ULTRASONIC TESTING INSPECTION AND CORROSION ANALYSIS OF HULL AND MOORING CLUSTERS OF BATTLESHIP TEXAS (BB-35)

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1. ULTRASONIC TESTING INSPECTION

1.1 HULL INSPECTION

The hull of the Battleship TEXAS (BB-35) was inspected (ultrasonic testing (UT)) by an underwater industrial dive team (VEOLIA ENVIRONMENTAL SERVICES of New Orleans) in December, 2010. Hull thickness measurements were carried out at fifty five (55) stations along the hull plating on 10 ft. centers from bow to stern, at three vertical elevations for each station – Waterline, Mid-depth and Mudline. Measurements were carried out on both Port and Starboard sides for each depth and station location (see APPENDIX A for location of measurement stations).

APPENDIX B provides the measurements in tabular form with original plate thickness, current plate thickness measured, actual plate loss and percentage plate loss at the various depths and station locations, for both Port and Starboard sides. The percentage losses are shown graphically in Figure 1 and Figure 2 and indicate no obvious trend although a slight increase in percentage loss with increasing distance from the bow is seen in Figure 1. The maximum percentage losses are 84.57 % for Station 35 (Bottom measurement) for Portside, and 82.94 % for Station 15 (Waterline measurement) for Starboard side.

Figure 3 and Figure 4 show the "exceedance frequency" curves for the hull thickness percentage loss for Port and Starboard sides, respectively, where the percentage loss in hull thickness is plotted against the cumulative percentage of total number of readings taken during the inspection. Both figures indicate fairly similar patterns for all three measurement depths. For both Port and Starboard sides, approximately 50 % or more of the measurements indicate a percentage loss of 50 % for the hull thickness at all three measurement depths.

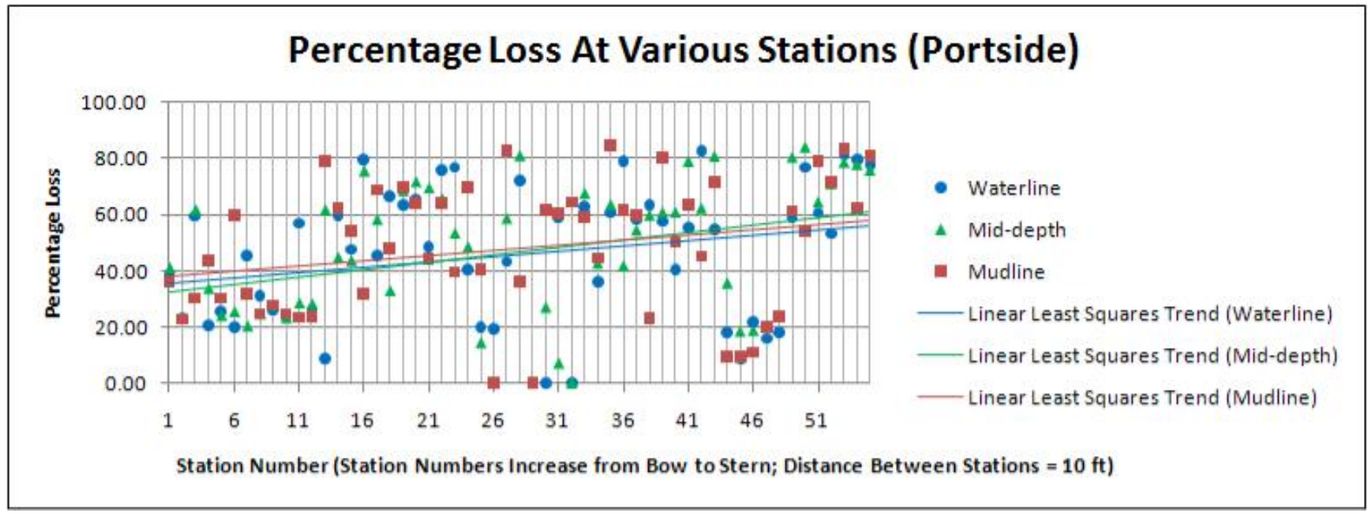

Figure 1 Percentage Loss of Hull Plating at Stations No. 1 Through Station No. 55 (PORT) (Linear Trend Lines for Measurements at Each Water Depth Are Also Shown)

