210.51

Q 210.51

AERO NAV LABORATORIES, INC.

14-29 112TH STREET • COLLEGE POINT, N.Y. 11356 • (212) 939-4422

(UNCLASSIFIED)

REPORT OF FRAGILITY TEST ON SMB-1-25/H4BC WITH STANDARD CAST ADAPTER FOR LIMITORQUE CORPORATION KING OF PRUSSIA, PENNSYLVANIA

TESTED BY	Walter R. Lienhi	ETL REPORT	5-6167-5
CHECKED BY	C. J. Cosignore	AERO NAV SALES ORDER	5-6167
APPROVED BY	Floyd L. Jensen	CUSTOMER P.O.	383864-3
DATE	17 December 1975		
GOVERNMENT QAR	NONE		

21051

(UNCLASSIFIED)

ADMINISTRATIVE DATA

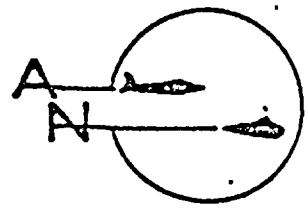
DATE
17 December 1975

PURPOSE OF TEST:	To determine the effects of seismic vibration on the physical and operational characteristics of the submitted specimen.
MANUFACTURER:	LIMITORQUE CORPORATION 181 S. Gulph Road King of Prussia, Pennsylvania 19406
MANUFACTURER TYPE AND SERIAL NUMBER:	Limitorque SMB-1-25/H4BC Position A 4 Train - 4 Gear Limit Switch See paragraph 2.0 for name plate data
DRAWINGS SPECIFICATIONS OR EXHIBIT:	Tested in accordance with IEEE-344 and detailed instructions of client.
QUANTITY OF ITEMS TESTED:	One (1) only
EQUIPMENT:	Unclassified
REPORT:	Unclassified
DATE TEST COMPLETED:	18 November 1975
TEST CONDUCTED BY:	AERO NAV LABORATORIES, INC. 14-29 112th STREET COLLEGE POINT, NEW YORK 11356
DISPOSITION OF SPECIMEN:	Returned to client
ABSTRACT:	It is the function of the Aero Nav Laboratories, Inc., as an impartial testing agency in performing this test, to subject the specimen to seismic vibration of magnitude and direction as specified in the detailed specifications.

210.71

(UNCLASSIFIED)

FACTUAL DATA



1.0 DESCRIPTION OF TEST APPARATUS:

1.1 Vibration Machine & Control System, Type RVH-72-5000, Serial No. 51402, manufactured by L.A.B. Corporation. Calibration Due: 5 March 1976

1.2 Accelerometers, Model 2213E, Serial Nos. CP36, CP37, CP48, LA57 and CP43, manufactured by Endevco Corporation. Calibration Due: 18 January 1976.

1.3 Amplifier, Model 2616, Serial No. CA13, manufactured by Endevco Corporation. Calibration Due: 18 January 1976.

1.4 Power Supply, Model 2622, Serial No. CA24, manufactured by Endevco Corporation. Calibration Due: 18 January 1976.

1.5 Band Pass Filter, Model No. 330M, Serial No. 2116, manufactured by Krohn-Hite Corporation. Calibration Due: 26 February 1976.

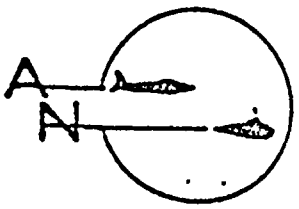
1.6 True R.M.S. VTVM, Model 320A, Serial No. 8622, manufactured by Ballantine Labs. Calibration Due: 29 February 1976.

2.0 NAME PLATE DATA:

SMB-1 S/N 216677 , Order No. 383964E

Motor - Reliance
25 ft pounds
ID # 447015-AZ

H4BC - S/N 216691
Order No. 383964E, Position A



3.0 METHOD OF TEST:

The submitted specimen mounted on a baseplate supplied by Limitorque Corporation was affixed to the table of the seismic simulator in such a manner that the axis of the H4BC stem nut was vertical. Five (5) accelerometers were used to monitor resonant conditions of the actuator.

During the test the actuator was electrically connected to a control console supplied by Limitorque.

3.1 Resonant Frequency Search:

The specimen was subjected to a resonant frequency search from 5 to 33 Hz. The applied excitation levels were in accordance with Table I. The frequency range was increased in discrete steps of 1 Hz and vibration was maintained at each frequency for a period of not less than six (6) hours.

The above test was performed in each of the three (3) mutually perpendicular axis.

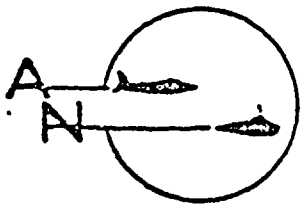
Table I - Amplitudes of Vibration

Frequency (Hz)	Acceleration (G peak)
5 to 33	0.1 to 0.75

3.2 Seismic Dwell Test:

Upon completion of the resonant frequency search in all axes, the specimen was subjected to a seismic dwell test at each of the resonant frequencies noted during the resonant frequency search. If no resonant frequencies were noted the seismic dwell test was performed at 33 Hz.

The acceleration levels used for the dwell tests started at 3 g's and was increased in 1 "g" increments until either the specimen failed or the maximum level of the vibration machine was reached. This test was performed in each of the three (3) mutually perpendicular axes. During and after each dwell in each axis the specimen was operated.



4.0 RESULTS OF TEST (continued):

The following observations were noted and recorded during the above detailed test procedure:

4.1 Vertical Axis (Along the H4BC Stem):

Accelerometer Locations and Orientation:

Input - On baseplate - vertical

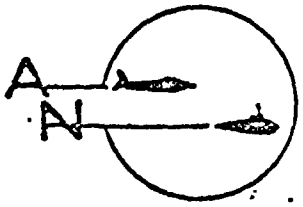
Outputs A - Table Input (H_2)

B - Table Input (H_1)

C - Unit Response (H_1)

D - Unit Response (V)

E - Unit Response (H_2)

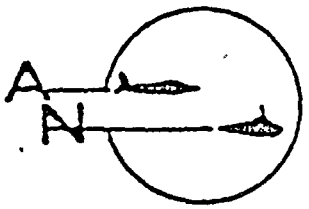


4.0 RESULTS OF TEST (continued):

4.1.1 Resonant Frequency Search:

Freq. (Hz)	Input (G's)	Outputs (G's) A	B	C	D	E
4	0.105	0.016	0.0135	0.013	0.115	0.011
5	0.125	0.016	0.011	0.013	0.150	0.008
6	0.185	0.014	0.014	0.015	0.220	0.0086
7	0.240	0.016	0.0155	0.0125	0.270	0.103
8	0.320	0.024	0.017	0.0145	0.370	0.011
9	0.380	0.020	0.0225	0.014	0.430	0.012
10	0.445	0.021	0.037	0.0165	0.485	0.012
11	0.550	0.027	0.051	0.017	0.590	0.0117
12	0.660	0.029	0.056	0.023	0.720	0.012
13	0.820	0.036	0.064	0.022	0.860	0.017
14	1.000	0.052	0.070	0.022	0.920	0.019
15	1.050	0.054	0.076	0.032	1.110	0.018
16	0.200	0.033	0.023	0.025	0.210	0.017
17	0.230	0.035	0.024	0.030	0.240	0.018
18	0.250	0.044	0.039	0.027	0.270	0.019
19	0.270	0.047	0.030	0.026	0.300	0.014
20	0.305	0.031	0.032	0.026	0.330	0.018
21	0.340	0.037	0.035	0.025	0.360	0.017
22	0.370	0.047	0.037	0.026	0.385	0.016
23	0.410	0.053	0.041	0.027	0.420	0.0147
24	0.440	0.054	0.046	0.027	0.470	0.0145
25	0.480	0.052	0.0495	0.0315	0.510	0.016
26	0.530	0.057	0.0545	0.034	0.560	0.019
27	0.570	0.063	0.059	0.042	0.600	0.021
28	0.600	0.054	0.064	0.048	0.655	0.027
29	0.640	0.053	0.067	0.059	0.700	0.0345
30	0.680	0.047	0.072	0.092	0.760	0.062
31	0.730	0.054	0.078	0.068	0.810	0.042
32	0.790	0.050	0.085	0.068	0.890	0.041
33	0.850	0.047	0.093	0.084	1.000	0.057

210.51



4.0 RESULTS OF TEST (continued)

4.2 Horizontal Axis (H_1) Along the Motor:

Accelerometer Locations and Orientation:

Input - On baseplate (H_1)

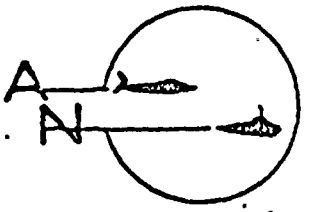
Outputs A - Table Input (H_2)

B - Table Input (V_1)

C - Unit Response (H_1)

D - Unit Response (H_2)

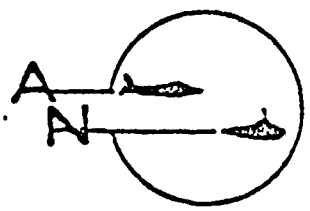
E - Unit Response (V)



