LEAD INDUSTRIES ASSOCIATION
~~420 LEXINGTON AVENUE~~ 60 East 42nd Street
NEW YORK 17, N. Y.

Pigments and Chemicals Division

November 27, 1957

SUBJECT: NOTICE OF MEETING

To Members of the Red Lead Technical Committee:

There will be a meeting of the Red Lead Technical Committee of the Lead Industries Association on Friday, December 6, 1957, at 9:30 A.M., in the offices of the Association.

The meeting has been called primarily to discuss the proposed revision to American Water Works Association specification D-102-55T, Tentative Recommended Practice for Painting and Repainting Steel Tanks, Standpipes or Reservoirs and Elevated Tanks for Water Storage, and other matters that may properly come before the committee.

A tentative agenda follows:

1. Approval of minutes of previous meeting of September 17, 1957.

2. Proposed revision to AWWA specification D-102-55T. Memoranda attached:

   a. A brief history of the Red Lead Paint - Potable Water Tank Controversy, 1949-1957.

   b. Lead Content of Water from Lead Painted Standpipes and Tanks by Harvey B. Elkins, Ph.D.

   c. The Solubility of Red Lead and Solution Characteristics of Red Lead Paints in Distilled, Natural and Treated Waters, by D. A. Fraser and L. T. Fairhall. (If not herewith, will be mailed to you as soon as available.)

   d. Summary of the proposed revision to AWWA specification D-102-55T.

3. Chairman's report of SSPC meeting held in Pittsburgh, Pa., October 8, 1957.

4. Compilation and review of completed L.I.A. projects made by the chairman.

5. Review of lead cyanamid and red lead performance tests conducted by The Eagle-Picher Co.

6. Review of L.I.A. Project 25.

7. Correspondence received by secretary.

8. New business.

9. Next meeting date.

Sincerely yours,

David M. Borcina

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Secretary, Red Lead Technical Committee

BY ORDER OF THE CHAIRMAN

LEAD CONTENT OF WATER FROM LEAD PAINTED STANDPIPES AND TANKS

by

Harvey B. Elkins, Ph.D.

Purpose and method

Because of the suggestion that lead paint on the inner surface of standpipes and tanks used for the storage of potable water might produce a lead poisoning hazard, a study of the lead content of such water was inaugurated. Arrangements were made by the Lead Industries Association to have two standpipes in Massachusetts painted internally with a phenol formaldehyde base paint with a red lead pigment. This paint, referred to hereafter as Type IV paint, was made in accordance with specifications of the American Waterworks Association for paint for water storage tanks. Samples of water were taken from these standpipes shortly after filling, and at various intervals thereafter, up to the present time (seven years and five years, respectively, after the painting).

In addition limited studies were made at five other tanks. Two of these were in Massachusetts, but were painted with a synthetic base paint with a lead chromate pigment, referred to hereafter as K. & F. King paint.

The other three tanks were in New Jersey and had been painted with Type IV paint.

Collection of samples

Samples from three of the Massachusetts standpipes were collected by engineers of the Massachusetts Department of Public Health. Samples from the New Jersey tanks were obtained by personnel of the Hackensack water works. The samples from the Metropolitan State Hospital were collected chiefly by the writer, but in a few cases by maintenance men at the Hospital. These were ordinarily

collected in 2½ liter acid bottles, and a little hydrochloric acid was usually added shortly after collection, to prevent deposition of lead on the glass, a phenomenon which had been observed to take place, albeit very slowly, in dilute standard solutions of lead salts.

