Ramtech Laboratories, Inc.

RAMTECH LABORATORIES, INC.

14104 ORANGE AVENUE, PARAMOUNT, CALIFORNIA 90723 • TELEPHONE (310) 633-4824 • FAX (310) 633-4128

Ms. Liz Aguirre/Mr. Ron Aguirre
ULTRASEAL INTERNATIONAL, INC.
1100 North Wilcox Avenue
Los Angeles, CA 90038

November 21, 1994

Dear Ms. and Mr. Aguirre:

1. Results of the cold stability testing are attached.

2. I recommend increasing your anti freeze component to meet the old or new freezing requirements.

3. I am sorry for the delay but tests had to be validated to insure repeatable results.

4. Corrosion testing has been proceeding. I have prepared the steel and aluminum wheel samples. (Magnesium wheels are no longer being produced). I have validated the specific alloys the wheel manufacturers are using so this can be included in the new corrosion test procedure.

5. At some point we should discuss a letter (Technical Memorandum) to the Postal Service regarding the results.

6. The billing for my time will be separately forwarded at the end of all of the testing, etc.

Sincerely Yours,

RAMTECH LABORATORIES, INC.

Robert A. Dunaetz
Chief Chemist
RADmeza

Enclosure:

- ***Report No. 10160-94***

RAMTECH LABORATORIES, INC.

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Ms. Liz Aguirre/Mr. Ron Aguirre
ULTRASEAL INTERNATIONAL, INC.
1100 North Wilcox Avenue
Los Angeles, CA 90038

November 21, 1994

Laboratory No.10160-94

Ms. Aguirre/Mr. Aguirre:

BACKGROUND:

It was reported that the currently marketed Ultraseal Tire Sealant was unable to meet the Cold Stability Test Requirements of U. S. Postal Service Specification.

The validation approach was two fold:

(1) Run the cold stability test under closely controlled conditions on the current formulation, a glycol rich version and one with a shortage of the anti freeze compound.

(2) Establish a revised test method to ensure that future tests are conducted in the same manner. The revised test method would be used as the standard for future comparisons.

(3) Start chamber temperature downward at a maximum rate of 2 °F per minute.

(4) Periodically test hardness/softness of test sample. Use a rounded plastic rod of ~ 1/2" diameter for depression or insertion. Monitor and record results at about every 4 °F drop in temperature.

(5) Results shall contain immersed thermocouple temperature readings and description of the physical condition of the sample.

The definitions, procedures, results and conclusions are detailed on the following pages.

Report Prepared By:

RAMTECH LABORATORIES, INC.

Robert A. Dunaetz
Chief Chemist
RAM/RAD/mezz

Report Approved By:

RAMTECH LABORATORIES, INC.

Ronald A. Macey, P. E.
Laboratory Director

Definitions of sample conditions are as follows:

DEFINITIONS:

Soft	=	Soft to the touch, material is mushy with no presence of solid crystals.
Semi Soft	=	Somewhat soft to touch, will separate or displace when pushed or touched. Crystals present but not interconnected to each other.
Solid	=	Firm or hard to the touch. Will not separate when pushed. Crystals are interconnected to form a solid mass.

PROCEDURES:

The following procedure was used on the final freezing test run. This is based on lessons learned in the preliminary testing.

"3.3 COLD STABILITY PROCEDURE":

3.3.1. Establish a freezing chamber temperature of +10 to 0 °F. Chamber shall be controllable down to -60 °F. Temperature reduction rate shall be controllable downward at the rate of 2 °F per minute or slower to prevent uneven sample freezing.

3.3.2. Place 100 ± 2 ml of each test sample in a aluminum cup. Place a thermocouple immersed in the sample, and a thermocouple in the adjacent chamber area to monitor ambient environment temperature.

3.3.6. At temperature of -32 °F or above the sample shall show no signs of freezing as indicated by a semi soft (slushy) or hard solid condition.

3.3.7. At temperatures of -36 °F to -40 °F the sample may show a semi solid or slushy condition. The sample shall not be hard or solid.

3.3.8. The sample shall be removed from the refrigerated environment and allowed to return to ambient room conditions (+70 °F to +90 °F). The sample shall return to the original liquid state complying to 2.7.2 of this specification.

RESULTS:

1. The freezing points and physical characteristics of the three submitted Sealant Samples are shown in Table No. 1.

2. Only the Ultraseal with 10% excess glycol was found to pass the -40 °F cold stability test. The current formulation failed to meet the old requirements even with the new closely controlled test procedure.

3. The detailed temperature values recorded during the validation test are contained in Table No. 2.

CONCLUSIONS:

1. The amount of glycol anti freeze should be increased by 10% to meet the cold stability requirements. The +10% offers very little safety margin. Possibly if economics permit +15% glycol cold would provide a safer margin.

2. The new test procedure contained in this report is more definitive, detailed and repeatable than the original procedure. It is believed that the old procedure could yield freezing point results that could vary by ± 10 °F depending upon operator care and equipment variations.

Table No. 1

KEY FREEZING POINT MEASUREMENTS/PRODUCT PHYSICAL CHARACTERISTICS

Time in Minutes From Start of Tests	(1) Current Lot of Ultraseal	(2) 10% Excess of Glycol	(3) 10% Reduction of Glycol	COMMENTS
50	-13 °F Soft	-14 °F Soft	-8 °F Soft	All samples are soft.
73	-20 °F Soft	-20 °F Soft	-17 °F Semi Solid	(3) Entering semi solid range.
104	-28 °F Semi Solid	-26 °F Soft	-26 °F Solid	(1) Entering semi solid range. (2) Remains soft. (3) Turns solid.
124	-39 °F Solid	-36 °F Semi Solid	-37 °F Solid	(1) Turns solid. (Fails current specification) (2) Entering semi solid range. (3) Solid.
144	-47 °F Solid	-43 °F Solid	-44 °F Solid	All are solid. (2) Turns solid at -43 °F.
158	-51 °F Solid	-45 °F Solid	-45 °F Solid	All are solid.

DEFINITIONS:

Soft	=	Soft to the touch, material is mushy with no presence of solid crystals.
Semi Soft	=	Somewhat soft to touch, will separate or displace when pushed or touched. Crystals present but not interconnected to each other. Sealant wets contact surfaces.
Solid	=	Firm or hard to the touch. Will not separate when pushed. Crystals are interconnected to form a solid mass.

Table No. 2

TEMPERATURE OF SAMPLE AND CHAMBER IN °F				
Time (In Minutes)	(1) Current Batch	(2) 10% More E.G.	(3) 10% Less E.G.	(4) Chamber
(Placed Sample In Chamber)				
0	+0066.	+0057.	+0066.	+0006.
1.	+0063.	+0055.	+0063.	+0004.
2.	+0063.	+0053.	+0060.	+0003.
3.	+0059.	+0051.	+0057.	+0002.
4.	+0057.	+0049.	+0055.	+0001.
5.	+0055.	+0047.	+0052.	+0001.
6.	+0052.	+0046.	+0049.	+0001.
7.	+0049.	+0044.	+0048.	+0006.
8.	+0049.	+0044.	+0046.	-0009.
9.	+0046.	+0042.	+0043.	-0021.
10.	+0044.	+0040.	+0041.	-0025.
11.	+0041.	+0038.	+0039.	-0024.
12.	+0040.	+0037.	+0035.	-0030.
13.	+0035.	+0034.	+0032.	-0034.
14.	+0033.	+0032.	+0030.	-0037.
15.	+0030.	+0030.	+0027.	-0039.
16.	+0027.	+0027.	+0024.	-0040.
17.	+0025.	+0025.	+0023.	-0040.
18.	+0023.	+0023.	+0021.	-0039.
19.	+0021.	+0021.	+0018.	-0039.
20.	+0018.	+0019.	+0017.	-0039.
21.	+0016.	+0017.	+0015.	-0044.
22.	+0014.	+0015.	+0014.	-0036.
23.	+0012.	+0013.	+0012.	-0043.
24.	+0011.	+0012.	+0010.	-0041.
25.	+0008.	+0010.	+0008.	-0041.
26.	+0006.	+0008.	+0007.	-0043.

