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R. A. Moore

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ANALYTICAL RESEARCH DEPARTMENT REPORT

ADP 8139

Subject Elemental Analysis of Various Paints for Pb, Sb, Ba, Hg, Cd, As and Se Contents 064-101

Manufacturer S-W Co. Customer

Department Analytical Research

Requested by R. W. Scott Date Completed 4-28-72

ABSTRACT

Ninety-eight Sherwin-Williams paints have been analyzed by the Analytical Research Department and several outside testing laboratories for Pb, Sb, Ba, Hg, Cd, As and Se contents. The work was performed in order to comply with an FDA request to provide this information in conjunction with pending legislation to limit the quantities of these elements allowable in paints.

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cc - HES JCW REB GS [redacted] FCC GCS KHW JJL JDM JAP LMF JAL

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PURPOSE

Ninety-eight Sherwin-Williams paints were selected for analysis to determine the quantities of Pb, Sb, Ba (total and water soluble), Hg, Cd, As and Se present in typical dried paint films. The first group of seven paints was to be analyzed by the Analytical Research Department and two outside laboratories for all seven elements; the Chicago Board of Health was to analyze five of the paints for Pb only. The second group of ninety-one paints was to be analyzed for Pb, Sb and Ba in this department and for Hg, Cd, As and Se by an outside laboratory. The data were required in order to meet an FDA demand for this information in conjunction with pending legislation to regulate the quantities of toxic or heavy elements allowable in paints used in, on and near residential structures. The deadline for reporting this information was April 8, 1972.

RESULTS

Seven paint samples were analyzed by this laboratory, the Chicago Board of Health, Arro Laboratory (Joliet, Illinois) and Analytical Consulting Services, Inc. (Mr. Bogumil Kosciesza). The results, which are averages of duplicate determinations, follow; 'N.D.' means not detected.

	Percent Lead in Paint Solids			
Sample	Analytical Research	Board of Health	Analy. Cons. Ser. Inc.	Arro Lab.
#325 - K7 G 33	0.003	0.003	0.028	0.004
#326 - K3 G 33	0.010	0.01	0.017	0.011
#327 - A3 W 16	0.20	Not Sent	0.238	0.26
#328 - Lowe Brothers Spray, Holland Yellow 974	0.43	0.35	0.474	Not Sent
#329 - A6 Y 61	0.005	0.006	N.D.	0.005
#330 - A-100 White	0.003	0.002	N.D.	0.004
#331 - A2 W 4	0.17	Not Sent	Not Sent	0.16

	Percent Antimony in Paint Solids		
Sample	Analytical Research	Analy. Cons. Ser. Inc.	Arro Lab.
#325	0.003	0.0066	0.005
#326	N.D.	0.0046	0.004
#327	N.D.	0.0030	0.003
#328	N.D.	0.0047	Not Sent
#329	0.001	0.0107	0.741
#330	0.001	0.0026	0.012
#331	0.001	Not Sent	N.D.

Sample	Percent Barium in Paint Solids Analytical Research	Arro Lab.
#325	0.003	N.D.
#326	0.0003	0.053
#327	0.0003	0.024
#328	0.0003	Not Sent
#329	0.0003	N.D.
#330	0.002	N.D.
#331	0.011	0.065

Barium determination was not requested from Analytical Consulting Service, Inc.

Sample	Percent Mercury in Paint Solids Analytical Research	Analy. Cons. Ser. Inc.	Arro Lab.
#325	0.007	N.D.	0.000002
#326	0.004	0.071	N.D.
#327	0.004	N.D.	N.D.
#328	0.004	N.D.	Not Sent
#329	0.004	N.D.	0.000002
#330	0.003	N.D.	N.D.
#331	0.005	Not Sent	N.D.

Sample	Percent Cadmium in Paint Solids Analytical Research	Analy. Cons. Ser. Inc.	Arro Lab.
#325	N.D.	0.000	0.0001
#326	0.00003	0.0009	0.0005
#327	0.00006	0.0010	0.0004
#328	0.0002	0.0033	Not Sent
#329	0.003	0.0048	0.003
#330	0.005	0.0067	0.003
#331	0.0004	Not Sent	0.0006

Sample	Percent Arsenic in Paint Solids Analytical Research	Analy. Cons. Ser. Inc.	Arro Lab.
#325	0.001	N.D.	0.092
#326	0.007	N.D.	0.028
#327	0.012	N.D.	0.034
#328	N.D.	N.D.	Not Sent
#329	N.D.	0.0011	N.D.
#330	N.D.	N.D.	N.D.
#331	N.D.	Not Sent	0.025

