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CONSERVATION ADVISORY SCIENCE NOTES

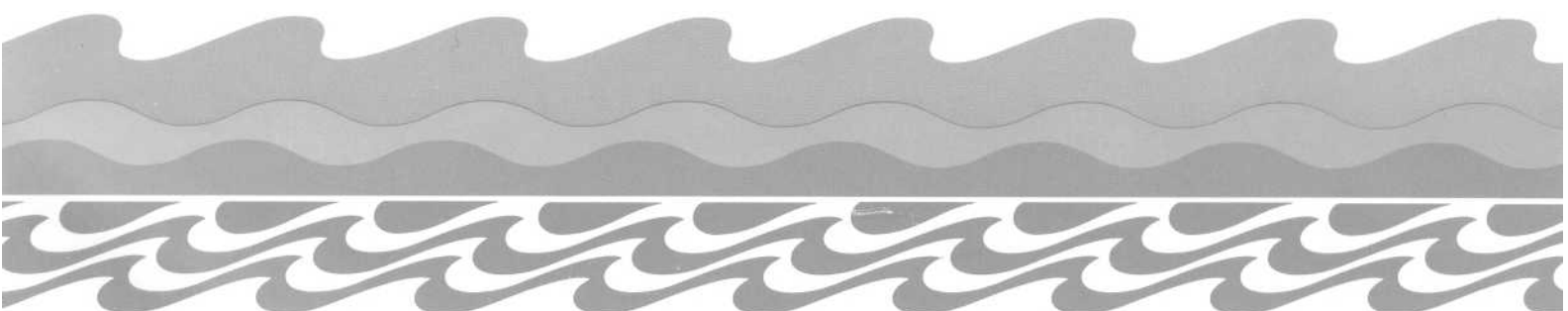
No. 61

**ACCELERATED LIFE ENVIRONMENTAL TESTS OF VARIOUS
OUTDOOR SIGNS**

(Short Answers in Conservation Science)

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Commissioned by: Visitor Services Division

Location: NZMS

TEST REPORT

DATE ISSUED: 15 October 1993

ITEM TESTED: **ACCELERATED LIFE
ENVIRONMENTAL TESTS OF
VARIOUS OUTDOOR SIGNS**

CLIENT'S NAME: Department of Conservation
P O Box 10-420
WELLINGTON

Attention: Mr Neil Sheerin

CLIENT'S REFERENCE: Letter dated 19 August 1993


TEST SPECIFICATION: Accelerated Life Environmental Tests

DATE OF TEST COMPLETION: 12 October 1993

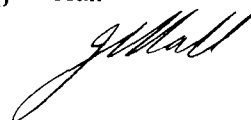
SUMMARY OF RESULTS: Please see the text of the report.

This Report Must Not Be Quoted Except In Full

Prepared By: J V Hall



Approved By: J V Hall



Checked By: G van Kuppevelt



Report Number 65229:JVH:SMH

TEST ITEMS

The following samples of outdoor signs were supplied by the client for accelerated environmental testing.

Sample 1 Alulam

An aluminium/wood fibre composite, consisting of what appears to be a 4 mm thick plastic type core covered with 1 mm thick aluminium plates with yellow baked enamel lettering on a green background.

Sample 2 Resin laminate, with aluminium channel and vinyl lettering

An air-blown foam core 25 mm thick covered with 3 mm thick plastic sheets (AES) coloured green. The top edge is covered with a folded moulding (Trovicel), while the other edges are bonded to a recessed aluminium channel. The lettering is self-adhesive vinyl.

Sample 3 Resin laminate, without aluminium channel and with painted lettering

Same as sample 2 except without aluminium channel and with mask-and-spray painted lettering.

Sample 4 Coloursteel/plywood laminate

Powder-coated coloursteel laminated onto a nominal 17 mm thick plywood sheet, without lettering.

Four panels 100 mm square were cut out of each of the above samples, each incorporating a section of lettering (with the exception of sample 4) and an edge of the sample.