Table No. No. 3

TEMPERATURE OF SAMPLE AND CHAMBER IN °F				
Time (In Minutes)	(1) Current Batch	(2) 10% More E.G.	(3) 10% Less E.G.	(4) Chamber
27.	+0004.	+0007.	+0004.	-0040.
28.	+0003.	+0005.	+0004.	-0043.
29.	+0001.	+0004.	+0002.	-0043.
30.	+0000.	+0002.	+0001.	-0044.
31.	+0001.	+0001.	+0000.	-0039.
32.	-0002.	+0000.	-0001.	-0046.
33.	-0003.	-0002.	-0001.	-0039.
34.	-0005.	-0003.	-0002.	-0043.
35.	-0006.	-0003.	-0002.	-0040.
36.	-0006.	-0005.	-0003.	-0039.
37.	-0006.	-0005.	-0003.	-0044.
38.	-0009.	-0007.	-0004.	-0038.
39.	-0009.	-0007.	-0004.	-0046.
40.	-0010.	-0009.	-0005.	-0045.
41.	-0010.	-0010.	-0005.	-0038.
42.	-0010.	-0010.	-0006.	-0039.
43.	-0012.	-0011.	-0006.	-0040.
44.	-0012.	-0012.	-0006.	-0039.
45.	-0012.	-0013.	-0006.	-0044.
46.	-0013.	-0014.	-0007.	-0043.
47.	-0012.	-0014.	-0007.	-0042.
48.	-0012.	-0014.	-0008.	-0039.
49.	-0013.	-0014.	-0009.	-0042.
50.	-0013.	-0014.	-0008.	-0041.
51.	-0011.	-0014.	-0009.	-0043.
52.	-0012.	-0015.	-0009.	-0042.
53.	-0014.	-0016.	-0010.	-0039.

Table No. 4

TEMPERATURE OF SAMPLE AND CHAMBER IN °F				
Time (In Minutes)	(1) Current Batch	(2) 10% More E.G.	(3) 10% Less E.G.	(4) Chamber
54.	-0013.	-0015.	-0010.	-0042.
55.	-0014.	-0017.	-0011.	-0037.
56.	-0014.	-0016.	-0010.	-0042.
57.	-0014.	-0016.	-0011.	-0040.
58.	-0014.	-0016.	-0011.	-0042.
59.	-0015.	-0016.	-0012.	-0042.
60.	-0015.	-0017.	-0013.	-0042.
61.	-0016.	-0017.	-0013.	-0043.
62.	-0016.	-0017.	-0013.	-0039.
63.	-0017.	-0017.	-0014.	-0043.
64.	-0017.	-0017.	-0014.	-0041.
65.	-0017.	-0018.	-0014.	-0040.
66.	-0017.	-0018.	-0014.	-0039.
67.	-0017.	-0018.	-0015.	-0040.
68.	-0018.	-0019.	-0015.	-0043.
69.	-0018.	-0018.	-0016.	-0045.
70.	-0019.	-0019.	-0016.	-0041.
71.	-0019.	-0019.	-0017.	-0037.
72.	-0019.	-0020.	-0017.	-0035.
73.	-0020.	-0020.	-0017.	-0039.
74.	-0021.	-0020.	-0017.	-0046.
75.	-0021.	-0021.	-0018.	-0042.
76.	-0021.	-0021	-0018.	-0041.
77.	-0021.	-0021.	-0019.	-0042.
78.	-0021.	-0021.	-0019.	-0041.
79.	-0022.	-0021.	-0019.	-0041.
80.	-0022.	-0021.	-0020.	-0041.

Table No. 5

TEMPERATURE OF SAMPLE AND CHAMBER IN °F				
Time (In Minutes)	(1) Current Batch	(2) 10% More E.G.	(3) 10% Less E.G.	(4) Chamber
81.	-0022.	-0021.	-0020.	-0043.
82.	-0022.	-0021.	-0020.	-0042.
83.	-0023.	-0021.	-0021.	-0037.
84.	-0023.	-0021.	-0021.	-0041.
85.	-0024.	-0022.	-0021.	-0041.
86.	-0024.	-0023.	-0021.	-0041.
87.	-0024.	-0023.	-0022.	-0039.
88.	-0025.	-0023.	-0022.	-0039.
89.	-0025.	-0022.	-0022.	-0042.
90.	-0025.	-0023.	-0022.	-0039.
91.	-0025.	-0023.	-0023.	-0041.
92.	-0025.	-0024.	-0024.	-0039.
93.	-0026.	-0025.	-0024.	-0039.
94.	-0026.	-0025.	-0024.	-0040.
95.	-0026.	-0025.	-0024.	-0040.
96.	-0026.	-0025.	-0024.	-0040.
97.	-0026.	-0025.	-0025.	-0042.
98.	-0028.	-0025.	-0025.	-0042.
99.	-0028.	-0025.	-0025.	-0039.
100.	-0027.	-0025.	-0025.	-0035.
101.	-0028.	-0026.	-0025.	-0036.
102.	-0028.	-0026.	-0026.	-0045.
103.	-0028.	-0026	-0026.	-0041.
104.	-0028.	-0026.	-0026.	-0041.

COMMENTS:

At 104 Minutes:
(1) Semi Solid.
(2) Still Soft.
(3) Solid.

Table No. 6

TEMPERATURE OF SAMPLE AND CHAMBER IN °F				
Time (In Minutes)	(1) Current Batch	(2) 10% More E.G.	(3) 10% Less E.G.	(4) Chamber
105.	-0029.	-0028.	-0028.	-0016.
106.	-0028.	-0026.	-0027.	-0040.
107.	-0030.	-0028.	-0028.	-0045.
108.	-0031.	-0028.	-0028.	-0046.
109.	-0031.	-0028.	-0028.	-0047.
110.	-0031.	-0029.	-0029.	-0047.
111.	-0032.	-0030.	-0030.	-0047.
112.	-0033.	-0030.	-0031.	-0048.
113.	-0034.	-0032.	-0032.	-0049.
114.	-0035.	-0032.	-0032.	-0051.
115.	-0035.	-0032.	-0032.	-0050.
116.	-0035.	-0032.	-0032.	-0051.
117.	-0035.	-0032.	-0032.	-0051.
118.	-0036.	-0033.	-0034.	-0051.
119.	-0037.	-0034.	-0035.	-0051.
120.	-0038.	-0034.	-0035.	-0052.
121.	-0036.	-0034.	-0035.	-0052
122.	-0039.	-0035.	-0036.	-0052.
123.	-0039.	-0036.	-0037.	-0052.
124.	-0039.	-0036.	-0037.	-0053.
125.	-0040.	-0037.	-0038.	-0053.
126.	-0040.	-0036.	-0037.	-0036.
127.	-0041.	-0038.	-0039.	-0047.
128.	-0042.	-0038.	-0039.	-0051.
129.	-0043.	-0039	-0039.	-0052.
130.	-0042.	-0039.	-0039.	-0053.
131.	-0043.	-0039.	-0039.	-0053.
132.	-0043.	-0039.	-0040.	-0053.
133.	-0043.	-0039.	-0040.	-0054.

COMMENTS:

At 124 Minutes:

(1) Solid @ -39 °F.
(2) Semi Solid @ -36 °F.
(3) Solid @ -37 °F.

Table No. 7

TEMPERATURE OF SAMPLE AND CHAMBER IN °F				
Time (In Minutes)	(1) Current Batch	(2) 10% More E.G.	(3) 10% Less E.G.	(4) Chamber
134.	-0044.	-0040.	-0041.	-0054.
135.	-0044.	-0040.	-0041.	-0054.
136.	-0045.	-0041.	-0042.	-0055.
137.	-0046.	-0041.	-0043.	-0055.
138.	-0046.	-0042.	-0043.	-0055.
139.	-0046.	-0041.	-0043.	-0054.
140.	-0046.	-0043.	-0043.	-0055.
141.	-0046.	-0042.	-0043.	-0053.
142.	-0047.	-0043.	-0043.	-0052.
143.	-0047.	-0043.	-0044.	-0053.
144.	-0048.	-0043.	-0044.	-0053.
145.	-0048.	-0043.	-0044.	-0053.
146.	-0048.	-0043.	-0044.	-0037.
147.	-0049.	-0044.	-0044.	-0050.
148.	-0049.	-0043.	-0044.	-0053
149.	-0049.	-0044.	-0044.	-0053.
150.	-0050.	-0044.	-0044.	-0053.
151.	-0050.	-0045.	-0045.	-0053.
152.	-0050.	-0045.	-0045.	-0052.
153.	-0051.	-0045.	-0045.	-0052.
154.	-0050.	-0045.	-0045.	-0053.
155.	-0050.	-0045.	-0044.	-0052.
156.	-0051.	-0045.	-0045.	-0052.
157.	-0051.	-0045.	-0045.	-0052.
158.	-0051.	-0045.	-0045.	-0021.

COMMENTS:

At 144 Minutes:

(1) Hard Solid @ -48 °F.
(2) Turning Solid @ -43 °F.
(3) Hard Solid @ -44 °F.

RAMTECH LABORATORIES, INC.

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Ms. Liz Aguire
ULTRASEAL INTERNATIONAL, INC.
1100 N. Wilcox Avenue
Los Angeles, CA 90038

July 6, 1995

Subject.: High Temperature Capability of Ultraseal Tire Life Extender.

