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AUTH.NAME AUTHOR AFFILIATION
BOUCHEY,G.D. Washington Public Power Supply System
RECIP.NAME RECIPIENT AFFILIATION
TEDESCO,R.L. Assistant Director for Licensing

SUBJECT: Responds to NRC 801030,810302 & 0604 requests for info re: steel containment const details,geometry,penetration locations & matl properties;const drawings for design load & loading combinations & matls properties test repts.

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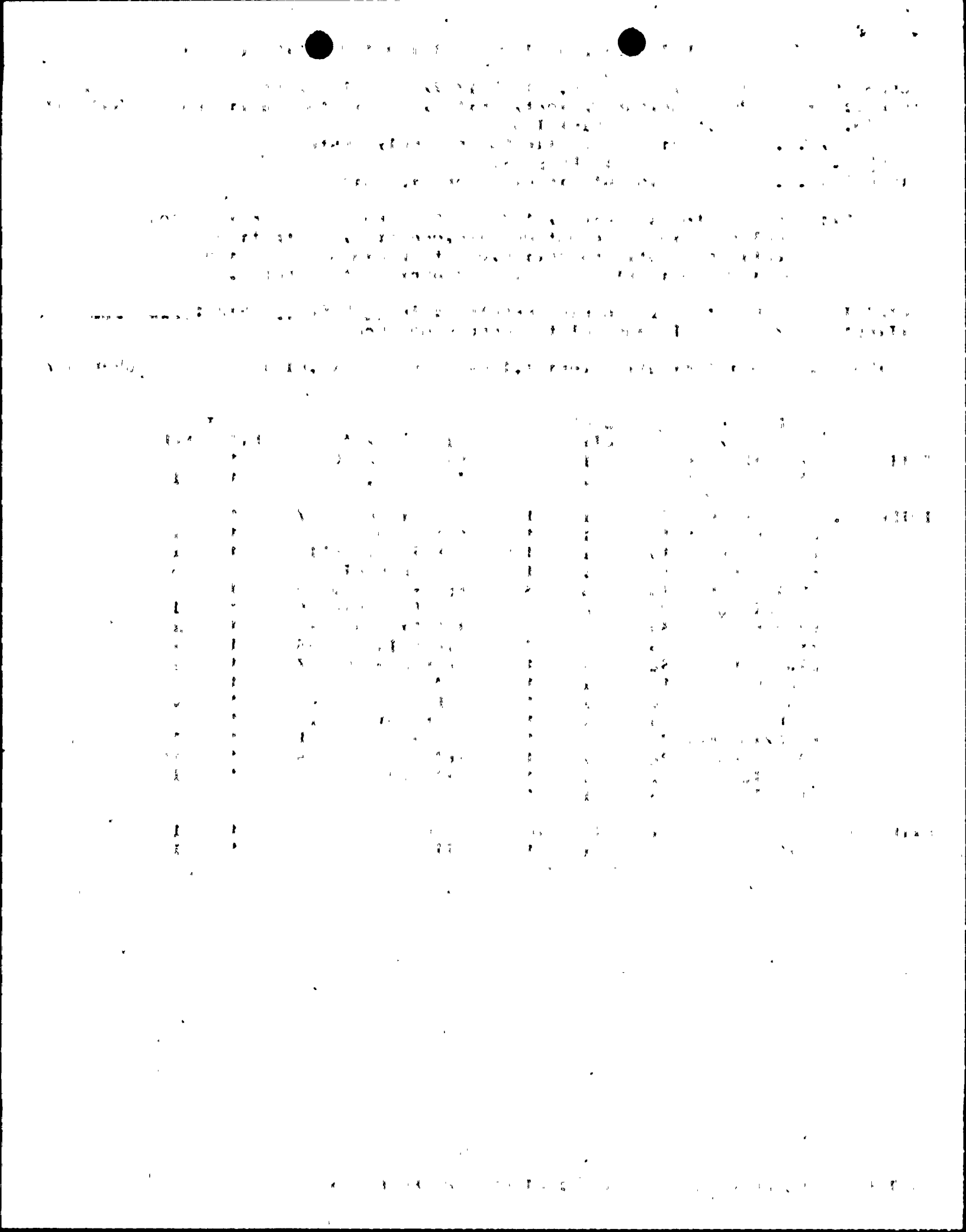

Washington Public Power Supply System
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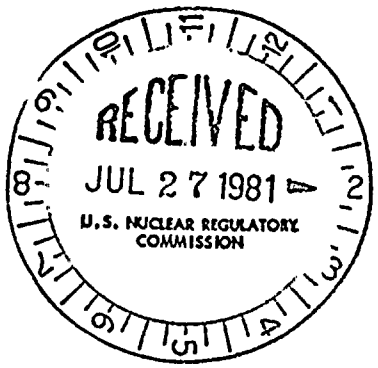
July 22, 1981
G02-81-194

