification Requirements for Pipe, Fittings, Flanges, and Bolting for Use in ASME Section III Nuclear Class 2 or 3 Systems | April 6, 1979 |
| 4. Attachment Q, Pipe, Fittings, Tubing, and Miscellaneous Components Austenitic Stainless Steel Heat Treatment Welding Materials, Packaging, and Marking | December 26, 1978 |



<u>Prepared</u>	<u>Date</u>	<u>Correlated</u>	<u>Date</u>	<u>Submitted</u>	<u>Date</u>	<u>Approved</u>	<u>Date</u>
T.R. Winters	6/6/79	H.W. Johnson	6/5/79	R.J. G...	6/5/79	L.H. H...	6/6/79

Schedule of Prices

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ITEM No.	ARTICLES OR SERVICES (GIVE DESCRIPTION OR CATALOG NO.)	QUANTITY	UNIT	UNIT PRICE	AMOUNT																																								
	<p><u>Design Requirements:</u></p> <p>The flexible instrumentation hose assemblies will contain static system water as sensing lines to instrumentation in the reactor coolant system (RCS), main steam system (MS), feed water system (FW), and auxiliary feed water system (AFW). The hose is to absorb thermal expansion movements between equipment/piping and instrumentation connections.</p> <p><u>Internal design conditions:</u></p> <table border="1"> <thead> <tr> <th></th> <th><u>RCS</u></th> <th><u>MS</u></th> <th><u>FW</u></th> <th><u>AFW</u></th> </tr> </thead> <tbody> <tr> <td>Design pressure, pounds per square inch gauge</td> <td>2500</td> <td>1200</td> <td>1200</td> <td>1600</td> </tr> <tr> <td>Design temperature, °F</td> <td>700</td> <td>600</td> <td>600</td> <td>120</td> </tr> <tr> <td>Operating pressure, pounds per square inch gauge</td> <td>2335</td> <td>1100</td> <td>1100</td> <td>1200</td> </tr> <tr> <td>Operating temperature, °F</td> <td>650</td> <td>550</td> <td>560</td> <td>90</td> </tr> </tbody> </table> <p>The environment is:</p> <table border="1"> <thead> <tr> <th><u>Environment</u></th> <th><u>Normal</u></th> <th><u>Accident</u></th> </tr> </thead> <tbody> <tr> <td>Ambient temperature, °F</td> <td>140 maximum</td> <td>250</td> </tr> <tr> <td>Ambient pressure, per square inch gauge</td> <td>±0.3</td> <td>15</td> </tr> <tr> <td>Humidity, percent</td> <td>80</td> <td>100</td> </tr> <tr> <td>Radiation</td> <td>2 rad/hr</td> <td>10⁸ rad 40-year total</td> </tr> </tbody> </table> <p><u>Cyclic Life Requirements:</u></p> <p><u>General.</u> Assembly shall be designed for a total lifetime of 40 years and undergo the conditions specified below. Cyclic design shall be based on analytical and test results. Certified design report shall be submitted for permanent retention by TVA.</p>		<u>RCS</u>	<u>MS</u>	<u>FW</u>	<u>AFW</u>	Design pressure, pounds per square inch gauge	2500	1200	1200	1600	Design temperature, °F	700	600	600	120	Operating pressure, pounds per square inch gauge	2335	1100	1100	1200	Operating temperature, °F	650	550	560	90	<u>Environment</u>	<u>Normal</u>	<u>Accident</u>	Ambient temperature, °F	140 maximum	250	Ambient pressure, per square inch gauge	±0.3	15	Humidity, percent	80	100	Radiation	2 rad/hr	10 ⁸ rad 40-year total			(Quote unit price and compute extension)	
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	<p><u>Model description.</u> The hose assemblies will be installed per Contractor's recommendations as delineated in an instruction manual to be submitted for permanent retention by TVA. Displacements are applied to one end connection along three orthogonal axes simultaneously. The assembly is filled with fluid and pressurized to the operating pressure.</p> <p><u>Displacement due to thermal expansion.</u> The hose assemblies shall be capable of the following thermal expansion movements:</p> <p style="margin-left: 40px;">X axis = -0.444 inch Y axis = +2.886 inches Z axis = -2.128 inches</p> <p><u>Mechanically induced vibration.</u> Sine wave input corresponding to 0.5 g acceleration in each direction at frequencies of 10, 15, 30, and 60 Hz. Evaluate for input at most critical frequency for 40 years of continuous service.</p> <p><u>Seismic criteria.</u> Seismic test criteria shall be as delineated in Metal Bellows Corporation's qualification test procedure QTP73989, paragraph 4.6.</p> <p>Contractor shall furnish data with respect to the susceptibility of the flexible instrumentation hose assemblies to damage by inadvertent mishandling (e.g., crushing, kinking, etc.) and also provide any special handling instruction/protection methods he feels are required to prevent such damage.</p>			(Quote unit price and compute extension)	

