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August 28, 1945.

R E P O R T

of the

ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 1925.

Resistance of Painted Steel to
Salt Spray Corrosion.

(Copy No. 10.)

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Background:

A letter dated February 15, 1945, from Captain V. E. Ellis, for the Director of Automotive Design, Army Engineering Design Branch, Department of Munitions and Supply, Ottawa, Canada, requested that corrosion tests be performed on a number of painted steel panels. These panels were to be obtained from various manufacturers by Captain Ellis. All were to be of "khaki" colour and painted according to Specification O.A. 76 and Design Change Instruction B5-58.

The present report describes the results obtained when the panels were exposed to the action of salt spray. These results should be an indication of the performance of the various painted steels under marine conditions. A similar series of painted steels is being tested in the Weather-Ometer, to indicate their performance under inland weather conditions. So far there has been no evidence of deterioration due to corrosion in the Weather-Ometer panels. In some cases there has been considerable colour fading.

Panels Investigated:

The painted panels investigated were as follows:

1. George W. Reed and Co. Ltd., 4107 Richelieu St.,
Montreal,
14-Gauge Ordinary Hot Rolled Carbon Steel.
2. Motor Coach Industries Ltd.
14-Gauge, Hot Rolled, Blue Annealed Steel, Inland
Steel Corporation, Chicago, Ill.

Physical Properties -

Yield Point, 39,300 lb.
Ultimate Strength, 56,790 lb.
Elongation, 29 per cent.

3. Western Auto and Truck Body Works Ltd., 702 Broad-
way Ave., Winnipeg, Man.
USS HR sheets.
4. The Frost and Wood Co. Ltd., Smiths Falls, Ont.
14-Gauge, BSS 5007/214.
5. The Metallic Roofing Co. Ltd.
No information was submitted.
6. Gotfredson Ltd., Windsor, Ont.
14-Gauge, Low Carbon, Open Hearth, Full Annealed,
Pickled and Oiled Steel.
7. Sunshine Waterloo Company, Waterloo, Ont.
14-Gauge, 1010 Blue Annealed Steel.
8. Border Cities Wire and Iron Works, Windsor, Ont.
14-Gauge, 1010 Blue Annealed Steel.
9. Truscon Steel Company, Windsor, Ontario.
14-Gauge, 1010 Blue Annealed Steel.

(Continued on next page)

Chemical Analyses:

The chemical analyses attached to the various steels were as follows:

	Carbon	Manganese	Phosphorus	Sulphur
	- P e r C e n t -			
1. G. W. Reed & Co.*	0.03	0.30	0.007	0.038
2. Motor Coach Industries	0.09	0.39	0.009	0.028
3. Western Auto & Truck Body Works	(0.09) (0.08)	0.43 0.45	0.012 0.012	0.028) 0.033)
4. Frost & Wood Co.*	0.07	0.37	0.007	0.024
5. Metallic Roofing Co. Ltd.*	0.045	0.33	0.004	0.030
6. Gotfredson	0.08-0.15	0.30-0.50	0.04 max.	0.05 max.
7. Sunshine Waterloo Co.	0.05-0.15	0.30-0.60	0.45 max. (0.045)	0.55 max. (0.055)
8. Border Cities Wire & Iron Works	0.05-0.15	0.30-0.60	0.45 max. (0.045)	0.55 max. (0.055)
9. Truscon Steel Co.	0.05-0.15	0.30-0.60	0.45 max. (0.045)	0.55 max. (0.055)

Note: In some cases the phosphorus and sulphur analyses which accompanied the panels probably were in error. The analyses which probably are correct are given in brackets.

* As no analysis accompanied these steels, they were analysed in these Laboratories.

INVESTIGATION:

Panels from the various manufacturers were placed in the Salt Spray Cabinet in which a spray from 20 per cent salt (sodium chloride) solution and a temperature of 95° F. were used.

Results After 7 Days -

All panels showed signs of rust around the edges.

Results After 64 Days -

The panels were removed from the salt spray. Their condition was as follows:

(Investigation, cont'd) -

G. W. Reed & Co. - Central parts of panels were affected comparatively little. Considerable corrosion at the edges and the paint adjacent to the corroded areas contained many small blisters. See Figure 1.

Motor Coach Industries - Considerable corrosion and blistering. Part of the surfaces comparatively unaffected except for a number of fairly small isolated rust spots on one of the panels. See Figure 2.

Western Auto and Truck Body Works - Most of surfaces corroded and blistered. See Figure 3.

Frost & Wood Co. - General breakdown of surfaces due to corrosion and large and small blisters. See Figure 4.

Metallic Roofing Co. Ltd. - General breakdown on one panel, and the other in very bad condition. See Figure 5.

Gotfredson - General breakdown. See Figure 6.

Sunshine Waterloo Co. - A number of fairly small, isolated spots where corrosion has taken place in addition to corrosion around the edges. See Figure 7.

