

LEAD INDUSTRIES ASSOCIATION

488 LEXINGTON AVENUE
NEW YORK 17, N. Y.

RED LEAD DIVISION - DIVISION OF THE LEAD INDUSTRIES ASSOCIATION

CONFIDENTIAL - FOR COMMITTEE USE ONLY

SUBJECT TO REVISION

RED LEAD TECHNICAL COMMITTEE

New York, N. Y.

December 7, 1944

A meeting of the members of the Red Lead Technical Committee of the Lead Industries Association was held in the Association's office on Thursday, December 7, 1944. The following were present:

Committee

A.C. Coats
O.F. Shobe
J.O. Johnston
G. Diehlman
A.J. Rickschoff

Representing

Eagle-Picher Lead Co.
Glidden Co.
Hammond Lead Products, Inc.
National Lead Co.
National Lead Co.

F.E. Normer Secretary

L.L. Carriak, Director of Red Lead Research

The meeting was called to order at 10:00 A.M. with Dr. Carriak presiding.

SURFACE TREATMENT & PRIMER PAINTS DESIGNED FOR USE ON GALVANIZED IRON

Location of Tests

Spangled galvanized iron panels were secured from one source and distributed to:

Eagle-Picher Lead Co.	Joplin, Mo.
Glidden Company	Cleveland, Ohio
National Lead Co.	New York

for test in each of their laboratories.

Application

The paint system under test is to be applied to each side of the panel. Two panels for each primer and top coat system are to be exposed as follows:

The paint system for one panel consists of one coat of primer followed by one coat of aluminum top coats.



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The paint system for the second panel consists of two coats of primer followed by one coat of aluminum top coat.

Method of Exposure

The panels are to be exposed to the atmosphere at a 45° angle to the horizontal facing due south.

The inspection should be at regular intervals.

The first inspection should be 30 days after exposure. Subsequent inspections should be at 6 month intervals or oftener if the extent of failure warrants more frequent inspection.

Surface Treatment

The following types of surfaces are to constitute the base for each paint test system:

1. Allow the galvanized panel to weather three months before application of the test paint system.
2. Allow the galvanized paint to weather six months before application of the test paint system.
3. Wash the panel with mineral spirits and apply the paint test system at once.
4. Treat the surface with Lithoform, a proprietary solution sold by the American Chemical Paint Co., Ambler, Pa., for treating zinc and cadmium surfaces to insure adhesion of paint. Apply as recommended by the manufacturer.
5. Treat the surface with a common etching solution of copper sulfate (3 oz. per gal. of water). (The National Bureau of Standards NBS page 6 employed 8 ounces per gal.)
6. Treat the surface with _____, a proprietary solution sold by the _____ for testing zinc surfaces.

Primer Formulations

1. Red Lead-Linear oil conforming to TT-P-86, Sept. 9, 1939.
2. Red Lead-Linear oil conforming to TT-P-86, Amend. 1, Dec. 1, 1943.
3. Pigment J (New L.I.A. No. P-16) in Vehicle 6 (New L.I.A. V-4) PV = 23
4. Pigment J (New L.I.A. No. P-16) in Vehicle 6 (New L.I.A. V-4) PV = 23
5. Pigmentation
 - 40% Red Lead, 97% grade
 - 40% Iron Oxide, CEN #872
 - 10% Diatomaceous silica
- Vehicle 6 (New L.I.A. V-4), PV = 43

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6. Red Lead-Zinc Dust — submitted by Mr. George Dickman in his letter of Jan. 4, 1944, as follows:

The Red Lead-Zinc Dust paint primer which we used for steel surfaces had the following composition:

81.7% Pigment	18.3% Vehicle
71.7% Zinc Dust	100% Enkeltite Varnish XV10340
28.3% Red Lead (97% grade)	
PV — 80.8%	
WT/gal — 27.8 lbs.	

7. Federal Specification TT-P-641, April 20, 1939, Type I vehicle, a Zinc Dust-Zinc Oxide-Linseed oil specification.

8. New Jersey Zinc Company's Galvanized Iron Primer as submitted by Mr. O.P. Shobe in his letter of Dec. 19, 1944, as follows:

The New Jersey Zinc Company's formula for Galvanized Iron Primer is their paint "D", composed of 85% pigment and 15% vehicle. The pigment analysis is

XX-80 Zinc Oxide	80%
Iron Oxide	18%
Zinc Dust	2%

The vehicle analysis is

Glyptal 93468 solution	84.94%
Mineral spirits	12.02%
Rosin Manganese (4% Mn)	0.7%

Weight per gallon — 16.7 lb.

Solids in paint by volume — 53.2%

Volatile in paint by weight — 19.6%

Pigment to non-volatile vehicle by volume — 40.8%

Pigment to non-volatile vehicle by weight — 81.2%

This material is reported to have been reduced for spraying and brushing with 33 parts of paint and 7 parts of thinner by weight. I presume the thinner was mineral spirits or V.M. & P. Naphtha. The material is used full body for roller coating applications.

Top Coat

Aluminum Paint

Pigmentation, conforming to TT-4408, Type I, March 6, 1942.

Vehicle, conforming to TT-V-61, Type I, Oct. 2, 1939, Amend. 2, Sept. 10, 1943.

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MISSISSIPPI RIVER VALLEY DAM PRIMER PROJECT

It was decided to submit to Mr. Sol Glaser, Prin. Eng., Upper Mississippi Valley Authority, some of the better red lead-multiple pigment formulations which have shown promise on our Sayville test, and which were submitted for test on the Montgomery Dam Gates Ohio River Test project.