Analysis

The usual procedure for lead in water involves the direct extraction of 100 ml. or less of water with dithizone. A more sensitive method was needed to detect amounts of lead below 0.01 mg. per liter, the limit of sensitivity of the direct method. Two procedures were tried. The first was concentration of 300 to 500 ml. of the acidified water sample by evaporation, to volume which could be conveniently extracted with dithizone, after addition of the necessary reagents. The other procedure involved coprecipitation with calcium oxalate. To 400 or 500 ml. of water in an erlenmeyer flask, 10 to 15 ml. of saturated ammonium oxalate solution (lead-free) was added, the pH adjusted to about 4.5 (using brom cresol green indicator), with acetic acid, and 1 ml. of 10% $CaCl_2$ solution added, as the mixture was swirled. The precipitate was allowed to stand overnight, preferably in a large test tube, and the supernatant liquid siphoned off. The residual slurry was transferred to a pyrex test tube and centrifuged. The clear supernatant liquid was poured off and the residue digested with perchloric acid and then analyzed by the standard dithizone procedure. A blank, using 50 or 100 ml. of de-ionized water, was run with each set of samples.

Both methods were used on the first eight water samples. Essential agreement was obtained in seven samples, but in the eighth a significantly higher value was obtained by the coprecipitation method (0.018 mg./l. vs. 0.006 by the evaporation method).

Since the evaporation method was more laborious and time consuming, and chances for contamination were greater, as evidenced by higher blank values, it was abandoned and the remainder of the samples were analyzed only by the coprecipitation procedure.

Sensitivity and accuracy of method

The dithizone procedure, as used in these determinations, is sensitive to about 1 ug. of lead (results are reported to the nearest 0.1 ug., but cannot be duplicated as closely as this). If a 500 ml. sample is analyzed, the sensitivity is about 2 ug., or 0.002 mg. of lead per liter of water. This is one fiftieth the tolerance value of 0.1 mg. per liter.

Analysis of control samples indicated an accuracy of about 10% in the concentration range 0.02 to 0.03 mg. of lead per liter of water.

Results

A total of 81 samples were analyzed. Of these, 62 represented tank samples, 17 were classed as influent samples, and two as control samples. A further breakdown is given in Table 1.

Table 1

Number of Samples Analyzed

Source	Tank Samples	Influent Samples	Other
Wrentham	23	2	
Pondville	3		
New Jersey	7	8	
Metropolitan Hospital	29	7	
Control			2
	62	17	2

The results of all the analyses, by source of sample, are given in Tables 2 to 8, inclusive.

Table 2

Wrentham State School

Old Riveted Standpipe - Capacity 180,000 Gallons

Painted Early July, 1950, With Type IV Paint - pH of Water, 6.0 to 6.4

Results of Analyses for Lead

Date of Sample	Lead Found - Mg./L.	Comment
5/18/50	0.000	Influent
5/18/50	0.000	Prior to painting
7/17/50	0.000	Wash water, after painting
7/18/50	0.003	Wash water, after painting
7/19/50	0.001	Wash water, after painting
7/24/50	0.002	Second filling
7/31/50	0.000	Static one week
8/8/50	0.016	On line 8 days
8/21/50	0.000	On line 21 days
9/25/50	0.001	On line 2 months
7/9/51	0.050	One year after painting
7/9/51	0.003	One year after painting
8/5/52	0.001	Two years after painting
6/22/53	0.001	Three years after painting
5/3/55	0.001	Five years after painting
5/14/57	0.002	Seven years after painting

Table 3

Wrentham State School

New Welded Standpipe - Capacity 500,000 Gallons

Painted August 17, 1950, with E. & F. King Paint - pH of Water, 6.1

Results of Analyses for Lead

Date of Sample	Lead Found - Mg./L.	Comment
8/28/50	0.002	
9/19/50	0.004	On line about 3 weeks
9/25/50	0.000	On line one month
9/9/51	0.002	One year after painting
9/9/51	0.002	One year after painting
8/5/52	0.003	Two years after painting
6/22/53	0.001	Three years after painting
8/18/54	0.001	Four years after painting
5/14/57	0.001	Seven years after painting