RESPONDS TO: GI2-81-83 and GI2-81-90

RESPONSE REQUESTED BY: N/A

Docket No. 50-397



U. S. Nuclear Regulatory Commission
Office of Nuclear Reactor Regulation
Washington, D.C. 20555

Attention: R.L. Tedesco
Assistant Director for Licensing
Division of Licensing

Gentlemen:

Subject: SUPPLY SYSTEM NUCLEAR PROJECT NO. 2
CONTAINMENT BUCKLING INFORMATION

Reference: (1) Letter, BJ Youngblood, NRC to RL Ferguson, Supply System, dated October 30, 1980

(2) Letter, G02-80-283, GD Bouchey, Supply System to BJ Youngblood, NRC, dated December 10, 1980

(3) Letter, RL Tedesco, NRC to RL Ferguson, Supply System, dated March 2, 1981

(4) Letter, RL Tedesco, NRC to RL Ferguson, Supply System, dated June 4, 1981

Reference (1) requested information from the Supply System concerning construction details, geometry, penetration locations, and material properties of the WNP-2 steel containment. This information was indicated as being required for current research involving predicted response of containments to hydrogen burning or explosion following an accident.

In response to this request, Reference (2) transmitted copies of construction drawings, and information relating to design loading and load combinations, to your office. Concurrently with Reference (2), this information was also transmitted to Mr. Dave Bushnell of Lockheed, who we understood was performing some of this analysis under contract to the NRC. Through conversations with Mr. Bushnell, we understood the materials properties information required could be obtained from the material specifications referenced on the drawings transmitted with Reference (2), and therefore,

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that the actual material properties, as given in mill test reports, was not required. This understanding was stated in Reference (2).

Reference (3) restated the NRC request in Reference (1) for the materials properties test reports. Specifically, the information requested was the Modulus of Elasticity, Poisson's ratio, yield stress, ultimate stress, and fracture stress (as used in fracture mechanics analysis) for the shell plates and reinforcing members of the primary containment, and the bolt yield stress. The information requested was in the form of mean values with associated standard deviations. In response to Reference (3), the documentation pertaining to the primary containment was reviewed and the information in Attachment 1 was compiled. Attachment 1 provides mean values and standard deviations for yield stress and ultimate stress for the shell plates, by elevation, in the cylindrical and conical sections of the containment, and for the horizontal and vertical stiffeners in the wetwell. Attachment 1 also provides Charpy impact test data in the form of mean values and standard deviations for the shell plates in the cylindrical and conical portions of the containment, and for the horizontal stiffeners in the wetwell. This information may be used to obtain the fracture stress. The actual test values for yield stress and ultimate stress for the two heats represented by the bolts attaching the containment head to the top of the cone are also given in Attachment 1, as well as Poisson's ratio and the Modulus of Elasticity used in design.

While in the process of compiling the information above, we received Reference (4), which requested some of the same information requested in Reference (1) and Reference (3). We consider items 1, 2, and 3, in Reference (4) to be fully addressed in Reference (2), and in the information provided above and in Attachment 1.

In response to item 5 of Reference (4), any imperfections are within ASME Section III, Subsection NE, Summer 1972 Addenda Allowable Values.

The information requested in items 4, 6, 7, 8, and 9 of Reference (4) will be transmitted to your office by separate correspondence within three weeks. This information is contained in the Contractor's Stress Report for the primary containment, and some additional effort is necessary to identify the pertinent sections, and possibly to consolidate it in a form suitable for your purposes. It should be understood that the information contained in these reports does not reflect the revised loading conditions due to hydrodynamic effects during a LOCA or SRV discharge event, and the resulting containment vessel modifications, i.e. addition of horizontal stiffeners and penetration stiffening. A revised stress report will be prepared by the Contractor (Pittsburgh Des Moines Company) once the load definition process is completed. This information will

probably not be available until early 1982, but can be submitted to your office if it is needed for your research.

We request that you keep us advised as to the progress of your study. If any adverse conclusions are drawn from your analysis, we would appreciate the opportunity to discuss the technical issues with your staff and consultants at an early stage. Please contact Mr. Dave Shoua of my office (telephone 509--375-5501) if we can be of any further assistance, or if clarification of the information transmitted to you is required. We would be pleased to send some of our technical personnel to your offices to answer your questions regarding any of the information which has been, or soon will be transmitted, and to gain a better understanding of the scope of your research project.

Very truly yours,

G. D. Bouchey
Nuclear Safety Director

EAF:LWV:kjf

Attachments:

cc: JA Forrest - B&R RO
HR Canter - B&R RO
J. Ellswanger - B&R NY
RE Snaith - B&R NY
JJ Verderber - B&R NY
AI Cygelman - B&R Site 979S
FA MacLean - General Electric
S. Smith - General Electric
ND Lewis - EFSEC, Olympia
WS Chin - Bonneville Power Admin.
NS Reynolds - Debevoise & Liberman
OK Earle - B&R HAPO Bldg.
A. Schwencer - NRC
WNP-2 Files

ATTACHMENT 1

GENERAL NOTES FOR ATTACHMENT 1

1. The Mean Material Values are listed on top with the Normal Standard Deviation underneath.

2. All Charpy V Notch tests were taken with the specimen in the longitudinal orientation. Test temperature was -30°F, except Ring 1, which was tested at -25°F.