Reference: Test Report No. 10371-95, "Heat Stability of Ultraseal Tire Life Extender", dated June 20, 1995.

Dear Ms. Aguire:

After reviewing the results of the elevated temperature testing of the Ultraseal Tire Extender (reference) I have come to the conclusion that the subject sealant compound is functional and stable up to and in the 274 °F to 287 °F temperature range.

This is based on a normal tire inflation pressure of 30 to 40 psig. The safe operating temperature of the sealant will be about 300 °F if used in heavy duty tires (i. e. trucks) with tire pressures in the range of 60 psig. More precise temperature limits could be determined but rather extensive and elaborated test methods would be required. This would involve heating inflated tires containing the sealant under closely monitored conditions. Since the sealant material is aqueous in nature, it will generally follow the established thermodynamic laws of water and steam. From this the results of the testing and the conclusions reached are considered to be reliable and accurate

I recommend that you submit the subject test report to the U. S. Postal Service for their review and approval.

Sincerely yours,

RAMTECH LABORATORIES, INC.

R. A. Dunaetz
Chief Chemist
RAD/mess

RAMTECH LABORATORIES, INC.

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Ms. Liz Aguire
ULTRASEAL INTERNATIONAL, INC.
1100 N. Wilcox Avenue
Los Angeles, CA 90038

June 20, 1995

Subject: Heat Stability of Ultraseal Tire Life Extender

Laboratory No. 10371-95

Dear Ms. Aguire:

PROPOSE:

To determine if the liquid Ultraseal Tire Life Extender changes consistency when thermally aged for specific periods of time.

PROCEDURE:

1. Obtain new clean glass jars of about one ounce capacity, with screw caps for the aging container.
2. Fill each jar to about one-half inch from the top with Ultraseal. There shall be eight specimens in jars used for testing.
3. Exposure Temperature Schedule.

The testing procedure, results, discussions and conclusion are detailed on the following pages.

Report Prepared By:

RAMTECH LABORATORIES, INC.

Robert Dunaetz

R. A. Dunaetz
Chief Chemist

Report Approved By:

RAMTECH LABORATORIES, INC.

Ronald A. Macey, P. E.
Laboratory Director

PROCEDURE: (Cont.)

Specimen Number	Exposure Temperature	Exposure Time @ Temperature
1, 2	140 °F	6 Hours
3, 4	210 °F	2.5 Hours
5, 6	250 °F	2.5 Hours
7, 8	275 °F	2.5 Hours

4. Place two specimens in a calibrated oven operating at the listed exposure temperatures. The odd numbered specimens shall have the metal caps loosely screwed on, such that the sample can breath. The even numbered specimens shall have the caps tightly screwed onto the jar. Allow 15 minutes for the jar and content to reach temperature and stabilize.

5. After the specimens have been thermally exposed, remove the jars and allow them to cool prior to inspection.

6. Inspection - Inspect the cooled specimens for the following conditions:

   A. Separation of a clear liquid floating on the base material.
   B. Color change throughout and at specific layers.
   C. Solidification, if any.
   D. Consistence of liquid portion.
   E. Odor.

7. Record data and observations.

DISCUSSION ON THE PROCEDURE:

1. Since the atmosphere inside of a tire can have an air pressure of zero to greater than 65 psig*, the data generated in this report must be reviewed as testing performed on the lower end of this scale.

2. Some of the specimens were purposely aged at zero psig. The remainder were aged in seal jars with an estimated internal pressure of 10 to 15 psig when at temperature. The two types of atmospheres were easily achievable and were within the scope of this investigation.

NOTE:

PSIG = Pounds per square inch, gauge. This is the type reading obtained when inflating a tire.

RESULTS:

The results of the testing at the four different temperatures in both sealed and unsealed containers is presented in Tables Nos. 1, 2, 3, and 4.

CONCLUSIONS AND DISCUSSION:

1. The Ultraseal Tire Extender showed good stability until its boiling point was reached.

2. At low pressures (i.e. 0 to 10 psig) the material is stable into the 240 to 250 °F range. The performance of the product and its physical characteristics do not change until boiling conditions are reached.

3. Based on the established properties of water transforming into steam (boiling point), the upper limits of Ultraseal are extrapolated to 274 °F at 30 psig, and 287 °F at 40 psig. This correlation is presented in Table No. 5.

Table No. 1

Exposure Temperature 140 °F

Exposure Time 6.0 Hours

Inspection Criteria	Specimen No. 1 Cap Loosely Screwed Onto The Jar	Specimen No. 2 Cap Tightly Screwed Onto The Jar
A. Separation of liquid floating on the base material.	No separation.	No separation.
B. Color change throughout and at specific layers.	Color remained unchanged.	Color remained unchanged.
C. Solidification, if any.	Thickened slightly but remained thixotropic.	Consistency remained unchanged.
D. Consistence of liquid portion.	Changed to slightly more viscosity	Consistency remained unchanged.
E. Odor.	Very mild sweet chemical, no change.	Very mild sweet chemical, no change.

Table No. 2

Exposure Temperature 210 °F

Exposure Time 2.5 Hours

Inspection Criteria	Specimen No. 3 Cap Loosely Screwed Onto The Jar	Specimen No. 4 Cap Tightly Screwed Onto The Jar
A. Separation of liquid floating on the base material.	No separation.	No separation.
B. Color change throughout and at specific layers.	Color remained unchanged.	Color remained unchanged.
C. Solidification, if any.	Thickened slightly but remained thixotropic.	Consistency remained unchanged.
D. Consistence of liquid portion.	Remained consistent but gained in viscosity.	Slight gain in viscosity.
E. Odor.	Very mild sweet chemical, no change.	Very mild sweet chemical, no change.

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Ms. Liz Aguire
ULTRASEAL INTERNATIONAL, INC.
1100 N. Wilcox Avenue
Los Angeles, CA 90038

June 20, 1995

Subject: Heat Stability of Ultraseal Tire Life Extender

Laboratory No. 10371-95

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PROPOSE:

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1. Obtain new clean glass jars of about one ounce capacity, with screw caps for the aging container.
2. Fill each jar to about one-half inch from the top with Ultraseal. There shall be eight specimens in jars used for testing.
3. Exposure Temperature Schedule.

The testing procedure, results, discussions and conclusion are detailed on the following pages.

Report Prepared By:

RAMTECH LABORATORIES, INC.

Robert Dunaetz

R. A. Dunaetz
Chief Chemist

Report Approved By:

RAMTECH LABORATORIES, INC.

Ronald A. Macey

Ronald A. Macey, P. E.
Laboratory Director

RAMTECH LABORATORIES, INC.

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RAMTECH LABORATORIES, INC.

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R. A. Dunaetz
Chief Chemist

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Ronald A. Macey, P. E.
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Inspection Criteria	Specimen No. 1 Cap Loosely Screwed Onto The Jar	Specimen No. 2 Cap Tightly Screwed Onto The Jar
A. Separation of liquid floating on the base material.	No separation.	No separation.
B. Color change throughout and at specific layers.	Color remained unchanged.	Color remained unchanged.
C. Solidification, if any.	Thickened slightly but remained thixotropic.	Consistency remained unchanged.
D. Consistence of liquid portion.	Changed to slightly more viscosity	Consistency remained unchanged.
E. Odor.	Very mild sweet chemical, no change.	Very mild sweet chemical, no change.

Table No. 2

Exposure Temperature 210 °F

Exposure Time 2.5 Hours

Inspection Criteria		Specimen No. 3 Cap Loosely Screwed Onto The Jar	Specimen No. 4 Cap Tightly Screwed Onto The Jar
A.	Separation of liquid floating on the base material.	No separation.	No separation.
B.	Color change throughout and at specific layers.	Color remained unchanged.	Color remained unchanged.
C.	Solidification, if any.	Thickened slightly but remained thixotropic.	Consistency remained unchanged.
D.	Consistence of liquid portion.	Remained consistent but gained in viscosity.	Slight gain in viscosity.
E.	Odor.	Very mild sweet chemical, no change.	Very mild sweet chemical, no change.

Table No. 3

Exposure Temperature 250 °F

Exposure Time 2.5 Hours

Inspection Criteria	Specimen No. 5 Cap Loosely Screwed Onto The Jar	Specimen No. 6 Cap Tightly Screwed Onto The Jar
A. Separation of liquid floating on the base material.	Complete separation of clear green liquid from agglomerated solids. Material boiled out of container.	Some separation of clear green liquid from agglomerated solids. Material boiled within sealed container.
B. Color change throughout and at specific layers.	Color remained green but separated into two phases.	Color remained green but started to separate into two phases.
C. Solidification, if any.	Both separated phases remained gel like. Boiled over material outside of container dried.	Material remained pourable.
D. Consistence of liquid portion.	Became a non-pourable gel like material.	Remained a pourable but high viscosity liquid.
E. Odor.	Very mild sweet chemical, no change.	Very mild sweet chemical, no change.