Border Cities Wire & Iron Works - Corrosion around the edges. Many small blisters just beginning to form. See Figure 8.

Truscon Steel Co. - Corrosion around the edges. Considerable number of small blisters just beginning to form. See Figure 9.

CONCLUSIONS:

1. The painted panels from the various sources may be arranged according to their resistance to Salt Spray Corrosion, as follows:

Truscon Steel Co.)	Best.
Border Cities Wire & Iron Works.)	
Sunshine Waterloo Co.		
Motor Coach Industries.		
G. W. Reed & Co.		
Western Auto and Truck Body Works.		
Metallic Roofing Co. Ltd.		
Frost & Wood Co.		
Gotfredson Ltd.		- Worst.

The samples from the Metallic Roofing Co. Ltd. were separated from one another by oiled paper when they were received. Some of the oil undoubtedly came in contact with the paint and may have increased its life to a certain extent.

2. The colour of the paint on the various samples was slightly faded due to the action of the salt spray.

3. As far as could be judged by inspection, a considerable amount of the deterioration of the paint on the various panels was due to corrosion beginning at the edges and spreading underneath the paint. This caused blisters which eventually broke giving the corroding agent free access to the metal.

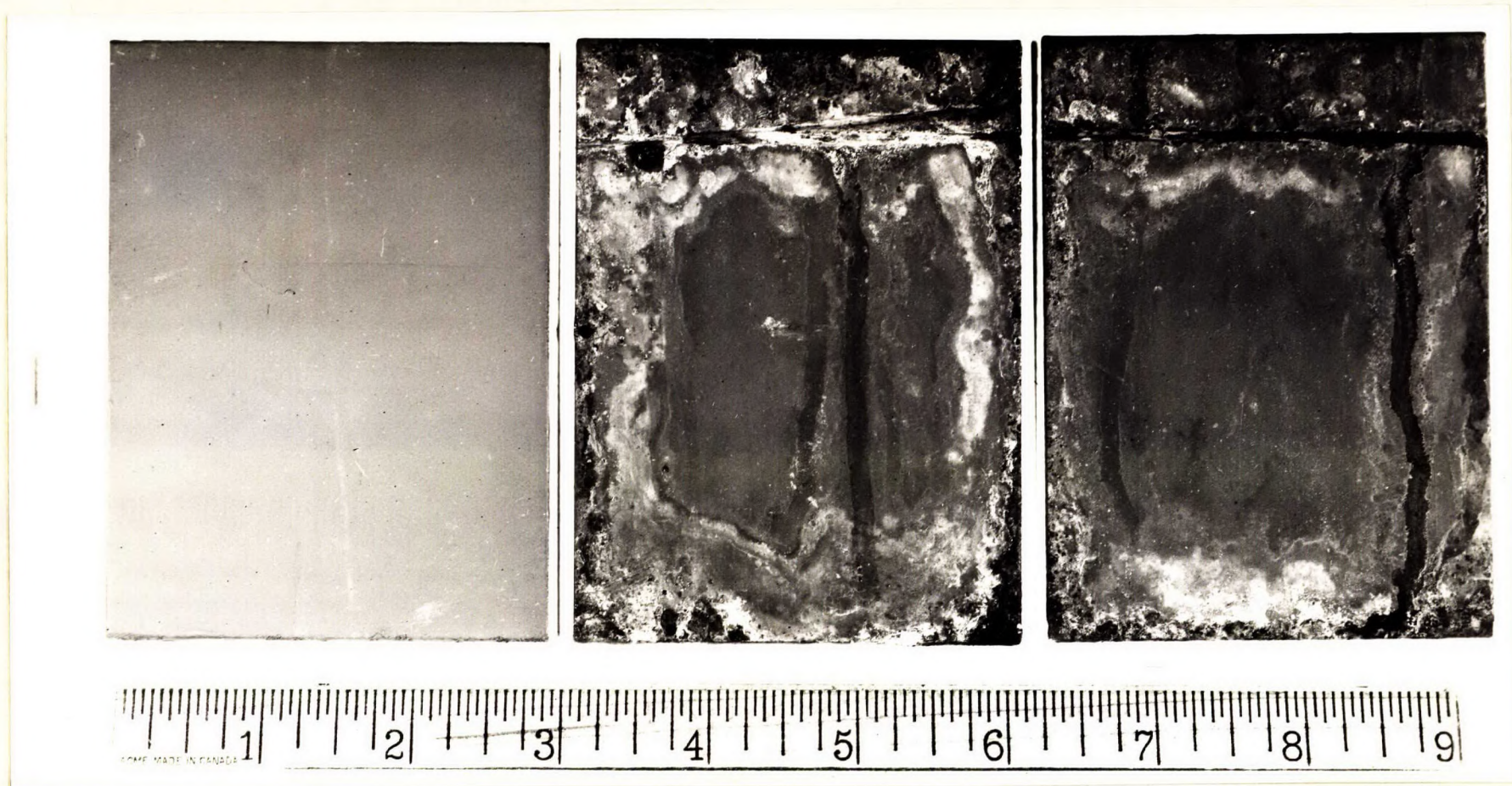
SUGGESTION:

It is suggested that a phosphate coating produced on the steel surface by Bonderizing or a similar process would tend to prevent the corrosion from spreading underneath the paint.