Two of each of the above panels were then subjected to the salt/fog test, while one panel was used for the UV accelerated aging and the remaining panel used in the thermal shock tests.

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A. Procedure 1 Salt/Fog, simulating a coastal environment

Test Procedure

Two panels of each of the four samples were supplied for salt/fog evaluation (see photos 1 and 2).

The test procedures used were as laid down in US military specification MIL-STD-810E, Method 509-3, with the salt spray temperature maintained at 35°C.

All samples were exposed to a 5 % sodium chloride (NaCl) salt fog in an enclosed environment at 35°C.

A period of 24 hours of salt/fog exposure was followed by a 24 hour drying period, with the samples transferred to ambient dry conditions. These cycles were repeated 4 times, for a total test duration of 8 days.

During the 24 hour drying periods the samples were removed from the salt fog cabinet, rinsed off with like warm water and left to dry at ambient.

Test Results

Sample 1 Both panels were beginning to show some oxidation of the unpainted aluminium around the bolt holes on the edge of the panel. No change to the painted surfaces or lettering.

Sample 2 Start of oxidation of the aluminium channel on the edges of the sample. No change to colour of panels or lettering.

Sample 3 No change to colour of panels or lettering.

Sample 4 On the edges where the samples were cut out corrosion was apparent on both samples, with lifting of the paint, but no change to the painted surface itself. See Figures 3 and 4.