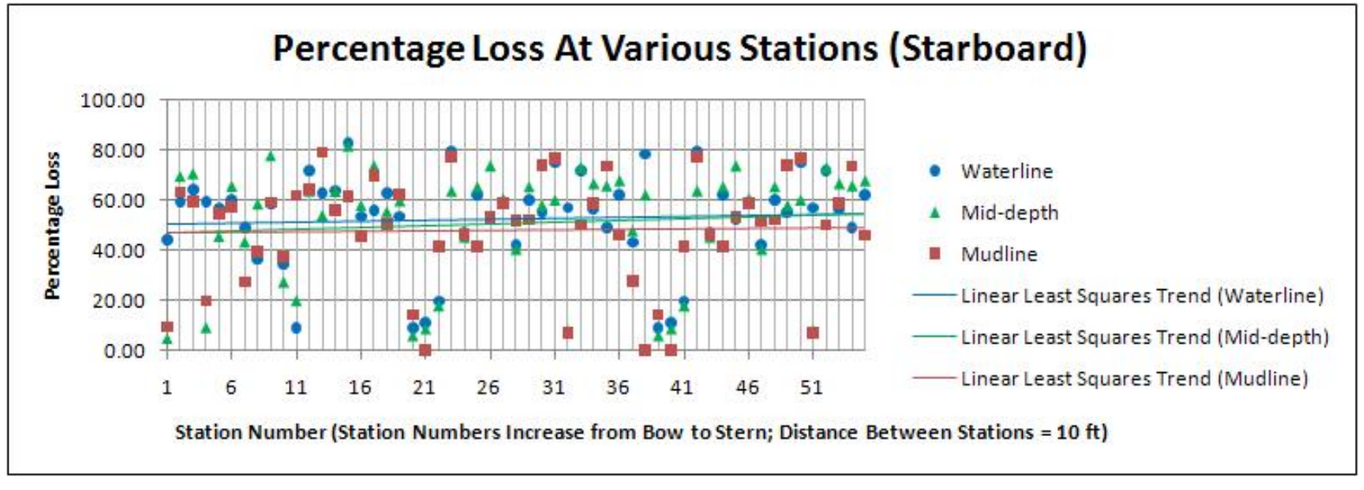

Figure 2 Percentage Loss of Hull Plating at Station No. 1 Through Station No. 55 (STARBOARD) (Linear Trend Lines for Measurements at Each Water Depth Are Also Shown)

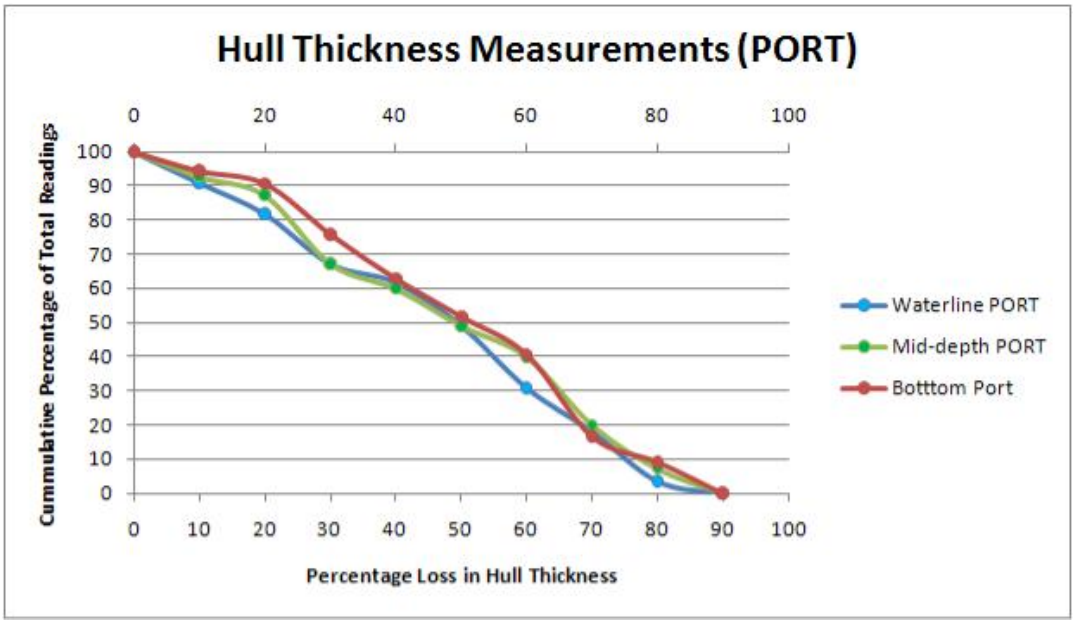

Figure 3 Exceedance Frequency Curve for Percentage Loss in Hull Thickness (PORT)