4.0 RESULTS OF TEST (continued)

4.2.1 Resonant Frequency Search:

Freq. (Hz)	Input (G's)	Outputs (G's) A	B	C	D	E
4	0.087	0.038	0.0049	0.067	0.018	0.027
5	0.130	0.045	0.008	0.099	.0121	0.031
6	0.170	0.047	0.010	0.150	0.019	0.031
7	0.225	0.049	0.0135	0.220	0.023	0.027
8	0.280	0.051	0.014	0.280	0.026	0.030
9	0.345	0.051	0.016	0.360	0.030	0.033
10	0.420	0.047	0.021	0.430	0.028	0.040
11	0.520	0.044	0.025	0.540	0.025	0.047
12	0.620	0.044	0.029	0.660	0.027	0.052
13	0.760	0.050	0.036	0.770	0.049	0.061
14	0.850	0.053	0.042	0.890	0.066	0.066
15	0.980	0.066	0.053	1.100	0.087	0.087
16	0.190	0.070	0.0185	0.190	0.018	0.028
17	0.220	0.061	0.0195	0.220	0.017	0.031
18	0.230	0.059	0.022	0.240	0.0175	0.0355
19	0.250	0.060	0.025	0.270	0.0195	0.036
20	0.270	0.063	0.028	0.310	0.024	0.038
21	0.295	0.065	0.031	0.340	0.025	0.042
22	0.325	0.045	0.033	0.370	0.029	0.046
23	0.360	0.052	0.036	0.405	0.032	0.047
24	0.400	0.052	0.0395	0.440	0.036	0.056
25	0.425	0.050	0.042	0.475	0.039	0.051
26	0.470	0.040	0.046	0.520	0.042	0.060
27	0.510	0.039	0.050	0.540	0.045	0.063
28	0.550	0.041	0.054	0.620	0.050	0.06
29	0.590	0.046	0.058	0.640	0.061	0.077
30	0.535	0.047	0.063	0.730	0.073	0.105
31	0.680	0.047	0.067	0.780	0.077	0.083
32	0.720	0.044	0.072	0.820	0.086	0.083
33	0.821	0.045	0.082	0.940	0.105	0.096



4.0 RESULTS OF TEST (continued):

4.3 Horizontal Axis (H_2) Along the H4BC Input Shaft:

Accelerometer Locations and Orientation:

Input - On baseplate - in direction of vibration

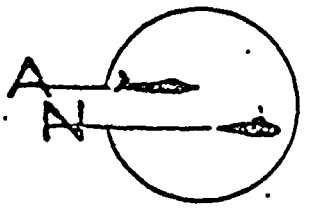
Outputs A - Table Input (H_1)

B - Table Input (V)

C - Unit Response(H_2)

D - Unit Response (H_1)

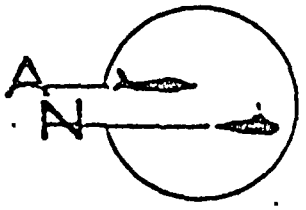
E - Unit Response (V)



4.0 RESULTS OF TEST (continued):

4.3.1 Resonant Frequency Search:

Freq. (Hz)	Input (G's)	Outputs (G') A	B	C	D	E
4	0.089	0.013	0.0185	0.076	0.024	0.027
5	0.115	0.016	0.0185	0.115	0.027	0.0245
6	0.165	0.0175	0.022	0.175	0.033	0.023
7	0.210	0.018	0.024	0.225	0.033	0.024
8	0.280	0.022	0.027	0.280	0.022	0.031
9	0.360	0.028	0.032	0.340	0.056	0.034
10	0.435	0.036	0.036	0.400	0.067	0.037
11	0.530	0.042	0.041	0.470	0.062	0.038
12	0.670	0.050	0.052	0.640	0.057	0.046
13	0.770	0.057	0.056	0.710	0.062	0.049
14	0.890	0.063	0.066	0.840	0.070	0.049
15	1.100	0.082	0.084	1.100	0.080	0.055
16	0.190	0.021	0.022	0.175	0.027	0.026
17	0.205	0.021	0.024	0.195	0.036	0.027
18	0.230	0.023	0.026	0.225	0.029	0.024
19	0.245	0.024	0.028	0.240	0.028	0.026
20	0.280	0.025	0.030	0.275	0.020	0.026
21	0.310	0.027	0.034	0.310	0.0165	0.031
22	0.340	0.031	0.037	0.335	0.0165	0.031
23	0.370	0.034	0.041	0.370	0.0195	0.037
24	0.395	0.035	0.043	0.400	0.018	0.0325
25	0.440	0.0385	0.047	0.440	0.017	0.033
26	0.461	0.041	0.049	0.470	0.0185	0.034
27	0.510	0.052	0.0445	0.520	0.018	0.0345
28	0.555	0.047	0.057	0.552	0.0205	0.037
29	0.600	0.051	0.061	0.590	0.024	0.040
30	0.630	0.056	0.066	0.630	0.038	0.051
31	0.700	0.060	0.071	0.700	0.027	0.042
32	0.750	0.065	0.075	0.750	0.029	0.036
33	0.790	0.068	0.079	0.790	0.043	0.039



4.0 RESULTS OF TEST (continued):

4.4 Seismic Dwell Test:

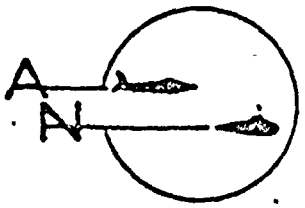
4.4.1 Vertical Axis (Along the H4BC Stem):

The Seismic Dwell Tests were performed at 33 Hz for a duration of thirty (30) seconds at each level.

The following observations were noted and recorded during the Dwell Tests:

			Response Acceleration			
Frequency (Hz)	Input (G's)	Motor (V)	Motor (H_a)	V	H_a	H_t
33	3.4	3.5 g's	0.150 g's	3.8 g's	0.29 g's	0.27 g's
33	4.7	4.9	0.230	5.2	0.38	0.37
33	5.9	6.5	0.330	6.6	0.43	0.46
33	7.3	8.0	0.480	8.2	0.55	0.59
33	8.4	9.4	0.570	9.6	0.62	0.70

There was no evidence of operational malfunction or mechanical damage to the specimen as a result of this test.



4.0 RESULTS OF TEST (continued):

4.4 Seismic Dwell Tests (continued):

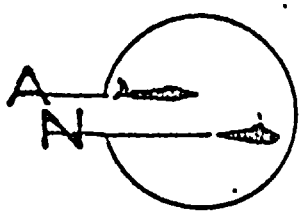
4.4.2 Horizontal Axis (H_1) Along the Motor:

The Seismic Dwell Tests were performed at 33 Hz for a duration of thirty (30) seconds at each level.

The following observations were noted and recorded during the Dwell Tests.

Frequency (Hz)	Input (G's)	Response Acceleration Motor (H_1)	Motor (V)	H_1	H_2	V
33	3.0	3.5 g's	0.010 g's	3.5 g's	0.34 g's	0.08 g's
33	4.1	4.9	0.170	4.8	0.70	0.29
33	5.5	6.3	0.220	6.1	0.82	0.31
33	6.8	7.6	0.330	7.5	0.92	0.45
33	8.0	8.9	0.310	8.9	1.10	0.43

There was no evidence of operational malfunction or mechanical damage to the specimen as a result of this test.



4.0 RESULTS OF TEST (continued):

4.4 Seismic Dwell Tests (continued):

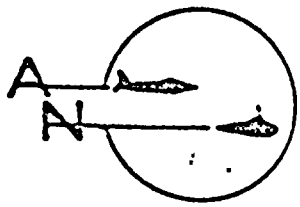
4.4.3 Horizontal Axis (H_2) Along the H4Bc Input Shaft):

The Seismic Dwell Tests were performed at 33 Hz for a duration of thirty (30) seconds at each level.

The following observations were noted and recorded during the Dwell Tests:

Frequency (Hz)	Input (G's)	Response Acceleration Motor (H_2)	Motor (V)	H_2	H_1	V
33	2.8	3.1 g's	0.045 g's	2.8 g's	0.048 g's	0.036 g's
33	3.8	4.3	0.065	4.1	0.065	0.065
33	4.9	5.6	0.078	5.2	0.120	0.130
33	6.2	7.0	0.220	6.4	0.230	0.290
33	7.9	9.0	0.150	8.5	0.290	0.420

There was no evidence of operational malfunction or mechanical damage to the specimen as a result of this test.



5.0 VISUAL POST TEST EXAMINATION:

Visual Post Test Examination revealed no evidence of any external physical damage as a result of the stress of this test.

6.0 RECOMMENDATIONS:

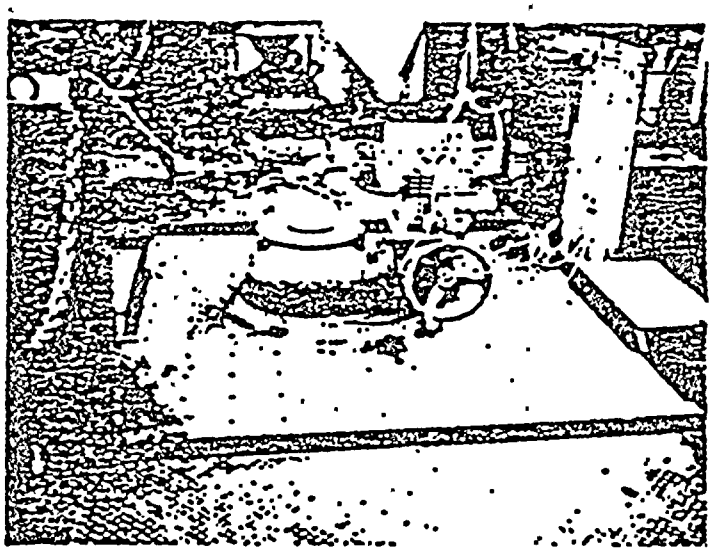
None, data merely submitted.

7.0 CONCLUSIONS:

Final evaluation of the submitted specimen for conformance to the requirements of the detailed specifications will be accomplished by Limitorque Corporation upon review of results reported herein and further examination as required.