Table No. 4

Exposure Temperature 275 °F

Exposure Time 2.5 Hours

Inspection Criteria	Specimen No. 7 Cap Loosely Screwed Onto The Jar	Specimen No. 8 Cap Tightly Screwed Onto The Jar
A. Separation of liquid floating on the base material.	Complete separation of clear green liquid from agglomerated solids. Material boiled out of container.	Fairly complete separation of clear green liquid from agglomerated solids. Material boiled in container.
B. Color change throughout and at specific layers.	Color remained green but separated into two phases.	Color remained green but separated into two phases
C. Solidification, if any.	Material remaining in jar dried.	Material became a non-pourable gel.
D. Consistence of liquid portion.	Material turned to a solid.	All material solidified.
E. Odor.	Very mild sweet chemical, no change.	Very mild sweet chemical, no change.

Table No. 5

CORRELATION BETWEEN PRESSURE AND BOILING POINTS OF CONTAINING LIQUIDS*

Absolute Pressure, Lb./sq. in (PSIA)	Gauge Pressure** Lb./sq. in (PSIG)	Water Boiling Temperature, °F	Comment
14.7	0	212	Flat tire.
25	~ 10	240	Low inflated tire.
35	~ 20	259	Inflated tire.
45	~ 30	274	Inflated tire.
55	~ 40	287	Inflated tire.
65	~ 50	298	Inflated tire.

* Extrapolated data from Keenan and Keyes, "Thermodynamic Properties of Steam" John Wiley & Sons, New York, 1936.

** The gauge pressure would be that of an inflated tire. As the pressure goes up, the boiling point of the water in the Tire Life Extender increases. From this it can be extrapolated that the sealant boiling point will be in the 270 °F to 280 °F for normally inflated passenger vehicle tires.

RAMTECH LABORATORIES, INC.

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Ms. Liz Aguire
Mr. Ron Aguire
ULTRASEAL INTERNATIONAL, INC.
1100 N. Wilcox Avenue
Los Angeles, CA 90038

June 6, 1995

Subject: Corrosion Characteristics of Ultraseal Tire Life Extender on Aluminum and Steel Alloys.

Laboratory No. 10248-94

Dear Ms. & Mr. Aguire:

BACKGROUND:

Corrosion and corrosion growth are recognized as significant degradation mechanisms that effect the reliability, durability and integrity of metal automotive wheels that are in contact with tire life extended sealants. This testing was undertaken to characterize the effects that Ultraseal Tire Life Extender has on typical aluminum and steel wheels.

The testing method, results and conclusion are detailed on the following pages.

Report Prepared By:

RAMTECH LABORATORIES, INC.

R. A. Dunaetz
Chief Chemist

RAM/RAD/DP/meza.

Report Approved By:

RAMTECH LABORATORIES, INC.

Ronald A. Macey, P. E.
Laboratory Director

Principal Investigator By:

RAMTECH LABORATORIES, INC.

Dwarika Prasad
Senior Staff Engineer

Enclosure:

Attachment "A" &
Photographs Nos. 1 through 7.

TESTING METHOD:

The test method selected for testing was one that is used to test steel, as well as aluminum equipment subjected to long term field conditions. The accelerated test is based on thermal cycling for an eight week period. This equates to an outdoor exposure period of five years, based on actual industry testing and experience.

The details of the test are contained in Attachment "A".

In reference to requirements, the Postal Service Vehicle Maintenance Document V-09-95 requires corrosion resistance such that no more than 0.025% weight loss occur when exposed to tire sealant at 140 °F for 48 hours. This test procedure is followed as it allows for painted test coupons to be tested, the test period is too short to establish a trend, and the positioning of the test coupon (i.e. immersed, half immersed or all in the vapor phase) is not specified. The test procedure used and described herein attempts to over come all o f these deficiencies.

RESULTS:

1. The results of the weight loss and the observation of surface conditions of the specimens is contained in Tables No. 1 through No. 12 on the following pages.

2. The most severe corrosion observed was recorded in Table No. 2. This was on a steel wheel specimen exposed to the vapors only of the tire sealant. This specimen was selected for further inspection. A photographic record of the corrosion is recorded in Photographs Nos. 1, 2 and 3. The shape of the corrosive action into the surface is shown in Photographs Nos. 4, 5, 6 and 7. Table No. 13 records the depth of the corrosion blemishes.

CONCLUSIONS:

1. Regarding the steel wheel specimens:

   A. The vapor phase above the sealant is the most corrosive.
   B. The half immersion position into the sealant is less corrosive than the vapor zone by itself.
   C. The immersion into the sealant position is mildly corrosive but is essentially benign.
   D. Mild corrosion did occur on all steel specimens but the 0.025% weight loss did not occur until at least 200 hours of accumulated 140 °F exposure. The liquid and half immersed specimens did not reach this level of weight loss until at least 700 hours exposure.
   E. There were no deep pits observed in any of the steel specimens. Corrosion was irregular and occurred at random locations. A pit is described as a recessed area that is at least two times than it is wide.

2. Regarding the aluminum wheel test specimens:

   A. The vapor phase above the sealant was quite benign. Very mild corrosion was observed however.
   B. The specimens that were half immersed were found to be oxidized and gained weight. No corrosion was observed.

CONCLUSIONS: (Cont.)

C. The fully immersed specimens suffered the most corrosion. The 0.025% weight loss occurred at about 450 hours on one worse case specimen.

D. There were no deep corrosion pits observed in any of the specimens. Where corrosion did occur it did so in a uniform mild manner and was not readily observable or apparent.

3. The further investigation into the worse case corrosion (steel in vapor phase above sealant) showed the deepest intrusion to be 9.4 mils (See Photographs Nos. 4, 5, 6 and 7 plus Table No. 13).

4. Normally wheels are constructed of sufficient thickness to have a 100% safety margin. This means one half or ~ 50 mils of thickness would have to be removed prior to a dangerous condition to occur. This was not the case in any of the tests performed.

5. The overall conclusion is that Ultraseal Tire Life Extender is safe to use on both aluminum and steel wheels, and for safety purposes will not degrade the life of the wheel.

6. The Ultraseal product will meet the Postal Service corrosion requirements of Specification V-09-95.

TABLE NO.1

CORROSION TESTS ON ULTRASEAL MATERIAL

Sample No: 2
Type of Wheel: Steel, SAE 1010 Alloy.
Exposure Configuration: Vapor exposure.
High/Low Temperatures: +140 °F/ +38 °F.

OBSERVATIONS AND WEIGHT DATA

	Properties	Control or Before Exposure	2 Weeks Exposure	4 Weeks Exposure	6 Weeks Exposure	8 Weeks Exposure
1.	Surface Appearance	Bright. Surface. Polished by sand paper.	No change.	Slight surface brightness breakdown at surface.	Surface near edge started to corrode.	Random corrosion observed.
2.	Surface Erosion (Uniform Corrosion).	None.	No change.	No change.	Some localized attack only.	Localized attack only.
3.	Surface Attack (Local blemishes).	None.	No change.	Negligible local surface attack.	Shallow surface attack observed.	Measurable depth to corroded spots.
4.	Weight in Grams	49.6685	49.6680	49.6565	49.6358	49.6324
5.	Total Weight Change, %	0.0000	-0.0010	-0.0240	-0.0658	-0.0727
6.	Time @ 140 °F, Hrs.	0	192	384	576	768

TABLE NO. 2

CORROSION TESTS ON ULTRASEAL MATERIAL

Sample No: 3
Type of Wheel: Steel, SAE 1010 Alloy.
Exposure Configuration: Vapor exposure.
High/Low Temperatures: +140 °F/ +38 °F

OBSERVATIONS AND WEIGHT DATA

	Properties	Control or Before Exposure	2 Weeks Exposure	4 Weeks Exposure	6 Weeks Exposure	8 Weeks Exposure
1.	Surface Appearance	Bright. Surface. Polished by sand paper.	No change.	Slight change in surface brightness.	Slight corrosion near edges.	Corrosion blemishes cover about 20% of the area.
2.	Surface Erosion (Uniform Corrosion).	None.	No change.	Slight tarnish.	Localized breakdown at a few spots.	Uniform surface, local attack only.
3.	Surface Attack (Local blemishes).	None.	No change.	Corrosion at edges. Some breakdown observed.	Shallow surface attack observed.	Substantial localized attack occurring.
4.	Weight in Grams	51.7782	51.7761	51.7585	51.7291	51.7087
5.	Total Weight Change, %	0.0000	-0.0040	-0.0380	-0.0948	-0.1342
6.	Time @ 140 °F, Hrs.	0	192	384	576	768

TABLE NO. 3

CORROSION TESTS ON ULTRASEAL MATERIAL

Sample No: 4
Type of Wheel: Steel, SAE 1010 Alloy.
Exposure Configuration: Half immersed for combined vapor-liquid exposure.
High/Low Temperatures: +140 °F/ +38 °F.