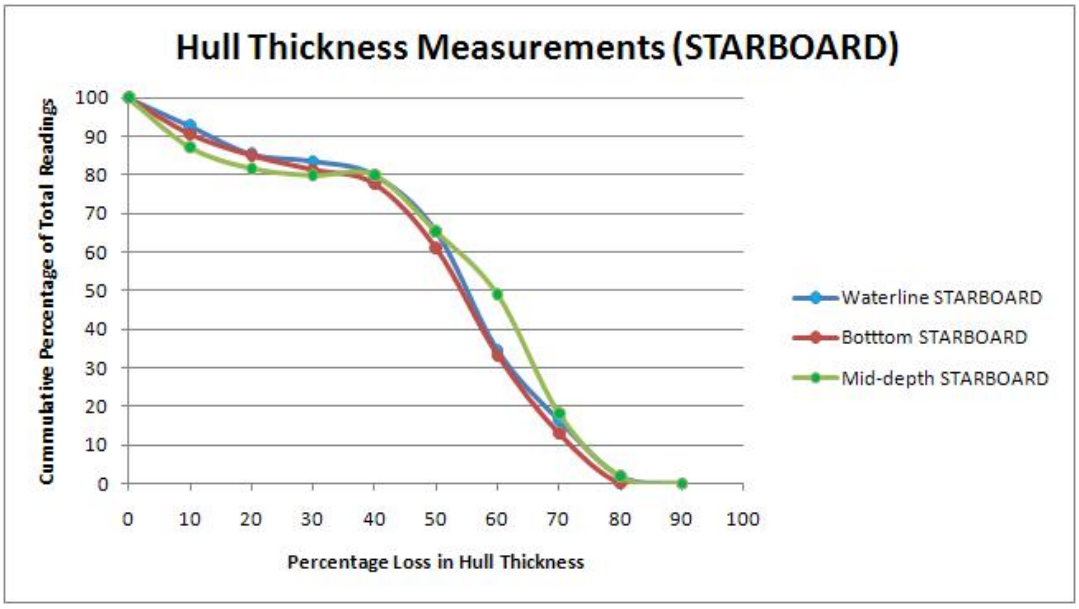

Figure 4 Exceedance Frequence Curve for Percentage Loss in Hull Thickness (STARBOARD)

These measurements confirm that the vessel's shell plate structure (for both blister tanks and the hull) is failing and is in need of urgent repair through dry docking, or in this case, a dry berthing solution.

1.2 MOORING CLUSTERS INSPECTION

The vessel's mooring clusters (Figure 5 and Figure 6) appeared to be in fine repair and have many years of service life remaining. Inspection by the dive team revealed no significant structural

problems with the cells down to the mud line.

Figure 5 Aft Pair of Mooring Clusters (Starboard Side)

Interior inspection of the four boxes revealed the structures to be in excellent condition. Likewise, the underwater inspection of the four piles showed uniform UT readings from waterline down to the mudline. UT readings of each cluster were taken at three vertical elevations (Waterline, Mid-depth and Mudline) and four compass orientations (N, S, E, W) relative to the slip orientation and are shown in Table 1.

Figure 6 Forward Pair of Mooring Clusters (Starboard Side)

Table 1 UT Readings (inches) of Forward and Aft Clusters ("N" signifies the channel side of the monopile. "E", "S" and "W" signify measurements through the compass rose on 90 degree clockwise increments from "N" measurement)

FORWARD MOORING CLUSTER								
	FORWARD MONOPILE				AFT MONOPILE			
	N	E	S	W	N	E	S	W
WATERLINE	1.540	1.501	1.495	1.543	1.475	1.505	1.487	1.550
MID-DEPTH	1.520	1.487	1.550	1.501	1.533	1.492	1.522	1.475
MUDLINE	1.555	1.490	1.500	1.473	1.465	1.500	1.480	1.477
AFT MOORING CLUSTER								
	FORWARD MONOPILE				AFT MONOPILE			
	N	E	S	W	N	E	S	W
WATERLINE	1.522	1.501	1.479	1.488	1.469	1.501	1.522	1.501
MID-DEPTH	1.500	1.467	1.490	1.499	1.500	1.500	1.467	1.480
MUDLINE	1.500	1.459	1.489	1.501	1.477	1.500	1.465	1.455

The mooring cluster piles appear to be in excellent structural condition with above-water weldments appearing in good condition.

2. CORROSION ANALYSIS

As part of the conducted survey on the Battleship TEXAS (BB-35), a corrosion investigation was undertaken to assess underwater steel corrosion rate resulting from electrolytic action. The investigation which was conducted on December 2nd, 2010 consisted of the following:

- Stations were spaced at approximately 40 ft. centers
- Readings were taken on the Port and Starboard sides of the ship at the waterline (Table 2)

- Equipment used was an M.C. Miller Silver Chloride half cell operating through a ceramic salt bridge and connected to a digital Fluke meter set to millivolt (mV) scale
- Ambient air temperature 55° F
- Water temperature 59 ^{o} F

An overview of corrosion as it relates to the mV scale is provided herein:

- Steel has a base voltage in an electrolyte of around 500 mV
- Depending on the alloy and/or purity of the steel, it can range from around 790 mV for mild steel with no coating or protection to well below 500 mV for stainless steel. The lower the number the more noble the metal, leading to less corrosion
- Steel is well protected if the readings are between 800 mV and 1,000 mV is possible to damage the metal by over protecting it. Steel is over protected at around 1,100 mV and at 1,200 mV, damage to coatings and the metal is quite likely. This is the case in the waters around the Battleship TEXAS (BB-35) (Table 2).