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Sample	Percent Selenium in Paint Solids		
	Analytical Research	Analy. Cons. Ser. Inc.	Arro Lab.
#325	N.D.	N.D.	0.033
#326	0.002	N.D.	0.032
#327	0.003	N.D.	0.044
#328	N.D.	N.D.	Not Sent
#329	0.002	N.D.	0.044
#330	0.001	N.D.	0.036
#331	0.005	Not Sent	0.020

#331 was not sent to Analytical Consulting Service, Inc. or the Board of Health because the dry paint film could not be adequately removed from the glass plate substrate on which it was dried for proper sampling. #328 was not sent to Arro Lab. because the spray paint could not be accurately sampled as a liquid in the procedure that Arro was using. #327 was also omitted from the Board of Health samples.

Comparison of the results between labs generally indicates good agreement. Analytical Research, the Board of Health and Analytical Consulting Services, Inc. all used essentially the same procedure for the lead determination. Arro Lab. used a different procedure for Pb and the other elements which might give somewhat high results. See Methods section for details on procedures used.

Ninety-one paints were analyzed for Pb, Sb and Ba in this laboratory and for Hg, Cd, As and Se by the Rosner-Hixson Laboratory in Chicago. In the following results, 'N.D.' means not detected. The procedures used and the expected detection limits are described in the Methods section. Three formulas were known to contain Sb, and two results are reported for these; the first represents the total Sb, the second the acid-soluble Sb. Attempts to determine total Ba in two samples were unsuccessful; the Ba results reported represent acid-soluble Ba.

No.	Formula	Percent of Paint Solids (Average of Duplicate Determinations)						
		Pb	Sb	Ba	Hg	Cd	As	Se
1	A1 W 11	0.54	0.003	0.001	N.D.	N.D.	N.D.	0.0014
2	A2 A 28	2.32	0.003	0.021	N.D.	N.D.	0.0004	N.D.
3	A2 A 30	0.006	0.003	0.0002	N.D.	N.D.	N.D.	N.D.
4	A2 A 42	1.00	N.D.	0.0003	N.D.	N.D.	0.0015	N.D.
5	A2 A 57	0.35	0.004	N.D.	N.D.	N.D.	N.D.	0.0031
6	A2 B 18	2.00	N.D.	0.001	N.D.	N.D.	N.D.	N.D.
7	A2 G 12	4.37	0.020	0.003	N.D.	N.D.	0.0035	N.D.

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No.	Formula	Percent of Paint Solids (Average of Duplicate Determinations) Pb	Sb	Ba	Hg	Cd	As	Se
8	A2 G 103	0.31	0.002	0.002	N.D.	N.D.	0.0005	0.0016
9	A2 N 70	1.85	N.D.	0.003	N.D.	N.D.	N.D.	N.D.
10	A2 W 5	0.35	0.008	0.002	N.D.	N.D.	N.D.	N.D.
11	A2 W 8	0.14	0.003	0.002	N.D.	N.D.	0.0002	N.D.
12	A2 Y 52	0.88	0.001	0.0004	0.00008	N.D.	0.0005	N.D.
13	A2 Y 60	0.008	1.12 N.D.	0.006	0.00008	N.D.	0.0013	N.D.
14	A3 W 16	0.25	0.005	0.0003	N.D.	N.D.	N.D.	N.D.
15	A5 V 2	0.010	0.007	N.D.	N.D.	N.D.	0.0005	0.0025
16	A5 V 23	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
17	A6 W 96	0.003	N.D.	N.D.	N.D.	0.0037	N.D.	N.D.
18	A6 Y 61	0.005	1.23 0.004	0.0003	N.D.	0.0038	N.D.	N.D.
19	A11 R 15	0.75	0.007	0.007	N.D.	N.D.	0.0007	N.D.
20	A11 R 47	0.64	0.006	0.002	N.D.	N.D.	0.0004	N.D.
21	A14 R 39	0.87	N.D.	0.004	N.D.	N.D.	N.D.	N.D.
22	A14 W 24	1.06	N.D.	0.001	N.D.	N.D.	N.D.	N.D.
23	A14 W 34	0.39	N.D.	0.001	N.D.	N.D.	N.D.	N.D.
24	A14 Y 25	0.69	0.004	0.047	N.D.	N.D.	0.0033	0.0054
25	A14 Y 35	0.32	0.002	N.D.	N.D.	N.D.	N.D.	N.D.
26	A17 V 1	0.038	N.D.	0.004	N.D.	N.D.	N.D.	N.D.
27	A22 Y 20	0.001	0.003	0.005	N.D.	N.D.	N.D.	0.0046
28	A22 W 2	0.003	0.002	0.003	0.00014	N.D.	N.D.	0.0071
29	A24 G 2	0.005	0.008	N.D.	N.D.	N.D.	0.0006	N.D.
30	A24 W 1	0.002	N.D.	N.D.	N.D.	N.D.	0.0003	N.D.
31	A25 W 3	0.001	0.003	0.006	N.D.	N.D.	0.0004	N.D.
32	A25 Y 12	0.002	1.95 0.005	0.021	0.00013	N.D.	0.0004	0.0028
33	A33 G 110	0.53	0.009	N.D.	N.D.	N.D.	N.D.	N.D.
34	A33 L 21	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
35	A33 W 82	0.62	0.007	0.0003	N.D.	N.D.	N.D.	N.D.
36	A35 A 35	0.20	N.D.	0.002	N.D.	N.D.	N.D.	N.D.