OBSERVATIONS AND WEIGHT DATA

	Properties	Control or Before Exposure	2 Weeks Exposure	4 Weeks Exposure	6 Weeks Exposure	8 Weeks Exposure
1.	Surface Appearance	Bright. Surface. Polished by sand paper.	No change.	Slight surface loss of luster.	Negligible change.	Slight evidence of corrosion on surface in vapors.
2.	Surface Erosion (Uniform Corrosion).	None.	No change.	Slight tarnish.	Slight tarnish.	Slight tarnish.
3.	Surface Attack (Local blemishes).	None.	No change.	No change.	No change.	Slight corrosion spotting on surface in vapor zone.
4.	Weight in Grams	52.7435	52.7435	52.7434	52.7433	52.7400
5.	Total Weight Change, %	0.0000	0.0000	-0.0002	-0.0004	-0.0066
6.	Time @ 140 °F, Hrs.	0	192	384	576	768

TABLE NO. 4

CORROSION TESTS ON ULTRASEAL MATERIAL

Sample No: 5
Type of Wheel: Steel, SAE 1010 Alloy.
Exposure Configuration: Half immersed for combined vapor-liquid exposure.
High/Low Temperatures: +140 °F/ +38 °F.

OBSERVATIONS AND WEIGHT DATA

	Properties	Control or Before Exposure	2 Weeks Exposure	4 Weeks Exposure	6 Weeks Exposure	8 Weeks Exposure
1.	Surface Appearance	Bright. Surface. Polished by sand paper.	No change.	Some loss of luster affect at edges.	Loss of luster, changes at edges.	Loss of luster, slight edge attack.
2.	Surface Erosion (Uniform Corrosion).	None.	No change.	No change.	No change.	No change, no tarnishing.
3.	Surface Attack (Local blemishes).	None.	No change.	No change.	No change.	Slight corrosion on edges in vapor zone.
4.	Weight in Grams	52.3553	52.3548	52.3541	52.3476	52.3420
5.	Total Weight Change, %	0.0000	-0.0010	-0.0022	-0.0147	-0.0254
6.	Time @ 140 °F, Hrs.	0	192	384	576	768

TABLE NO. 5

CORROSION TESTS ON ULTRASEAL MATERIAL

Sample No: 6
Type of Wheel: Steel, SAE 1010 Alloy.
Exposure Configuration: Full immersed for Liquid exposure only.
High/Low Temperatures: +140 °F/ +38 °F.

OBSERVATIONS AND WEIGHT DATA

	Properties	Control or Before Exposure	2 Weeks Exposure	4 Weeks Exposure	6 Weeks Exposure	8 Weeks Exposure
1.	Surface Appearance	Bright. Surface. Polished by sand paper.	No change.	No change.	No change.	No change, slight trace of tarnishing.
2.	Surface Erosion (Uniform Corrosion).	None.	No change.	No change.	No change.	No change, no corrosion.
3.	Surface Attack (Local blemishes).	None.	No change.	No change.	No change.	No change.
4.	Weight in Grams	48.3213	48.3210	48.3189	48.3185	48.3185
5.	Total Weight Change, %	0.0000	-0.0006	-0.0050	-0.0058	-0.0058
6.	Time @ 140 °F, Hrs.	0	192	384	576	768

TABLE NO. 6

CORROSION TESTS ON ULTRASEAL MATERIAL

Sample No: 11
Type of Wheel: Steel, SAE 1010 Alloy.
Exposure Configuration: Full immerssed for Liquid exposure only.
High/Low Temperatures: +140 °F/ +38 °F.

OBSERVATIONS AND WEIGHT DATA

	Properties	Control or Before Exposure	2 Weeks Exposure	4 Weeks Exposure	6 Weeks Exposure	8 Weeks Exposure
1.	Surface Appearance	Bright. Surface. Polished by sand paper.	No change.	No change.	No change.	No change, no tarnishing.
2.	Surface Erosion (Uniform Corrosion).	None.	No change.	No change.	No change.	No change, no corrosion.
3.	Surface Attack (Local blemishes).	None.	No change.	No change.	No change.	No change.
4.	Weight in Grams	51.7423	51.7421	51.7413	51.7408	51.7398
5.	Total Weight Change, %	0.0000	-0.0004	-0.0019	-0.0029	-0.0048
6.	Time @ 140 °F, Hrs.	0	192	384	576	768

TABLE NO. 6

CORROSION TESTS ON ULTRASEAL MATERIAL

Sample No: 11
Type of Wheel: Steel, SAE 1010 Alloy.
Exposure Configuration: Full immerssed for Liquid exposure only.
High/Low Temperatures: +140 °F/ +38 °F.

OBSERVATIONS AND WEIGHT DATA

	Properties	Control or Before Exposure	2 Weeks Exposure	4 Weeks Exposure	6 Weeks Exposure	8 Weeks Exposure
1.	Surface Appearance	Bright. Surface. Polished by sand paper.	No change.	No change.	No change.	No change, no tarnishing.
2.	Surface Erosion (Uniform Corrosion).	None.	No change.	No change.	No change.	No change, no corrosion.
3.	Surface Attack (Local blemishes).	None.	No change.	No change.	No change.	No change.
4.	Weight in Grams	51.7423	51.7421	51.7413	51.7408	51.7398
5.	Total Weight Change, %	0.0000	-0.0004	-0.0019	-0.0029	-0.0048
6.	Time @ 140 °F, Hrs.	0	192	384	576	768

TABLE NO. 8

CORROSION TESTS ON ULTRASEAL MATERIAL

Sample No: 24
Type of Wheel: Aluminum, Cast Alloy A356.
Exposure Configuration: Vapor exposure.
High/Low Temperatures: +140 °F/+38 °F.

OBSERVATIONS AND WEIGHT DATA

	Properties	Control or Before Exposure	2 Weeks Exposure	4 Weeks Exposure	6 Weeks Exposure	8 Weeks Exposure
1.	Surface Appearance	Bright. Surface. Polished by sand paper.	No change.	Slight loss of luster.	Slight loss of luster.	Slight loss of luster, mild gray appearance.
2.	Surface Erosion (Uniform Corrosion).	None.	No change.	No change.	No change.	No change.
3.	Surface Attack (Local blemishes).	None.	No change.	No change.	No change.	No change, no visable evidence of corrosion.
4.	Weight in Grams	24.3856	24.3856	24.3856	24.3856	28.3852
5.	Total Weight Change, %	0.0000	-0.0000	-0.0000	-0.000	-0.0016
6.	Time @ 140 °F, Hrs.	0	192	384	576	768

TABLE NO. 8

CORROSION TESTS ON ULTRASEAL MATERIAL

Sample No: 24
Type of Wheel: Aluminum, Cast Alloy A356.
Exposure Configuration: Vapor exposure.
High/Low Temperatures: +140 °F/+38 °F.

OBSERVATIONS AND WEIGHT DATA

	Properties	Control or Before Exposure	2 Weeks Exposure	4 Weeks Exposure	6 Weeks Exposure	8 Weeks Exposure
1.	Surface Appearance	Bright. Surface. Polished by sand paper.	No change.	Slight loss of luster.	Slight loss of luster.	Slight loss of luster, mild gray appearance.
2.	Surface Erosion (Uniform Corrosion).	None.	No change.	No change.	No change.	No change.
3.	Surface Attack (Local blemishes).	None.	No change.	No change.	No change.	No change, no visable evidence of corrosion.
4.	Weight in Grams	24.3856	24.3856	24.3856	24.3856	28.3852
5.	Total Weight Change, %	0.0000	-0.0000	-0.0000	-0.000	-0.0016
6.	Time @ 140 °F, Hrs.	0	192	384	576	768

TABLE NO. 10

CORROSION TESTS ON ULTRASEAL MATERIAL

Sample No: 23
Type of Wheel: Aluminum, Cast Alloy A356.
Exposure Configuration: Half immersed for combined vapor-liquid exposure.
High/Low Temperatures: +140 °F/+38 °F.

