O T T A W A September 14, 1945.

R E P O R T

of the

ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 1933.

Relationship of Paint Thickness and Steel Microstructure to Corrosion Resistance of Painted Steel Sheets.

(Copy No. 10.)

Bureau of Mines
Division of Metallic
Minerals
-
Physical Metallurgy
Research Laboratories

CANADA
DEPARTMENT
OF
MINES AND RESOURCES
Mines and Geology Branch

O T T A W A September 14, 1945.

R E P O R T

of the

ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 1933.

Relationship of Paint Thickness and Steel Microstructure to Corrosion Resistance of Painted Steel Sheets.

==========

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, Ontario, requested that the corrosion resistance of a number of painted steel panels be investigated.

Report of Investigation No. 1925, dated August 28, 1945, described the results obtained when the panels were exposed to the action of salt spray. Since the above-mentioned report was written, work has been done to determine the reasons why some panels had greater salt spray corrosion resistance than others.

Tests Performed:

A. Paint Thickness

The thickness of the paint film was determined by an Aminco-Brenner Magne-Gage. An uncorroded sample from each manufacturer was used, except in the case of the Sunshine Waterloo Co. In the latter case no uncorroded sample was available.

In Table I the samples from the various sources are arranged according to their resistance to salt spray corrosion (from Page 5 of Report of Investigation No. 1925). Beside each, the thickness of the paint film is listed.

TABLE I.

Source		Paint Thickness, in inches.
Truscon Steel Co.	-	0.00379
Border Cities Wire and Iron Works	-	0.00471
Sunshine Waterloo Co.	-	
Motor Coach Industries	-	0.00244
G. W. Reed & Co.	-	0.00301
Western Auto and Truck Body Works	-	0.00225
Metallic Roofing Co. Ltd.	-	0.00294
Frost & Wood Co.	-	0.00161
Gotfredson Ltd.	-	0.00160

It can be observed from Table I that the samples may be divided into three groups. The samples from Truscon Steel Co. and Border Cities Wire and Iron Works had the greatest corrosion resistance (see Figure 1) and also the thickest paint film. The samples from Gotfredson Limited and Frost & Wood Company had the least corrosion resistance (see Figure 2) and also the thinnest paint film. The remainder of the samples were intermediate in corrosion resistance (see Figure 3) and intermediate in paint film thickness.

B. Metallography.

The microstructures of the steel panels from the various sources were examined to determine whether there was any connection between the condition of the steel and the

(Tests Performed, cont'd) -

corrosion resistance of the painted panels.

Figure IV shows the cross-section of one of the panels from the Border Cities Wire and Iron Works which was one of the more resistant samples to salt spray corrosion. Figure V shows the cross-section of one of the panels from Gotfredson Limited which was one of the least resistant to salt spray corrosion. Little difference can be seen in the microstructures of these two samples, although they were very different in their resistance to the action of salt spray.

Figure VI shows the cross-section of one of the panels from the Sunshine Waterloo Co. The steel in this panel differs from the others in that the grains are elongated near the surface, indicating some cold work.

Figure VII shows the cross-section of one of the panels from Geo. W. Reed and Co. Ltd. The steel in this panel differs from the others in that the non-metallic inclusions (sulphide and silicate) are more numerous.

Conclusions:

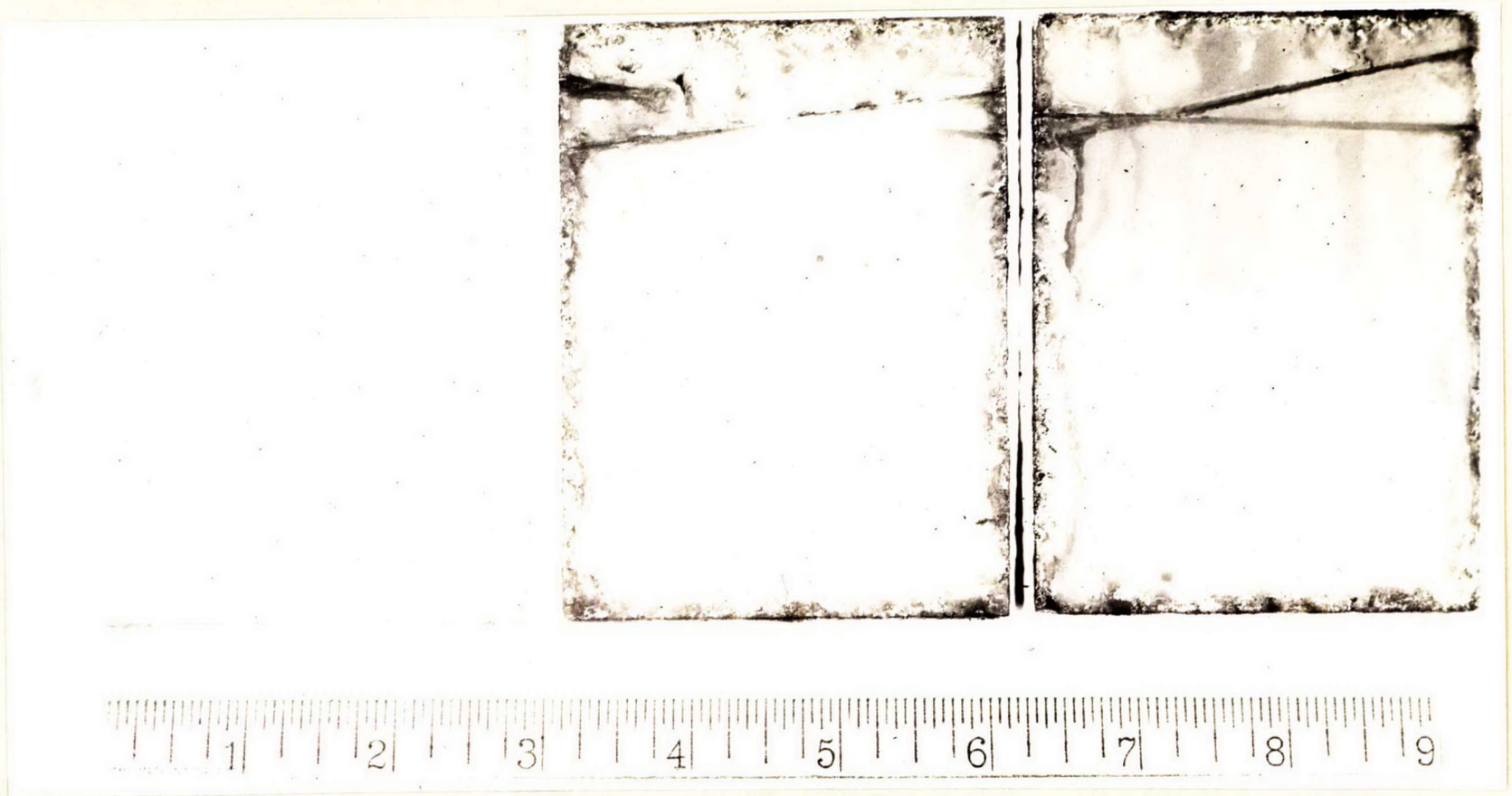
1. No connection between the microstructure of the steel and the corrosion resistance of the painted samples could be detected.

2. A definite connection is seen between the thickness of the paint film and the corrosion resistance. The corrosion resistance increases as the thickness of the paint film increases.

oooooooooooo
oooooooo
oo

GV:LB.

(Figures 1 to 7 follow,
on Pages 4 to 8.)



(a) (b) (c)

PAINTED STEEL PANELS FROM TRUSCON STEEL CO.

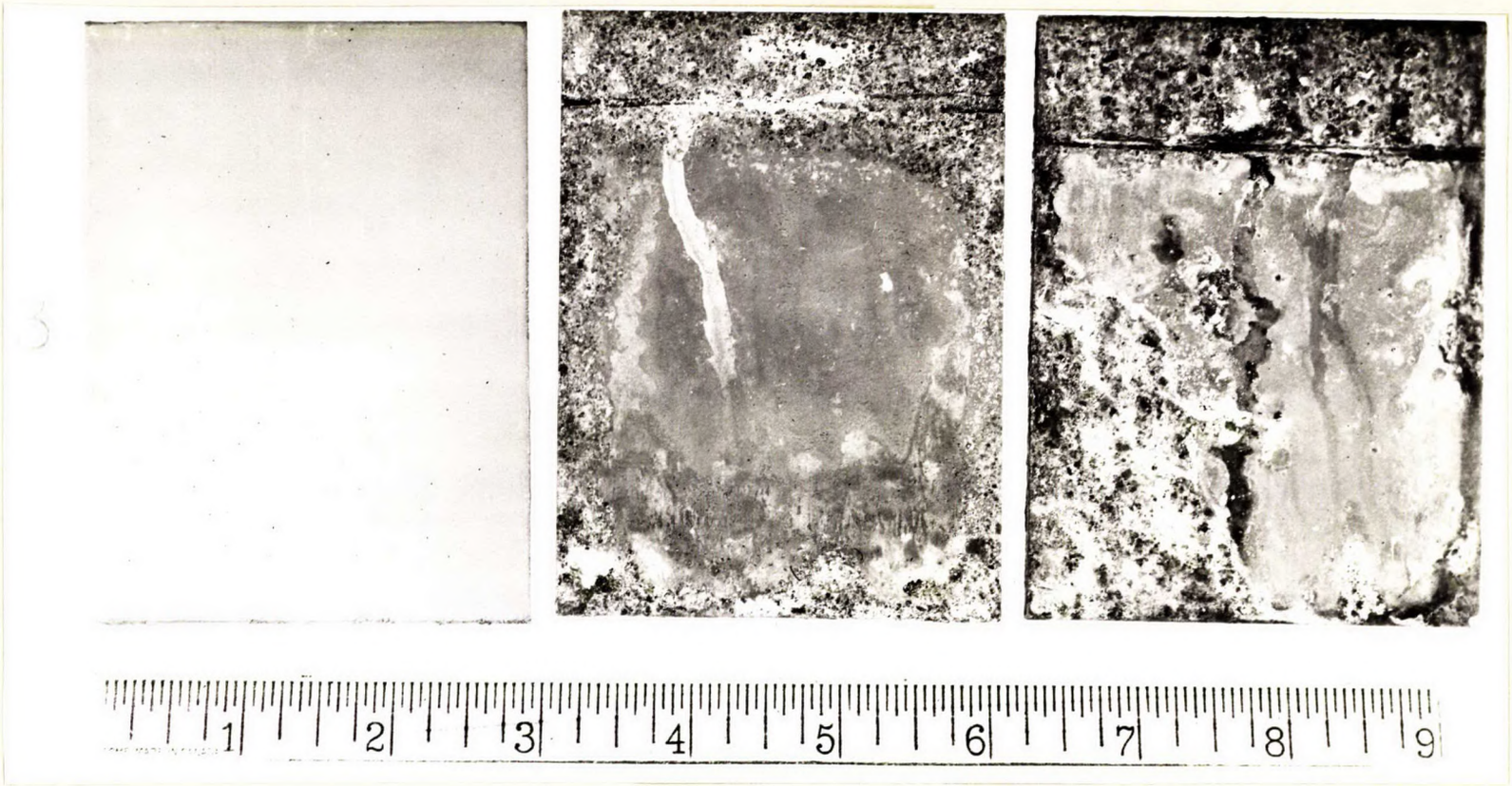
(a) Uncorroded; (b) and (c), After 64 Days in Salt Spray Cabinet.