When measuring for corrosion, results that show wide differences in voltages from one part of the vessel to another in excess of 200 mV indicate possible stray current affecting the vessel or widely dissimilar metals being used in close proximity to each other. Either case requires immediate attention. The greater the discrepancy in readings, the faster the metal is being corroded and the sooner failure will occur. It should be recognized that other factors can influence the rate of plate corrosion, such as water current, salinity and chemical contamination in the water or in the vessel's bilge. These conditions were observed on the Battleship TEXAS (BB-35).

There are apparent "hot spots," and it appears that the ship is freely corroding in that a cathodic protection system has been installed, but which has issues regarding the settings from the rectifiers. The readings in the ‘on’ condition are too high and have probably burned away the steel protective coating system years ago. This system needs replacement if the decision is made to keep the ship in her current berth arrangement at the Battleship Basin. It is highly probable that the bottom coatings on the ship have failed and that there will likely be plate replacement prior to, or during, dry berthing. Additionally, rivet heads have demonstrably started to leak.

Table 2 Corrosion Meter Readings at 40 ft. Centers from Stem to Stern (mV; “*” represents a Deep Reading taken just above the Mudline). Cells highlighted in pink signify voltage measurements in excess of 1200 mV and denote likely damage to coatings and metals.

STEM	
1221.5	
1273.7*	
PORT	STARBOARD
962.1	821.1
1322.1	833.2
1235.5	1133.4
1444.5	1323.4
1245.8	1094.3
1431.2	987.4
1199.3	1462.1
1340.3	948.9
1258.1	1385.5
1164.4	955.5
1246.3	1374.1
937.6	1447.3
1511.5	1378.1
1448.7	1372.1
1422.2	1547.1
STERN	
1463.2	
1333.3*	

3. SUMMARY

- While there are no obvious trends for the variation of the plate loss along the vessel's length or depth, for both Port and Starboard sides, approximately 50 % or more of the UT measurements indicate a loss of 50 % for the hull thickness from the waterline down to the mudline.
- The vessel's shell plate structure (for both blister tanks and the hull) is failing and is in need of urgent repair prior to any movement of the vessel.
- The vessel's mooring clusters appeared to be in good condition and have many years of service life remaining. The UT inspection revealed no loss of thickness for the piles down to the mudline.
- A corrosion analysis of the vessel hull showed apparent "hot spots" and it appears that the ship is freely corroding in that a cathodic protection system has been installed, but which has issues regarding the settings from the rectifiers.
- The corrosion readings suggest that over-protection of the metal might have caused damage to the coatings and the metal, and that the bottom coatings on the ship have failed.

APPENDIX A

STATION ANNOTATION FOR ULTRASONIC TESTING MEASUREMENTS

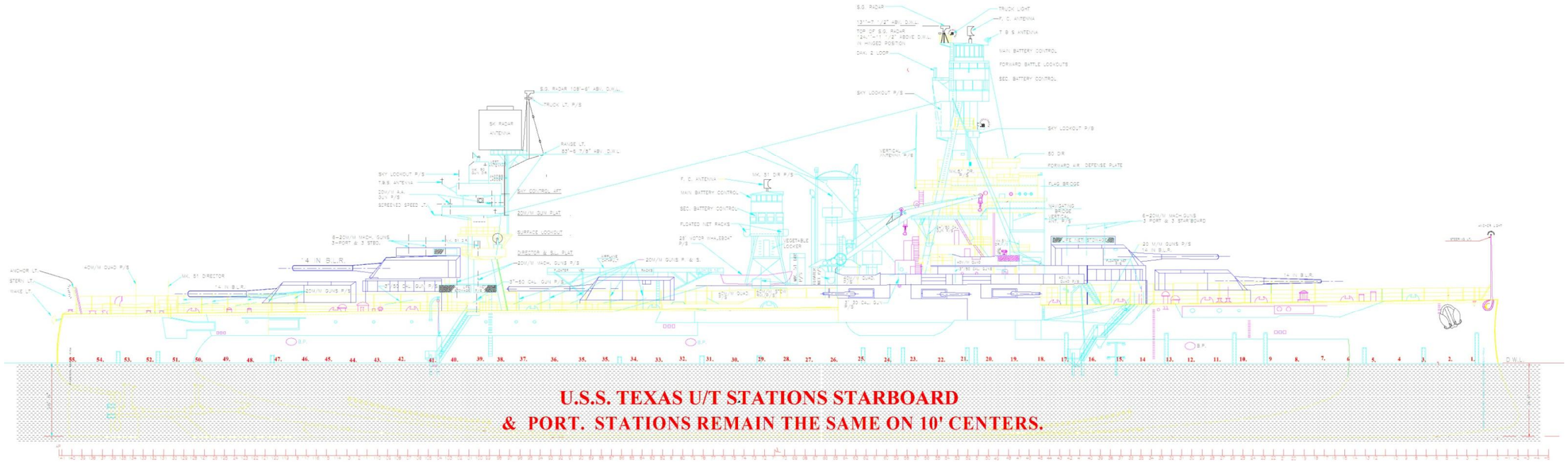

Figure A-1 Station Annotation for Ultrasonic Testing Measurements

APPENDIX B

ULTRASONIC TESTING MEASUREMENTS FOR HULL THICKNESS

Table B-1 Ultrasonic Testing Hull Thickness Measurements and Percentage Loss for PORT Side Stations (Station No. 1 – Station No. 20), "W" – Waterline, "M" – Mid-depth, "B" – Bottom/Mudline

