

Dominique D. Skipworth,
by Her Legal Guardian,
Pandora Williams

Plaintiff

v.

Lead Industries Assoc., Inc.,
et al.,

Defendant

Court of Common Pleas
Philadelphia County, PA

March Term, 1992

No. 3069

Lead Case -- Code #19

AFFIDAVIT OF JAMES C. BURROWS

I. Introduction

1. I am a Vice President of Charles River Associates ("CRA"), an economics consulting group in Boston, Massachusetts. For over 25 years, I have specialized in the economic analysis of minerals and metals industries and have performed or supervised hundreds of economic studies of virtually all minerals and metals commodities. I have performed these studies for over a dozen government agencies -- including the Environmental Protection Agency ("EPA"), the Occupational Safety and Health Administration ("OSHA"), and the General Services Administration ("GSA") -- as well as for most major domestic and foreign producers and consumers of minerals and metals commodities. I obtained a Ph.D. in economics from the Massachusetts Institute of Technology in 1964. I have been the author

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or co-author of six books, four of them on topics in mineral economics.

2. I have conducted or managed the following studies specifically with respect to lead:

- Studies of the economic impact of proposed environmental standards on lead, for the EPA, OSHA, the Council on Environmental Quality, and the Lead Industries Association ("LIA").
- Studies of new technologies for meeting proposed lead emission standards, for the EPA.
- Lead market forecasts and feasibility studies, for industrial clients.
- Forecasts and policy evaluations of the lead market, for the GSA.
- Policy analyses with respect to lead, for a number of government agencies.

3. In addition to my work in mineral economics, I have worked as an economics expert in a number of antitrust and merger proceedings and have conducted research in connection with the economics of a number of other industries. A summary of my training and experience is set forth in my curriculum vitae, a copy of which is attached hereto as Exhibit A.

II. The Nature of the Task and Summary of Opinions

4. I have been asked by the defendants to compile, review, and assess information concerning the production and sale of lead pigments and other lead

products in the United States since 1870 (the "relevant time period"). I have also been asked to determine whether a reliable market-share analysis of lead pigments production and sales in the United States during that time period is feasible in this case. As an economist and an experienced practitioner in the fields of antitrust and merger analysis, I am well acquainted with the concept of "market share" as it has been used in a variety of legal contexts.

5. I, together with persons working under my direct supervision, have conducted an extensive search for information concerning the production and sale of lead pigments in the United States. Among the materials I have reviewed are voluminous documents from a number of government agencies, including the U.S. Bureau of the Census ("Census"), the U.S. Bureau of Mines (the "USBM"), the U.S. Geological Survey, the War Production Board, the Federal Trade Commission (the "FTC"), the U.S. Tariff Commission, and the U.S. Department of Labor. A list of such documents is attached as Exhibit B. I have also reviewed the Complaint, the Amended Complaint, and plaintiff's expert reports for John Smith, Gary Barach, and Michael Fox in this case.

6. Based on my research, it is my opinion to a reasonable degree of certainty that there is no basis upon which to determine the individual market shares of

participants in the relevant lead pigments market in the United States for the relevant time period. It is also my opinion to a reasonable degree of certainty that any attempt to apportion liability for injuries allegedly due to exposure to lead pigments based on a market-share analysis would be arbitrary and would not result in liability proportionate to the risk allegedly created by lead pigments.

7. To summarize, the bases for my opinions are as follows:

a. Any determination of a participant's "market share" requires a definition of the relevant product and the relevant market during a manageable period of time. Plaintiff alleges that she was injured by ingestion of lead contained in "paint, plaster, and/or other accessible materials on the interior and exterior surfaces" of her home. Complaint ¶ 33. However, there are many different compounds containing lead found in such materials. These compounds include many different kinds of lead pigment, which were sold in different amounts at different times for different uses by different manufacturers. Without a unique product definition, any market-share analysis would be speculative and not result in liability proportionate to the risk allegedly created by each defendant.

b. Because it is not known when any lead paint was applied to plaintiff's home, the relevant time to determine market shares must encompass the entire period during which such paint could have been applied, beginning when the house was built in 1870. Throughout this 100+-year period, the markets for residential lead pigments underwent vast changes. Total production and sales changed radically, and a large number of companies (defendant and

nondefendant) entered and exited the business at different times. Only 3 defendants produced lead pigments during the 19th century, and two defendants (or their alleged predecessors) had not yet entered the market before World War I, when the majority of the lead pigment produced in the U.S. was sold. In short, the market shares of individual participants including the defendants were not fixed, but varied greatly.

c. No data exist on the production or sales of lead pigments specifically for interior residential use. Even with respect to total production or sales, compilations of data are inconsistent with each other and incomplete. Because of the unavailability of data, a reliable market-share analysis is impossible; any market-share analysis would by necessity be speculative and unreliable -- and therefore not result in liability proportionate to the risk allegedly created by each defendant.

