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April 18, 1945.

R E P O R T

of the

ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 1844.

(Further to Report of Investigation)
(No. 1831, dated April 4, 1945.)

Corrosion Resistance of Cadmium-Plated
Steel Bolts.

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Background:

A requisition dated March 22, 1945, was received from Mr. A. M. Toye, I.O.M.E.(1), of the Inspection Board of United Kingdom and Canada, 479 Bank Street, Ottawa, Ontario, requesting that a number of electroplated tee bolts be tested for thickness of protective coating and for resistance to salt spray. Later, a verbal request was received to test one extra bolt.

The bolts were to be made of Atlas S.P.S. 245 steel. Those submitted for test were as follows:

- 2 bolts (numbered 1 and 2) plated with cadmium for 10 minutes.
- 2 bolts (numbered 3 and 4) plated with cadmium for 20 minutes.
- 1 bolt (numbered 5) plated with cadmium, taken at random from production.

(Background, cont'd) -

- 1 bolt (numbered 6), unplated.
- 1 bolt (numbered 7) plated with zinc and then passivated
- 1 bolt (additional), unplated. To be covered in these Laboratories with graphite grease to be submitted by Mr. Toye.

According to specifications, the cadmium-plated bolts should have coatings between 0.0005 and 0.0010 inch thick and should be uncorroded after 500 hours in the Salt Spray Test and the zinc-plated one should have a coating between 0.0002 and 0.0005 inch thick and should be uncorroded after 200 hours in the Salt Spray Test.

Due to the urgency of the request the thickness data were reported as soon as they were obtained, in O.D.M.L. Report of Investigation No. 1831, entitled "Thickness of Corrosion-Resistant Cadmium-plated Coatings on Steel Bolts", dated April 4, 1945.

The results of the corrosion test are presented in the present report.

Test Procedure:

The steel tee bolts were tested in the 20 per cent salt (sodium chloride) spray test at 95° F.

Results:

1. The uncoated bolt showed general deterioration by the end of seven hours in the test.
2. The bolt coated with graphite grease showed general deterioration by the end of seven hours in the test.
3. No iron rust was observed on Bolt No. 7 at the end of 200 hours in the test.
4. No iron rust was observed on Bolts Nos. 1, 2 and 4 at the end of 500 hours in the test.
5. One very small rust spot was observed on

(Results, cont'd) -

Bolt No. 3 at the end of 500 hours in the test. The spot occurred at the angle at the bottom of one of the threads. The coating would be expected to be thinner at a point such as this than at most other points on the surface.

6. Two small rust spots were observed on Bolt No. 5 at the end of 500 hours in the test. These failures also occurred at angles at the bottom of two of the threads.

Conclusions:

1. The uncoated S.P.S. 245 steel offers little resistance to corrosion.

2. The S.P.S. 245 steel is not protected against corrosion to any appreciable extent by a film of graphite grease.

3. The corrosion resistance of the zinc-plated and passivated bolt conformed to specifications.

4. The corrosion resistance of the two bolts plated for ten minutes and of one of the bolts plated for twenty minutes conformed to specifications.

5. The corrosion resistance of one bolt plated for twenty minutes and of the bolt selected at random from production conformed to specifications except for one or two small rust spots.

It would appear that the ten-minute plating time gives adequate protection against corrosion if proper care is taken throughout the procedure.

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