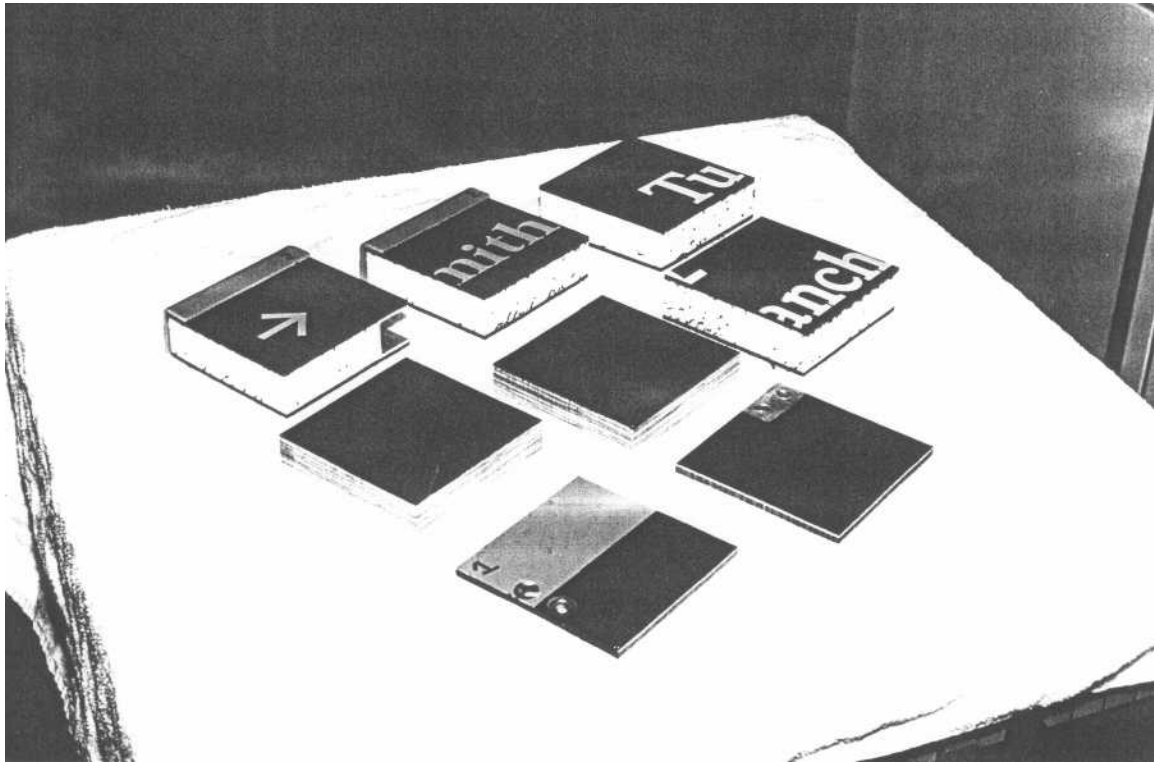


Figure 1 Test samples as received, before the salt/fog test

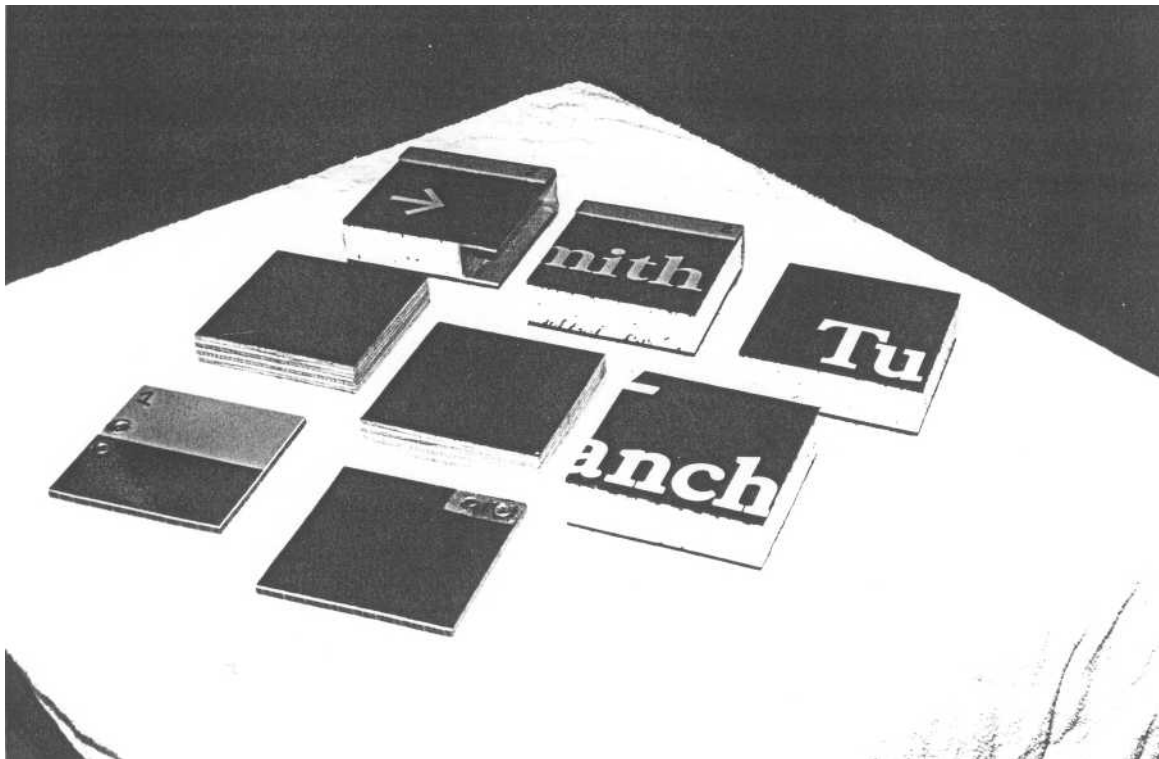


Figure 2 Test samples before the salt/fog test

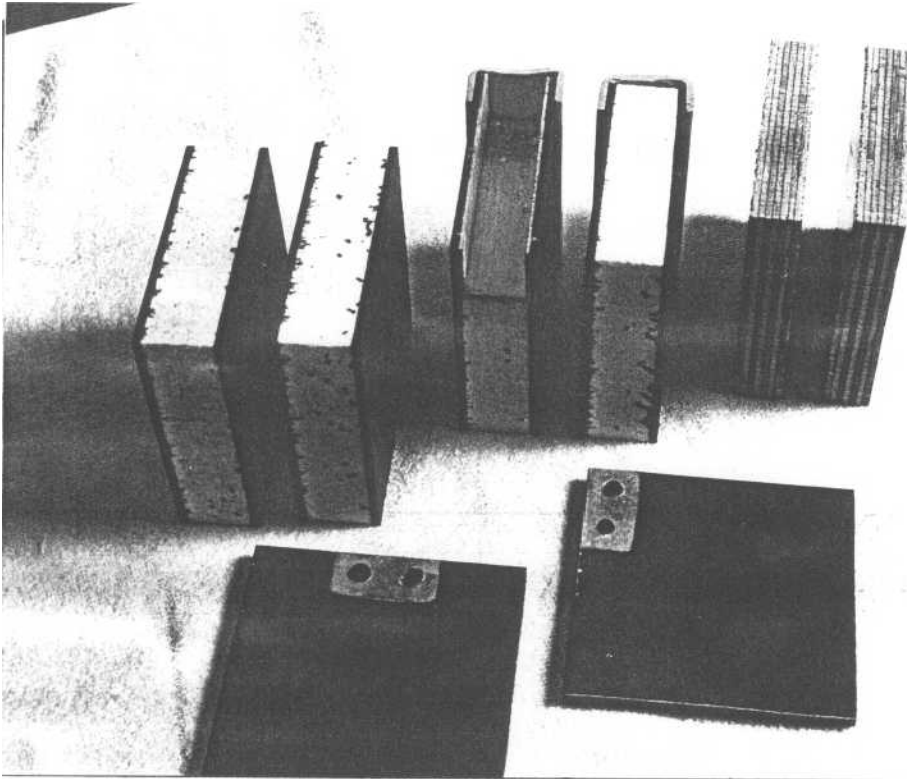


Figure 3 Test samples AFTER the salt/fog tests

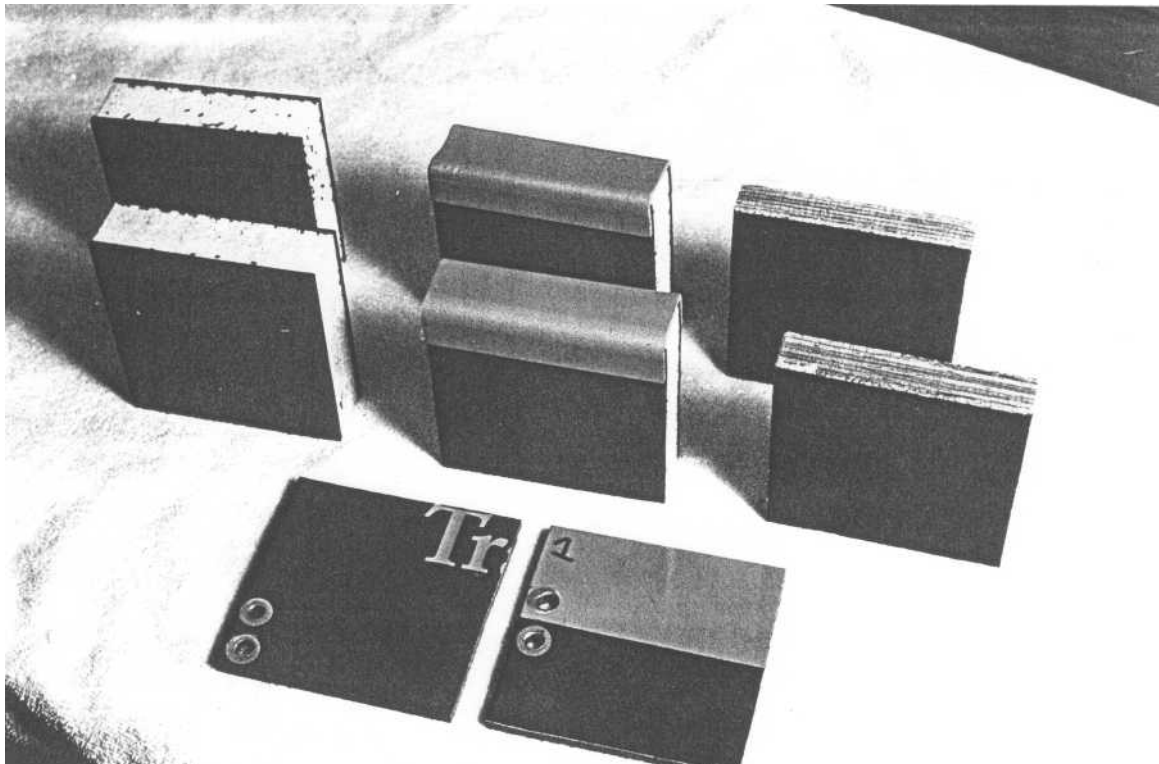


Figure 4 Test samples AFTER the salt/fog tests

