TECHNICAL REPORT

REPORT OF TEST ON PLAQUES
ENVIRONMENTAL TEST FOR PRODELIN INC.

June 21, 1995
Revision 0

Prepared By: Associated Testing Laboratories, Inc.
Report of Test on

PIAQUES
ENVIRONMENTAL TESTS
for
PRODELIN INC.

Associated Testing Laboratories, Inc.
Wayne, New Jersey 07470
Burlington, Massachusetts 01803

Date  February 11, 1983

<table>
<thead>
<tr>
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<th>Prepared</th>
<th>Checked</th>
<th>Approved</th>
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</thead>
<tbody>
<tr>
<td>By</td>
<td>G. Murphy</td>
<td>R. Utter</td>
<td>P. Delia</td>
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<tr>
<td>Signed</td>
<td>G. Murphy</td>
<td>R. Utter</td>
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<tr>
<td>Date</td>
<td>1-14-83</td>
<td>2/14/83</td>
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Administrative Data

1.0 Purpose of Test:
To subject the plaques to environmental tests.

2.0 Manufacturer:
Eagle-Picher Industries, Inc.
Plastics Division
Submitted for testing by:
Prodelin Inc.
P.O. Box 131
Prodelin Way
Hightstown, New Jersey 08520

3.0 Manufacturer’s Type or Model No.:
Plaques, SMC-SL-192

4.0 Drawing, Specification or Exhibit:
Specification MIL-STD-810C

5.0 Quantity of Items Tested:
Twelve (12) submitted, ten (10) submitted

6.0 Security Classification of Items:
Unclassified

7.0 Date Test Completed:
February 7, 1983

8.0 Test Conducted By: Associated Testing Laboratories, Inc.
23 Vincent Street, Wayne, New Jersey 07470

9.0 Disposition of Specimens:
Returned to Prodelin Inc.

10.0 Abstract:
The plaques were subjected to a series of environmental tests. Following is a summary of the test results.

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Associated Testing Laboratories, Inc.
Wayne, New Jersey 07470
Burlington, Massachusetts 01803
10.0 Abstract: (continued)

Plaques S/N 1 through 7
The seven samples completed the following tests with no evidence of physical damage or degradation.
1. Solar Radiation
2. Humidity
3. Salt Spray
4. Temperature Cycling

Plaques S/N 8, 9 and 10
At the completion of the 28-day fungus test, the plaques were examined for evidence of fungus growth, and a trace of growth was noted on all panels.
## LIST OF APPARATUS

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Manufacturer</th>
<th>Model</th>
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<tr>
<td>Radiometer</td>
<td>Eppley</td>
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<td>Tenney</td>
<td>TMUF-100350</td>
<td>12/27/82</td>
<td>2/27/83</td>
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SOLAR RADIATION TEST
(Plaques S/N 1 through 7)

TEST PROCEDURE
(Reference: Method 505.1, Procedure I, of Specification MIL-STD-810C)

The plaques were placed in a test chamber with the smooth side of the plaques facing upward. The chamber was sealed and the ambient temperature increased to +49°C for a period of 48 hours.

During this period, the plaques were subjected to 104 ±4 watts/square foot of solar radiation conforming to Specification MIL-STD-810C.

At the completion of the 48-hour period, the plaques were removed from the test chamber and compared to two untested plaques (referee samples).

TEST RESULTS

The plaques completed the solar radiation test with no evidence of deterioration or degradation.
HUMIDITY TEST
(Plaques S/N 1 through 7)

TEST PROCEDURE
(Reference: Method 507.1, Procedure II, of Specification MIL-STD-810C)

The plaques were placed in a rubber-coated holder such that the plaques were in the vertical position and did not touch each other. The plaques were then subjected to the humidity test as specified in Method 507.1, Procedure II, of Specification MIL-STD-810C. The humidity test conditions are graphically shown in Figure 1 of this report.

At the completion of the humidity test, the plaques were removed from the test chamber and visually compared to two untested units (referee samples).

TEST RESULTS

The plaques completed the humidity test with no evidence of deterioration or degradation.
NOTES:
1. Tolerance during temperature change shall not be greater than ± 3°C (6°F).
2. Relative humidity shall be maintained at 94 ± 4 percent at all times.
3. Rate of temperature change between 30°C and 65°C shall not be less than 8°C per hour.
4. The measured increase in temperature from 20°C to 30°C shall not be less than 10°C.
5. Test measurements shall be taken only at the period specified in the applicable equipment or system specification.