The formulations recommended are:

1. Pigmentation J (L.I.A. P-16) in vehicle 13 (L.I.A. V-10) as used in old L.I.A. primer 6 (New L.I.A. No. 28).
2. Pigmentation J (L.I.A. P-16) in vehicle TT-V-51, Dec. 1938.
3. The formulations submitted to the Montgomery Dam project, Mr. Diehlman's letter, Jan. 4, 1944, are as follows:

"Red Lead Primer M3386"

70.48% Pigment	29.52% Vehicle
91.7% Red Lead (97% grade)	91.4% Enkellite Varnish XV10348
8.0% Celite #21	8.0% Hi Flash Naphtin
.8% Aluminum stearate	
PV -- 40.0%	
Wt/Gal -- 19.4%	

"Red Lead-Zinc Yellow Primer - M3387"

This conforms with Lead Industries Association Primer No. 6.

"White Lead Finish Coat Paint - M331A"

87.4% Pigment	12.6% Vehicle
84.3% Basic Carbonate White Lead	82.4% Enkellite Varnish XV10348
14.9% Zinc Oxide	17.6% Thinner
.8% Aluminum Stearate	
.8% Raw Sienna	
Wt/gal -- 17.8 lbs.	

LOW-COST MULTIPLE RED LEAD PIGMENTATION FOR
U.S. NAVY COMMISSION

These low-cost multiple red lead primers were placed on test, August 6, 1944, at the North Florida Test Service, Daytona Beach, Fla. The material cost of these paints ranged from \$1.10 to \$1.25 per gallon.

These primers have been on test for five (5) months.

These tests will be discussed at our regular Technical Committee meeting in January. The complete data to date is as far as available is attached as Exhibit A.

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OIL STORAGE TANK PAINTS

Paints have been formulated for this test. The location of a suitable test tank is still under consideration. Mr. O.P. Shobe will try and arrange for a test location near Cleveland or Chicago.

PRIMER RECOMMENDATION TO BUREAU OF SHIPS

The Bureau of Ships is inaugurating a practical primer test program. It is to be conducted upon 8 ships in the Atlantic Ocean and 8 ships in the Pacific Ocean.

The tests are to be inspected periodically. The Bureau of Ships is to have full control of the repainting of these ships.

The Lead Industries Association was to have submitted two primers for the test.

As a standard of comparison of the drying time Navy red lead formulation No. 1, 100% red lead dispersed in linseed oil, is to be the standard of comparison. If sufficient time is not allowed for the drying of Navy No. 1 then it should not be used at all.

The multiple red lead low cost pigmentation recommended are:

1. Pigmentation J (L.I.A. P-16) dispersed in Vehicle 20 (L.I.A. V-26). This is old L.I.A. primer No. 4 (Now L.I.A. No. 33). It was rated first after 15 months exposure at Sayville, L.I.
2. This is L.I.A. primer No. 111 which is Pigmentation P-79 in Vehicle V-66. This is a low cost primer formulation which is better than the standards after 4 months exposure at the North Florida Test Service.

This program was shelved in accordance with my letter of December 22, 1944, to each member of the Technical Committee.

The meeting adjourned at 8:00 P.M.

L. L. Carrick

L. L. Carrick

SUMMARY OF LOW-COST MULTIPLE RED LEAD PRIMERS TO DATE

EXHIBIT A

The statements below are subject to change upon completion of the exposure.

At the present, we find for Tide-Range exposures the following:

Panel No. 4, L.I.A. Paint No. 111, which is a red lead multiple pigmentation in a phthalic anhydride vehicle conforming to that used by the U.S.M.C. in their zinc chromate primer SS-MC-29, Sept. 21, 1943, is the most outstanding low-cost primer of this series. This primer has a better exposure record than the following standards:

1. Panel No. 11 - Zinc Chromate Primer USMC SS-MC-29, Sept. 21, 1943.
2. Panel No. 12 - Red Lead Primer USMC SS-MC-29, Aug. 28, 1943, and
3. Panel No. 13 - Zinc Chromate Primer, Navy SS-P-18, Oct. 15, 1943.

The formulation of this paint is as follows:

PIGMENTATION

Red Lead	85%
Zinc Chromate	10%
Iron Oxide	5%
Magnesium Silicate	2%
Nice	10%

VEHICLE

An alkyl Resin Solution (SS-MC-29)	72.5%
Mineral Spirits	20.0%
Hi-Flash Naphtha	6.0%
Cobalt Naphthenate	.5%

The material cost per gallon is \$1.25.

Panel No. 3, L.I.A. Paint No. 108, which is a red lead multiple pigmentation in a vehicle of dehydrated castor oil, cottonseed oil, containing SS2943, is the close second to Panel No. 4, L.I.A. Paint No. 111.

The formulation of this paint is as follows:

PIGMENTATION

Red Lead	80%
Zinc Chromate	10%
Zinc Oxide	10%
Magnesium Silicate	5%
Diatomaceous Silica	10%

VEHICLE

Dehydrated Castor Oil	55.75%
Cottonseed Oil	8.25%
Alkyl Resin Solution	18.92%
Mineral Spirits	60.5%
Hi-Flash Naphtha	4.82%
Dipentene	8.37%
Naphthenate	1.4%

The material cost per gallon is \$1.21.

For Total Submersion in salt water the five months exposure of the red lead multiple pigmentation, old L.I.A. No. 3 in Vehicle No. 13 (old No.) is the most outstanding formulation. It is outstanding and superior to any of the standards or to any of the other low-cost multiple pigmentations considered.

EXHIBIT ADETAILED REPORTLOW-COST MULTIPLE RED LEAD PIGMENTATION PRIMERSUNITED STATES MARITIME COMMISSIONPURPOSE

These low material cost red lead multiple pigmentation primers were developed to meet a low material cost range of \$1.10 to \$1.24 per gallon. This cost range will compete with the present Navy 52-P-18 and the U.S.M.C. 52-MC-29, Zinc Chromate primers.

INTRODUCTION

Ten low material cost red lead multiple pigmentation primers and five standard primers were prepared and placed on total submersion in sea water and tide-range exposure at the North Florida Test Service, Daytona Beach, Fla.

Three primer paints 48-B-1, 49-B-1 and 50-B-1 were prepared by the Eagle-Fischer Lead Co.