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(Figures 1 to 9)
(follow, on Pages)
(6 to 14.)



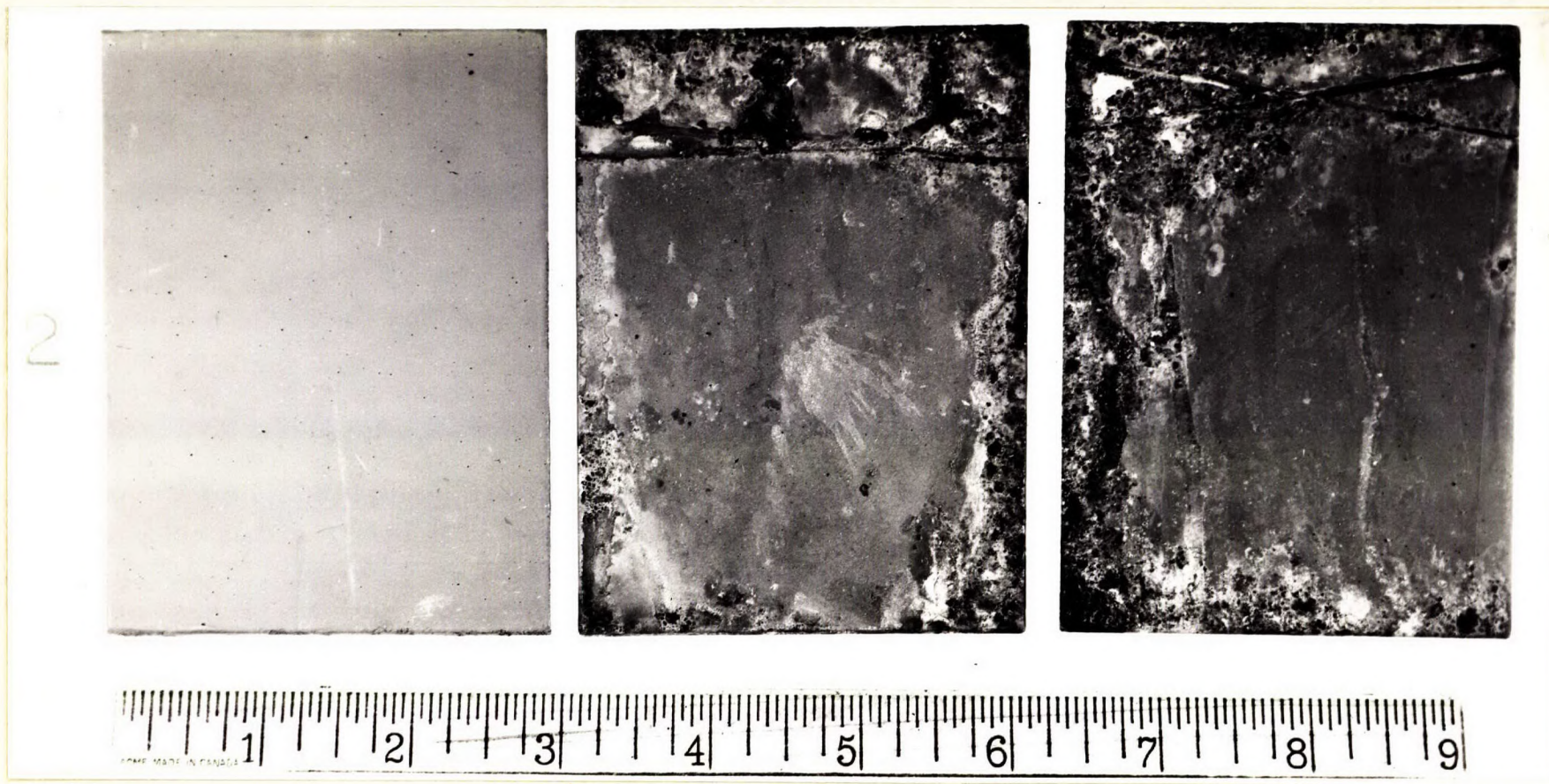
(a)

(b)

(c)

PAINTED STEEL PANELS FROM G.W. REED & CO.

(a) Uncorroded; (b) and (c), After 64 Days in the Salt Spray Cabinet.