Figure 1
Humidity Test Conditions
TEMPERATURE CYCLING TEST
(Plaques S/N 1 through 7)

TEST PROCEDURE
(Reference: Method 503.1, Procedure I, of Specification MIL-STD-810C)

The plaques were placed in a rubber-coated carrier and subjected to the following temperature cycling test.

Step 1: The plaques were placed in a test chamber and the temperature was increased to +71°C for a period of not less than 4 hours.

Step 2: At the completion of the 4-hour period, the units were transferred, within 5 minutes, to a cold temperature chamber which was maintained at -57°C.

Step 3: The plaques were exposed to -57°C for a period of not less than 4 hours.

Step 4: At the completion of the 4-hour period, the units were returned, within 5 minutes, to the high temperature chamber which was maintained at +71°C.

Step 5: The plaques were exposed to +71°C for a period of not less than 4 hours.

Step 6: Steps 2 through 5 were repeated.

Step 7: Steps 2 and 3 were repeated.

Step 8: The plaques were removed from the test chamber and allowed to stabilize at room ambient conditions.

Upon completion of the temperature cycling test, the plaques were visually compared to two untested units (referee samples).

TEST RESULTS

The plaques completed the temperature cycling test with no evidence of deterioration or degradation.
SALT SPRAY TEST
(Plaques S/N 1 through 7)

TEST PROCEDURE
(Reference: Method 509.1, Procedure I, of Specification
MIL-STD-810C)

The plaques were placed within a salt spray test chamber using
nylon cord, and the chamber temperature was increased to +95°F.
The chamber temperature was maintained at +95°F for a period of
48 hours. During this period, the units were subjected to the
specified salt spray fog.

The salt spray fog was produced using a 5% salt solution prepared
by dissolving 5 +1 parts by weight of sodium chloride in 95 parts
by weight of demineralized water. The sodium chloride contained
on the dry basis not more than 0.1% of sodium iodide and not more
than 0.2% of total impurities. The demineralized water used to
prepare the solution contained less than 200 parts per million of
total solids. The solution was adjusted to and maintained at a
specific gravity between 1.023 and 1.037 and at a pH value
between 6.5 and 7.2 when measured at a temperature of +95°F.

At the completion of the 48-hour salt spray test, the plaques
were removed from the chamber and gently rinsed in running tap
water. The plaques were then visually compared to untested
plaques (referee samples).

TEST RESULTS

The plaques completed the salt spray test with no evidence of
deterioration or degradation.
FUNGUS TEST  
(Plaques S/N 8, 9 and 10)

TEST PROCEDURE  
(Reference: Method 508.1, Procedure I, of Specification MIL-STD-810C)

The plaques were suspended within a fungus test chamber and were preconditioned for a minimum period of 4 hours at +86°F and 97 ±2% relative humidity, prior to inoculation.

Upon completion of the preconditioning period, the plaques and control items were inoculated with the mixed fungus spore suspension by means of a fine mist atomizer. The following fungi were used.

Aspergillus niger  
Asperillus flavus  
Aspergillus versicolor  
Penicillium funiculosum  
Chaetomium globosum

Immediately following the inoculation of the plaques, the test chamber was sealed. The units were then subjected to 28 continuous incubation cycles of temperature and humidity. One cycle consisted of the following.

<table>
<thead>
<tr>
<th>Temperature (°F)</th>
<th>Relative Humidity (%)</th>
<th>Duration (hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>86 ±2</td>
<td>95 ±5</td>
<td>20</td>
</tr>
<tr>
<td>77 ±2</td>
<td>100</td>
<td>4</td>
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</table>

After 7 days, the growth on the control items was inspected to assure that the environmental conditions were suitable for growth.

Upon completion of the exposure period (28 days), the plaques were removed from the chamber and examined for evidence of fungus growth on the painted surfaces. In addition, the units were visually examined for evidence of deterioration and/or corrosion.
FUNGUS TEST
(Plaques S/N 8, 9 and 10)

TEST RESULTS

At the completion of the 28-day fungus test, the plaques were examined for evidence of fungus growth, and a trace of growth was noted on all panels.