210.51

SMB-1-25/H4BC MOTOR ACTUATOR



SEISMIC TEST SETUP

210, 51

REPORT B-0006

SUBJECT: Seismic Testing of SMB-1-25/H4BC with Standard Cast Iron Adapter

REFERENCE: Limitorque Purchase Order #
Aero Nav Test Report: 5-6167-5

Unit Idenfication:

SMB-1-24/H4BC Position "A"
4-Train-4 Gear Limit Switch

SMB-1	Serial Number	216677
Motor	I.D. Number	447015-AZ
H4BC	Serial Number	216691

Objective: To perform a fragility test per IEEE-344 on the SMB-1-25/H4BC with standard cast iron adapter.

210, 71

Procedure: The SMB-1 was mounted to the H4BC using a standard cast iron adapter. The combination was then scanned in each of the three major axis and the fragility test performed in one axis.

A new cast adapter was installed after the first fragility test and the fragility test repeated in another axis.

After the 2nd fragility test the cast adaptor was replaced with aa new cast iron adapter and the 3rd fragility test was performed in the 3rd axis.

The new adapters were used for each axis even though there was no evidence of damage to any of the adapters during the seismic fragility testing.

All rotors were monitored by means of indicator lights.

Additional contacts on the spare rotors were wired in series with a sensitive chatter circuit to detect contact chatter.

The unit was run from an "open" position (controlled by the limit switch) to a closed torque out position (controlled by the torque switch) back to the "open" position duirng and after each of the dwells and at the end of the seismic qualification.

The torque switch was set at the minimum setting and the H4BC was torqued out against the internal stops.

2105/

Results: The unit functioned properly performing all control functions and all indicating functions. There was no indication of contact chatter or physical damage.

Conclusion: The unit performed all functions and torqued out at the minimum torque switch setting with no malfunctions or physical damage during all the dwells and at the end of the seismic qualification test. The unit is considered qualified per the IEEE Standard 344 specification for seismic levels up to 8 g's.

Shearon Harris Nuclear Power Plant
Draft SER Open Item No. 354
NRC Question 210.52

(Valve) Requirements of Specification 16.1g

The Specification CAR-SH-M-44, Rev. 13, dated 1/28/83 states that Category 2 and 3 valves shall be capable of sustaining several types of thermal transients. Describe the data furnished by the Seller to assure that Category 2 or 3 butterfly valves meet 16.1g of the Specification.

RESPONSE:

Item 1 & 2 of paragraph 16.1g is a general design requirement for design specification prepared by Ebasco for valves. The requirements are not considered applicable to butterfly valves and, therefore, paragraph 16.1g (Item 1 & 2) will be deleted from specification (CAR-SH-M-44, Rev. 14).

However, discussion with Jamesbury (valve supplier) indicated that Category 2 and 3 butterfly valves can easily withstand heating and cooling of 100°F/hr between 40°F and the valve design temperature. The maximum design temperature of supplied valves are 140°F and 220°F.

Q - 210.52

16.1 SPECIAL REQUIREMENTS (Cont'd)

d - Valve trim shall not contain copper or copper alloy components, aluminum or aluminum alloy components.

e - Teflon or other nonmetallic sealing whose properties are affected by radiation shall not be used in the construction of any valves installed in radioactive service.

f - Valves shall not contain pockets or other cavities where radioactive materials can accumulate.

g - All valves in Piping System Categories 1, 2 and 3 shall be designed per ASME B & P V Code Section III for cyclic duty as follows: R 14

Category 1 - Later on request

Category 2 and 3

Valves in piping Category 2 and 3 shall be capable of being heated and cooled at a rate of 100° F per hour between 40° F and the design temperature of the valve as defined in the Valve List. In addition valves shall be capable of sustaining cyclic thermal transients as follows:

1 - Valves shall be capable of sustaining without adverse effects, a step change in the temperature of the working fluid from 40° F to 400° F for 200 cycles during the design life of the valves.

2 - Valves shall be capable of sustaining without adverse effects, a step change in the temperature of the working fluid from 500° F to 40° F for 10 cycles during the design life of the valves.

h - The design life of all valves and accessories specified herein shall be 40 years.

Shearon Harris Nuclear Power Plant
Draft SER Open Item No. 354
NRC Question 210.53

Valve Report (JHA-77-99 dated 8/2/78) Pages 2 and 3

Pages 2 and 3 are missing; please supply these pages.

RESPONSE:

Page 2 and 3 are in fact the pages 1 and 2 of two pages of tabulation #28403, Rev. 2.

(7876FXTccc)

Shearon Harris Nuclear Power Plant
Draft SER Open Item No. 354
NRC Ouestion 210.54

Valve Report, Correspondence with Specification

The Report JHA-77-99 dated 8/2/78 does not use the same identifications used in the Specification CAR-SH-M-44, Rev. 13, dated 1/28/83. Furnish a cross-index between the Specification Category 2 or 3 valves and the Report. (It seems like there is at least one Category 3 valve in the Specification that is not covered by the Report.)

RESPONSE:

The cross-index between the Specification Category 2 or 3 valves and the Report is provided in the attached tables.

(7876FXTccc)

CROSS-INDEX

PONY 435082. QUESTION: 210.54

SPEC. DATA SH	VALVE SIZE	VALVE OPERATOR	SPEC IDENTIFICATION (VALVE TAG NO.)	PROJECT IDENTIFICATION	REPORT PAGE NO.
1/48	30"	Motor	3SW-B1SA-1,2 3SW-B2SB-1,2	30"-SMB00/7-1/2-H2BC	64
2/48	30"	Gear	3SW-B7SA-1,2 3SW-B9SB-1,2 3SW-B105SA-1,2 3SW-B106SB-1,2	30"-VGC-35	40
3/48	30"	Motor	3SW-B5SA-1,2 3SW-B6SB-1,2 3SW-B13SB-1,2 3SW-B14SSB-1,2	30"-SMB00/7-1/2 H2BC	40
4/48	14"	Gear	3SW-B25SA-1,2 3SW-B26SB-1,2	14"-VGC-8	25
5/48	14"	Gear	3SW-B21SA-1,2 3SW-B22SB-1,2 3SW-B23SB-1,2 3SW-B24SB-1,2 3SW-B103SA-1,2 3SW-B104SB-1,2	14"-VGC-8	25
6/48	8"	Motor	3SW-B45SA-1,2 3SW-B46SA-1,2 3SW-B47SA-1,2 3SW-B48SB-1,2	8" SMB00/5H1BC	46
6/48	8"	Motor	3SW-B49SA-1,2 3SW-B50SB-1,2 3SW-B51SB-1,2 3SW-B52SB-1,2	8" SMB00/5H1BC	46

210.54

3537X

CROSS-INDEX

PONY 435082. QUESTION: 210.54

SPEC DATA SH	VALVE SIZE	VALVE OPERATOR	SPEC IDENTIFICATION (VALVE TAG NO.)	PROJECT IDENTIFICATION	REPORT PAGE NO.
7/48	24"	Gear	3SW-B17SA-1,2 3SW-B18SA-1,2 3SW-B19SA-1,2 3SW-B20SB-1,2	24" VGC-20	36
8/48	30"	Motor	3SW-B15SA-1,2 3SW-B16SB-1,2	30" SMB00/7-1/2H2BC	64
23/48	12"	Gear	3SW-B82SA-1,2 3SW-B83SA-1,2 3SW-B84SB-1,2 3SW-B85SB-1,2	12" VGC-8	18
25/48	6"	Motor	3SW-B74SA-1,2 3SW-B75SA-1,2 3SW-B76SB-1,2 3SW-B77SB-1,2	6" SMB000/2-HOBC	42
26/48	4"	Handle	3SW-B86SB-1,2 3SW-B87SA-1,2	4" Handle	14
27/48	8"	Gear	3SW-B66SA-1,2 3SW-B67SA-1,2 3SW-B68SB-1,2 3SW-B69SB-1,2 3SW-B107SA-1,2 3SW-B108SA-1,2 3SW-B109SB-1,2 3SW-B110SB-1,2	8" VGC-3	16

210.54

CROSS-INDEX

PONY 435082. QUESTION: 210.54

SPEC DATA SH	VALVE SIZE	VALVE OPERATOR	SPEC IDENTIFICATION (VALVE TAG NO.)	PROJECT IDENTIFICATION	REPORT PAGE NO.
28/48	8"	Motor	3SW-B70SA-1,2 3SW-B71SA-1,2 3SW-B72SB-1,2 3SW-B73SB-1,2	8" SMB00/5-H1BC	46
33/48	36"	Motor	3SW-B8SA-1,2	*Not included (Note: 1)	
36/48	8"	Gear	3SW-B301SA-1,2 3SW-B302SA-1,2 3SW-B304SB-1,2 3SW-B305SB-1,2	8" VGC-3	16
37/48	10"	Gear	3CH-B5SA-1,2 3CH-B6SB-1,2 3CX-B5SA-1,2 3CH-B6SA-1,2 3CX-B7SA-1,2 3CX-B8SB-1,2	*Not included (Note: 1)	
44/48	4"	Gear	3CH-B7SA-1,2 3CH-B8SA-1,2 3CH-B9SA-1,2 3CH-B10SA-1,2 3CH-B11SA-1,2 3CH-B12SA-1,2 3CH-B13SA-1,2 3CH-B14SB-1,2 3CH-B15SB-1,2 3CH-B16SB-1,2 3CH-B17SB-1,2 3CH-B18SB-1,2 3CH-B19SB-1,2 3CH-B20SB-1,2	Not included	

