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O T T A W A April 20, 1945.

REPORT
of the
ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 1846.

Corrosion-Resisting Properties of a Zinc
Coating Sprayed on Steel.

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Background:

A requisition (No. 33, File No. NS 15428-1 FD
684 (Staff)) dated December 18, 1944, was received from the Director of Scientific Research Development, Department of National Defence, Naval Service, Ottawa, Ontario, requesting that a zinc-sprayed piece of steel be tested for corrosion resistance in the salt spray and for thickness of zinc coating, and that it be examined metallographically to determine the type of bond between the zinc coating and the steel basis metal.

TESTS PERFORMED:

I. Salt Spray Corrosion Test.

The sample of zinc-sprayed steel was suspended in spray from a 5 per cent salt (sodium chloride) solution at 90° F. and allowed to remain there until general corrosion occurred on the surface next to the spray nozzle.

Results -

After 24 days: A few small spots of rust were observed near one corner of the sample.

After 34 days: Several small rust spots were observed on the large face about an inch from one end.

After 100 days: Fairly small rust spots began to form on all parts of the large face.

II. Thickness Measurements.

The thickness of the zinc coating was measured at a number of points on the surface by means of the Aminco-Brenner Magne-Gage produced by the American Instrument Co. This instrument cannot measure thicknesses greater than 0.002 inch.

THICKNESS READING (Inches)

	Large Face I	Large Face II	Side Face I	Side Face II
	0.0017	0.0014	0.0014	+0.002
	0.0011	0.0016	0.0012	+0.002
	0.0009	+0.0020	0.0012	+0.002
	0.0015	0.0018		
	0.0012	0.0014		
	0.0017	0.0020		
<u>Average:</u>	0.0013	+0.0017	0.0013	+0.002

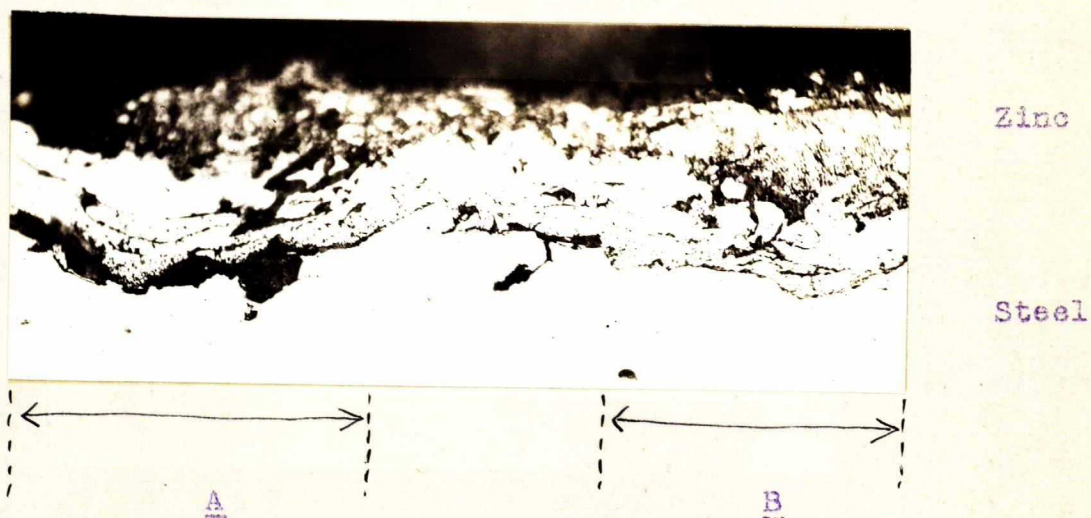
This coating was thicker than is usually used for protection against corrosion.

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III. Metallographic Examination.

A section of the coated metal was polished and examined under the microscope. Figure 1 shows a typical portion of the interface between zinc and steel.

Figure 1.



SECTION OF STEEL COATED WITH ZINC BY SPRAYING.

X500. As polished.

The following points may be observed:

1. In the part of the figure marked A the dark areas between steel and zinc indicate either air space or else non-metallic impurity. No direct contact is visible between metallic zinc and metallic iron.
2. In the part marked B there is much better (though not perfect) contact between metallic zinc and metallic iron.
3. The zinc is very porous.
4. The zinc tends to be stratified.

(Continued on next page)

Remarks:

Steel coated with zinc by any process will be protected for a period of time, the length of which will depend upon the thickness of the metal in the coating. As zinc protects the steel electrolytically the coating may be very porous without decreasing the amount of protection.

The sprayed zinc coating is much more porous, much less uniform and much less adherent than coatings produced by electroplating or hot-dipping processes. However, there are times when it is more convenient to apply a coating by spraying than by other processes.

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