Reading Number	Vertical Position	Original thickness (inches)	Current thickness (inches)	Loss (inches)	% loss	Reading Number	Vertical Position	Original thickness (inches)	Current thickness (inches)	Loss (inches)	% loss
STA.1	W	0.551	0.337	0.214	38.84%	STA. 11	W	0.551	0.237	0.314	56.99%
	M	0.551	0.324	0.227	41.20%		M	0.551	0.393	0.158	28.68%
	B	0.551	0.352	0.199	36.12%		B	0.551	0.422	0.129	23.41%
STA. 2	W	0.551	0.424	0.127	23.05%	STA. 12	W	0.551	0.406	0.145	26.32%
	M	0.551	0.423	0.128	23.23%		M	0.551	0.395	0.156	28.31%
	B	0.551	0.425	0.126	22.87%		B	0.551	0.419	0.132	23.96%
STA. 3	W	0.551	0.223	0.328	59.53%	STA. 13	W	0.551	0.503	0.048	8.71%
	M	0.551	0.210	0.341	61.89%		M	0.551	0.210	0.341	61.89%
	B	0.551	0.384	0.167	30.31%		B	0.551	0.115	0.436	79.13%
STA. 4	W	0.551	0.438	0.113	20.51%	STA. 14	W	0.551	0.222	0.329	59.71%
	M	0.551	0.365	0.186	33.76%		M	0.551	0.304	0.247	44.83%
	B	0.551	0.310	0.241	43.74%		B	0.551	0.209	0.342	62.07%
STA. 5	W	0.551	0.410	0.141	25.59%	STA. 15	W	0.551	0.288	0.263	47.73%
	M	0.551	0.418	0.133	24.14%		M	0.551	0.310	0.241	43.74%
	B	0.551	0.384	0.167	30.31%		B	0.551	0.252	0.299	54.26%
STA. 6	W	0.551	0.440	0.111	20.15%	STA.16	W	0.551	0.113	0.438	79.49%
	M	0.551	0.410	0.141	25.59%		M	0.551	0.135	0.416	75.50%
	B	0.551	0.222	0.329	59.71%		B	0.551	0.375	0.176	31.94%
STA. 7	W	0.551	0.300	0.251	45.55%	STA. 17	W	0.551	0.300	0.251	45.55%
	M	0.551	0.438	0.113	20.51%		M	0.551	0.229	0.322	58.44%
	B	0.551	0.375	0.176	31.94%		B	0.551	0.172	0.379	68.78%
STA. 8	W	0.551	0.380	0.171	31.03%	STA. 18	W	0.551	0.184	0.367	66.61%
	M	0.551	0.414	0.137	24.86%		M	0.551	0.369	0.182	33.03%
	B	0.551	0.415	0.136	24.68%		B	0.551	0.287	0.264	47.91%
STA. 9	W	0.551	0.407	0.144	26.13%	STA.19	W	0.551	0.200	0.351	63.70%
	M	0.551	0.397	0.154	27.95%		M	0.551	0.173	0.378	68.60%
	B	0.551	0.398	0.153	27.77%		B	0.551	0.167	0.384	0.69691
STA. 10	W	0.551	0.424	0.127	23.05%	STA 20	W	0.551	0.190	0.361	65.52%
	M	0.551	0.422	0.129	23.41%		M	0.551	0.155	0.396	71.87%
	B	0.551	0.415	0.136	24.68%		B	0.551	0.197	0.354	64.25%

Table B-2 Ultrasonic Testing Hull Thickness Measurements and Percentage Loss for PORT Side Stations (Station No. 21 – Station No. 55), "W" – Waterline, "M" – Mid-depth, "B" – Bottom/Mudline