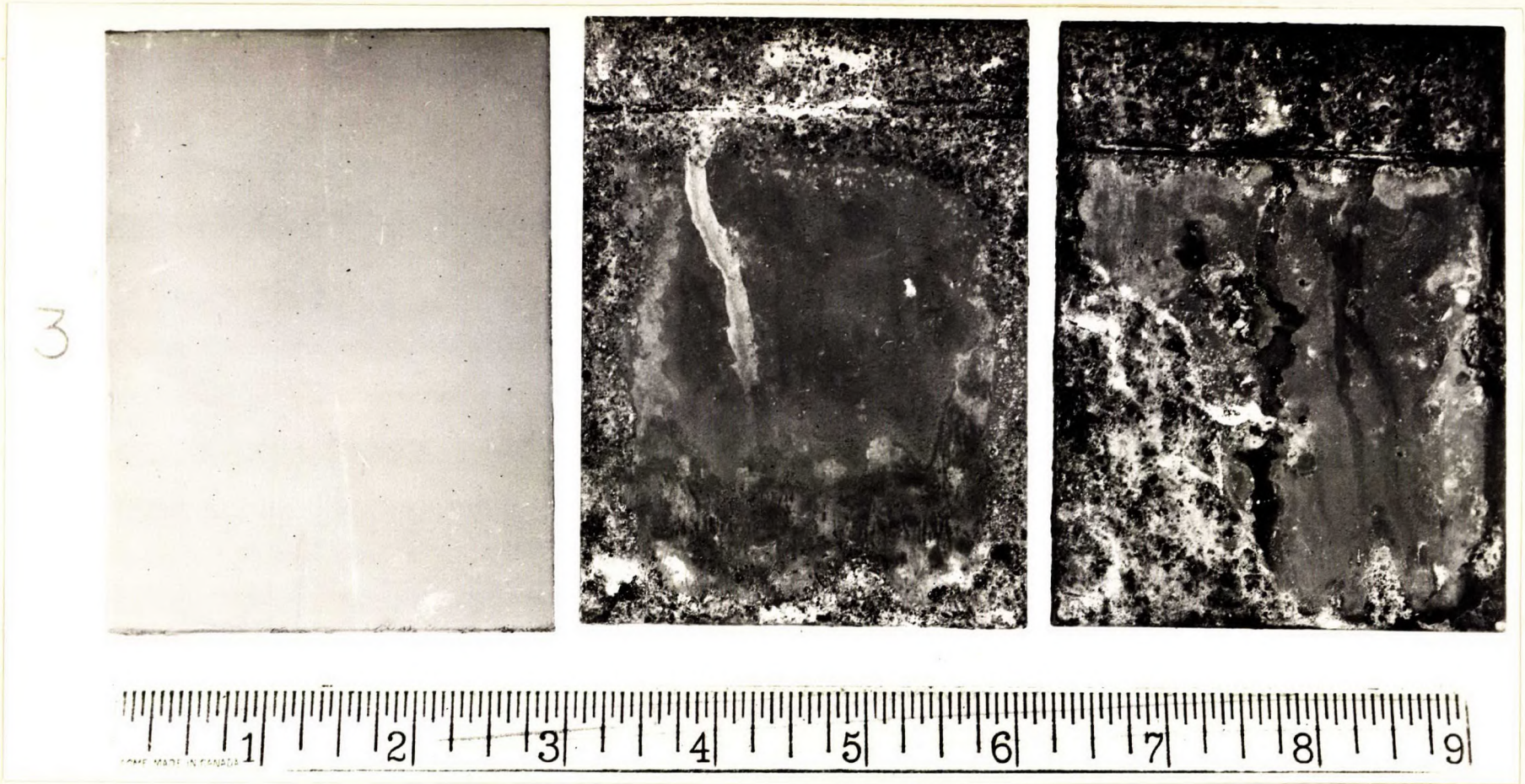
(a)

(b)

(c)

PAINTED STEEL PANELS FROM MOTOR COACH INDUSTRIES.

(a) Uncorroded; (b) and (c), After 64 Days in the Salt Spray Cabinet.



(a)

(b)