Three primer paints, M3226, M3228, and M3227 were prepared by the National Lead Co.

Four primer paints, GL51076, GL51077, GL51078 and GL51079 were prepared by the Glidden Co.

Five primer paints were used as standards of comparison. They are --

GL50641 (U.S.M.C. 52-MC-29), Sept. 21, 1943
 M-2566 (U.S.M.C. 52-MC-23), August 28, 1943
 GL44-Y-79 (Navy 52-P-18), October 13, 1943
 L-1-A. No. 1 (New No. 30)
 L-1-A. No. 6 (New No. 38)

PREPARATION OF TEST PANELSPanel

The panels were 14 gauge, hot rolled steel, 6" by 12".

Paint Systems

Tide-Range -- each panel received two coats of the primer and one top coat of U.S.M.C. Low visibility gray (52-M-4), March 9, 1943.

Total Submersion -- each panel received two coats of the primer and one coat of U.S.M.C. anti-fouling paint MC-52-B-1 Class II, August 28, 1943.

FORMULATIONS

EXHIBIT A

THE EAGLE-PICTER LEAD COMPANY

The Composition Data - Pounds Required for 100 Gallons of Paint

Leads Designation	108	109	110			
Paint No.	P-72	P-73	P-74			
Pigmentation Mtd	V-63	V-63	V-63			
Vehicle No.						
Manufacturer's No.	B-P 80-S-1	B-P 45-S-1	B-P 45-S-1			
	Lbs.	Percent	Lbs.	Percent	Lbs.	Percent
Red Lead (90% grade)	377.08	50%	339.27	50%	353.82	50%
Zinc Chromate (KC-2510)	75.42	10%				
Fine Oxide (52-MC-8)	75.42	10%	119.89	18%	75.76	10%
Iron Oxide (MC-469)					75.76	10%
Magnesium Silicate (2M)	180.84	20%	189.78	20%	183.53	20%
Discontinuous Silicate (Dicalite L)	75.42	10%	75.87	10%	75.76	10%
Total Pigment	754.17	100%	794.67	100%	767.83	100%
Dehydrated Castor Oil (Isoline)	194.82	22.73%	194.92	22.73%	194.80	22.73%
Oil-soluble Oil	20.23	2.34%	20.23	2.34%	20.23	2.34%
Bakelite BR2948	83.72	11.92%	83.78	11.92%	83.71	11.92%
Mineral Spirits	240.71	40.00%	240.73	40.00%	240.70	40.00%
Hi Flash Naphtha	29.00	4.82%	29.00	4.82%	29.00	4.82%
Dipentene	20.30	2.37%	20.30	2.37%	20.30	2.37%
Pb Naphthenate-34%	8.43	.90%	8.43	.90%	8.43	.90%
Mn Naphthenate-6%	3.62	.60%	3.62	.60%	3.62	.60%
Ce Naphthenate-4%	1.81	.30%	1.81	.30%	1.81	.30%
Total Vehicle	601.74	100%	601.77	100%	601.70	100%
Total Pigs. & Vehicle	1355.89		1400.44		1369.54	
Raw Material Cost/Gallon	\$1.21		\$1.19		\$1.18	
Wt/Gallon	12.88 lbs.		14.00 lbs.		12.88 lbs.	
Flt.	20%		20%		20%	
% Pigment	55.62		57.08		55.08	
% Vehicle	44.38		42.92		44.92	

EXHIBIT A

NATIONAL LEAD COMPANY

The Composition Data - Pounds Required for 100 Gallons of Paint

Leads Designation	111	112	113			
Paint No.	P-79	P-79	P-80			
Pigmentation No.	V-80	V-80	V-80			
Vehicle No.						
Manufacturer's No.	M-3225	M-3226	M-3227			
	Lbs.	Percent	Lbs.	Percent	Lbs.	Percent
Red Lead (97% grade)	417.	55%	434.	56%	434.	56.0%
Zinc Chromate (EC2818A)	79.	10%	79.	10%	79.	10.0%
Indian Red (CK No. 8098)	15.	2%	16.	2%	16.	2.0%
Magnesium Silicate	175.	23%	182.	23%	182.	23.0%
Diatomaceous Silica	--	--	--	--	84.	7.0%
Mica (325 mesh)	78.	10%	78.	10%	--	--
Totals	789.	100.0%	780.	100.0%	787.	100%
Alkyd resin (82-MC-21)	445.	78.4	--	--	--	--
Linseed oil (22 viscosity)	--	--	147.	20%	147.	20%
Varnish: LV-297	--	--	278.	47.4%	278.	47.4%
Mineral Spirits	128.0	20.0%	114.	19.4%	106.0	17.0%
High Flash Naphtha	42.0	6.0%	44.	7.0%	82.0	8.0%
Lead Naphthenate (24%)	--	--	3.8	0.0%	3.8	0.0%
Cobalt Naphthenate (6%)	1.9	.3%	1.0	0.2%	1.0	0.2%
		100%		100%		100%
Raw Material Cost Per Gal:	\$1.28		\$1.17		\$1.16	
Wt/Gal:	13.76 lbs.		13.78		13.97	
TV	35.3		34.71		34.71	
% Pigment	68.8		67.8		66.8	
% Vehicle	44.8		42.9		43.6	

EXHIBIT A

Panel designation and details of the weight of paint applied to each square foot of panel surface.