No.	Formula	Percent of Paint Solids (Average of Duplicate Determinations) Pb	Sb	Ba	Hg	Cd	As	Se
37	A35 F 3	0.023	N.D.	N.D.	N.D.	N.D.	0.0011	N.D.
38	A35 N 55	0.004	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
39	A35 N 56	0.001	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
40	A35 S 11	0.003	N.D.	0.0006	0.0007	N.D.	N.D.	0.0221
41	A35 V 34	0.001	N.D.	N.D.	0.0006	N.D.	N.D.	N.D.
42	A35 W 66	0.061	0.007	0.001	N.D.	N.D.	0.0004	N.D.
43	A36 W 80	0.013	0.002	N.D.	N.D.	N.D.	N.D.	N.D.
44	A37 W 64	0.013	0.003	N.D.	N.D.	N.D.	N.D.	N.D.
45	A37 Y 28	0.012	N.D.	0.005	N.D.	N.D.	0.0005	N.D.
46	A38 H 25	0.14	0.002	0.002	N.D.	N.D.	N.D.	0.0014
47	A44 W 22	0.001	0.003	0.004	N.D.	N.D.	N.D.	0.0029
48	A45 W 81	0.017	0.005	0.005	N.D.	N.D.	0.0002	0.0031
49	A46 G 113	0.63	N.D.	0.005	N.D.	N.D.	N.D.	0.0060
50	A53 W 14	0.010	0.006	0.003	N.D.	N.D.	N.D.	0.0322
51	A53 W 21	0.012	0.006	0.003	N.D.	N.D.	0.0004	N.D.
52	A53 W 53	0.004	0.006	0.003	N.D.	N.D.	N.D.	0.0021
53	A54 W 7	0.001	N.D.	N.D.	0.0002	N.D.	0.0003	0.0030
54	A54 Y 9	0.002	N.D.	0.001	0.00014	N.D.	N.D.	0.0026
55	A55 T 4	0.45	0.005	0.0002	N.D.	N.D.	N.D.	N.D.
56	A57 A 15	0.30	0.004	0.013	N.D.	0.0016	N.D.	N.D.
57	A61 V 19	0.002	N.D.	0.001	N.D.	N.D.	N.D.	N.D.
58	A64 S 8	0.005	0.005	0.0003	N.D.	N.D.	N.D.	N.D.
59	A66 V 5	0.43	N.D.	0.002	N.D.	N.D.	N.D.	N.D.
60	A86 W 51	0.002	0.007	0.008	N.D.	N.D.	0.0017	N.D.
61	B42 W 100	0.002	0.004	0.43	0.0001	N.D.	N.D.	N.D.
62	C20 W 1	0.005	N.D.	0.0003	N.D.	N.D.	N.D.	N.D.
63	E60 W 2	0.059	0.004	0.002	N.D.	N.D.	N.D.	N.D.
64	F65 W 1	0.48	N.D.	0.0002	N.D.	N.D.	N.D.	0.0036
65	K3 W 91	0.012	N.D.	0.0007	0.0001	N.D.	0.0007	N.D.
66	K3 W 97	0.015	0.003	0.001	N.D.	N.D.	N.D.	N.D.