210.54

CROSS-INDEX

PONY 435082. QUESTION: 210.54

SPEC DATA SH	VALVE SIZE	VALVE OPERATOR	SPEC IDENTIFICATION (VALVE TAG NO.)	PROJECT IDENTIFICATION	REPORT PAGE NO.
			3CX-B9SA-1,2 3CX-B10SA-1,2 3CX-B11SA-1,2 3CX-B12SA-1,2 3CX-B13SA-1,2 3CX-B14SA-1,2 3CX-B15SA-1,2 3CX-B16SB-1,2 3CX-B17SB-1,2 3CX-B18SB-1,2 3CX-B19SB-1,2 3CX-B20SB-1,2		
42/48	4"	Gear	3CX-B21SB-1,2 3CX-B22SB-1,2	*Not included (Note: 1)	
1/7	16"	Gear	3SF-B6SB-1&4, 2&3 3SF-B20SA-1&4, 2&3 3SF-B18SB-1&4, 2&3 3SF-B1SA-1&4, 2&3 3SF-B2SB-1&4, 2&3 3SF-B5SA-1&4, 2&3	VGC-8	29
2/7 3/7	12"	Gear	3SF-B3SA-1&4, 2&3 3SF-B4SB-1&4, 2&3 3SF-B7SA-1&4, 2&3 3SF-B8SB-1&$, 2&3 3SF-B11SN-1&4, 2&3 3SF-B16SN-1&4, 2&3 3SF-B17SA-1,2 3SF-B17SB-3,4	VGC-8	18

*Note (1): These valves (indicate *) were added to the subject contract (PONY 435082) after Report JHA-77-99 was submitted. Report will be revised to include all added valves.

CROSS-INDEX

PONY 435082. QUESTION: 210.54

SPEC DATA SH	VALVE SIZE	VALVE OPERATOR	SPEC IDENTIFICATION (VALVE TAG NO.)	PROJECT IDENTIFICATION	REPORT PAGE NO.
			3SF-B21SB-1&4, 2&3 3SF-B22SA-1&4, 2&3 3SF-B24SB-1&4, 2&3 3SF-B25SB-1&4, 2&3 3SF-B26SA-1&4, 2&3 3SF-B28SA-1&4, 2&3 3SF-B29SA-1&4, 2&3 3SF-B30SB-1&4, 2&3		
4/7	4"	Handle	3SF-B31SN-1&4, 2&3 3SF-B32SA-1&4, 2&3 3SF-B33SB-1&4, 2&3 3SF-B34SA-1&4, 2&3 3SF-B35SB-1&4, 2&3	Handle	14
7/7	12"	Gear	3SF-B9SA-1&4, 2&3 3SF-B10SB-1&4, 2&3 3SF-B15SB-1&4, 2&3 3SF-B19SA-1&4, 2&3	VGC-8	18

210.54

Shearon Harris Nuclear Power Plant
Draft SER Open Item No. 354
NRC Question 210.55

Valve Report Dimensional Input

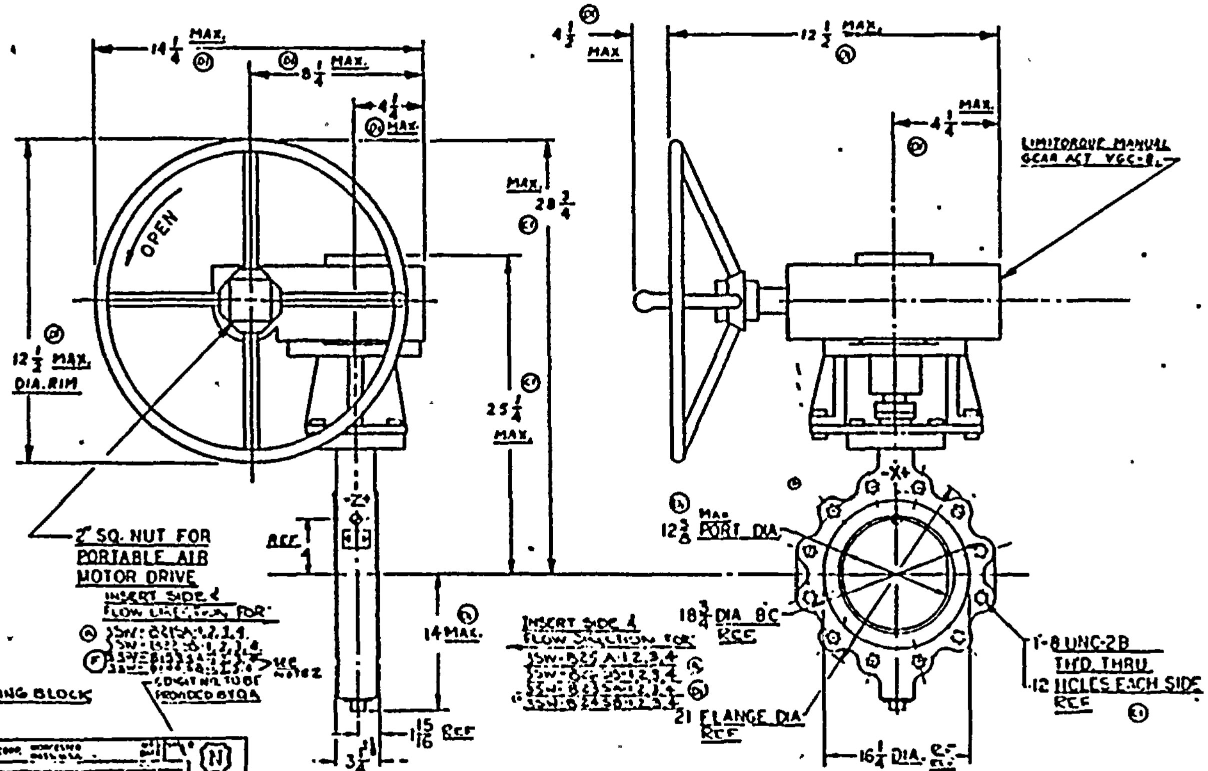
The procedure in Report JHA-77-99 dated 8/2/78 is incomprehensible without drawings of the valves. Furnish drawings for the valve identification on Butterfly Valve Data Sheet 5 of 48, P. O. No. NY-435082. The drawings should be in sufficient detail so that we can check the dimensions used in the calculations in the Report for this specific valve.

RESPONSE:

Please find attached copies of valve drawings on Valve Data Sheet 5 of 48. These are the drawings furnished by Jamesbury to Ebasco. Jamesbury do not release detail (shop) drawings of their product other than to an independent engineering consultant for analysis work. However, if a specific dimension or group can be identified for a given part we can more easily comply with your request.

(7876FXTccc)

210.55



APPROXIMATE WT. 265#

Ⓖ DENOTES C-G OF UNIT

NOTE:

1. THIS OUTLINE DRAWING IS PICTORIALLY SYMBOLIC OF THE PRODUCT TO BE SUPPLIED. ITEMS SUCH AS, BUT NOT LIMITED TO, HANDWHEEL SPOKES OR LINKAGE CONFIGURATIONS MAY OR MAY NOT REFLECT THE ACTUAL APPEARANCE OF THE VALVE. THE DIMENSIONAL DATA PRESENTED HEREON WILL NOT CHANGE.

2. 3SW-8103 SA-1,2,3,4 & 3SW-8104 SB-1,2,3,4 ARE TO BE INSTALLED UPSIDE DOWN.

SEE TAGGING BLOCK ABOVE.

ALL DATA TO BE STAMPED ON NAMEPLATES MUST BE 3/32 MIN. HEIGHT.

SEE TAGGING BLOCK ABOVE

6 DIGIT NO. TO BE PROVIDED BY QA

NUCLEAR
ASME SECT. III
EDITION 1974
ADDENDA
CLASS 3

SHEARON HARRIS PROJECT CAR 4374

CUSTOMER EBASCO SERVICES AGENT FOR CAROLINA POWER & LIGHT CO.

EBASCO ITEMS 4 & 5

P O NO NY 435082 JOB NO ND-28404

ITEM 4 QTY. OF 8
ITEM 5 QTY. OF 24
TOTAL QTY. OF 32

DO NOT SCALE DRAWING

THIS DRAWING AND ALL INFORMATION CONTAINED HEREIN ARE THE PROPERTY OF THE JAMESBURY CORP. AND ARE NOT TO BE USED EXCEPT AS AUTHORIZED BY SAID CORP.

TITLE 14" WAFER SPHERE VALVE NUCLEAR CL3 150# ANSI FLANGED, VGC-8 MANUAL GEAR ACTUATOR

jamesbury corp.