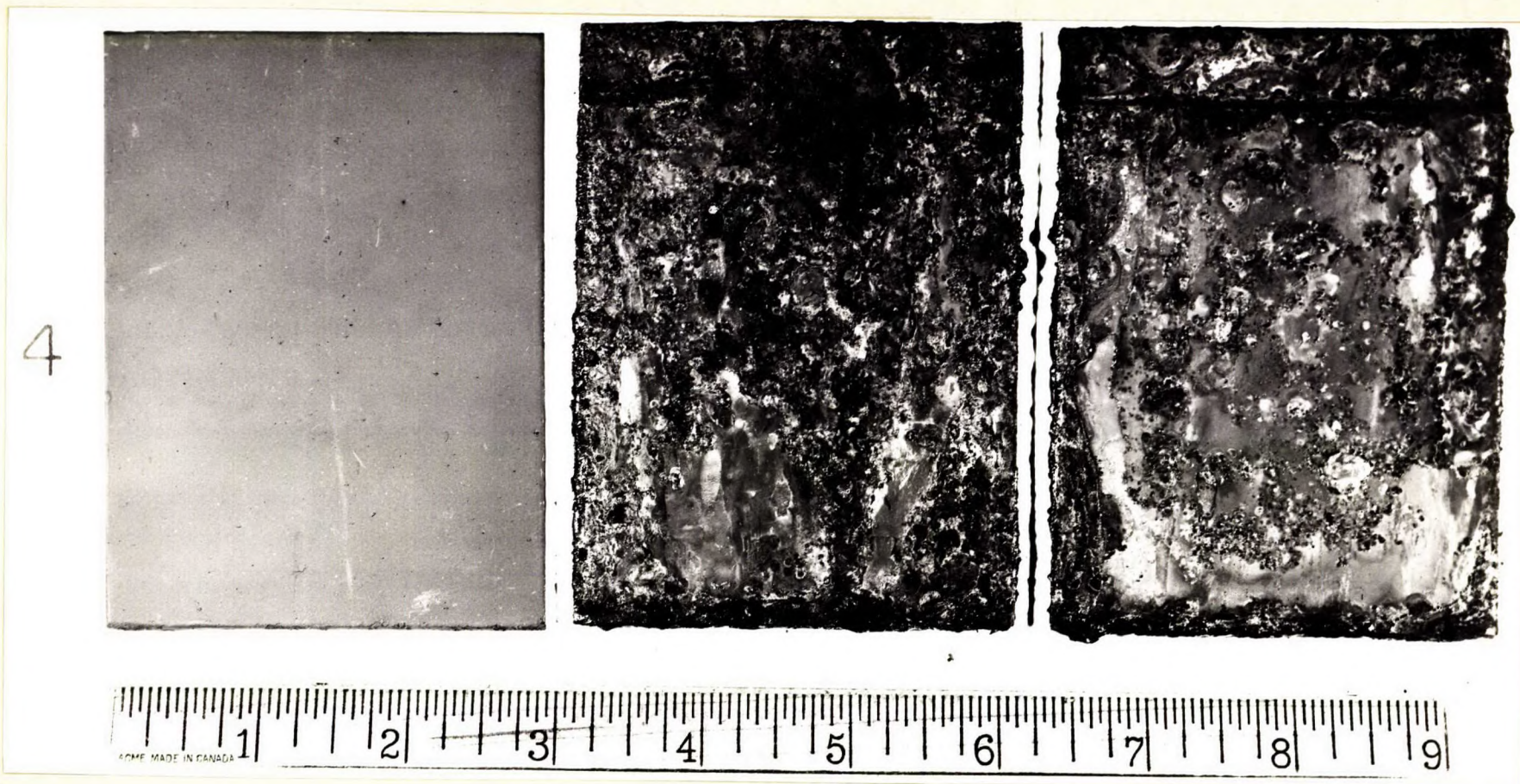
(c)

PAINTED STEEL PANELS FROM WESTERN AUTO & TRUCK BODY WORKS.

(a) Uncorroded; (b) and (c), After 64 Days in the Salt Spray Cabinet.

Figure 5.

(Page 8)



(a)

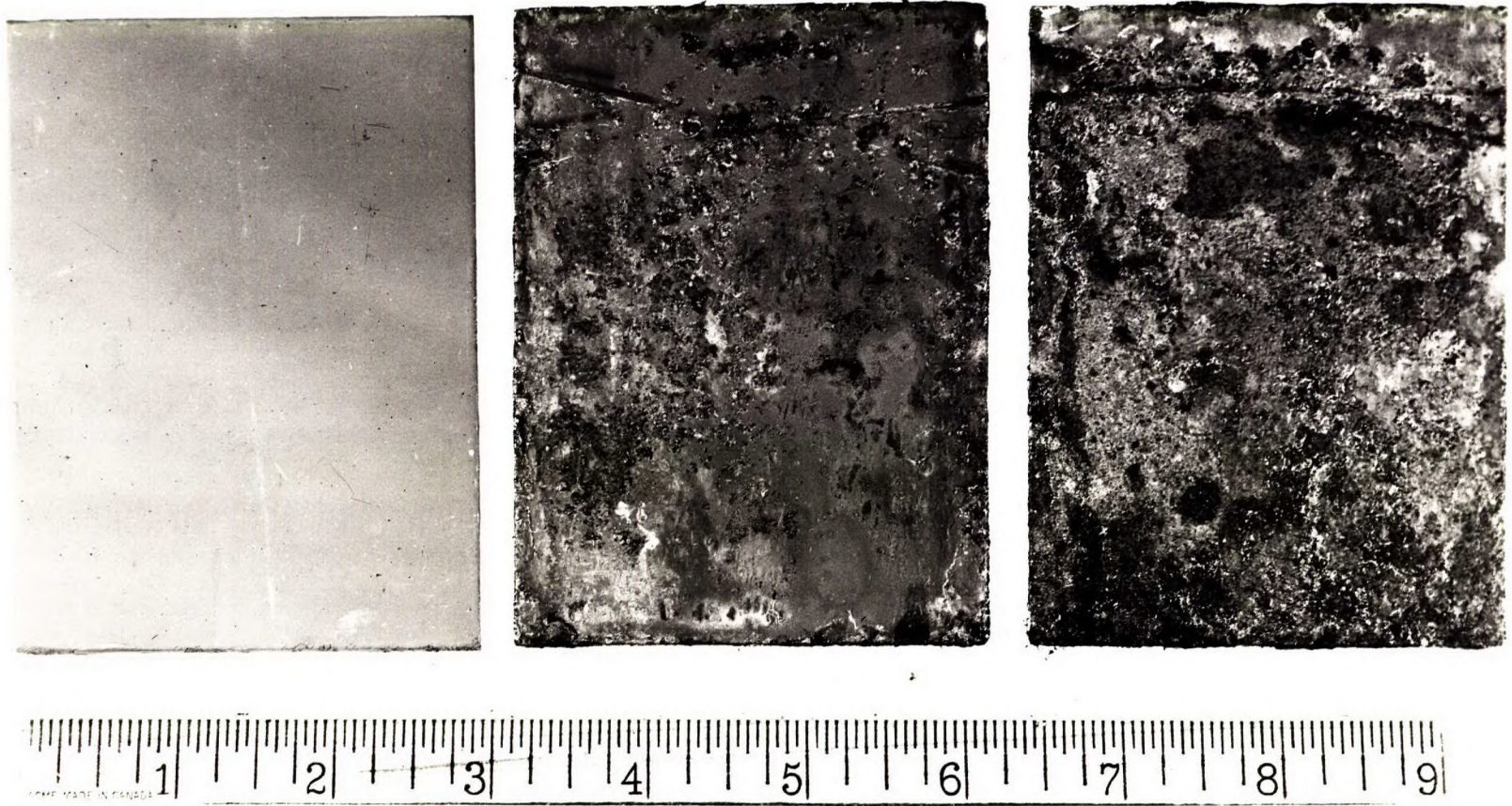
(b)