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No.	Formula	Percent of Paint Solids (Average of Duplicate Determinations) Pb	Sb	Ba	Hg	Cd	As	Se
67	K3 Y 66	0.011	0.001	0.0004	N.D.	N.D.	0.0002	N.D.
68	K3 Y 68	0.017	0.005	0.001	N.D.	N.D.	0.0003	0.0017
69	K4 W 95	0.014	0.002	0.003	N.D.	N.D.	N.D.	N.D.
70	K4 Y 66	0.017	0.001	N.D.	N.D.	N.D.	0.0009	0.0017
71	K5 W 91	0.001	N.D.	N.D.	N.D.	N.D.	0.0002	N.D.
72	K5 W 97	0.001	0.006	N.D.	N.D.	N.D.	0.0005	N.D.
73	K5 Y 66	0.001	N.D.	N.D.	N.D.	N.D.	0.0006	N.D.
74	K7 R 44	0.003	0.006	0.004	N.D.	N.D.	N.D.	N.D.
75	K7 W 93	0.003	0.003	0.001	N.D.	N.D.	0.0005	N.D.
76	K10 Y 63	0.003	0.005	0.086	N.D.	N.D.	N.D.	N.D.
77	K16 W 2	0.001	N.D.	0.001	0.0017	N.D.	0.0002	0.0025
78	K67 R 21	0.43	N.D.	0.002	N.D.	N.D.	0.0021	0.0186
79	K67 W 12	0.041	N.D.	0.008	N.D.	N.D.	0.0029	N.D.
80	K67 W 14	0.33	N.D.	N.D.	0.0004	N.D.	N.D.	N.D.
81	K67 W 32	0.14	N.D.	0.0001	N.D.	N.D.	0.0019	N.D.
82	K67 Y 4	0.37	N.D.	0.009	0.0007	N.D.	0.0016	0.0166
83	K67 Y 17	0.005	N.D.	0.0004	0.0002	N.D.	0.0009	N.D.
84	K67 Y 33	0.32	N.D.	0.007	0.0002	N.D.	0.0036	N.D.
85	N83 G 7	0.24	0.003	0.006	N.D.	N.D.	N.D.	0.0019
86	N90 S 5	0.005	0.006	0.0003	N.D.	N.D.	N.D.	0.0045
87	N90 S 7	0.002	0.007	0.001	0.00015	N.D.	N.D.	0.0019
88	N91 B 2	0.63	N.D.	0.0003	N.D.	N.D.	0.0002	0.0012
89	N93 C 2	N.D.	0.006	0.001	N.D.	N.D.	0.0007	N.D.
90	T60 F 10	0.011	0.002	N.D.	N.D.	N.D.	0.0013	N.D.
91	T70 F 12	N.D.	0.002	0.002	N.D.	N.D.	N.D.	N.D.

All the above data was reported to the FDA on 4-7-72 with the exception of #22 (A14 W 24) and #24 (A14 Y 25); these formulas are currently being revised to eliminate the lead drier.

METHODS

The procedures used by each laboratory are briefly described along with the detection limits or lowest quantities detected.

Analytical Research Department

1. Elements sought: All seven elements on original group of 7 samples; Pb, Sb and Ba on ninety-one samples.

2. Sample preparation for Pb, Sb and Ba (acid soluble): About 2 g. of the total paint is accurately weighed into a porcelain crucible, dried and charred on a hotplate and ultimately ashed in a muffle furnace at 500-550°C. for one-half hour. A standard NVM determination on the paint is also performed at the same time. For aerosol samples, which cannot be accurately weighed in liquid form, the paint is sprayed onto glass plates or Teflon® sheets, air dried and scraped off; about 1 g. of dried film is accurately weighed into the crucible. The cooled ash is extracted with 5-7 ml. of 50% nitric acid and heated on a hot plate until 2-3 ml. of solution remains. This is transferred to a 100-ml. beaker, the crucible is washed 2-3 times with 5 ml. of hot 50% ammonium acetate solution, and these washings are added to the beaker. If the solution contains any insoluble material, it is quantitatively filtered through medium porosity filter paper into a 50-ml. volumetric flask using distilled water for transferring and washing. The volume is adjusted to the mark.