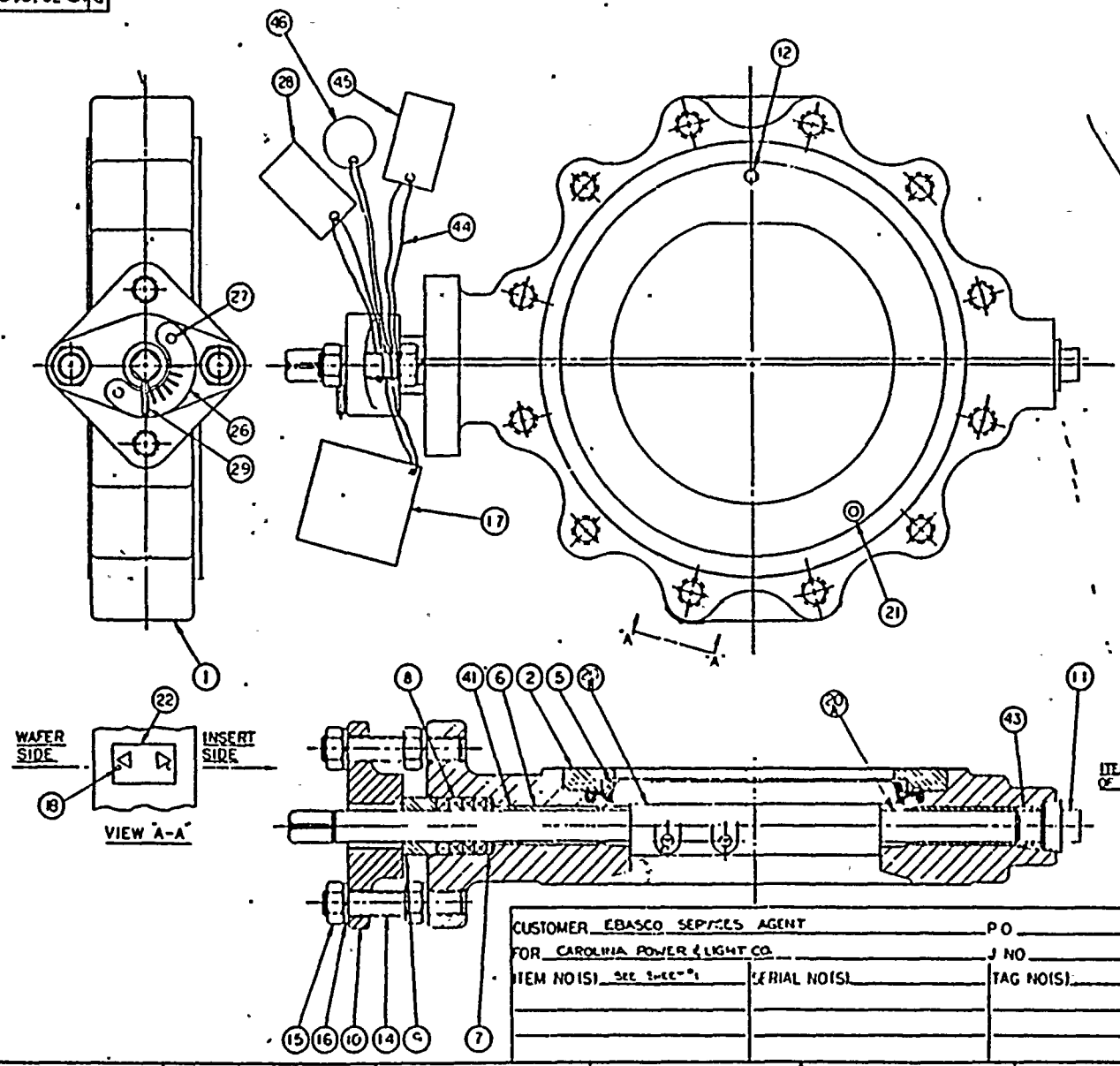
D ND-28404-06

SH 1 OF 2

QTY.	EBASCO ITEM	TAG NOS.
8	4	3SW-B3SSA-1,2,3,4; 3SW-B4SB-1,2,3,4
24	5	[illegible]

2/6 JT

210.55



★ PRESSURE RETAINING PARTS AS DEFINED BY ASME CODE MUST BE PROCESSED FOR NUCLEAR Q A PROGRAM.

ITEM	PART NAME	QTY	MATERIAL
1	BODY ★	1	ASME SA-216, WCB
2	INSERT	1	ASTM A-36, CARBON STEEL
5	SEAT	1	FILLED TEFLON
6	SHAFT BEARING	2	316 TEFLON
7	SPACER	1	ST STL AISI 300 SERIES
8	SHAFT SEAL	1	PTFE
9	COMPRESSION RING	1	ST ST'L AISI 300 SERIES
10	COMPRESSION PLATE	1	ASTM A-216, GRADE WCB
11	PRESSURE PLUG ★	1	ASME SA-1[illegible]
12	INSERT PIN	1	ST STL AISI 300 SERIES
14	STUD	2	ST. ST'L. AISI 300 SERIES
15	JAM NUT	4	ST. ST'L. AISI 300 SERIES
16	LOCKWASHER	4	CARBON STEEL, CAD. OR ZINC PLATED
17	NAMEPLATE	1	ST. ST L. AISI 300 SERIES
21	SOC HD CAP SCREW	12	ST. STL AISI 300 SERIES
26	INDICATOR PLATE	1	ST STL AISI 300 SERIES
27	DRIVE SCREW	2	ST STL AISI 300 SERIES
28	PATENT TAG	1	ALUMINUM
29	INDICATOR POINTER	1	CARBON STEEL
41	BEARING SPACER (TOP)	1	TEFLON
43	BEARING SPACER (BOT)	1	TEFLON
44	WIRE TIE	1	LEAD & ST ST'L
45	INSTALLATION TAG	1	TYVEK WEATHER RESISTANT PAPER
18	DRIVE SCREW	2	ST ST'L AISI 300 SERIES
22	FLOW DIR TAG	1	ALUMINUM
20	SHAFT & WAFER ½ ★		SEE BELOW
24	SHAFT	1	ASTM-A-564 - GRADE 630 H[illegible]
25	WAFER ★	1	ASME SA[illegible]
30	TAPER PIN	2	ASTM-A 564 - GRADE 630 H[illegible]
46	CUSTOMER'S TAG	1	ST. ST'L. AISI 300 SERIES

ITEM 20 CONSISTS OF THESE PARTS

CUSTOMER EBASCO SERVICES AGENT PO

FOR CAROLINA POWER & LIGHT CO. J NO

ITEM NO(S) See Sheet 1 SERIAL NO(S) TAG NO(S)

NUCLEAR ASME SECT. III

WAFER SPRING VALVE

SIZE 14 MODEL A

150 ANSI

D 10-2040401

Shearon Harris Nuclear Power Plant
Draft SER Open Item No. 354
NRC Ouestion 210.56

Valve Static Equivalent Loads

The Report JHA-77-99 dated 8/2/78 (Page 4) cites static equivalent loads and gives the source as "Ref. 1." Reference 1 (p. 98 of the Report) is: "Ebasco Spec., Addendum F, Rev. 5, 5-19-77." We do not find the cited loads therein. Is the Report incorrect? The Specification CAR-SH-M-44 (Rev. 13) (6.) gives static equivalent seismic loads, without definition as to whether Seismic is SSE or (1/2) SSE. Where did the writer of the Report obtain the static equivalent loads cited on p. 4 of the Report?

RESPONSE:

The Reference 1 listed in page 98 of the Seismic Report should be the Ebasco Specification CAR-SH-M-44; Addendum F is part of the specification.

CAR-SH-M-44 Paragraph 6 specifies the static seismic loads which the valves must be designed to withstand. The specified seismic loads are considered to be DBE (Design Basis Earthquake). Therefore, Seller's interpretation of static seismic loads cited on page 4 of the Report is correct.

(7876FXTccc)

Shearon Harris Nuclear Power Plant
Draft SER Open Item No. 354
NRC Ouestion 210.57

Valve Shaft, Allowable Stresses (p. 10 of Report JHA-77-99 dated 8/2/78)

(a) Where did the 95000 (psi?) yield strength for "Type 316 ST. STL." come from?

(b) Material to A-564 Type 630 is furnished with minimum specified yield strengths ranging from 75 ksi to 170 ksi, depending upon the hardening and/or aging treatment. Where does the Specification CAR-SH-M-44, Rev. 13 address this treatment so that the Report can use a yield strength of 125 ksi?

(c) Page 93 of the Report shows calculated shaft membrane plus bending stresses of up to 74000 psi. If failure of the shaft can lead to failure of the pressure boundary and if the calculated stresses are mainly due to pressure, the calculated stresses are deemed to be excessive. What are the calculated shaft stresses for the valve identified in Butterfly Valve Data Sheet 5 of 48, P. O. No. NY-435082 due to the Design Pressure of 225 psig? What are the allowable stresses for design conditions and where are they identified in the Specification?