B. Procedure 2 UV Accelerated Aging

Test Procedure

One panel of each sample was mounted in a chamber fitted with a bank of UV emitting fluorescent lamps. Each of these samples was exposed for 1 000 hours, with the samples examined after approximately each 250 hours period.

Half the surface area of each sample was masked for comparison.

Test Results

The most dramatic change was sample 1 with the high-gloss surface dulling and losing its green colour (after 240 hours). The lettering had dulled and paled in colour.

Sample 2, the yellow Trovicel frame had developed a strong brown colouration. The green surface had dulled slightly from its original matt finish and had darkened slightly in colour. The bright yellow letters had faded slightly, but one letter had started to lift at the edge (after 240 hours).

Sample 3 behaved similar to sample 2 except that the letters had dulled and had paled in colour.

Sample 4 without any lettering had dulled and paled from its original semi-gloss, though less pronounced than sample 1.

See Figures 5, 6, 7 and 8.

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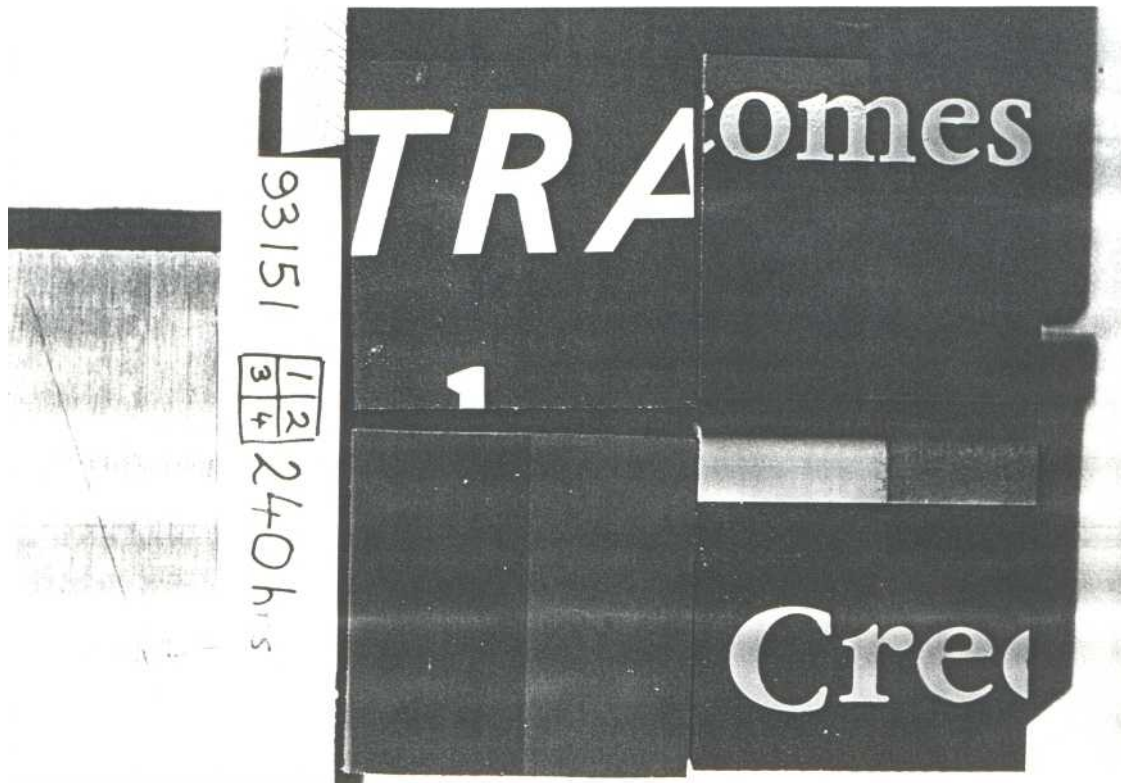