Table 4

Pondville Standpipe - Capacity 100,000 Gallons

Used for Standby Storage - Painted August, 1950, with E. & F. King Paint

Results of Analyses for Lead

Date of Sample	Lead Found - Mg./L.	Comment
8/15/50	0.37	24 hours after filling
8/21/50	0.002	7 days after filling
8/28/50	0.000	14 days after filling

Table 5

Hackensack, New Jersey, Water Company Samples

Tank	Date	Lead Found - Mg./L.	Comment
Alpine Elevated Tank	1/51	0.002	Influent
100,000 gallons	1/51	0.010	Effluent
Painted in Septem-	7/51	0.015	Effluent
ber, 1949, with	9/51	0.000	Influent
Type IV Paint.	9/51	0.007	Effluent
Grandview Elevated Tank	1/51	0.007	Influent
75,000 gallons	1/51	0.004	Effluent
Painted in August,	7/51	0.007	Influent
1950	9/51	0.005	Influent
1 coat red lead	9/51	0.014	Dip Sample
1 coat Type IV			
Wash Water Tank	1/51	0.005	Influent
125,000 gallons	7/51	0.021	Influent
Painted in Septem-	7/51	0.008	Sample
ber, 1949, with	9/51	0.003	Influent
Type IV	9/51	0.002	Dip Sample

Table 6

Metropolitan Hospital, Waltham, Massachusetts

Standpipe - Capacity 1,250,000 Gallons

Painting with Type IV Paint - Completed July 25, 1952 - pH of Water, 6.6

Results of Analyses for Lead

Date of Sample	Lead Found - Mg./L.	Comment
7/29/52 - P. M.	0.004	Four days after painting
7/30/52 - A. M.	0.005	
7/31/52 - A. M.	0.005	
7/31/52 - P. M.	0.003	
8/1/52 - A. M.	0.003	One week after painting
8/1/52 - P. M.	0.002	
8/4/52 - A. M.	0.004	
8/4/52 - P. M.	0.001	
8/5/52	0.005	
8/7/52	0.010	Two weeks after painting
8/8/52	0.004	
8/11/52	0.005	
8/15/52	0.012	
8/22/52	0.006	
8/23/52	0.001	One month after painting
9/3/52	0.015	
9/3/52	0.002	Boiler house
9/10/52	0.013	Meter near tank
10/3/52	0.016	Two months after painting
11/13/52	0.003	
11/13/52	0.004	Garage
11/13/52	0.002	Nurses' home

Table 6 - Continued

Date of Sample	Lead Found - Mg./L.	Comment
8/8/53	0.000	One year after painting
8/26/54	0.005	Boot shed - 2 years after painting
8/26/54	0.002	Boot shed - 2 years after painting
6/4/55	0.001	Boot shed - 3 years after painting
6/4/55	0.001	Children's Building
6/1/57	0.003	Boot shed - 5 years after painting
6/1/57	0.002	Boiler house
	"Influent" Samples	
8/15/52	0.001	266 Congress Street, Boston
8/21/52	0.018	Fernald School pump house
9/2/52	0.007	Fernald School pump house
9/2/52	0.025	303 Mill Street, Belmont
10/9/53	0.009	Fernald School pump house
10/9/53	0.001	Fernald School pump house
6/1/57	0.004	Fernald School pump house

Where not specified, samples were collected at machine shop or laundry.

Table 7

Control Samples (50 ml. water)

Date	Lead Added	Lead Found	Recovery
9/2/54	10 ug.	9.3 ug.	93%
6/9/55	15.4 ug.	15.8 ug.	103%

The average concentrations of lead, in samples obtained at various times following painting, from all the tanks studied, are shown in Table 8.