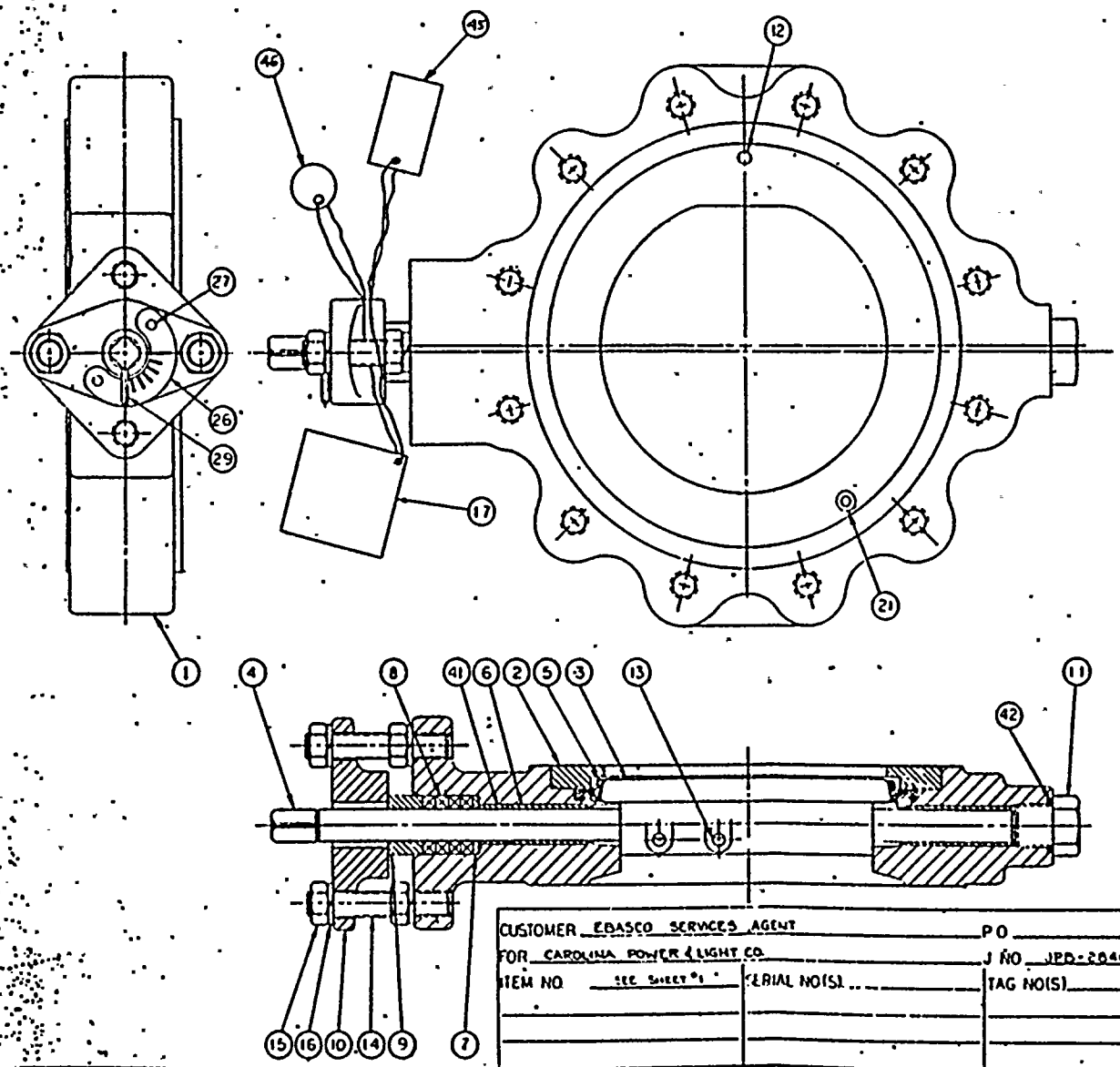
RESPONSE:

(a) The 316SS referenced is per 00-S-763 condition B which has a yield of 95000 psi. The shaft material was later changed to ASTM A-564 type 630 H1025. (See approved outline/assembly drawing). The yield is higher for A-564 than 00-S-763.

(b) The Specification does not specify detail requirements of all materials used to fabricate the valves. The Seller had selected A-564 Type 630 H1025 as the shaft material as indicated in the valve assembly drawings (sample attached). Therefore, the use of 125 ksi yield strength is appropriate per ASME material specification (A-564 type 630 H1025-Yield stress = 145,000 psi).

(c) The 14" valve with SMB-000/2HIBC Actuator was deleted from the contract and is not applicable. However, the stress shown is for a design pressure of 225 psig and qualifies shaft for the item on data sheet 5 of 48 with gear actuator. The valve shaft is not a pressure retaining part by ASME Section III Code and the actual allowable stress is per the AISC manual of steel construction or 0.9 x Sy of 145000 = 130500 psi, hence a 76% safety factor on allowable.

(7876FXTccc)



ITEM NO	PART NAME	QTY	MATERIAL
1	BODY	1	ASTM A-216 GRADE WCB
2	INSERT	1	ASTM A-36, CARBON STEEL
3	WAFER	1	ASTM A-351 CF8M
4	SHAFT	1	ASTM A 564, GRADE 630 H-1025
5	SEAT	1	FILLED TEFLON
6	SHAFT BEARING	2	FILAMENT WOUND FILLED TEFLON
7	SPACER	1	ST STL AISI 300 SERIES
8	SHAFT SEAL	4	J CRANE 187-2X
9	COMPRESSION RING	1	ST ST'L AISI 300 SERIES
10	COMPRESSION PLATE	1	ASTM A-216, GRADE WCB
11	PRESSURE PLUG	1	ASTM A-106 · GRIZLIS J. CORP.
12	INSERT PIN	1	ST ST'L AISI 300 SERIES
13	WEDGE PIN	2	ASTM A-564 GRADE 630 H-1025
14	STUD	2	CARBON STEEL CAD OR ZINC PLATED
15	JAM NUT	4	CARBON STEEL CAD OR ZINC PLATED
16	LOCKWASHER	4	CARBON STEEL CAD OR ZINC PLATED
17	NAMEPLATE	1	ALUMINUM
21	SOC HD CAP SCREW	16	ST. STL. AISI 300 SERIES
26	INDICATOR PLATE	1	ST ST'L AISI 300 SERIES
27	DRIVE SCREW	2	ST ST'L AISI 300 SERIES
29	INDICATOR POINTER	1	CARBON STEEL
41	BEARING SPACER	1	TEFLON
42	PLUG SEAL	1	TEFLON
45	INSTALLATION TAG	1	TYVEK WEATHER RESISTANT PAPER
46	CUSTOMER TAG	1	ST. STL. AISI 300 SERIES

210.57

CUSTOMER EBASCO SERVICES AGENT PO

FOR CAROLINA POWER & LIGHT CO. J NO JPD-28405

ITEM NO SEE SHEET #1 SERIAL NO(S) TAG NO(S)

ASSEMBLY — WAFER SPHERE VALVE FIG 8726TA-12 MODEL C 150# ANSI

jamesbury D R-28405-17

SEE SHT 1 OF 2

D R-28405-17

Shearon Harris Nuclear Power Plant
Draft SER Open Item No. 354
NRC Question 210.58

Valve Hydrostatic Tests

The Specification CAR-SH-M-44, Rev. 13 (8.2) gives hydrostatic test requirements for nuclear safety class valves.

(a) Does Section III require a hydrostatic (body) test of 1.5 times the design pressure? If not, what is your interpretation of the Code hydrostatic test requirements for butterfly valves?

(b) Specification 8.2a: Is the pressure rating of 100F the same as the Design Pressure? If not, what is the pressure rating of 100F? Provide a sample record of the performance of the seat tightness test.

RESPONSE:

(a) Yes, hydrostatic (body) test is required. Each valve shall be given a shell test at a gage pressure no less than 1.5 times the 100F rating, rounded off to the next higher 25 psi (1 bar) increment.

(b) Not necessarily. The design pressure and temperature must fall within the allowable pressure/temperature rating Tables of ANSI B16.5 or B16.34, whichever is applicable, if one adopts the use of the ANSI Class rating. Hence, since 225 psig at 40°F falls within the 150# ANSI Class standard, the hydro test should be (per ANSI 16.34 for SA 216 WCB) 285 psi @ 100°F x 1.5 427.5 psig and then upgrading to the nearest increment of 25 gives a test pressure of 450 psig.

Note: Sample record of seat tightness is attached.

(7876FXTccc)

uality Assurance Department
lomesbury Corp.
rcester, MA

211.58 NUCLEAR Quality Assurance Form

N.Q.A. Form No. 202
Date: 4/24/79
Rev. H Sht. 1 of 4

Title: Nuclear/Projects Products Quality Checklist

Q.A. Approval GPM 4.25.79

Jomesbury Order No. ND-28404 Valve Serial No. 12A Size 12"
Customer Tag No. 3SW-BB2-SA-1 Valve Assembly Drawing No. ND-28404-12 Rev. B/A

	Operation	Performed by	Date
1.	Clean wetted parts per JSN-C 2 Rev. 4	Oper. 1464	8-12-80
2.	Check that proper handling equipment is being used for pressure retaining parts.	Insp. AT	8-13-80
3.	Check for completeness of documentation package per Nuclear QA Manual, Sect. 6, para. 6.2	Insp. AT	8-13-80
4.	Check assembly drawing revision letter with Engineering Services (Blueprint Room)	Insp. AT	8-13-80
5.	Record revision letter of pressure retaining parts, and verify with Engineering Services.	Insp. AT	8-13-80
6.	Record pressure retaining part information. If incomplete call Q.A.E.		

Part Name	Part No.	Rev.	Qty	Heat Code/Serial #	Heat No.
W.S. BODY	548-9123-22	0	1	JYA 2	7189
WAFER	096-9114-36	0	1	JYF 5	6914
PRES. PLUG	045-9082-36	0	1	CYT 45	A16588

Identified 2

Insp. AT 8-13-80

7.	Check parts & materials against order	Assembler 1329	8-18-80
8.	Assemble complete per JSN A-2 Rev. 2 & B/P	Assembler 1329	8-18-80
		TW " 2360	8/18/80

REVIEWED BY
IRASCO ENGINEERING
IRASCO YQA REP.