3. Sample preparation for total Sb (used for samples #13, 18 and 32): About 1 g. of dried paint film broken into small pieces is accurately weighed into a platinum crucible with cover. 10 g. of 2:1 Na_2CO_3-$Na_2B_4O_7$ fusion mixture is added and mixed with the sample. The sample is then ashed and heated over a Fischer burner for 2-3 hours until fusion is complete. The hot fused sample is then poured onto a metal slab and cooled. The fused 'disc', crucible and cover are placed in a 250-ml. beaker and 100 ml. of 50% HCl is added. The beaker is allowed to sit overnight. The crucible and cover are removed, washed with distilled water and the washings added to the sample solution which is then quantitatively transferred to a 200-ml. volumetric flask and diluted to the mark. The same procedure was attempted for total Ba without success; the fused sample was not completely soluble in HCl.

4. Sample preparation for Hg, Cd, As and Se: Approximately 4 g. of wet paint (or 1.5 g. of dried film for the aerosol samples) is weighed into a 250-ml. Erlenmeyer flask and dried. 25 ml. of 18N sulfuric acid and 20 ml. of 7N nitric acid are added. A 300-mm. Allihn condenser, packed to a height of 50 mm. with Raschig rings and glass beads, and with cooling water is attached. Using a heating mantle,

the flask is gently heated for 1 hour at 150°C. The flask is cooled and 20 ml. of 1:1 nitric-perchloric acids added through the condenser. The water is drained from the condenser and the flask then heated until dense fumes of perchlorate appear or until the sample appears to be in solution. The flask is cooled and the condenser rinsed down with two 5-ml. portions of water. The flask is reheated to dense fumes of perchlorate. The flask is cooled and the solution quantitatively transferred to a 50-ml. volumetric flask. If any insoluble material is present, the solution must be filtered into another flask before diluting to the mark. Extreme caution must be practiced throughout this procedure due to the high reactivity and hazardous nature of the reagents.

5. Instrumental methods: Standard flame atomic absorption procedures were used for all the elements. Calibration curves were prepared for the 5-50 or 25-100 ppm ranges using the following standard solutions for atomic absorption:

Pb - $Pb(NO_3)_2$ in 1% HNO_3
Sb - $SbCl_3$ in dilute HCl
Ba - $BaCl_2$ in water
Hg - $HgCl_2$ in 0.25N H_2SO_4
Cd - $CdCl_2$ in approx. 4.5N HCl
As - As_2O_3 dissolved in 20% NaOH neutralized with dilute H_2SO_4
Se - SeO_2 in water

A standard addition technique was used for the total Sb determination. After Pb and Sb were run NaCl was added to the dry ash sample solutions prior to the Ba analysis to prevent ionization of the Ba and consequently low results. A blank reference solution was prepared for the Hg, Cd, As and Se analyses using the reagents called for in the digestion procedure.

6. Detection Limits: The lowest quantities of Pb, Sb and Ba detected in this work are:

0.0005% Pb
0.001% Sb
0.0001% Ba

For Hg, Cd, As and Se the AA response for the blank reference solutions was subtracted from the responses for the samples. The lowest quantities of these elements detected over and above the blank are:

Hg	0.003%
Cd	0.00003%
As	0.001%
Se	0.001%

Chicago Board of Health

Their procedure for lead is the same as that used in the Analytical Research Department.

Analytical Consulting Services, Inc.

1. Elements analyzed for: Pb, Sb, Hg, Cd, As and Se in six of the original group of seven paints. Ba analysis was not requested.

2. Sample preparation for Hg: A weighed sample of dried paint film was digested with H_2SO_4 and oxidized with potassium permanganate solution. Excess permanganate was removed by the addition of hydroxylamine hydrochloride. Insoluble material was filtered out and the solution diluted volumetrically. $SnCl_2$ solution was added to reduce the Hg immediately prior to the flameless AA procedure.

3. Sample preparation for other elements: A weighed sample of dried paint film was charred under an infrared lamp and ashed at 500°C. in a muffle furnace; $Mg(NO_3)_2$ was used as an ashing aid. The ash was digested with HNO_3, filtered and diluted volumetrically.

4. Instrumental method: Standard flame and flameless (Hg) AA procedures were used.

5. Detection limits: The lowest quantities of Sb and Cd detected were:

   0.0026% Sb
   0.0009% Cd

   The detection limits for the other elements listed in the Analytical Consulting Services, Inc. report are:

Pb	0.001%
Hg	0.001%
As	0.001%
Se	0.002%

6. Comments: An NBS paint with known amounts of added elements was analyzed by Analytical Consulting Services, Inc. at the same time. The results are:

	Known	Found
% Pb	1.125	1.131
% Cd	0.034	0.0333
% As	0.036	0.035
% Se	0.010	0.011
% Hg	0.158	0.160
% Sb	0.034	0.0350

Agreement between known and determined quantities is excellent.