TIDE-RANGE PANELS

Exposure Panel No.	Manufacturers Primer Paint No.	L.I.A. Paint No.	Wt. in Gals. of Base Paint	Wt. in Gals. of 1st coat of Primer	Wt. in Gals. of 2nd coat of Primer	Wt. in Gals. of 32-MC-6
1	48-B-1	110	998	13.0	17.0	7.0
2	49-B-1	109	986	11.0	12.0	7.0
3	50-B-1	108	986	12.5	12.5	7.0
4	M-3228	111	981	12.5	9.5	7.0
5	M-3228	112	986	12.0	12.0	7.0
6	M-3227	113	986	12.5	11.0	7.0
7	GLS1076	103	989	10.5	8.0	7.0
8	GLS1077	104	1006	9.0	8.5	7.0
9	GLS1078	106	992	8.0	6.0	7.0
10	GLS1079	108	1025	8.5	7.0	7.0
11	GL-50641	52-MC-29	996	8.5	6.0	7.0
12	M-2568	52-MC-13	990	12.0	12	7.0
13	GL-44-Y-79	52-P-1C	988	9.5	7.5	7.0
14	LIA No. 1 (old No)	5C (new No)	977	7.5	6.0	7.0
15	(LIA No. 6 (old No) +35 (new No) M-3108		978	17.0	12	7.0

Date applied

July 27, 1944 July 31, 1944 July 31, 1944

NOTE: This is essentially old L.I.A. Primer No. 6 except some Hi-Flash Alkyd was added to improve the painting characteristics.

TOTAL-DIMENSION PANELS

Exposure Panel No.	Manufacturers Primer Paint No.	L.I.A. Paint No.	Wt. in Gals. of Base Paint	Wt. in Gals. of 1st coat of Primer	Wt. in Gals. of 2nd coat of Primer	Wt. in Gals. of 32-MC-6
16	48-B-1	110	998	13.0	17.0	8.0
17	49-B-1	109	970	11.0	12.0	8.0
18	50-B-1	108	986	12.5	12.5	8.0
19	M-3228	111	988	12.5	9.5	8.0
20	M-3228	112	987	12.0	12.0	8.0
21	M-3227	113	981	12.5	11.0	8.0
22	GLS1076	103	990	10.5	8.0	8.0
23	GLS1077	104	981	9.0	8.5	8.0
24	GLS1078	106	980	8.0	6.0	8.0
25	GLS1079	108	986	8.5	7.0	8.0
26	GLS0641	52-MC-29	974	8.5	6.0	8.0
27	M-2568	52-MC-13	983	12.0	12.0	8.0
28	GL-44-Y-79	52-P-1B	992	9.5	7.5	8.0
29	LIA No. 1 (old No)	5C (new No)	1006	7.5	6.0	8.0
30	(LIA No. 6 (old No) +35 (new No) M-3108		982	17.0	12.0	8.0

Date applied

July 27, 1944 July 31, 1944 July 31, 1944

See NOTE under TIDE-RANGE PANELS.

EXHIBIT A

The standard primers included with these tests have an approximate raw material cost per gallon as follows:

Designation of Standard	Raw Material Cost/Gal.
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62-F-18	\$1.20
62-MC-39	1.24
62-MC-33	1.68
L.I.L. No. 1 (New No. 30)	1.60 (or over)
L.I.L. No. 6 (New No. 36)	1.58

EXPOSURE

The panels for tide-range and total submersion in salt water were placed on exposure August 6, 1944, at the North Florida Test Service, Daytona Beach, Florida. Inspection of the Panels by the Test Service were made on the 6th of each succeeding month of exposure. The inspection by months are attached.

CODE WALTER 9-2
DATE PLACED ON TEST 8/6/44
DATE THIS INSPECTION 8/6/44

NORTH FLORIDA TEST SERVICE
DAYTONA BEACH, FLA.

TIDE-RANGE

AVERAGE WATER TEMP. F. 76°

PANEL NO.	PAINT NO.	SCUM SILL	BLISTERING Edge	Inter- To	CORROSION	CHECK-CHALK-ING	CRACK-ING	% AREA COATING DETECT	
								Topcoat	Primer
1	EP48-B-1	10	8 10 P	10	8 10 10 10	10	10	98	98
2	EP49-B-1	Pruling or any of these Panels.	8 9P P-1/8	10	8 10 10 10	10	10	98	98
3	EP50-B-1		7 10 P-1/16	10	8 9/ 10 10 10	10	10	98	98
4	M-3225		8 10 P	10	9/ 10 10 10	10	10	100	100
5	M-3226		8 10 P-1/4	10	10 9/ 10 10 10	10	10	98	98
6	M-3227		8 10 "	98edge	8 10 10 10	10	10	97	97
7	GL61076		8 9P P-1/8	10	8 10 10 10	10	10	94	94
8	GL61077		8 9P P-1/2	10	8 10 10 10	10	10	100	100
9	GL61078		8 9P P-1/2	10	8 10 10 10	10	10	98	98
10	GL61079		8 9P P-1/4	10	8 10 10 10	10	10	98	98
11	GL60941		7 9 P-1/16	10	8 10 10 10	10	10	100	100
12	M-3544		8 10 "	10	9/ 9/ 10 10	10	10	98	98
13	GL64779 (52-P-18)		10 10	10	9/ 10 10 10	10	10	100	100
14	LIA #4 (old No.)		8 8 P-1/2	10	7 8 10 10	10	10	94	94
15	M-3102 (LIA 6) Hi-Flash Naphten		8 10 P	10	9/ 10 10 10	10	10	100	100

NOTES: #2, 7, 8, 9, 10-Blistering is working in from edges.

#3 - Beginning to lose adhesion along edge near bottom.

#4 - Beginning to lose adhesion along edge near bottom and peel here.

#12 - Corrosion breaking through on face around heavy particles of pigment.

#14 - Losing adhesion along edges. Blistering working in from edges. Pinpoint corrosion breaking through coating.

CODE NUMBER 8-2
DATE PLACED ON TEST 8/6/44
DATE OF THIS INSPECTION 10/8/44

NORTH FLORIDA TEST SERVICE
DAYTONA BEACH, FLA.