(c)

PAINTED STEEL PANELS FROM FROST & WOOD CO.

(a) Uncorroded; (b) and (c), After 64 Days in the Salt Spray Cabinet.

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(a)

(b)

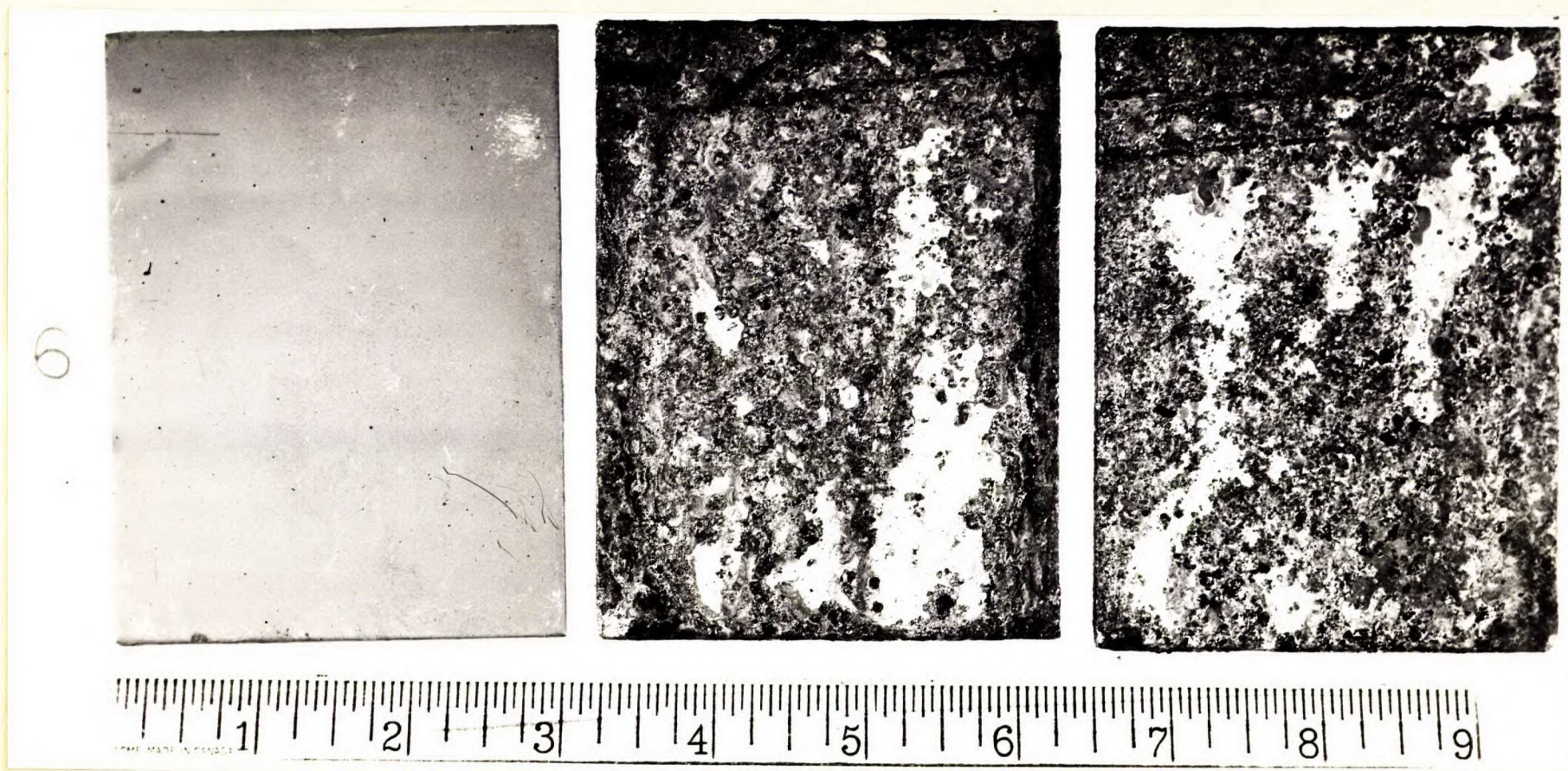
(c)