Figure 5 Samples after 240 hours UV exposure



Figure 6 Samples after 500 hours UV exposure

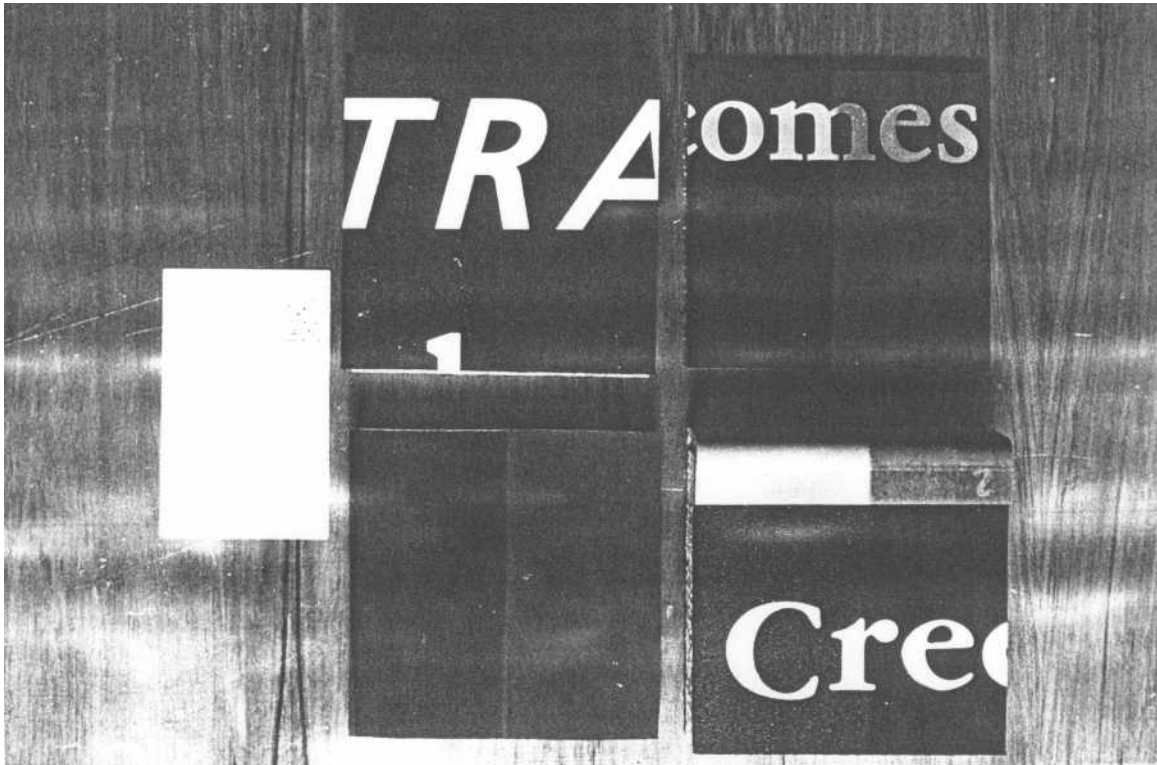


Figure 7 Samples after 1 000 hours, UV exposure

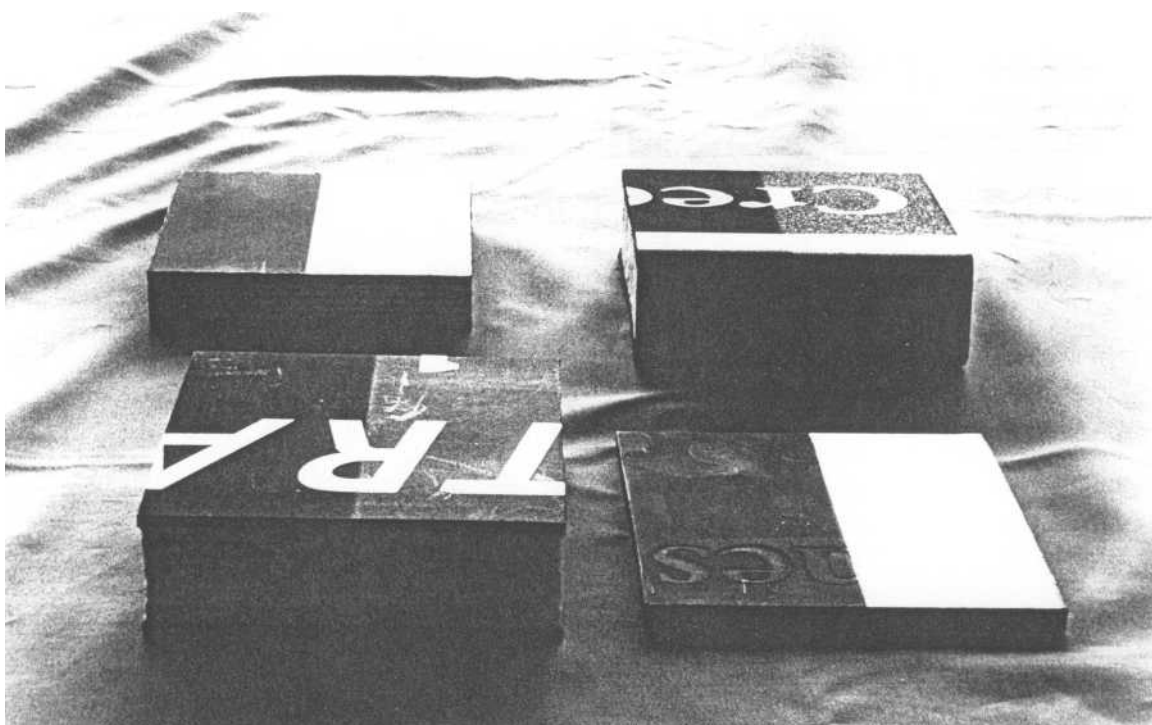


Figure 8 Samples after 1 000 hours, UV exposure showing change in surface gloss

C. Procedure 3 Temperature Shock

Test Procedure

One panel of each sample was heated to 40⁰C and then transferred to a chamber at -10⁰C. This was repeated 10 times to simulate sudden heating and cooling of the signs.

Test Results

This test proved to have the least effect on the samples with no changes apparent in any of the samples. No delamination or lifting of lettering was apparent on either of the samples.

CONCLUSIONS

From the salt/fog evaluation it is apparent that the signs incorporating exposed aluminium, samples 2 and 1 (at bolt holes) may suffer in a coastal environment. While the coloursteel sample (4) may need protection on the edges depending on the method of fabrication.

The UV accelerated tests for 1 000 hours are indicative of 5 - 10 years service, but are only valid as a comparative evaluation. Sample 1 showed the most dramatic change with significant darkening of the yellow lettering and green paint.

While sample 2 also showed darkening of the yellow top (Trovicel) cover, as well as indications that the self-adhesive lettering was lifting.

The matt finish paints (samples 2 and 3) tended to show less change than the gloss and semi gloss finishes. The temperature shock tests indicated no apparent changes in the samples, though this may be an issue on a larger sign if hole clearances for thermal expansion and contraction are not taken into account in the sign attachment.

The above assessment did not take into account the scratch or peel resistance of the lettering which may be an important issue in avoiding vandalization.