TIDE-RANGE

AVERAGE WATER TEMP. 7. 25°

PANEL NO.	PANEL SIZE	MOLASSES	ALGAE	BLISTERING	CORROSION	CHECK-CRACK-CRACK-Top	KROD-ING OR	% AREA COATING DETACH
NO.	Size	Fig.	Green	Edge	Inter- To	Edge	ING	Coat
10	10 x 1/8	10	9	8	P-1/8	10	7	98
20	10	10	9	8	"	10	6	97
30	10	10	9	8	P-1/16	10	7	97
4	10	10	9	8	P	10	9	98
5	10	10	9	8	P-1/4	7 Edge	8	97
6	10	10	9	8	"	8 Edge	8	96
70	10	10	9	8	P-1/8	10	8	97
80	10	10	9	8	P-1/4	7	6	96
9	10	10	9	8	P-1/2	6 Edge	9	96
100	10	10	9	8	(Sp. Pyl/8)	8	8	95
110	10	10	9	8	P-1/8	8	6	95
12	10	10	9	8	1/8-1/4	10	7	97
130	10	10	9	8	P-1/8	10	7	98
140	10	10	9	8	P-1/2	6	8	98
15	10	10	9	8	P-1/8	10	8	98

NOTES: #1, 2, 8 - Blistering working in from edge.

#7 - Coating losing adhesion for about 1" in from one edge.

#8 - Sealing working in from edge.

#10 - Blistering working in from edge.

#11 - Blistering working in from edge. May be losing adhesion along lower edge of panel.

#13 - Blistering working in from edge.

#14 - Blistering and sealing working in from edges. Coating losing adhesion. Corrosion breaking through blisters on face.

CODE NUMBER 9-2
 DATE PLACED ON TEST 2/8/44
 DATE OF THIS INSPECTION 11/6/44

NORTH FLORIDA TEST SERVICE
 DAYTONA BEACH, FLA.

TIDE-LINE

AVERAGE WATER TEMP. 81°F

PANEL NO.	PANEL SIZE	MOLINETS	ALGAE	BLISTERING			SCALING		CORROSION	CHECK-		PROD-ING OR		% LACEL	
				Green	SCUD	Edge	Inter-act	To Metal		Edge	Face	ING	CHALK-ING	CHALK-ING	COAT PRIMER
1.	8 1/2	10	6	7	6	7	7	10	7	10	10	10	10	98	98
2	8 1/2	10	6	7	6	7	7	10	7	10	10	10	10	98	97
3	8 1/2	10	6	7	6	7	7	10	7	10	10	10	10	98	97
4	8 1/2	10	6	7	6	7	7	10	7	10	10	10	10	97	98
5	8 1/2	10	6	7	6	7	7	10	7	10	10	10	10	98	98
6	8 1/2	10	6	7	6	7	7	10	7	10	10	10	10	98	98
7	8 1/2	10	6	7	6	7	7	10	7	10	10	10	10	98	98
8	8 1/2	10	6	7	6	7	7	10	7	10	10	10	10	98	98
9	8 1/2	10	6	7	6	7	7	10	7	10	10	10	10	98	98
10	8 1/2	10	6	7	6	7	7	10	7	10	10	10	10	98	98
11	8 1/2	10	6	7	6	7	7	10	7	10	10	10	10	98	98
12	8 1/2	10	6	7	6	7	7	10	7	10	10	10	10	98	98
13	8 1/2	10	6	7	6	7	7	10	7	10	10	10	10	98	98
14	8 1/2	10	6	7	6	7	7	10	7	10	10	10	10	98	98
15	8 1/2	10	6	7	6	7	7	10	7	10	10	10	10	98	98

NOTES: GENERAL NOTE: Generally, faces and backs of these panels show little if any difference in breakdown. Breakdown is more pronounced toward bottom of panels, which are, of course, immersed for longer periods.

#1 - Conting losing adhesion on spot or two near bottom. Blistering and scaling working in from edge.

#7 - Blistering, scaling and corrosion working in from edge.

#10 - Scaling over the lower half of panel.

#12 - Scaling working in from edge along bottom.

#15 - Conting losing adhesion in spots along edge. Scaling working away from these spots.

CODE NUMBER 9-3
 DATE PLACED ON TEST 9/8/66
 DATE OF THE INSPECTION 12/4/66

NORTH FLORIDA TEST SERVICE
 DAYTONA BEACH, FLA.

TIDE-RANGE

AVERAGE WATER TEMP. F. 67°

PANEL NO.	BARNACLES	MOLLOUSKS	ALGAE	PLASTERING				SCALING		CORROSION		CRACK-		% AREA	
				Green	SCUM	SILT	Edge	Inter- coat	To Metal	Edge	Gen.	DMG	Coat	Primer	Impact
10	1/2"	10	5	5	5	5	5	5	5	5	5	5	5	5	5
20	6	2/ 2/0	5	5	5	5	5	5	5	5	5	5	5	5	5
30	7	10	5	5	5	5	5	5	5	5	5	5	5	5	5
40	6	2/	5	5	5	5	5	5	5	5	5	5	5	5	5
50	5	2 1/2	5	5	5	5	5	5	5	5	5	5	5	5	5
60	5	7	5	5	5	5	5	5	5	5	5	5	5	5	5
70	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
80	5	10	5	5	5	5	5	5	5	5	5	5	5	5	5
90	7	9	5	5	5	5	5	5	5	5	5	5	5	5	5
100	6	10	5	5	5	5	5	5	5	5	5	5	5	5	5
110	6	2 1/2	5	5	5	5	5	5	5	5	5	5	5	5	5
120	6	5	5	5	5	5	5	5	5	5	5	5	5	5	5
130	5	2 1/2	5	5	5	5	5	5	5	5	5	5	5	5	5
140	6	5	5	5	5	5	5	5	5	5	5	5	5	5	5
150	6	5	5	5	5	5	5	5	5	5	5	5	5	5	5

NOTES: GENERAL NOTE: Fouling is mainly on lower half of panel, which is immersed for longest period.