PAINTED STEEL PANELS FROM METALLIC ROOFING CO. LTD.

(a) Uncorroded; (b) and (c), After 64 Days in the Salt Spray Cabinet.

Figure 5.

(Page 10)



(a)

(b)

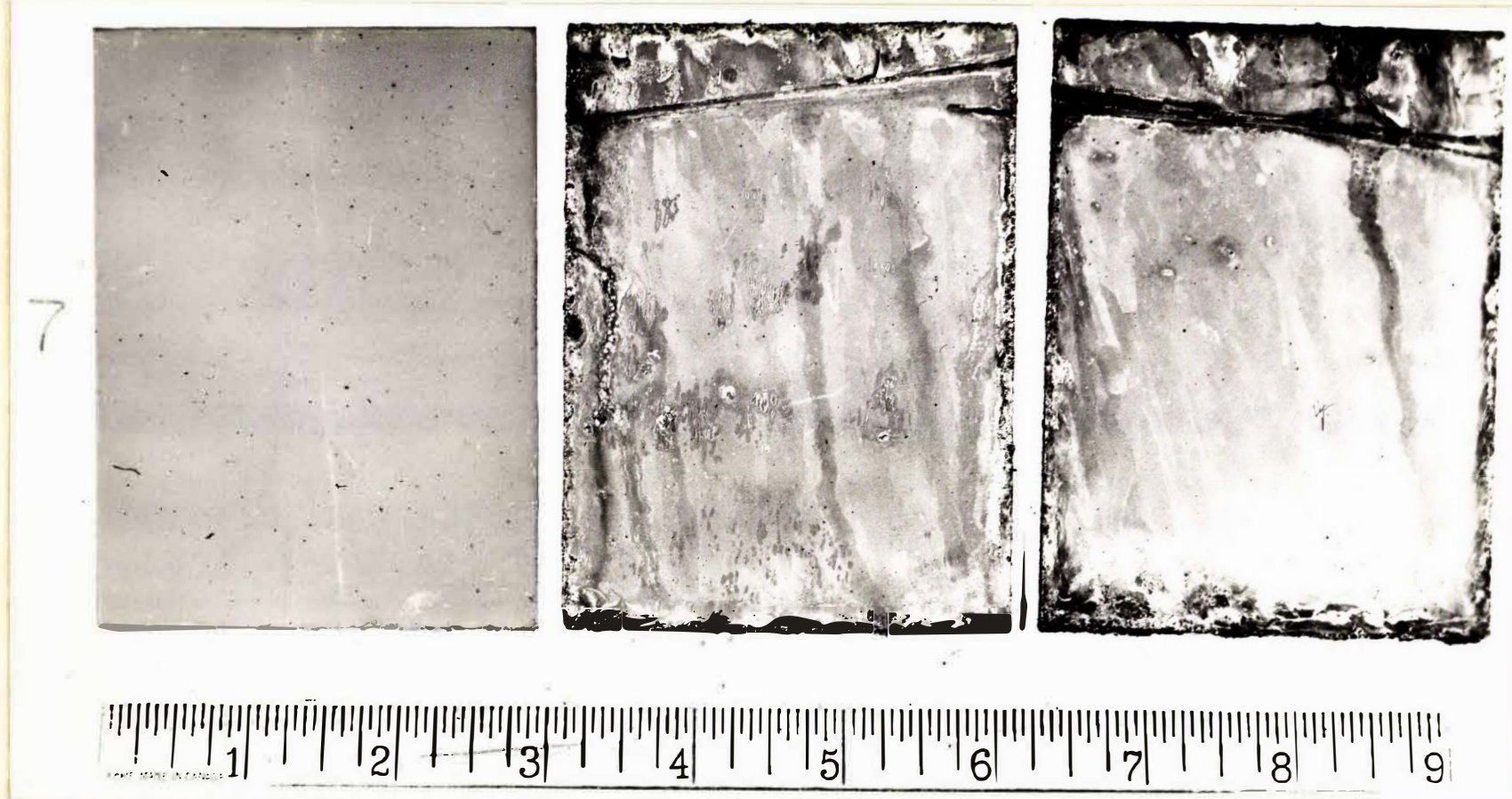
(c)

PAINTED STEEL PANELS FROM GOTFREDSON LTD.