Arro Laboratory

1. Elements analyzed for: All seven elements in six of the original group of seven paints.

2. Sample preparation - water based paints: For all elements except Hg, 0.5 g. of total paint weighed accurately was diluted volumetrically to 50 ml. with distilled water.

   For Hg, 1 g. of total paint was accurately weighed then diluted to 50 ml. with H_2O. The samples were then digested with 1 ml. of 25% H_2SO_4 and 1 ml. of 4% $KMnO_4$. Hydroxylamine hydrochloride and $SnCl_2$ solutions were added and the samples in their entirety run by flameless AA.

3. Sample preparation - solvent based paints: For Pb, Ba and Cd, 0.5 g. of total paint was diluted volumetrically to 50 ml. with MIBK. For Se and Sb, acetone was used.

   For Hg, procedure was the same as for the water based samples.

   For As, 1 g. of total paint and 5 g. of K_2CO_3 were heated in a nickel crucible in a muffle furnace to the melting point of the flux, cooled and taken up in dilute HNO_3.

4. Instrumental procedures: The standard flameless AA procedure was used for Hg. Flame AA procedures were followed for the other elements, including As, with Arro Laboratories aqueous and oil based standards used for the calibration curves. Baseline correction for the MIBK and acetone was taken into account. All samples were shaken immediately prior to aspiration, and the suspensions were shown to be stable by steady readings over a minute interval. Effects on the results due to any insoluble material in the solution or to the organic binder were not known.

5. Detection limits: The lowest quantities of Pb, Se and Cd detected for the paint solids were:

   0.004% Pb
   0.020% Se
   0.0001% Cd

   The detection limits for the other elements were:

   Sb 0.001%
   Ba 0.002%
   Hg 0.000002%
   As 0.044% for water based samples

Lowest quantity of As detected in the solvent based samples was 0.025%.

6. Comments: Although the Arro results appear to agree fairly well with the others for most elements, it is not generally considered good AA practice to run solutions containing particulate or organic matter. Also, the Arro results for As and Se appear to be quite high.

Rosner-Hixson Laboratory

1. Elements analyzed for: Hg, Cd, As and Se in ninety-one paints.

2. Sample preparation and method: For Hg, total paint was dried, wet ashed with H_2SO_4-H_2O_2, reduced with $SnCl_2$ and Hg measured by flameless AA.

   For Cd, dried paint was wet ashed with H_2SO_4-H_2O_2 and Cd measured by AA.

   For As, dried paint was wet ashed with sulfuric-nitric-perchloric acids, arsine was generated and measured by the Gutzeit reaction.

   For Se, the paint was dry ashed with alkaline fixative, reacted with codeine, and the Se measured by colorimetry.

3. Detection limits: The following detection limits were listed in the Rosner-Hixson written report. The first figure is for all samples except Nos. 36-42 and 78-84 for which the figures in parentheses apply. Much smaller sample sizes were necessary for the aerosol paints because the sprayed, dried, scraped films had to be used for samples.

Hg	0.00001% (0.00005%)
Cd	0.0006% (0.0016%)
As	0.0001% (0.0002%)
Se	0.001% (0.002%)

DISCUSSION

It should be noted that all the detection limits reported must be considered for the element once it is in solution and not for the element in the paint. Little data, except perhaps for Pb, are available to indicate how accurately the elements are extracted from the paint and retained during the various ashing and treatment procedures. Analytical Consulting Services, Inc.'s work with the NBS paint does, however, indicate good recovery, and data obtained in our laboratory for Pb indicate good recovery at the 0.5-1% Pb level.

ASTM Committee D-01.21.03 (Metals in Low Concentrations) is now studying the analysis of paints for toxic and heavy metals. Paints containing known amounts of added elements at 100 ppm or less and their corresponding blank paints are now being analyzed by several laboratories by the best methods available to these labs. These results will be compared and the best methods selected and defined. The paints will then be re-analyzed by several labs to determine the accuracy and reproducibility of the methods agreed upon.

A Perkin-Elmer 403 atomic absorption instrument has been approved and ordered for the Analytical Research Department. A graphite furnace sampling system will be included; this technique should enable us to directly analyze wet paints, with very low detection limits for most of the elements of interest.