- #1 - Primer running out slightly along edge. Barnacles causing loss of adhesion along bottom section.
- #2 - Sealing to metal beginning to work in from edges.
- #3 - Barnacles causing some damage to coating along bottom section.
- #4 - Barnacles causing slight damage to coating along bottom section.
- #5 - Barnacles causing loss of adhesion and some peeling along bottom section. Blistering and scaling beginning to work in from edges.
- #6 & #7 - Barnacles causing loss of adhesion and some peeling along bottom section.
- #8 & #9 - Barnacles causing loss of adhesion and some peeling along bottom section. Blistering, scaling and rust working in from edges.
- #10 - Blistering and rust working in from edges and in several spots over panel. Barnacles causing some damage.
- #11 - Blistering is occurring generally over panel. Heaviest scaling occurring over lower half. Barnacles do not appear to be damaging coating.
- #12 - Barnacles causing loss of adhesion and some scaling.
- #13 - Barnacles are under-cutting along edge.
- #14 - Blistering, scaling and corrosion has worked in, leaving only a small section in upper center intact.
- #15 - Coating has lost adhesion for about 1" to 1 1/2" along sides and bottom. Sealing working in from edges. Barnacles causing slight peeling, but mainly where coating had lost adhesion.

CODE NUMBER 9-3
DATE PLACED ON TEST 8/6/44
DATE THIS INSPECTION 1/4/48

NORTH FLORIDA TEST SERVICE
DAYTONA BEACH, FLA.

TYPE-RANGE

AVERAGE WATER TEMP. F. 80°

PANEL NO.	TIDEWATER		MOLLUSKS	ALGAE	SCUM	BLISTERING			SCALING & FLAKING		CORROSION		CRACKING	% AREA	
	BR. BRACE	HT. SILE				Edge	Con.	Size	Inter- cont	To total	Edge	Con.		Coating	Impact
1*	6	1/8-1/4	10	7	8	4	8	P-1/8	9	9	4	8	7	83	98
2*	6	"	9/16 1/2	8	8	4	7	"		4Edge	4	8	7	90	90
3	6	"	9/16 5/8	8	8	8	8	"		8Edge	6	9	10	94	94
4*	6	"	9/16 1/2	8	8	7	10	"			6	10	10	98	98
5*	6	"	9/16	8	8	4	8	P-1/8	Pocking	7	4	7	6	80	84
6*	6	"	8 1/2	8	8	4	8	P-1/8		7	4	8	7	80	82
7*	8	"	8	8	8	2	8	P-1/8		6	8	8	7	80	80
8*	6	"	10	8	8	-	7	"		4	2	8	7	75	75
9*	6	"	9	8	8	-	7	"		4	2	8	7	75	75
10*	6	"	10	8	8	-	8	"		3	3	4	7	80	80
11	8	"	9	8	8	-	3	P-1/2		1	3	4	8	83	85
12	8	"	9	8	8	8	8	1/8-1/4		6	4	8	9	75	75
13*	8	1/8-1/4	8 1/8-1/2	8	7	-	6	P-1/8		8Edge	6	10	8	94	94
14	-	"	"	-	-	-	-	-		0	1	2	-	8	8
15	6	"	8	8	7	-	9	1/8		8	3	7	10	75	75

- NOTES: #1, #2 -- Coating cracking near edges and rust breaking through.
#4 -- One or two brackles have undercut coating near bottom of panels.
#5 -- Coating scaling to metal on upper section of panel, but is cracking and pooling to primer along lower section, taking part of primer with topcoat. Rust breaking through remaining primer.
#6 -- Upper section of panel in relatively good condition.
#7, #8, #9 -- Flaking and scaling working in from edges and along lower section of panel. Upper section of panel in relatively good condition.
#10 -- Flaking and scaling working in from edges and along lower section of panel.
#13 -- Coating is losing adhesion for about 1/2" along edge.

NOTES: #17, 18 - Blistering working in from edges.
#19 - Chalking to undercut on blisters.
#22 - Blistering working in from edges. Losing adhesion along edges.
#23 - Primer running out through breaks in blisters. Coating losing adhesion over panel.
#25 -
#26 - Chalking to undercut on blisters.
#27 - Chalking to undercut on blisters.
#28 - Chalking or eroding to undercut on blisters.
#29 - Coating losing adhesion and peeling within cheek lines. Primer washing off where topcoat has peeled.
#30 - No indication of blistering, but coating may be losing adhesion along edge.

CODE NUMBER 9-1
DATE PLACED ON TEST 8/8/44
DATE OF THIS INSPECTION 10/6/44

NORTH FLORIDA TEST SERVICE
LANTANA BEACH, FLA.

TOTAL SUBMERSION

AVERAGE WATER TEMP. 79.0°

PANEL NO.	BARNACLES Htg. Size	ANNEALING Htg. Size	SCUM	EDGE	BLISTERING Size	PEELING To Inter-coat Metal	To CORROSION	CHECK-ING	CHALK-ING	CRACK-ING	% AREA COATING INTACT	
											Top Coat	Primer
16	9 to 1/8	9/ 1/2	8	2	7 (Gen. P-1/2)	10	9	10	10	8	10	99
17	9/ Seed	10	8	2	6	8	9	9	10	8	10	98
18	9/ "	10	8	2	4	8	9	9	10	8	10	98
19	9/ "	10	8	1	6 1/8-3/4	7E4ps	7	10	10	7	10	98
20	9 to 1/8	10	8	3	8 (Gen. P-3/8)	7	10	9	10	8	7	10
21	9 Seed	10	8	3	7 P-1/2	7	10	9	10	8	8	10
22	9 to 1/8	10	8	2	4 P-1/4	8	7	7	10	7	10	98
23	9 to 1/4	9/ 1/2	7	4	4 P-1/2	8	7	7	10	4	7	88
24	9 to 1/8	10	4	3	4 P-1/2	9	7	8	10	7	10	93
25	9 to 1/4	10	4	4	4 P-1	8	8	9	10	8	10	97
26	9 "	10	4	0	0 P-3/4	8	8	9	10	7	10	98
27	10	10	3	2	2 P-1/2	8	9	8	10	10	7	10
28	8 to 1/8	10	4	3	7 P-1/2 Gen. 1/4	7	10	10	10	4	10	90
29	8 to 1/4	10	4	7	5 1/8-1/2	6	8	9	2	8	9	94
30	9 Seed	10	8	10		SE4ps	10	7	9	10	98	98

NOTES: GENERAL NOTES: The rating was 10 for all panels under the following headings: MOLLUSKS, HYDROIDS, BRYOZOA (Encrusting and Filamentous), and ALGAE (Brown and Green).