FOR INFORMATION ONLY

NY 435082

36

Quality Assurance Department
Jamesbury Corp.
Worcester, MA

210.58 NUCLEAR Quality Assurance Form

N.Q.A. Form No. 202
Date: 4/24/79
Rev. H Sht. 2 of 4

FOR INFORMATION ONLY

Title: Nuclear/Projects Products Quality Checklist Valve Serial No. 12A

9. Hydrostatic/~~Pneumatic~~ Test per JSN T1 Rev. 8

Body

(1) Check that tester is on Qualified Valve Testers List. Q.A. Rep. [signature] 18AUG.80

(2) Check that nuclear pressure gages are used and are in calibration. Gage No. PGN-9
Test Pressure 425 psig
Time 10 min.
Leak Rate 0 Tester [signature] 8-18-80
Witnessed by: Q.A. Rep. [signature] 18AUG.80
All valves over 4" ANI [signature]
Customer N/R

10. Hydrostatic Test/~~Pneumatic~~ Test per JSN 125 Rev. 0

Wafer /~~Ball~~

(1) Check that tester is on Qualified Valve Testers List. Q.A.Rep. [signature] 28AUG.80

(2) Check that nuclear pressure gages are used and are in calibration. Gage No. PGN-12
Test Pressure 310 psig
Time 5 min./sec.
Leak Rate 0 Tester [signature] 8.28.80
Witnessed by: Q.A.Rep. [signature] 28AUG.80
All valves over 4" ANI N/R
Customer N/R

11. Assemble Topworks Assembler 2360 8-18-80

12. Hydrostatic/~~Pneumatic~~ Test per JSN 125 Rev. 0

Seat

(1) Check that tester is on Qualified Valve Testers List. Q.A.Rep. [signature] 28AUG.80

(2) Check that the pressure gage used is in calibration.
Gage No. PGN-12
Pressure 310 psig
Time 5 min./sec.. Tester [signature] 8.28.80
Leak rate 0 Q.A.Rep. [signature] 28AUG.80
Bidirectional NO Customer N/R

WITNESSED BY [signature]

BIASCO VQA REP. [signature]

NY 435082

Q 210.58

Rec'd by: TGT

App'd by: [signature]

JAMESBURY Corp.

JSN-T35

ENGINEERING SPECIFICATION

Eff. Date: 1/24/78

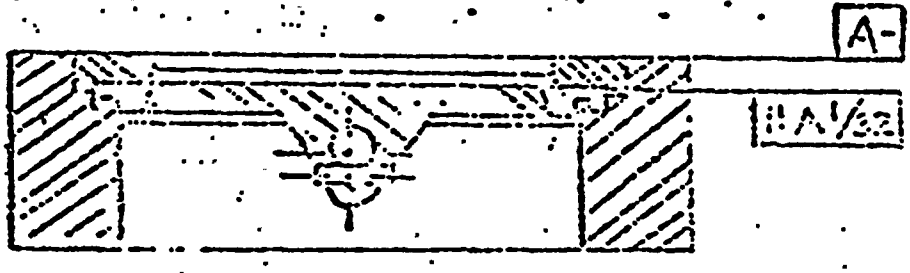
SUBJECT: Seat Testing and Disc Hydrostatic Testing - 5 minute duration

SCOPE: Wafer-Sphere Valves

REV.	DATE	APPR'L

1.0 GENERAL TESTING CONDITIONS

1.1 Each valve assembly will be given a seat, seal, and disc hydrostatic test. The valve actuating device (e.g., handle, actuator, electric or pneumatic actuator) to be used with the valve shall be installed and activated for valve opening and closing before conducting the test. Visually inspect the wafer (disc) for proper position. It should be level to within 1/32" from the body face.



Valves are to be clamped between blind flanges or pipe mating flanges using special gasket material provided. Center the holes carefully to prevent damage to the bolt holes and provide even gasket loading.

Inspect seat and valve cavity for possible contamination. There should be no visible particles, dirt, metal chips, or contamination. If contamination is found, the valve must be recleaned prior to testing.

1.4 Verification of the pointer and indicator plate is necessary to insure that the indicator pointer is over the 0° (closed position) mark on the indicator plate. When looking straight down, the pointer should cover the slot indicator line.

2.0 TEST PROCEDURE

2.1 After the valve has been hydrostatically tested, fully assembled with all applicable accessories, and with the insert properly compressed, the valve is to be stroked carefully from the fully closed to fully open position three (3) times to insure that the valve is properly

EBASCO SERVICES INCORPORATED

MATERIALS ENGINEERING AND PROCUREMENT QUALITY ASSURANCE

This Document:
- [x] Reviewed Without Comments
- [ ] Reviewed With Comments as Noted; Incorporate Comments and Distribute Revised Copies
- [ ] Rejected; Revise and Resubmit

NOTE: Review of this document, with or without comments, or approval conveyed with the applicable specification only and in no way relieves the engineering or contractor from any responsibility for delivery of the finished product, service and/or material in strict accordance with the Purchase Order.

BY: [signature]

DATE: 2/3/78

8310130282 830919
PDR ADOCK 05000400
PDR

2.0 CYCLE TEST (continued)

seated, and to demonstrate that the valve stroke can be accomplished without galling or binding.

2.2 For power-operated valves, switch settings and other accessories shall be verified to be in accordance with operating and design requirements.

3.0 SEAT AND DISC HYDROSTATIC TEST PROCEDURE

3.1 With valve in closed position, fill inlet side of the valve with water, assuring the removal of any entrapped air, and pressurize in accordance with Table I. Refer to the assembly drawing to establish the correct ANSI rating and shaft material. TABLE I

		HYDRO TEST PRESSURE +10%/-0%				
		ANSI RATING				
Size	Shaft Mat'l	150# Series			300# Series	
		8000	8100	8200, Mod C.	8100	8200
2" thru 12"	Steel 17-4 PH Nitrided	310 psig	310 psig	310 psig	310 psig	310 psig
	316	165 psig	310 psig	310 psig	310 psig	310 psig
14" thru 48"	Steel 17-4 PH Nitrided	310 psig	---	310 psig	---	---
	316	165 psig	---	165 psig	---	---

3.2 Inspect for seat leakage.

3.3 Acceptance/Rejection Criteria (Seat Test)

3.3.1 Resilient (non-metallic) seats - any visible indication of water leakage in a 5-minute time duration that the valve is subjected to the test pressure shall be cause for rejection.

3.3.2 Metallic seats - leakage rates in excess of that permitted below in a 5-minute time duration that the valve is subjected to the seat pressure shall be cause for rejection.

3.3 Acceptance/Rejection Criteria (Seat Test) - continued

Valve Size	Allowable leakage rate @ 310 psig Test Pressure
3"	35 ml/min
4"	60 ml/min
6"	60 ml/min
8"	75 ml/min

3.4 Depressurize and drain valve of water, and dry with dry and clean compressed air or dry nitrogen gas.

3.5 Acceptance/Rejection Criteria (Disc Hydrostatic Test)

3.5.1 Remove the valve from the test fixture and examine the disc. Any indications of deformation and/or cracking shall be cause for rejection.

4.0 TEST MEDIA

Clean tap water at a temperature not to exceed 120°F with 10% by volume of WB2527 rust inhibitor (White & Bagley Co., Worcester, Mass.) shall be used.

Shearon Harris Nuclear Power Plant
Draft SER Open Item No. 354
NRC Question 210.60

Piping Specification (CAR-SH-M-30, Rev. 16), Corrosion and Erosion Allowances

Where are corrosion/erosion allowances specified? If not specified, how are the requirements of NB/NC/ND-3640 evaluated?

RESPONSE:

The corrosion or erosion allowances for calculating the piping minimum wall thickness are currently not specified in the Ebasco Specification CAR-SH-M-30, General Power Piping.

However, an additional thickness to provide for corrosion or erosion was considered and is included in the wall thicknesses/schedules specified in the Ebasco Line List.

As stated in ASME-III, subsections NB/NC/ND-3640, the corrosion and erosion vary widely from installation to installation. While there are no code recommendations for a "specific corrosion/erosion thickness," allowances of 0.080" to 0.150" for carbon steel and 0.0025" for stainless steel materials is considered throughout the industry as an "adequate tolerance."

The pipe wall thicknesses/schedules specified on Shearon Harris Project are based on the equations specified in ASME-III, NB/NC/ND-3641.1. After considering the mill tolerances (12 1/2% for seamless pipes and 0.010" for the plate pipes), and additional thickness of 0.080" to 0.150" for CS pipes and 0.0025" for SS pipes is considered for corrosion/erosion.

It is noted that the corrosion/erosion allowance used on the Shearon Harris Project is not unique for each piping system, material grade, pipe size or water chemistry. Rather, a generic allowance (in the range of 0.080" to 0.150" for CS and 0.0025" for SS) is added to the calculated minimum wall. This is generally accomplished by selection of a commercially available wall thickness/schedule which exceeds the minimum calculated wall thickness by 0.080" to 0.150" (for CS pipes) or 0.0025" (for SS pipes).

We shall revise the M-30 specification to indicate that the wall thickness/schedule specified in the Ebasco Line List includes the tolerance for corrosion/erosion.

During the August 16, 1983, meeting with NRC in Bethesda, MD, a question has been raised regarding the "adequacy" of minimum pipe wall for the 48" Service Water lines (7SW48-312 and 7SW48-313).

Our further evaluation revealed the following:

- Min. wall calculation per Code equation assumes the weld joint efficiency equal to 1. This is justified by use of a plate pipe with 100% radiography (ASTM A-155 KC 65, Class 1).

(7876FXTccc)

NRC Question 210.60 (cont'd)

- Considering 0.140" corrosion/erosion allowance (the established range is 0.080" to 0.150") and 0.010" mill tolerance, the min. required wall is 0.371". The selected wall is 0.375".

We are enclosing a copy of our calculations pertaining to these Service Water Lines.

In general, the piping systems constructed from a carbon steel plate material, assume a weld joint efficiency equal to 1. This is based on the fact that the specified material specifications do require 100% radiograph examination. Refer to the individual pipe codes in Appendix A of Specification CAR-SH-M-30.

As stated above, the Ebasco specified pipe wall thicknesses do meet the Code requirements.

210.60

EBASCO SERVICES INCORPORATED

CALCULATION COVER SHEET

Sheet 1 of 4

CLIENT CAROLINA POWER & LIGHT COMPANY — OFS NO. CAR-6418.333

SHEARON HARRIS NUCLEAR POWER PLANT

PROJECT 900,000 KW-UNITS 1, 2, 3 & 4 — DEPT NO. 5360-MNE

SUBJECT SERVICE WATER PIPE WALL THICKNESS

CALCULATION NO. SW17 Supplement NUMBER OF SHEETS 4

PROBLEM

Verify adequacy of the wall thickness specified for large diameter plate pipe, safety & non-safety, used in the service water system.