Figure 1.

(a) (b) (c)

PAINTED STEEL PANELS FROM GOTFREDSON LTD.

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

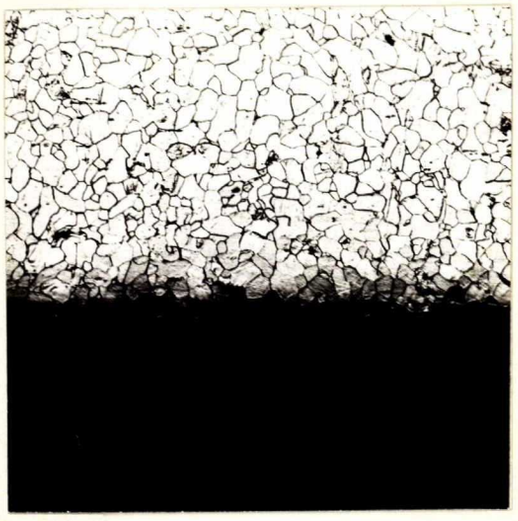


(a) (b) (c)

PAINTED STEEL PANELS FROM WESTERN AUTO & TRUCK BODY WORKS.

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

Figure 4.

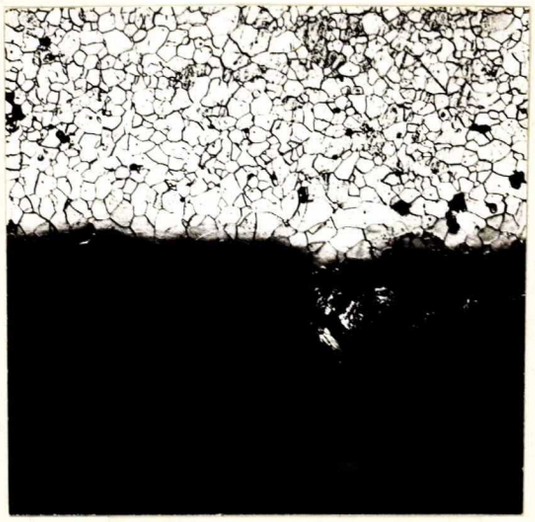


X100, etched in
2 per cent nital.

CROSS-SECTION OF PANEL AT SURFACE, SAMPLE FROM BORDER CITIES WIRE AND IRON WORKS.

-

Figure 5.



X100, etched in
2 per cent nital.

CROSS-SECTION OF PANEL AT SURFACE, SAMPLE FROM GOTFREDSON LTD.

-

Figure 6.

X100, etched in
2 per cent nital.

CROSS-SECTION OF PANEL AT SURFACE,
SAMPLE FROM SUNSHINE WATERLOO CO.

-

Figure 7.

X100, unetched.

CROSS-SECTION OF PANEL, SAMPLE FROM
GEO. W. REED AND CO. LTD.

-

GV:LB.