Barnacles and mollusks tight along edges and on undercut.

#20 - Primer running out slightly.

#22 - Coating seems to have little adhesion.

#25 - 1/4 coating barnacles have undercut along edge.

#28 - Topcoat chalking and eroding to yellow undercut in spots. Some barnacles dropping off, taking topcoat, and some taking coating to metal.

#29 - Larger barnacles undercutting.

CODE NUMBER 9-1
DATE PLACEMENT EXPOSURE 8/8/44
DATE OF THIS INSPECTION 11/6/44

NORTH FLORIDA TEST SERVICE
DAYTON, OHIO, FLA.

TOTAL SUBMERSION

AVERAGE WATER TEMP. F. 75°

PHYSICAL						PRELIM				CORROSION		CHECK-CRAKE		CRACK-Top		% AREA COVERED				
Engrist-Villason-						To				Inter-To		INS		INS		INS				
PANEL NO.	BARNACLES	WOLLUCKS	ing.	toes	SILT	BLISTERING	Inter-	To	coat	Metal	INS	INS	INS	INS	coat	Primer				
16	9	to 1/8	9/16	1/8	9/16	1/2	10	8	3	7	1/8-1/2	4	7	9	9	10	7	10	80	98
17	9	"	"	"	9	1	10	7	2	4	"	4	7	8	8	10	7	10	80	98
18	9	to 1/8	"	"	9/16	1/2	10	7	2	3	1/8-1	5	4	7	7	10	7	10	78	80
19	9	"	9/16-1/2	9/16	1/2	1	110	4	1	6	1/8-3/8	3	5	7	10	6	10	70	70	
20	9	to 1/8	10	10	10	7	3	3	1/8-1/2	"	"	2	9	8	10	3	7	10	80	97
21	8	"	9/16	1/8	10	10	7	3	6	"	"	2	8	8	8	2	7	10	80	96
22	-	-	-	-	-	-	-	-	-	-	-	9	4	4	-	-	-	25	25	
23	7	to 1/4	9/16-3/8	6/16-1/4	10	7	-	-	-	-	2	5	8	10	4	-	85	85		
24	8	to 1/8	9/16	9/16	10	7	3	4	P-1/2	4	6	8	10	4	10	80	80			
25	7	to 1/2	9/16	9/16	10	7	4	4	P-1	3	7	7	10	5	10	78	78			
26	8	to 1/4	10	9/16	10	7	0	0	P-3/4	3	7	8	10	5	10	70	70			
27	8	"	10	10	10	6	1	1	1/8-3/4	2	8	7	10	5	10	80	80			
28	7	to 1/8	9/16-3/8	9/16	10	7	3	4	P-1/2	5	7	8	10	1	10	80	80			
29	8	to 1/2	9/16	9/16	10	6	7	5	1/8-1/2	6	8	8	2	6	9	80	96			
30	8	to 1/4	9/16	9/16	10	7	8	6	1/8	6	9	10	7	6	10	90	90			

NOTES: GENERAL NOTES: All the panels under ANTIMONY were rated 10 except the following: #17 was rated 9/16 with Size 1/2; #19 was rated 9/16 with Size 1/2; #23 was rated 9 with Size 1/2-1; #24 was rated 9/16 with Size 9/16; #25 was rated 9 with Size 1/2 and #29 was rated 9 with Size 1/2-1. #22 was not rated.

Under HYDROLYSIS all were rated 10 except #23 was rated 9 with Size 2, #27 was rated 9/16 with Size 1/2; and #29 was rated 9 with Size 1. #22 was not rated.

Under ALKALI (Brown and Green) all rated 10 except #22 - was not rated.

- #16 - Topcoating seems to have poor adhesion to undercoat. Blistering is mainly of topcoat only.
- #17 - Blistering is partly of topcoat only and partly topcoat and primer.
- #18 - Poor adhesion of topcoat to primer. Primer has poor adhesion to metal where topcoat has peeled.
- #19 - Larger barnacles have undercut. Coating losing adhesion over panels.
- #20 - Topcoat peeling in long strips from primer. Very poor adhesion of topcoat to primer.
- #21 - Same as #20. Beginning to foul on primer also.
- #22 - Dashed indicate that no rating can be determined due to severe peeling of coating. Balance of coating has little or no adhesion.
- #23 - Coating remaining has lost all adhesion except in one or two spots.
- #24 - Coating losing adhesion around spots where blisters have broken.
- #25 - Coating losing adhesion and peeling around spots where blisters have broken.
- #26 - Coating losing adhesion over balance of panel. #27 - Coating losing adhesion over most of balance of panels.
- #28 - Corrosion pitting along edge. Blistering seems to have been of topcoat only.
- #29 - Corrosion pitting along edge. Coating appears to have little adhesion around spots where peeled.

NORTH FLORIDA TEST SERVICE
DAYTONA BEACH, FLA.

