File

FILE COPY

O T T A W A   December 1st, 1944.

REPORT

of the

ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 1755.

Examination of Zinc Base Die-Cast Adapter and Delay Holders, Bomb M.L. 2-inch Illuminating.

(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   December 1st, 1944.

R E P O R T

of the

ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 1755.

Examination of Zinc Base Die-Cast Adapter and Delay Holders, Bomb M.L. 2-inch Illuminating.

Origin of Samples and Object of Tests:

Six samples each of adapter and delay holders, Bomb M.L. 2-inch Illuminating, covered by Analysis Requisition No. O.T. 4295, Investigation No. 103, letter file No. 12/4/1, were received on November 2nd, 1944, from Mr. J. M. Gilmartin, I.O.M., for Inspector of Materials, Inspection Board of United Kingdom and Canada, Ottawa, Ontario. It was requested that these zinc base die-cast parts be subjected to a steam test as outlined by the New Jersey Zinc Company, in order to determine their susceptibility to intercrystalline corrosion.

Steam Test:

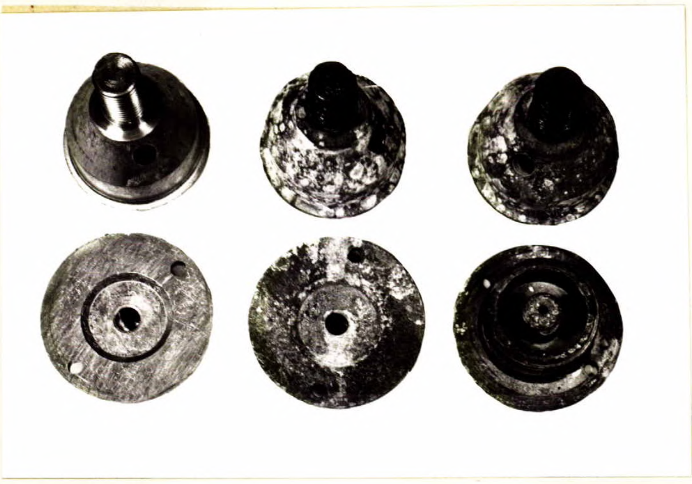
Five samples each of adapter and delay holders were maintained in a 95° C. steam atmosphere for ten days, using a cabinet constructed according to New Jersey Zinc Company specifications. Spacial or control variations in temperature were within -0 to +3 degrees Centigrade of the given temperature.

As shown in Figures 1 and 2, all samples corroded and cracked severely during this test.

Figure 1.

STEAM-TESTED SAMPLE.
Note cracks.
(Approximately to size).

Figure 2.

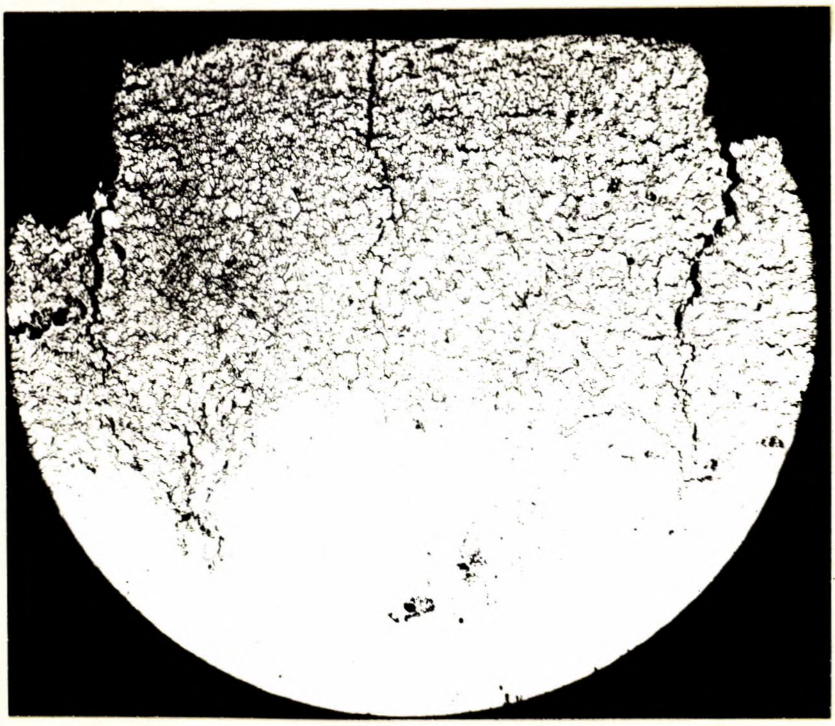


"AS RECEIVED" AND STEAM-TESTED SAMPLES.
"As received" samples at left.
(Approximately half size).

Microscopic Examination:

Microscopic examination of sections from an adapter and delay holder showed that network corrosion, to an average depth of about 0.020 inch, had occurred in the steam test (see Figure 3).

Figure 3.



X100, unetched.

HOLDER SUBJECTED TO STEAM TEST.

Exterior surface of sample at top of picture. Note network corrosion.

-

Spectrographic and Chemical Analysis:

One uncorroded, cone-shaped part (same form as part shown in Figure 1) was analysed spectrographically. Since only one zinc standard sample was available, the following results are comparative only:

(Continued on next page)

(Spectrographic and Chemical Analysis, cont'd) -

	Al	Cu	Mg	Pb	Sn	Cd	Mn	Si	Bi	Sb
Holder -	2	3	4	3	3	4	4	3	5	ND
	∨	∨	∨	∨	∨	∨	∨	|	∨	|
Die casting of another type, known to be good -	2	4	4-	5	ND	5?	5	3	ND	ND
	∧	∧	∧	|	∧	∧	|	|	|	|
Standard sample from New Jersey Zinc -	2	3	4	5	5-	5-	5	3	ND	ND
Per Cent -	4.0	0.1	0.038	0.002	0.002	0.0015	Not Determined.			

Symbols:
2 = Minor constituent. 4 = Traces.
3 = Strong traces. 5 = Faint traces.
ND = None detected.

a > b reads, in this case, "a" greater in quantity than "b".

A chemical analysis of the lead content of this spectrographically analysed part gave 0.008 per cent. There was not sufficient sample remaining for a tin determination.

One of the flat-surfaced threaded holders (see lower part of Figure 2) gave, on chemical analysis, tin 0.008 per cent and lead 0.005 per cent.

Discussion of Results:

The steam test, followed by macro- and micro-examinations, demonstrates that these die-cast parts are very susceptible to network corrosion.

The excessive tin content (in one sample it was 0.003 per cent over the usual maximum limit of 0.005 per cent) found by spectrographic and chemical analyses is undoubtedly the cause of most, if not all, of the susceptibility to corrosion. Chemical analysis results, which give the lead content as 0.008 per cent

(Discussion of Results, cont'd) -

in one sample and 0.005 per cent in another, indicate that the lead (another promoter of network corrosion) also may be too high. However, the sample with 0.008 per cent is only 0.001 per cent over the usually specified limit of 0.007 per cent and since chemical analysis results of such low concentrations measured on small samples may be somewhat in error it cannot be said definitely that the lead is excessive. Certainly, though, it is at least close to the limit.

Conclusion:

A rather extreme tendency to network corrosion, caused by excessive impurity content, renders these samples unfit for usual applications.

oooooooooo
oooooo
oo

LPT:GHB.