Reading Number	Vertical Position	Original thickness (inches)	Current thickness (inches)	Loss (inches)	% loss	Reading Number	Vertical Position	Original thickness (inches)	Current thickness (inches)	Loss (inches)	% loss
STA. 21	W	0.551	0.283	0.268	48.64%	STA. 39	W	0.551	0.234	0.317	57.53%
	M	0.551	0.167	0.384	69.69%		M	0.551	0.215	0.336	60.98%
	B	0.551	0.307	0.244	44.28%		B	0.551	0.109	0.442	80.22%
STA. 22	W	0.551	0.132	0.419	76.04%	STA. 40	W	0.551	0.328	0.223	40.47%
	M	0.551	0.188	0.363	65.88%		M	0.551	0.215	0.336	60.98%
	B	0.551	0.198	0.353	64.07%		B	0.551	0.275	0.276	50.09%
STA. 23	W	0.551	0.127	0.424	76.95%	STA.41	W	0.551	0.245	0.306	55.54%
	M	0.551	0.256	0.295	53.54%		M	0.551	0.115	0.436	79.13%
	B	0.551	0.333	0.218	39.56%		B	0.551	0.201	0.350	63.52%
STA.24	W	0.551	0.328	0.223	40.47%	STA. 42	W	0.551	0.095	0.456	82.76%
	M	0.551	0.283	0.268	48.64%		M	0.551	0.207	0.344	62.43%
	B	0.551	0.167	0.384	69.69%		B	0.551	0.302	0.249	45.19%
STA 25	W	0.551	0.441	0.110	19.96%	STA. 43	W	0.551	0.249	0.302	54.81%
	M	0.551	0.471	0.080	14.52%		M	0.551	0.105	0.446	80.94%
	B	0.551	0.328	0.223	40.47%		B	0.551	0.156	0.395	71.69%
STA. 26	W	0.551	0.445	0.106	19.24%	STA. 44	W	0.551	0.450	0.101	18.33%
	M	0.551	0.551	0.000	0.00%		M	0.551	0.354	0.197	35.75%
	B	0.551	0.551	0.000	0.00%		B	0.551	0.498	0.053	9.62%
STA. 27	W	0.551	0.312	0.239	43.38%	STA.45	W	0.551	0.503	0.048	8.71%
	M	0.551	0.227	0.324	58.80%		M	0.551	0.449	0.102	18.51%
	B	0.551	0.096	0.455	82.58%		B	0.551	0.499	0.052	9.44%
STA.28	W	0.551	0.154	0.397	72.05%	STA.46	W	0.551	0.430	0.121	21.96%
	M	0.551	0.104	0.447	81.13%		M	0.551	0.447	0.104	18.87%
	B	0.551	0.351	0.200	36.30%		B	0.551	0.490	0.061	11.07%
STA. 29	W	0.551	0.551	0.000	0.00%	STA.47	W	0.551	0.463	0.088	15.97%
	M	0.551	0.551	0.000	0.00%		M	0.551	0.438	0.113	20.51%
STA. 30	W	0.551	0.551	0.000	0.00%		B	0.551	0.441	0.110	19.96%
	M	0.551	0.346	0.205	37.21%	STA.48	W	0.551	0.450	0.101	18.33%
	B	0.551	0.211	0.340	61.71%		M	0.551	0.420	0.131	23.77%
STA.31	W	0.551	0.225	0.326	59.17%		B	0.551	0.421	0.130	23.59%
	M	0.551	0.511	0.040	7.26%	STA. 49	W	0.551	0.227	0.324	58.80%
	B	0.551	0.219	0.332	60.25%		M	0.551	0.107	0.444	80.58%
STA. 32	W	0.551	0.551	0.000	0.00%		B	0.551	0.213	0.338	61.34%
	M	0.551	0.551	0.000	0.00%	STA.50	W	0.551	0.127	0.424	76.95%
	B	0.551	0.196	0.355	64.43%		M	0.551	0.087	0.464	84.21%
STA.33	W	0.551	0.204	0.347	62.98%		B	0.551	0.252	0.299	54.26%
	M	0.551	0.178	0.373	67.70%	STA.51	W	0.551	0.216	0.335	60.80%
	B	0.551	0.226	0.325	58.98%		M	0.551	0.195	0.356	64.61%
STA. 34	W	0.551	0.351	0.200	36.30%		B	0.551	0.115	0.436	79.11%
	M	0.551	0.315	0.236	42.83%	STA.52	W	0.551	0.257	0.294	53.36%
	B	0.551	0.305	0.246	44.65%		M	0.551	0.159	0.392	71.14%
STA.35	W	0.551	0.217	0.334	60.62%		B	0.551	0.156	0.395	71.69%
	M	0.551	0.200	0.351	63.70%	STA.53	W	0.551	0.102	0.449	81.49%
	B	0.551	0.085	0.466	84.57%		M	0.551	0.117	0.434	78.77%
STA. 36	W	0.551	0.115	0.436	79.13%		B	0.551	0.091	0.460	83.48%
	M	0.551	0.320	0.231	41.92%	STA.54	W	0.551	0.111	0.440	79.85%
	B	0.551	0.211	0.340	61.71%		M	0.551	0.121	0.430	78.04%
STA. 37	W	0.551	0.230	0.321	58.26%		B	0.551	0.208	0.343	62.25%
	M	0.551	0.250	0.301	54.63%	STA.55	W	0.551	0.123	0.428	77.68%
	B	0.551	0.221	0.330	59.89%		M	0.551	0.132	0.419	76.04%
STA.38	W	0.551	0.200	0.351	63.70%		B	0.551	0.105	0.446	80.94%
	M	0.551	0.221	0.330	59.89%						
	B	0.551	0.423	0.128	23.23%						