3. Material certificate states "Grade B". All properties and heat treatment conform to Class 2 requirements. This is believed to be an editorial error.

ATTACHMENT 1

1. Modulus of Elasticity - ASME Code, Section III, 1971 Code, Appendix I, Table 1.6.0

2. Poisson's Ratio - 0.3 (from PDM Stress Report)

	Heat 1	Heat 2
3. Bolt Yield Stress	112,000	114,000
Bolt Ultimate Stress	133,000	134,000

CONTAINMENT SHELL

LOCATION	MATERIAL SPEC.	HEAT TREATMENT	STRESS YIELD	STRESS ULT.	CHARPY V NOTCH IMPACT DATA FT. LBS.	LAT. EXP.	% SHEAR
C Ring	SA516	Normalized	50,000	76,100	51	44	51
	GR.70		2,500	1,700	9	6	8
D Ring	SA516	Normalized	44,500	74,200	32	30	23
	GR.70		1,600	1,200	7	4	5
E Ring	SA516	Normalized	44,200	76,500	34	28	16
	GR.70		3,000	2,800	7	7	11
F Ring	SA516	Normalized	45,900	75,500	32	29	12
	GR.70		1,900	2,500	4	5	5
G Ring	SA516	Normalized	48,000	78,000	40	32	17
	GR.70		4,400	2,200	17	10	9
H Ring	SA516	Normalized	47,200	75,100	26	25	21
	GR.70		3,000	3,800	3	5	12
I Ring	SA516	Quenched &	52,400	78,400	70	50	54
	GR.70	Tempered	2,300	1,400	19	13	11
J Cone	SA537	Quenched &	68,400	90,700	80	59	72
	GR.B (Note 3)	Tempered	2,200	3,200	28	12	26
J Cone	SA516	Normalized	45,900	74,900	33	30	18
	GR.70		1,400	1,100	8	7	12
K Cone	SA537	Quenched &	71,900	94,500	79	57	32
	Cl.2	Tempered	3,700	1,700	11	7	34
L Cone	SA516	Normalized	44,400	76,500	35	31	14
	Gr.70		3,400	1,800	6	6	11

M Cone	SA516	Normalized	44,200	74,900	33	25	24
	GR.70		3,800	3,300	3	3	17
N Cone	SA537	Quenched &	69,500	91,700	76	58	75
	Cl.2	Tempered	3,900	3,500	5	3	19
O Cone	SA516	Normalized	50,600	76,200	30	27	10
	GR.70		1,700	2,200	7	7	7
P Cone	SA516	Normalized	47,600	75,600	28	27	16
	GR.70		4,400	2,300	2	4	10
Q Cone	SA516	Normalized	49,500	76,000	25	25	28
	GR.70		1,600	1,800	2	3	11
R Ring	SA516	Normalized	55,900	83,100	34	29	35
	GR.70		3,500	1,900	5	4	5

See Burns & Roe Drawing S797 for Ring Location (Reference 3)

HORIZONTAL STIFFENER TEES

LOCATION	MATERIAL SPEC.	HEAT TREATMENT	STRESS YIELD	STRESS ULT.	CHARPY V NOTCH IMPACT DATA FT. LBS.	LAT. EXP.	% SHEAR
Stiffener Ring #1	SA516	Normalized	49,000	75,700	38	37	26
	GR.70		1,100	500	14	9	6
Stiffener Ring #2	SA516	Normalized	49,100	75,900	40	38	27
	GR.70		1,500	700	14	12	7
Stiffener Ring #3	SA516	Normalized	49,200	75,900	36	37	31
	GR.70		1,400	800	13	9	8
Stiffener Ring #4	SA516	Normalized	48,800	75,700	35	36	33
	GR.70		900	500	9	6	9
Stiffener Ring #5	SA516	Normalized	49,900	76,000	38	39	31
	GR.70		1,400	1,000	11	7	7
Stiffener Ring #6	SA516	Normalized	50,200	76,200	37	39	29
	GR.70		1,500	1,100	8	6	8
Stiffener Ring #7	SA516	Normalized	48,300	75,500	38	39	28
	GR.70		800	800	14	10	8
AVERAGE	SA516	Normalized	49,200	75,800	37.4	37.7	29.3
	GR.70		1,400	800	11.8	8.1	8.7

See PDM drawings 1400 through 1406 for ring locations (Reference 3)

VERTICAL TEES

MATERIAL - ASTM A36-70

HEAT TREATMENT - None

YIELD STRESS - 49,500
STD. DEVIATION - 4,600

ULTIMATE STRESS - 70,800
STD. DEVIATION - 5,400