TENNESSEE VALLEY AUTHORITY

ASME SECTION III

CLASS 2 FLEXIBLE HOSE ASSEMBLIES

DESIGN SPECIFICATION CRITERIA LOCATOR

INFORMATION REQUIRED BY NCA-3252 AND ITS LOCATION IN THIS SPECIFICATION

- | | |
|--|--------------------|
| 1. Function of the component including any dimensions upon which the functional performance depends. | Schedule of prices |
| 2. The design requirements, i.e., the mechanical and operational loadings. | Schedule of prices |
| 3. The environmental conditions, including radiation. | Schedule of prices |
| 4. The code classification of the component. | Schedule of prices |
| 5. The definition of the component. | Schedule of prices |
| 6. Material requirements. | Schedule of prices |
| 7. Certification of the design specification. | Cover sheet |
| 8. Operability requirements. | Schedule of prices |

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ITEM NO.	ARTICLES OR SERVICES (GIVE DESCRIPTION OR CATALOG NO.)	QUANTITY	UNIT	UNIT PRICE	AMOUNT
	<p><u>SCHEDULE 2</u></p> <p><u>Watts Bar Nuclear Plant</u></p> <p><u>ASME Section III, Class 2</u></p> <p>Flexible instrumentation hoses - The flexible hose shall be a straight section of hose with end connections. Flexible hose shall be NPT stamped and meet the requirements of ASME B&PV Code Case N-192.</p> <p>The flexible hose is to have annular convolutions and be covered with braid. The pressure containing boundary consists of single-ply, welded or seamless tubing or inconel 625, ASME SB-443 (material to meet the requirements of SB-444 as modified by ASME Code Case N-188. Pressure test may be performed at top assembly, reference ND-6114), or SB-444.</p> <p>The braided wire covering the convoluted metal bellows shall be stainless and heat resisting steel wire in accordance with ASTM A 580-75 of material types listed in Tables I-7.0 and I-8.0 of ASME SA-479. All wire strands shall be welded to the welding collars and visually examined.</p> <p>The end connections shall be square cut 1/2-inch OD tube with a wall thickness of 0.095 inch, material of ASME SA-213, TP304.</p> <p>Metal Bellows Corporation nuclear instrumentation hose assembly, or equal.</p> <p>The boundaries of the hose assemblies are the ends or the end connections.</p> <p>The complete flexible hose assembly requires NPT stamp.</p>			<small>(Make unit complete)</small>	<small>(Make unit price and extension)</small>

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ITEM NO.	ARTICLES OR SERVICES (GIVE DESCRIPTION OR CATALOG NO.)	QUANTITY	UNIT	UNIT PRICE	AMOUNT										
2	<p>Flexible instrumentation hoses and material shall be manufactured in accordance with Section III of the ASME Boiler and Pressure Vessel Code, Division 1, latest edition and addenda in effect on contract date.</p> <p>For additional requirements see attachments C, M, and Q.</p> <p>ASME Section III, Class 2</p> <p>TVA material classification B</p> <p style="text-align: right;"><u>Mk No.</u></p> <p>1/2" OD tube size 47W600-416</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;"><u>Delivery No.</u></th> <th style="text-align: left;"><u>Qty</u></th> <th style="text-align: left;"><u>Date Wanted</u></th> <th style="text-align: left;"><u>Ship-To Ref</u></th> <th style="text-align: left;"><u>Acct Ref</u></th> </tr> </thead> <tbody> <tr> <td>01</td> <td>100%</td> <td>8-10-79</td> <td>02</td> <td>02</td> </tr> </tbody> </table> <p>Brand name & figure no. _____</p> <p>Manufacturer _____</p> <p>Point of manufacture _____</p> <p>Drawing submittal after award (days) _____</p> <p style="text-align: right;">Total Schedule 2</p> <p><u>Shipping Data.</u> Bidder must state:</p> <p>Number of calendar days after award for delivery, days _____</p> <p>Point of origin of shipment _____</p> <p>Method of shipment from origin and name of first carrier _____</p> <p>_____</p> <p>Method of delivery at destination _____</p> <p>Shipping weight _____</p>	<u>Delivery No.</u>	<u>Qty</u>	<u>Date Wanted</u>	<u>Ship-To Ref</u>	<u>Acct Ref</u>	01	100%	8-10-79	02	02	300	EA	(Quote unit price and compute extension)	
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