CODE NUMBER 9-1
DATE PLACED ON EXPOSURE 8/6/66
DATE OF THIS INSPECTION 12/6/66

TOTAL SUBMERSION

AVERAGE WATER TEMP. F. 67°

P.N. NO.	HYPERMARTENS		MOLIBDENUM		ANTIFULF		HYPERONIS		EXFOLO		PILASTING		CORROSION		CHECK-CHILE-CRACK		ALUM	
	HTG.	SIZE	HTG.	SIZE	HTG.	SIZE	HTG.	SIZE	HTG.	SIZE	HTG.	SIZE	HTG.	SIZE	HTG.	SIZE	HTG.	SIZE
16	8	2nd	1/8	10	8	1/8	8	1/8	8	1/8	8	1/8	8	1/8	8	1/8	8	1/8
17	7	1/8	8	1/8	8	1/8	8	1/8	8	1/8	8	1/8	8	1/8	8	1/8	8	1/8
18	8	1/8	8	1/8	8	1/8	8	1/8	8	1/8	8	1/8	8	1/8	8	1/8	8	1/8
19	8	1/8	8	1/8	8	1/8	8	1/8	8	1/8	8	1/8	8	1/8	8	1/8	8	1/8
20	Beginning to foul on primer																	
21	Fouling on metal																	
22	8	1/8	8	1/8	8	1/8	8	1/8	8	1/8	8	1/8	8	1/8	8	1/8	8	1/8
23	8	1/8	8	1/8	8	1/8	8	1/8	8	1/8	8	1/8	8	1/8	8	1/8	8	1/8
24	8	1/8	8	1/8	8	1/8	8	1/8	8	1/8	8	1/8	8	1/8	8	1/8	8	1/8
25	8	1/8	8	1/8	8	1/8	8	1/8	8	1/8	8	1/8	8	1/8	8	1/8	8	1/8
26	8	1/8	8	1/8	8	1/8	8	1/8	8	1/8	8	1/8	8	1/8	8	1/8	8	1/8
27	8	1/8	8	1/8	8	1/8	8	1/8	8	1/8	8	1/8	8	1/8	8	1/8	8	1/8
28	8	1/8	8	1/8	8	1/8	8	1/8	8	1/8	8	1/8	8	1/8	8	1/8	8	1/8
29	8	1/8	8	1/8	8	1/8	8	1/8	8	1/8	8	1/8	8	1/8	8	1/8	8	1/8
30	7	1/8	8	1/8	8	1/8	8	1/8	8	1/8	8	1/8	8	1/8	8	1/8	8	1/8

NOTES: GENERAL NOTES: All panels under HYPERONIS (Filamentous) were rated 10 except #20, #21, #22 which were not rated at all.

All panels under ALUM (Brown and Green) were rated 10, except #16, which was rated Brown - 8 and Green - 9; #20, #21, #22 were not rated at all; and #23 was rated Brown - 8 and Green - 8. Dash in rating columns indicates that no rating can be determined because of breakage down in coating.

- #16 - Primer running out and top coat losing adhesion in many spots. Exposed primer chalking.
- #17 - Primer running out and coating losing adhesion. Exposed primer chalking.
- #18 - Foulings were severe on back, chalking more severe on face. Exposed primer chalking.
- #20 - Foulings generally has started from edges and worked over panel. Exposed primer chalking.
- #21 - Exposed primer chalking.
- #22 - Topcoat has chalked to primer over most of panel. Foulings to metal where blisters are breaking.
- #23 - Primer running out.

PORT FLORIDA TEST SERVICE
LABORATORY, FLORIDA, U.S.A.

TOTAL SUBMERSION AVERAGE WATER TEMP. 80°

COIL NUMBER 9-1
DATE PLACED ON TEST 1/4/54
DATE THIS INSPECTION 1/6/54

PANEL REFERENCE	NO.	MOLYBDEUM	ANALYSIS	HYDROGEN	ENGRING	TOOL	ALCOHOL	SCUM	MISTERS	INTER-TO	CORROSION	CHECK-CHALK	CRACK-	COATING	TREAT	% AREA
NO.	1/2	1/4	1/8	1/16	1/32	1/64	1/128	1/256	1/512	1/1024	1/2048	1/4096	1/8192	1/16384	1/32768	1/65536
160	9	2/3	7	1/8-1/4	9/16	1/2	1/4	10	9	7	-	-	-	-	-	-
170	7	7	7	1/8-3/8	9/16	1/2	1/4	10	9	7	-	-	-	-	-	-
180	9	2/3	7	1/8-3/8	9/16	1/2	1/4	10	9	7	-	-	-	-	-	-
190	7	7	7	1/8-3/8	9/16	1/2	1/4	10	9	7	-	-	-	-	-	-
200	9	2/3	7	1/8-3/8	9/16	1/2	1/4	10	9	7	-	-	-	-	-	-
210	9	2/3	7	1/8-3/8	9/16	1/2	1/4	10	9	7	-	-	-	-	-	-
220	9	2/3	7	1/8-3/8	9/16	1/2	1/4	10	9	7	-	-	-	-	-	-
230	9	2/3	7	1/8-3/8	9/16	1/2	1/4	10	9	7	-	-	-	-	-	-
240	9	2/3	7	1/8-3/8	9/16	1/2	1/4	10	9	7	-	-	-	-	-	-
250	9	2/3	7	1/8-3/8	9/16	1/2	1/4	10	9	7	-	-	-	-	-	-
260	9	2/3	7	1/8-3/8	9/16	1/2	1/4	10	9	7	-	-	-	-	-	-
270	9	2/3	7	1/8-3/8	9/16	1/2	1/4	10	9	7	-	-	-	-	-	-
280	9	2/3	7	1/8-3/8	9/16	1/2	1/4	10	9	7	-	-	-	-	-	-
290	9	2/3	7	1/8-3/8	9/16	1/2	1/4	10	9	7	-	-	-	-	-	-
300	9	2/3	7	1/8-3/8	9/16	1/2	1/4	10	9	7	-	-	-	-	-	-

NOTE: #16, #17, #18, #19, #20 - Barnacles are undercutting coating to primer and to metal.

also, #18 - Blistering appears to have been mainly to primer.

#24 - Barnacles undercutting coating in spots.

#25 - Some fouling coming off, taking coating to primer and to metal in spots.

#27 - Corrosion pitting.

#28 - Some fouling dropping off and taking coating to intermediate.

#30 - " " and to metal in spots.