OBSERVATIONS AND WEIGHT DATA

	Properties	Control or Before Exposure	2 Weeks Exposure	4 Weeks Exposure	6 Weeks Exposure	8 Weeks Exposure
1.	Surface Appearance	Bright. Surface. Polished by sand paper.	No change.	Some color change at air-liquid phase.	Portion immersed became blackish color.	There is light color change of part in air, and dark black formed in liquid contact area appears to be oxide build up.
2.	Surface Erosion (Uniform Corrosion).	None.	No change.	No change.	No change.	No change.
3.	Surface Attack (Local blemishes).	None.	No change.	No change.	No change.	No change.
4.	Weight in Grams	56.0925	56.0949	56.1006	56.1010	56.1003
5.	Total Weight Change, %	0.0000	+ 0.0042	+ 0.0144	+ 0.0152	+ 0.0139
6.	Time @ 140 °F, Hrs.	0	192	384	576	768

TABLE NO. 11

CORROSION TESTS ON ULTRASEAL MATERIAL

Sample No: 16
Type of Wheel: Aluminum, Cast Alloy A356.
Exposure Configuration: Full immersed for liquid exposure.
High/Low Temperatures: +140 °F/+38 °F.

OBSERVATIONS AND WEIGHT DATA

	Properties	Control or Before Exposure	2 Weeks Exposure	4 Weeks Exposure	6 Weeks Exposure	8 Weeks Exposure
1.	Surface Appearance	Bright. Surface. Polished by sand paper.	No change.	Color became darker.	Color became light black.	Color became deep black.
2.	Surface Erosion (Uniform Corrosion).	None.	No change.	No change.	No change.	No change.
3.	Surface Attack (Local blemishes).	None.	No change.	Slight attack at surface.	Some slight attack at surface.	No increasse of localized attack.
4.	Weight in Grams	26.6411	26.6410	26.6407	26.6370	26.6360
5.	Total Weight Change, %	0.0000	-0.0004	-0.0015	-0.0153	-0.0191
6.	Time @ 140 °F, Hrs.	0	192	384	576	768

TABLE NO. 12

CORROSION TESTS ON ULTRASEAL MATERIAL

Sample No: 15
Type of Wheel: Aluminum, Cast Alloy A356.
Exposure Configuration: Full immersed for liquid exposure.
High/Low Temperatures: +140 °F/+38 °F.

OBSERVATIONS AND WEIGHT DATA

	Properties	Control or Before Exposure	2 Weeks Exposure	4 Weeks Exposure	6 Weeks Exposure	8 Weeks Exposure
1.	Surface Appearance	Bright. Surface. Polished by sand paper.	No change.	Some slight dark discoloration	Color became light black.	Color became deep black.
2.	Surface Erosion (Uniform Corrosion).	None.	No change.	No change.	No change.	No change.
3.	Surface Attack (Local blemishes).	None.	No change.	Slight attack at surface.	Some attack at surface.	No increase of localized attack.
4.	Weight in Grams	24.3556	24.3541	24.3514	24.3477	24.3473
5.	Total Weight Change, %	0.0000	-0.0062	-0.0172	-0.0324	-0.0340
6.	Time @ 140 °F, Hrs.	0	192	384	576	768

TABLE NO. 13

CORROSION TESTS ON ULTRASEAL MATERIAL

Sample No. 3

Steel Plate Corrosion Depth.
Steel Wheel Segment, After Eight Weeks Exposure.

CORROSION DEPTH READINGS, IN MILS (0.001") OF WORSE CASE TEST		
2.9	2.3	4.6
.85	2.7	.8
1.0	1.8	2.9
.85	.6	2.2
1.0	.55	1.1
2.1	9.4	2.2
1.8	1.6	2.0
2.25	1.4	.7
2.3	1.35	3.2
2.1	3.0	

Low: 0.55 Mils.

High: 9.4 Mils.

Total Thickness of Wheel: 100 Mils.

NOTE:

Measurements were made optically on calibrated metalographic equipment using magnification.

RAMTECH LABORATORIES, INC.

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Ms. Liz Aguire
Mr. Ron Aguire
ULTRASEAL INTERNATIONAL, INC.
1100 N. Wilcox Avenue
Los Angeles, CA 90038

June 6, 1995

Subject.: Corrosion Characteristics of Ultraseal Tire Life Extender on Aluminum and Steel Alloys, (Laboratory No. 10248 - attached).

Dear Ms. & Mr. Aguire:

After reviewing the results of the corrosion tests, I feel that your product is quite good for its purpose and will definitely not cause corrosion problems. Your corrosion inhibitors are working well and should not be altered.

You may want to submit a copy of the test procedure and/or a copy of the report to the Postal Service. I feel their Specification Test Method is invalid or misleading to say the least. Corrosion should not be treated as a simple two dimensional science. Accelerated tests as contained in their procedure is not a good or reliable measure of corrosion.

The tests on thermal stability were completed today. I'll prepare the report this weekend.

I'll call you next week to see where you wish to go from here.

Best Regards,

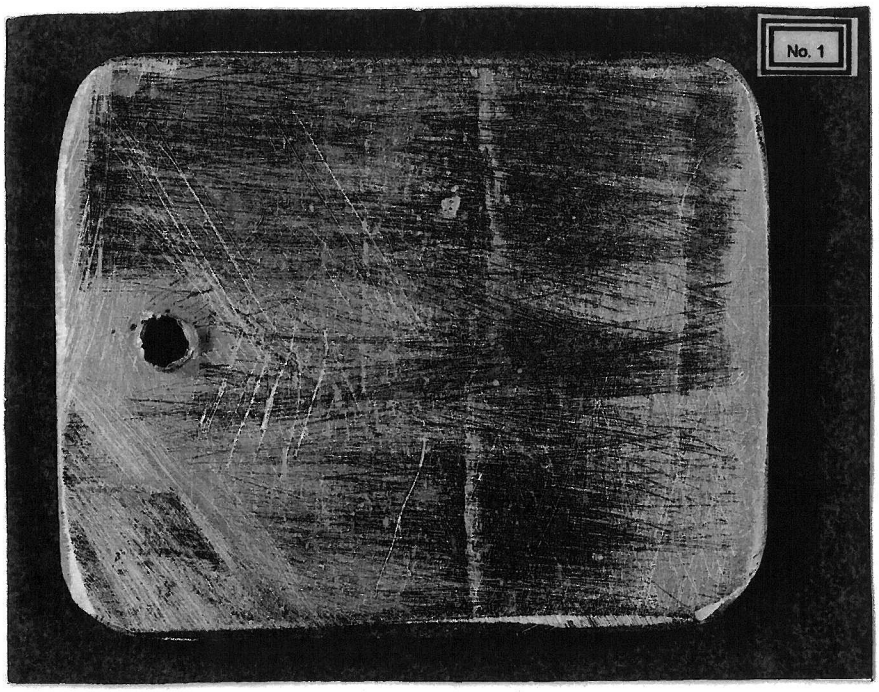
RAMTECH LABORATORIES, INC.

R. A. Dunaetz
Chief Chemist
RAD/meza

Enclosure:

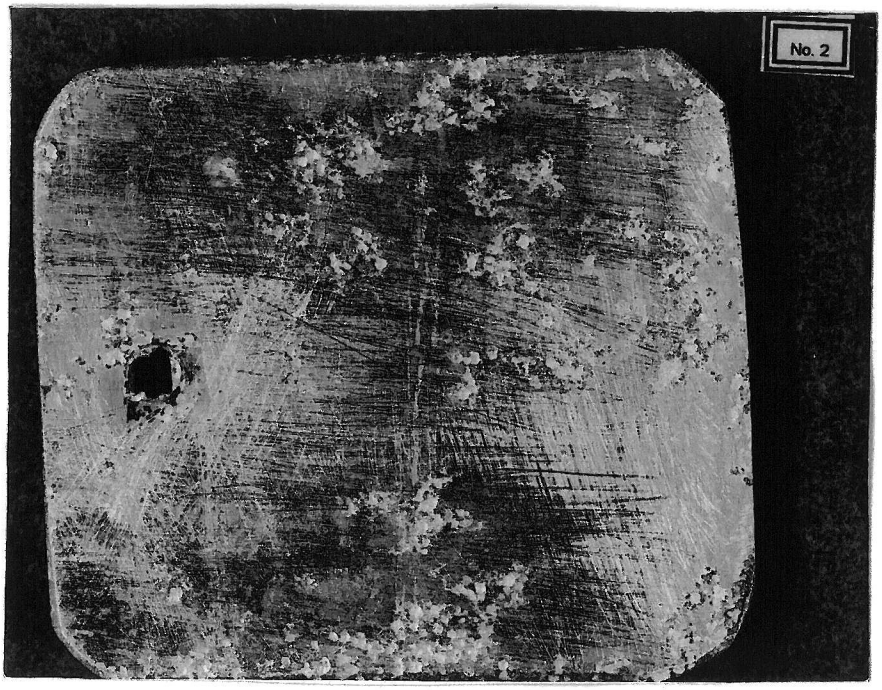
• Report No. 10248-94

SAVED AS ULTRSE2.DOC,2ND QTR95/MEZA,TYPED 6-6-95.