Table 8

Lead Concentrations and Time after Painting

Time after Painting	Number of Samples	Average Lead Content, Mg./L.
One week or less	10	0.04
One week to 3 months	23	0.006
Four to 16 months	11	0.009
Two years	8	0.005
Three years	4	0.001
Four years	1	0.001
Five years	3	0.002
Seven years	2	0.001
Influent water samples	17	0.007
Influent samples, selected	14	0.003

Discussion of Results

One sample, from the Pondville standpipe, had a lead content (0.37 mg./l.) above the tolerance level of 0.1 mg./l. The significance of this value is not great, for the following reasons:

(1) The sample was apparently taken immediately after painting, and represents wash water.

(2) The standpipe was for fire storage and not for potable water.

(3) Subsequent samples from the same standpipe had negligible lead contents.

The next highest value, (0.05 mg./l.), was found in a sample from the old Wrentham standpipe, taken about one year after painting. A second sample, taken at the same time, had a negligible lead content. The sample with the "high" value was turbid, and the lead content was associated with this turbidity.

The third highest value (.025 mg./l.) was in a sample from a tap in the writer's house in Belmont, Massachusetts. This water is from the same source as that which supplies the Metropolitan Hospital standpipe in Waltham. The lead content of this sample was attributed to plumbing fixtures. The fourth highest value (.021 mg./l.) was also in a sample of influent, from the Wash Water Tank in New Jersey. This sample was also turbid.

None of the remaining 75 samples had a lead content in excess of 0.02 mg./l. Eleven samples had lead concentrations between 0.01 and 0.02 mg./l. Of these, ten were "tank" samples, and one an influent sample, taken from the pump which supplies the Metropolitan Hospital standpipe. In this last case, the lead was again attributed to piping, since a second sample, taken after further flushing of the pump outlet, had a much lower lead content.

The remaining 64 samples had lead contents below 0.01 mg./l.

At the Metropolitan Hospital, the standpipe is ordinarily filled at night, and drawn on throughout the day. Any impurity extracted from the standpipe would be expected to be present in higher concentrations in the afternoon than in the morning. During the first week after the tank was painted samples were taken both in the morning and afternoon. There was no significant difference in the lead content of the two types of samples.

Conclusions

The average lead concentration in 54 samples of potable water taken from six standpipes and tanks was about 0.005 mg./l. In comparison the average lead content of 13 selected samples of influent water (three high values being rejected as unrepresentative) was 0.003 mg./l.

Most of these tests were made with waters of relatively low pH (6 to 6.6) which are presumably more aggressive to lead paints than more alkaline waters.

The only conclusion which can be drawn from these results is that the use of lead paint of the type involved in this study (Type IV) on the interior of tanks or standpipes used for potable water supplies produces no significant lead hazard.

In the case of the tanks studied, the addition to the total lead intake of the consumers of the water in question, due to paint from the tanks, is almost certainly undetectable. Under other conditions, particularly with smaller tanks and a slower rate of turnover of the water in the tanks, somewhat higher lead concentrations are theoretically possible.

While the lead content of the water from the New Jersey Tanks, the smallest tested, was somewhat greater than that from the largest tank (Metropolitan Hospital), the difference was of doubtful significance. Certainly, on the basis of these results, tanks considerably smaller than the 75,000 gallon Grandview tank could safely be painted with Type IV paint.

The margin of safety between the observed average concentration of 0.005 mg. of lead per liter of water (not all of which, in all probability, came from the paint), and the permissible concentration of 0.1 mg./l, is so great that the possibility of a lead hazard being produced by this type of lead paint in the tanks of any water supply system comparable to those studied would appear to be so remote as to preclude any need for serious consideration.

Summary

A study of the lead content of the water from seven standpipes and tanks painted with lead pigmented synthetic base paint has been made. A total of 62 samples were analyzed. With the exception of one sample, taken immediately after the tank was filled following painting, no harmful concentration of lead was found. The average lead content of the remaining 61 samples was .005 mg./l., or one-twentieth the permissible concentration. In comparison the lead content of 14 samples of influent water, which had no contact with the tanks in question, was 0.003 mg./l.

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October 21, 1957