(a) Uncorroded; (b) and (c), After 64 Days in the Salt Spray Cabinet.

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(a)

(b)

(c)

PAINTED STEEL PANELS FROM SUNSHINE WATERLOG CO.

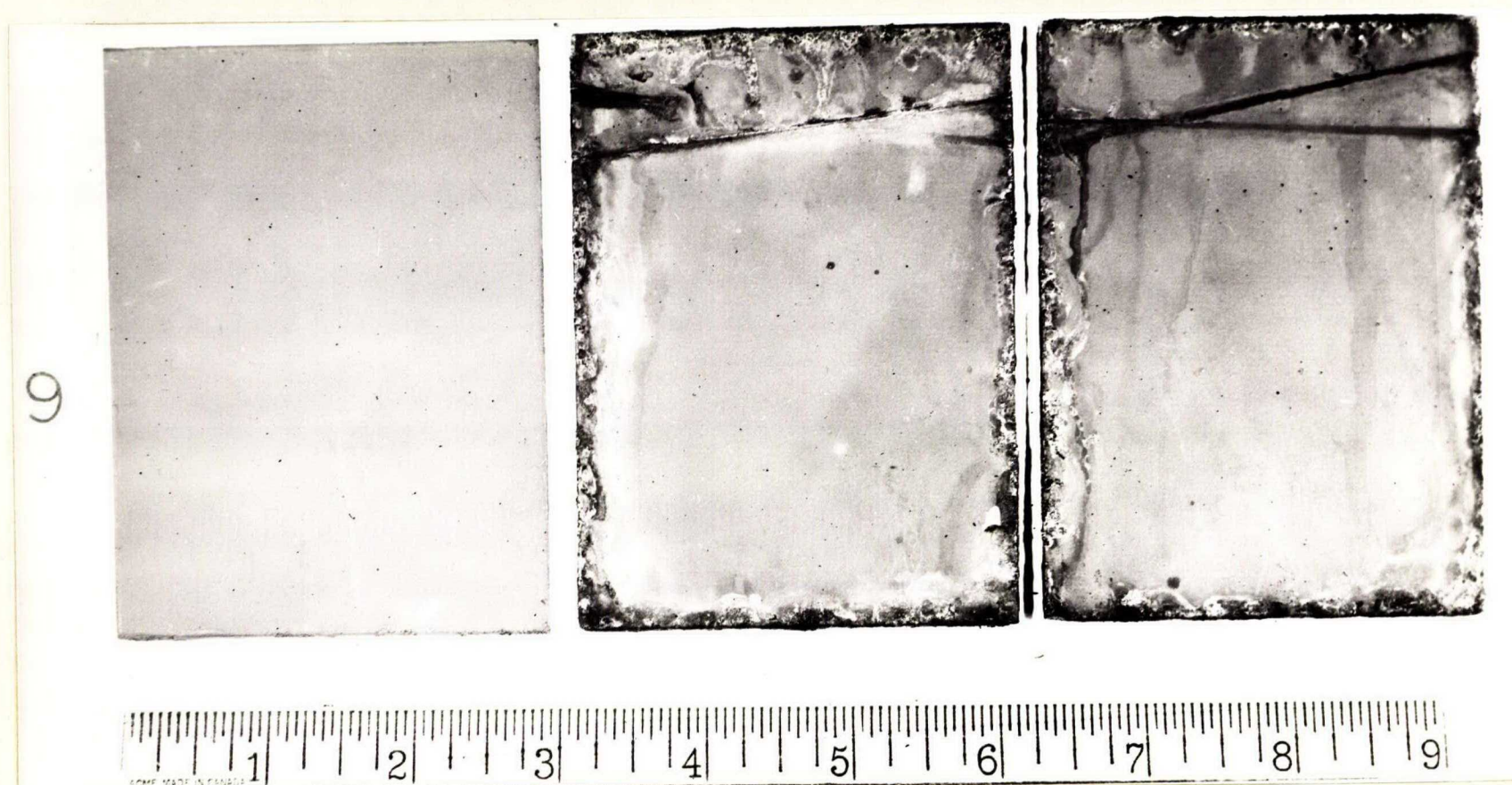
(a) Uncorroded; (b) and (c), After 64 Days in the Salt Spray Cabinet.

Figure 7.

(Page 12)

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(a)

(b)

(c)

PAINTED STEEL PANELS FROM TRUSCON STEEL CO.

(a) Uncorroded; (b) and (c), After 64 Days in the Salt Spray Cabinet.

Figure 9.