Photograph No. 1

Photograph No. 1 shows Control Steel Specimen prior to vapor phase exposure. (2 x Magnification).



Photograph No. 2

Photograph No. 2 shows Steel Specimen No. 3 after 8 weeks exposure to vapor phase conditions. (2 x Magnification).

ULTRASEAL INTERNATIONAL, INC.

June 6, 1995

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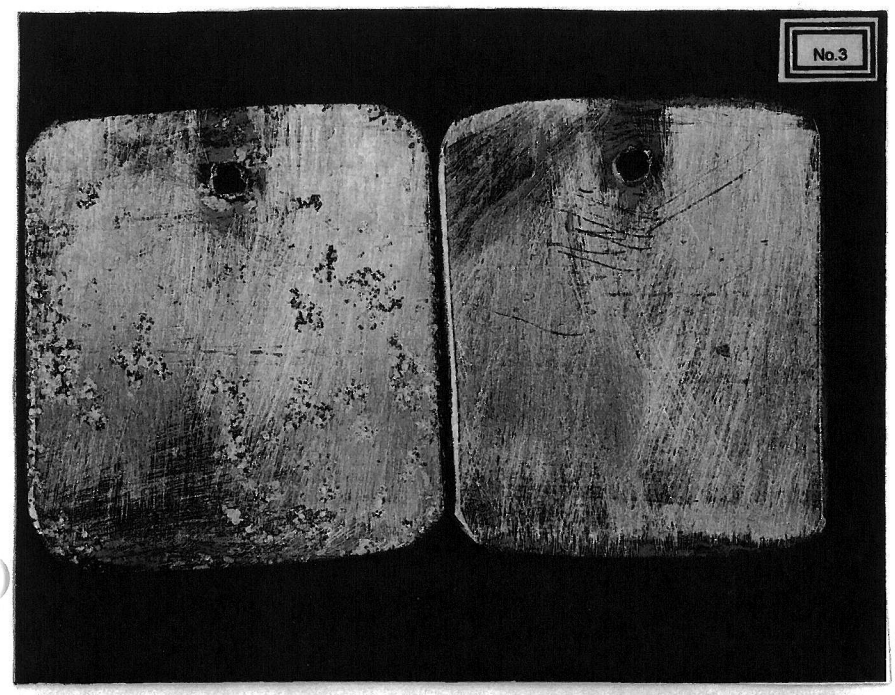
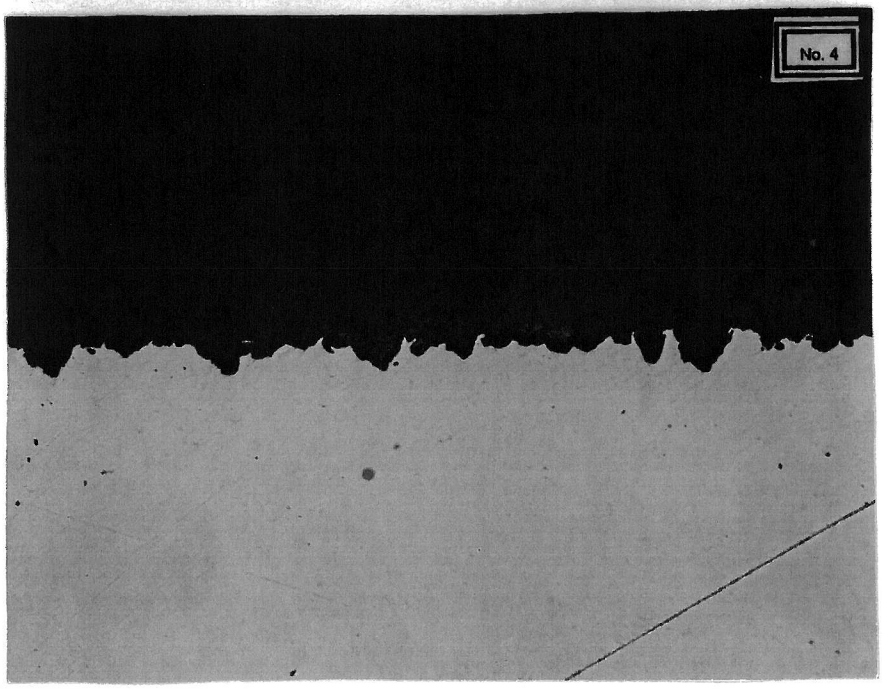


Photograph No. 3

Photograph No. 3 shows No. 3 Steel Specimen side-by-side with Control for further comparison.



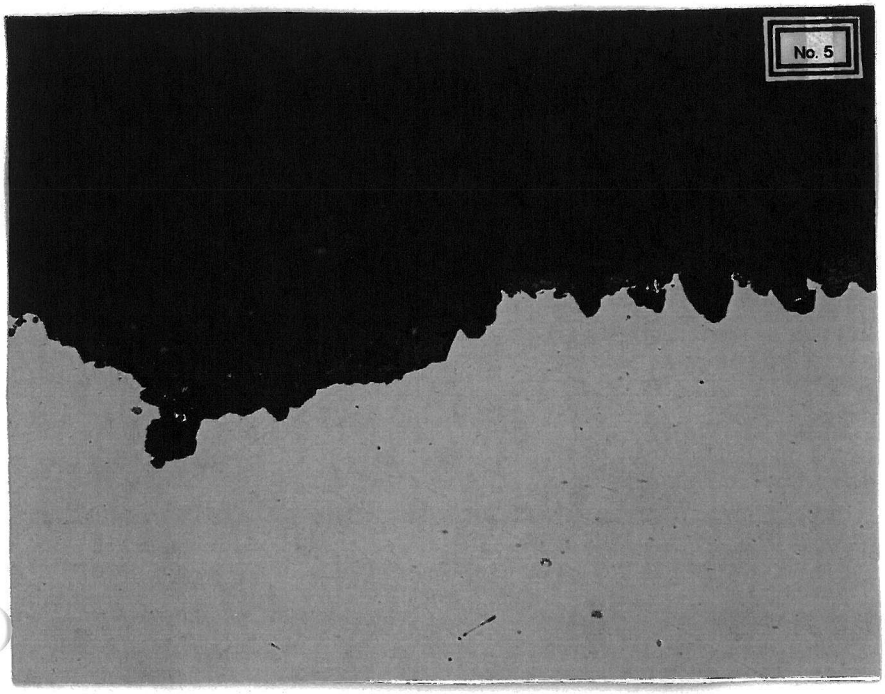
Photograph No. 4

Photograph No. 4 shows cross section of corrosion in exposed Steel Sample No. 3. Depth in this area is 0.5 to 1.6 mils (100 x Magnification) [Light colored area is steel rim section].

ULTRASEAL INTERNATIONAL, INC.

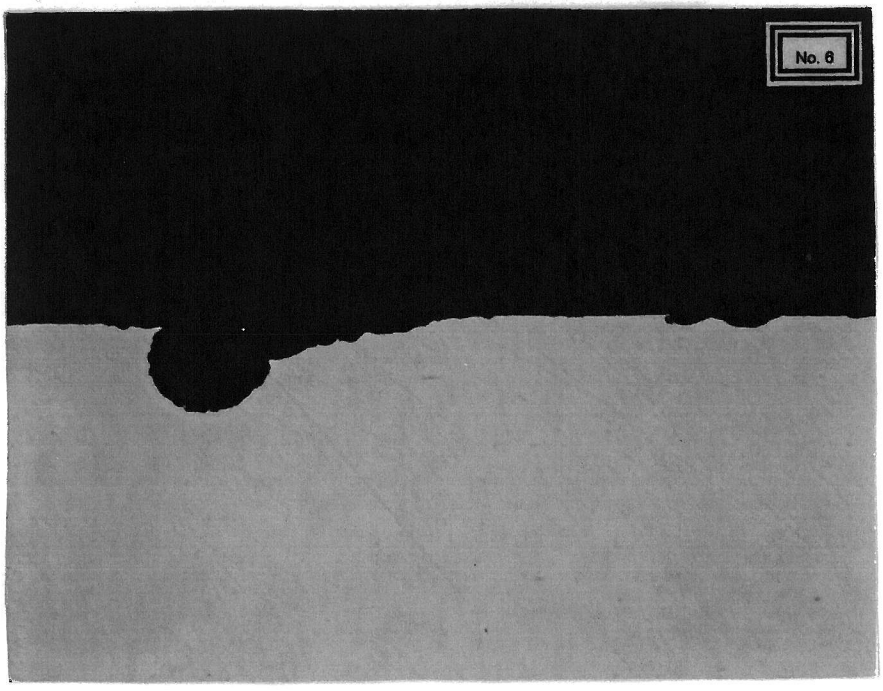
Laboratory No. 10248-94

June 6, 1995



Photograph No. 5

Photograph No. 5 shows cross section of corrosion in exposed Steel Sample No. 3. Maximum depth measured is 9.4 mils. (100 x Magnification).