Table B-3 Ultrasonic Testing Hull Thickness Measurements and Percentage Loss for STARBOARD Side Stations (Station No. 1 – Station No. 20), "W" – Waterline, "M" – Mid-depth, "B" – Bottom/Mudline

Reading Number	Vertical Position	Original thickness (inches)	Current thickness (inches)	Loss (inches)	% loss	Reading Number	Vertical Position	Original thickness (inches)	Current thickness (inches)	Loss (inches)	% loss
STA.1	W	0.551	0.306	0.245	44.46%	STA. 11	W	0.551	0.500	0.051	9.26%
	M	0.551	0.524	0.027	4.90%		M	0.551	0.441	0.110	19.96%
	B	0.551	0.498	0.053	9.62%		B	0.551	0.210	0.341	61.89%
STA. 2	W	0.551	0.222	0.329	59.71%	STA. 12	W	0.551	0.155	0.396	71.87%
	M	0.551	0.168	0.383	69.51%		M	0.551	0.200	0.351	63.70%
	B	0.551	0.203	0.348	63.16%		B	0.551	0.197	0.354	64.25%
STA. 3	W	0.551	0.197	0.354	64.25%	STA. 13	W	0.551	0.205	0.346	62.79%
	M	0.551	0.162	0.389	70.60%		M	0.551	0.254	0.297	53.90%
	B	0.551	0.398	0.153	27.77%		B	0.551	0.115	0.436	79.13%
STA. 4	W	0.551	0.222	0.329	59.71%	STA. 14	W	0.551	0.198	0.353	64.07%
	M	0.551	0.500	0.051	9.26%		M	0.551	0.201	0.350	63.52%
	B	0.551	0.441	0.110	19.96%		B	0.551	0.243	0.308	55.90%
STA. 5	W	0.551	0.239	0.312	56.62%	STA. 15	W	0.551	0.094	0.457	82.94%
	M	0.551	0.300	0.251	45.55%		M	0.551	0.102	0.449	81.49%
	B	0.551	0.250	0.301	54.63%		B	0.551	0.211	0.340	61.71%
STA. 6	W	0.551	0.220	0.331	60.07%	STA.16	W	0.551	0.255	0.296	53.72%
	M	0.551	0.190	0.361	65.52%		M	0.551	0.232	0.319	57.89%
	B	0.551	0.235	0.316	57.35%		B	0.551	0.300	0.251	45.55%
STA. 7	W	0.551	0.280	0.271	49.18%	STA. 17	W	0.551	0.243	0.308	55.90%
	M	0.551	0.312	0.239	43.38%		M	0.551	0.145	0.406	73.68%
	B	0.551	0.400	0.151	27.40%		B	0.551	0.166	0.385	69.87%
STA. 8	W	0.551	0.350	0.201	36.48%	STA. 18	W	0.551	0.205	0.346	62.79%
	M	0.551	0.229	0.322	58.44%		M	0.551	0.246	0.305	55.35%
	B	0.551	0.333	0.218	39.56%		B	0.551	0.272	0.279	50.64%
STA. 9	W	0.551	0.229	0.322	58.44%	STA.19	W	0.551	0.255	0.296	53.72%
	M	0.551	0.123	0.428	77.68%		M	0.551	0.222	0.329	59.71%
	B	0.551	0.225	0.326	59.17%		B	0.551	0.209	0.342	62.07%
STA. 10	W	0.551	0.359	0.192	34.85%	STA 20	W	0.551	0.500	0.051	9.26%
	M	0.551	0.400	0.151	27.40%		M	0.551	0.518	0.033	5.99%
	B	0.551	0.344	0.207	37.57%		B	0.551	0.472	0.079	14.34%

Table B-4 Ultrasonic Testing Hull Thickness Measurements and Percentage Loss for STARBOARD Side Stations (Station No. 21 – Station No. 55), "W" – Waterline, "M" – Mid-depth, "B" – Bottom/Mudline