REV NO	SH NOS	CALCULATION BY NAME	DATE	CHECKED BY NAME	DATE	OPTIONAL	REVIEWED OR APPROVED BY NAME	DATE
0	4	F Heyden	8/18/82	A Ward	8/19/82			

PRELIMINARY ☐ FINAL ☒ SUPERSEDES CALC NO. ____

EBASCO SERVICES INCORPORATED

BY F HEYDEN DATE 8/18/83 — 11.60 — SHEET 2 OF 4

CHKD. BY [illegible] DATE 8/19/83 — OFS NO. CAR 6418.555 DEPT. NO. 550

CLIENT CP&L

PROJECT SHNPP

SUBJECT CALC No SW17 Supplement — SW's PIPE WALL THICKNESS

CRITERIA

3/8" WALL THICKNESS IS SPECIFIED FOR ALL LARGE DIAMETER PIPING (30" O.D. & LARGER) IN THE SERVICE WATER SYSTEM (SSW). THIS CALCULATION EXAMINES THE LARGEST O.D. SPECIFIED FOR THIS SERVICE (48" O.D.) TO VERIFY THE ADEQUACY OF ALL LARGE DIAMETER PIPING. THE MATERIAL SPECIFICATION IS ASTM A155 KC 65 CLASS I AND THEREFORE THE LONGITUDINAL WELD JOINT EFFICIENCY IS 100%.

REFERENCES

1) PIPING LINE LIST (DWG No CAR 1364-E070) Rev 15
2) CALC No SW-17 — WALL THICKNESS SW SYSTEM
3) CODES & STANDARDS
   ANSI B31.1 — DATE OF ISSUE: 6/15/73 — FOR NON SAFETY PIPING
   ASME III — DATE OF ISSUE: 7/1/71 ADDENDA THRU 6/30/73 — FOR SAFETY CLASS PIPING
4) MEMO TO F HEYDEN (MECH) FROM C McCAUL (CONSTR.) DATED 8/18/83: SHEET 4 ATTACHED.

SUMMARY OF RESULTS

RESULTS SHOW SPECIFIED WALL IS ADEQUATE FOR ALL THE LARGE DIAMETER PIPING.

SYSTEM SERVICE WATER LINE DESIGNATION NO. SW 710.66

P - DESIGN PRESSURE, PSIG	REF 1	150			
T - DESIGN TEMPERATURE, F	REF 1	140			
PIPE SPECIFICATION & GRADE	REF 1	A155 KC65 CLASS I (WELD JOINT EFFICIENCY = 1.0)			
SE - ALLOWABLE STRESS, PSI **	REF 3	16200			
D - OUTSIDE DIAMETER OF PIPE, IN.	REF 1	48	(LARGEST PIPE O.D. USED @ P/T EQUIP.)		
C - ALLOWANCE FOR MINIMUM STRUCTURAL STABILITY *		0			
y - COEFFICIENT ***		0.4			
t_m - MINIMUM PIPE WALL THICKNESS, IN. (See NOTE 2)		0.221 + A			
t_n - NOMINAL WALL THICKNESS, IN. (See NOTE 3)		0.231 + A = 0.371			
t_s - FIRST STANDARD SCHEDULE THICKNESS EQUAL TO OR GREATER THAN t_n		0.375			
SCHEDULE (CORRESPONDING TO t_s)		-			
~~SCHEDULE~~ WALL THICKNESS SELECTED		0.375			
ID - INSIDE DIAMETER OF PIPE, IN. (See NOTE 1)					
C - ALLOWANCE FOR MINIMUM STRUCTURAL STABILITY *					
y - COEFFICIENT ***.					
t_m - MINIMUM PIPE WALL THICKNESS, IN. (See NOTE 2)					
t_n - NOMINAL WALL THICKNESS, IN. (See NOTE 3)					
t_s - FIRST STANDARD SCHEDULE THICKNESS EQUAL TO OR GREATER THAN t_n					
SCHEDULE (CORRESPONDING TO t_s)					
SCHEDULE SELECTED					

Use either of the following equations to determine t_m:

BASED ON OUTSIDE DIAMETER

$$t_m = \frac{P \times D}{2(SE + Py)} + C + A$$

BASED ON INSIDE DIAMETER (See NOTE 1)

$$t_m = \frac{P \times ID + 2SEC + 2yPC}{2(SE + Py - P)} + B$$

A = CORROSION ALLOWANCE = 0.140 (REF. 4)

* – C = Allowance for minimum structural stability
= 0.065" for 1/2 to 3-1/2 inch nominal pipe size
= 0.000 for 4 inch nominal pipe size and larger

** – SE = Maximum allowable stress in material due to internal pressure and joint efficiency, at the design temperature, psi.

B = .038" for pipe ordered to specified machined I.D. with tapered backing ring and extruded pipe specified by I.D. with tapered backing ring.
= .000" for the above pipe with flat backing ring or other types of pipe with any Design Guide M-4 backing ring.

*** – y = A coefficient having values as follows: (See NOTE 4)

TEMP. F	900 AND BELOW	950	1000	1050	1100	1150 AND ABOVE
Ferritic Steels	0.4	0.5	0.7	0.7	0.7	0.7
Austenitic Steels	0.4	0.4	0.4	0.4	0.5	0.7

NOTE 1 - Use maximum possible inside diameter with all its tolerances on wall thickness and outside diameters, except for pipe ordered to specified machined I.D. and extruded pipe specified by I.D. where note 8, paragraph 4, of Design Guide MNE-65 governs.

NOTE 2 - The pipe wall thickness required for a given pressure-temperature condition increases as pipe size increases.

NOTE 3 - For seamless pipe use $\frac{t_m}{0.875}$; for any size of plate pipe, add 0.010 inches to the calculated t_m to obtain t_n.

NOTE 4 - The value of "y" may be interpolated between 50 F values shown above. For nonferrous materials and cast iron use y = 0.4.

GENERAL NOTES: See Design Guide MNE-65 Pipe Line Sizing - for specific information.

CLIENT CP&L

STATION

PROJECT SHNPP

BY F HEYDEN (FOR ENGINEER) DATE 8/18/83

CHECKED A.B Hamrick DATE 8/19/83

APPROVED (SUPERVISOR) DATE

STANDARDIZED WORK SHEET
PIPE WALL THICKNESS AND SCHEDULE DETERMINATION

EBASCO SERVICES INCORPORATED
MECHANICAL-NUCLEAR ENGINEERING

WORK SHEET | MNE-WS-16

638-16/7-72

EBASCO Interoffice Correspondence

DATE August 18, 1983 FILE REF.

TO F. Heyden OFFICE LOCATION 87/2WTC

FROM C. McCaul C. McCaul OFFICE LOCATION 88/2WTC

SUBJECT SHEARON HARRIS
SERVICE WATER PIPING - CORROSION ALLOWANCE

I have reviewed the information you provided concerning water chemistry, and coatings to be provided for the subject piping.

Corrosion allowance depends on a number of factors including water chemistry, temperature, velocity, etc. In this case, calculation of corrosion allowance is complicated by the initial presence of a protective coating. I presume the coating will not be maintained, otherwise there would not be a need for any corrosion allowance. J. Firtel, Ebasco coatings expert, informed me that the specified coatings, Plasite 1000 primer and Plasite 7122 topcoat, could be expected to deteriorate 25% in five years.

There are a number of indices one may use to calculate, from water chemistry parameters, approximate corrosivity of a specific water. Based on the Langelier Index, the Shearon Harris service water is relatively corrosive. Corrosion rate for most soft (that is to say - corrosive) fresh waters falls in the range 0.002-0.006 in/yr. An average corrosion rate of 0.004 in/yr could reasonably be assumed for the Shearon Harris water. Based on a 40 year service life and deterioration of the initial coating as discussed above, about 0.140 inch average wall thickness loss could be expected over the life of the piping.

CMcC:jl

cc; J. Firtel

Shearon Harris Nuclear Power Plant
Draft SER Open item No. 354
NRC Ouestion 210.61

Piping Specification (CAR-SH-M-30, Rev. 16), Out-of-Roundness

In 12.01a and 12.02a, there is a requirement: "The degree of out-of-roundness shall be such that there will be no decrease in flexibility or increase in stress over the allowable stress for the design conditions."

(a) How is assurance obtained that this requirement is met?

(b) Is an increase in flexibility permitted?

(c) What is the "allowable stress for the design conditions"?

RESPONSE:

(a) The tolerances specified for bends in Paragraphs 12.01a and 12.02a in Part Two of Specification CAR-SH-M-30 are incorporated in Southwest's bending procedures and the bends furnished by Southwest are checked for compliance with the applicable procedure. The bending procedures which have been approved for use on the Shearon Harris Project are:

PROCEDURE NO.	REVISION	SUPPLEMENT
4-106	0	1
4-107	0	1
4-108	0	1
4-109	0	1

A copy of the above listed procedures is enclosed for your convenient reference.

(b) An increase in flexibility is not permitted.

(c) "The allowable stresses for the design conditions" are the stresses from ASME III, Appendix I for a specific pipe material grade and corresponding temperature specified in the Ebasco Line List.

Paragraphs 12.01a and 12.02a will be revised as follows:

"---- cross section without buckling or undue stretching of pipe wall. Out-of-roundness at pipe bends shall not exceed 6 percent ----."

In addition, Westinghouse will be advised about the 6% out-of-roundness allowed in Southwest Fabricating pipe bends.

210.61

ATTACHMENT