Photograph No. 6

Photograph No. 6 shows cross section of corrosion in a further area of exposed Steel Sample No. 3. Maximum depth measured is 4.6 mils.

(100 x Magnification).

ULTRASEAL INTERNATIONAL, INC.

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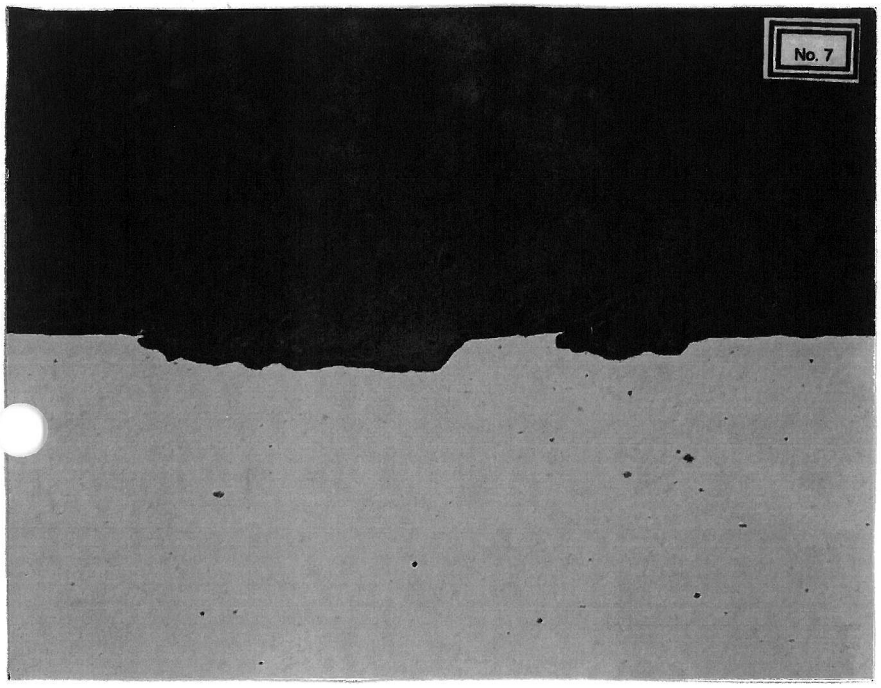


Photograph No. 7

Photograph No. 7 shows cross section of corrosion in last area of exposed Steel Sample No. 3. Maximum depth measured is 2.0 mils.

(100 x Magnification).

ULTRASEAL INTERNATIONAL INC.
Laboratory No. 10248-94
Attachment "A"

June 6, 1995

WHEEL SPECIMEN CORROSION TEST PROCEDURE
GENERAL PROCEDURE DESCRIPTION

1. Use standard formula Ultraseal Tire Sealant. Half fill 16 oz glass jars. Put one Aluminum or steel specimen in each jar.

2. Number of specimens:

   2 metals (al, steel) - See Test Section "A".
   3 locations (in sealant, 1/2 in. and half out and in vapor zone only).
   2 specimens (duplicates) for each position.

   2 x 3 x 2 = 12 jars (6 aluminum and 6 steel specimens).

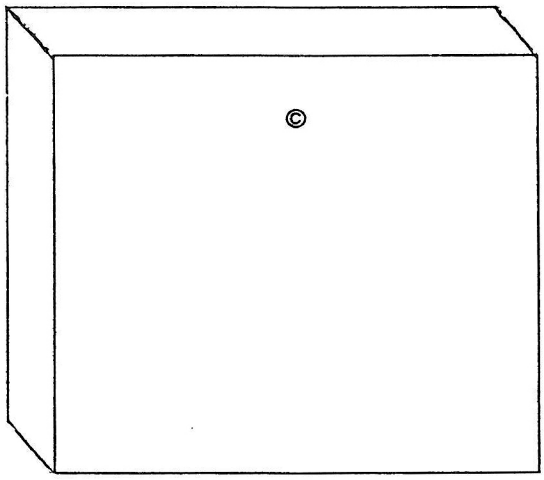
3. Suspend specimens in locations described in Test Section "B".
4. Exposed specimens in capped jars to exposure cycles shown in Test Section "C".
5. Record weight and observations shown in Test Section "D".

TEST SECTION "A"
TEST SPECIMENS

1. Size: Shall have a one side surface area of 2.0 to 6.0 sq. in.
2. Mounting: Shall have a 1/8" diameter hole for suspension on string or fishing line (when suspended into or over the tire sealant.

3. The specimens shall be fabricated from both steel and aluminum wheels. The alloy shall be determined prior to testing.

4. The specimen shall be bare metal with all paint and/or protective coatings removed.



5. Typical specimen.

TEST SECTION "B"

EXP0SURE CONFIGURATION DURING TEST

1. VAPOR ZONE EXPOSURE:

A test specimen (coupon) shall be suspended over (above) the pool of tire sealant.

2. TWO PHASE EXPOSURE:

A test coupon shall be suspended so that one half of the coupon is immersed in the sealant, while the other half is above the level of sealant exposed only to the vapors above the pool.

3. LIQUID EXPOSURE:

A test specimen shall be immersed completely in the pool of tire sealant.

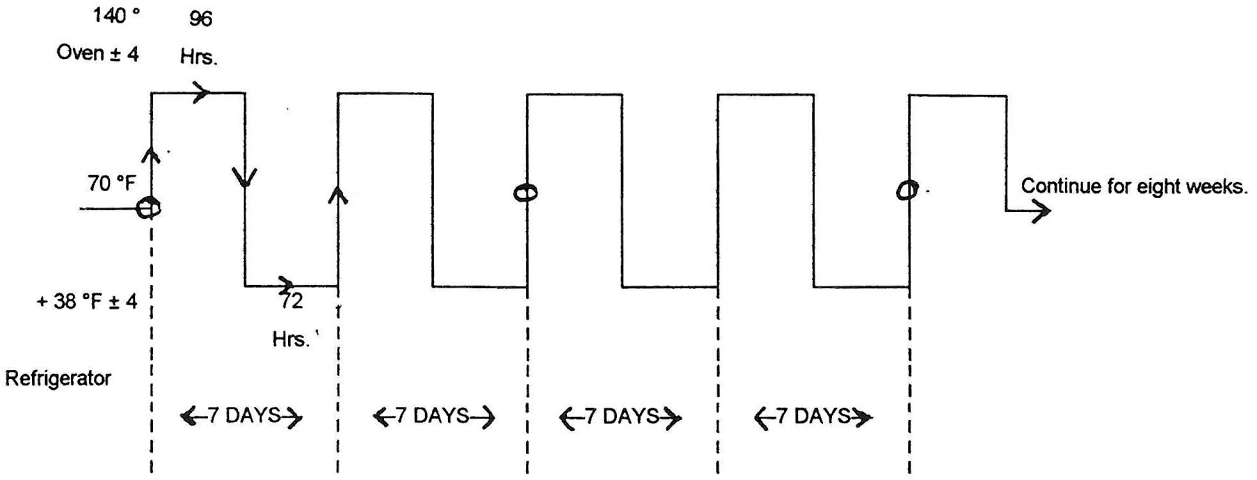
TEST SECTION "C"
EXPOSURE CYCLES

Exposure duration = 8 weeks.

Measurements: At start, and then every two weeks, i.e.

0	WEEK
2	WEEKS
4	WEEKS
6	WEEKS
8	WEEKS

MEASURE FIVE TIMES



At each inspection point:

0 = Inspection Points.

(1) Rinse and dry specimens.

(2) Weigh on analytical balance, record weight to nearest 0.1 mg.

(3) Describe surface condition.

(4) Replace in position in container within one hour.

TEST SECTION "D"

RECORD DATA/OBSERVATIONS:

A. Sample Number.

B. Wheel type and alloy.

C. Exposure configuration.

D. Matrix data (below).

Item No.	Properties	Control Conditions or Prior to Exposure	2 Weeks Exposure	4 Weeks Exposure	6 Weeks Exposure	8 Weeks Exposure
1.	Surface Appearance					
2.	Surface Erosion					
3.	Surface Attack					
4.	Weight in Grams					
5.	Total Weight Change, %					
6.	Time @ 140 °F, in Hours					