Reading Number	Vertical Position	Original thickness (inches)	Current thickness (inches)	Loss (inches)	% loss
STA. 21	W	0.551	0.488	0.063	11.43%
	M	0.551	0.503	0.048	8.71%
	B	0.551	0.549	0.002	0.36%
STA. 22	W	0.551	0.441	0.110	19.96%
	M	0.551	0.452	0.099	17.97%
	B	0.551	0.321	0.230	41.74%
STA. 23	W	0.551	0.114	0.437	79.31%
	M	0.551	0.200	0.351	63.70%
	B	0.551	0.124	0.427	77.50%
STA.24	W	0.551	0.292	0.259	47.01%
	M	0.551	0.302	0.249	45.19%
	B	0.551	0.295	0.256	46.46%
STA 25	W	0.551	0.209	0.342	62.07%
	M	0.551	0.191	0.360	65.34%
	B	0.551	0.323	0.228	41.38%
STA. 26	W	0.551	0.262	0.289	52.45%
	M	0.551	0.145	0.406	73.68%
	B	0.551	0.257	0.294	53.36%
STA. 27	W	0.551	0.229	0.322	58.44%
	M	0.551	0.217	0.334	60.62%
	B	0.551	0.228	0.323	58.62%
STA.28	W	0.551	0.317	0.234	42.47%
	M	0.551	0.328	0.223	40.47%
	B	0.551	0.265	0.286	51.91%
STA. 29	W	0.551	0.220	0.331	60.07%
	M	0.551	0.191	0.360	65.34%
STA. 30	W	0.551	0.263	0.288	52.27%
	M	0.551	0.245	0.306	55.54%
	B	0.551	0.232	0.319	57.89%
STA.31	W	0.551	0.143	0.408	74.05%
	M	0.551	0.138	0.413	74.95%
	B	0.551	0.220	0.331	60.07%
STA. 32	W	0.551	0.128	0.423	76.77%
	M	0.551	0.236	0.315	57.17%
	B	0.551	0.506	0.045	8.17%
STA.33	W	0.551	0.513	0.038	6.90%
	M	0.551	0.154	0.397	72.05%
	B	0.551	0.149	0.402	72.96%
STA. 34	W	0.551	0.275	0.276	50.09%
	M	0.551	0.239	0.312	56.62%
	B	0.551	0.184	0.367	66.61%
STA.35	W	0.551	0.226	0.325	58.98%
	M	0.551	0.281	0.270	49.00%
	B	0.551	0.189	0.362	65.70%
STA. 36	W	0.551	0.145	0.406	73.68%
	M	0.551	0.207	0.344	62.43%
	B	0.551	0.178	0.373	67.70%
STA. 37	W	0.551	0.297	0.254	46.10%
	M	0.551	0.313	0.238	43.19%
	B	0.551	0.288	0.263	47.73%
STA.38	W	0.551	0.399	0.152	27.59%
	M	0.551	0.119	0.432	78.40%
	B	0.551	0.209	0.342	62.07%
STA. 39	W	0.551	0.500	0.051	9.26%
	M	0.551	0.518	0.033	5.99%
	B	0.551	0.472	0.079	14.34%
STA. 40	W	0.551	0.488	0.063	11.43%
	M	0.551	0.503	0.048	8.71%
	B	0.551	0.549	0.002	0.36%
STA.41	W	0.551	0.441	0.110	19.96%
	M	0.551	0.452	0.099	17.97%
	B	0.551	0.321	0.230	41.74%
STA. 42	W	0.551	0.114	0.437	79.31%
	M	0.551	0.200	0.351	63.70%
	B	0.551	0.124	0.427	77.50%
STA. 43	W	0.551	0.292	0.259	47.01%
	M	0.551	0.302	0.249	45.19%
	B	0.551	0.295	0.256	46.46%
STA. 44	W	0.551	0.209	0.342	62.07%
	M	0.551	0.191	0.360	65.34%
	B	0.551	0.323	0.228	41.38%
STA.45	W	0.551	0.262	0.289	52.45%
	M	0.551	0.145	0.406	73.68%
	B	0.551	0.257	0.294	53.36%
STA.46	W	0.551	0.229	0.322	58.44%
	M	0.551	0.217	0.334	60.62%
	B	0.551	0.228	0.323	58.62%
STA.47	W	0.551	0.317	0.234	42.47%
	M	0.551	0.328	0.223	40.47%
	B	0.551	0.265	0.286	51.91%
STA.48	W	0.551	0.220	0.331	60.07%
	M	0.551	0.191	0.360	65.34%
	B	0.551	0.263	0.288	52.27%
STA. 49	W	0.551	0.245	0.306	55.54%
	M	0.551	0.232	0.319	57.89%
	B	0.551	0.143	0.408	74.05%
STA.50	W	0.551	0.138	0.413	74.95%
	M	0.551	0.220	0.331	60.07%
	B	0.551	0.128	0.423	76.77%
STA.51	W	0.551	0.236	0.315	57.17%
	M	0.551	0.506	0.045	8.17%
	B	0.551	0.513	0.038	6.90%
STA.52	W	0.551	0.154	0.397	72.05%
	M	0.551	0.149	0.402	72.96%
	B	0.551	0.275	0.276	50.09%
STA.53	W	0.551	0.239	0.312	56.62%
	M	0.551	0.184	0.367	66.61%
	B	0.551	0.226	0.325	58.98%
STA.54	W	0.551	0.281	0.270	49.00%
	M	0.551	0.189	0.362	65.70%
	B	0.551	0.145	0.406	73.68%
STA.55	W	0.551	0.207	0.344	62.43%
	M	0.551	0.178	0.373	67.70%
	B	0.551	0.297	0.254	46.10%