I will discuss each of these opinions below.

III. No Unique Market Definition

8. Any market analysis requires the identification of the relevant product during the relevant time period. In the case at hand, there is not a sufficiently specific product definition.

9. Plaintiff alleges that she was injured by ingestion of lead contained in "paint, plaster, and/or other accessible materials on the interior and exterior surfaces" of the property located at 2340 W. Stiles St., Philadelphia, PA (hereinafter, the "Premises"). Lead, however, is found in numerous products common in

everyday life. Lead has been used in such applications as batteries, ceramics, cable coverings, solder, gasoline, containers, and linoleum, many of which are claimed to contribute to human exposure to lead and lead compounds. During the 1900-1980 period, over 85 percent of total lead use reported by the U.S. Bureau of Mines was used in nonpigment applications.

10. Even if the relevant products in this case are limited to lead pigments, no single market definition would be possible. The word "pigment" refers to a generic class of chemical compounds that are one of the important ingredients in paints. Pigments give color and hiding power to paints and also are responsible for a paint's sheen, texture, consistency, porosity, and thickness.

11. Lead pigments have been used as an ingredient in paints and coatings throughout much of recorded history. During the relevant time period, lead pigments were generally sold in bulk as powder to paint manufacturers who decided what type and amount of lead pigment, if any, to use in their paint. In addition, manufacturers and wholesalers partially mixed dry white lead with linseed oil and sell it in the form of a paste called "white lead-in-oil." Lead pigments, including white lead pigments, also had a variety of nonpaint uses throughout the relevant time period, including ceramics,

batteries, linoleum, composition flooring, insecticides, oilcloth, rubber and plastics, inks, paper coatings, crayons, and cements -- all products commonly found in the home.

12. Plaintiffs have defined lead pigments as "all white lead pigments, including, without limitation, dry white lead carbonate, dry white lead sulfate and white lead-in-oil, which were mixed with other pigments and/or oil to produce lead paint." However, a substantial percentage of the lead-containing compounds used in "paint, plaster, and/or other accessible materials on interior and exterior surfaces" (which the Complaint alleged caused plaintiff's injury) were pigments other than basic lead carbonate or basic lead sulfate. These included leaded-zinc oxide (zinc oxide with basic lead sulfate), red lead, orange mineral, blue lead, litharge, and chrome yellow.

13. All of these lead pigments were used in house paints or other materials found in the home. White leads (including leaded zinc oxide) were used in paints as a base pigment for covering and weathering characteristics. Red lead, orange mineral, and blue lead were commonly used for metal-covering paints because they inhibit rust. Litharge, which was used as a drier in a wide variety of paints, as an ingredient of linoleum, and as a raw material for chrome pigments, was

a smaller but significant source of lead in paints. Litharge was ubiquitous, and in many paints was the only source of lead. Chrome yellow was used in paints because of its color properties.

14. Any analysis of the "lead pigment market" would have to encompass all of the numerous different types of lead pigment used for residential purposes. Plaintiff's expert, Gary Barach, recognizes this in his expert report at 3-4, but nonetheless attempts a market-share analysis that ignores all lead pigments except basic lead carbonate. Expert Report of Gary Barach, at 9. Plaintiff's expert Dr. John Smith also appears to have limited his analysis to basic lead carbonate without any explanation. Expert Report of John Smith at 5.

15. Further, although plaintiffs' experts appear to focus exclusively on basic lead carbonate, the only lead-containing compound found in all four of the paint chips analyzed by plaintiff's expert (Michael Fox) was lead metaborate -- $Pb(BO_2)_2 \cdot 2H_2O$ -- not lead carbonate. None of the kinds of lead pigment identified above is composed of lead metaborate. I know of no data regarding the production or sales of lead metaborate, either on an aggregate basis or for individual companies. None of plaintiff's experts identified any defendant as a manufacturer of lead metaborate, let

alone any defendant's market share in the lead metaborate market.

16. Another complicating factor is that many different kinds of lead pigment differed greatly in lead content. For example, although dry lead carbonate was [97] percent lead, white lead-in-oil generally had a lead content of approximately 85 percent lead, and leaded zinc oxide was often sold with a lead content of 35 percent. Because companies made different kinds of lead pigments with different lead contents, the apportionment of liability based on market share alone would not reflect the amount of lead sold by each participant for residential use.

IV. The Pigments Markets and Their Participants Were Constantly Changing

17. As noted above, the relevant time period begins when the house at 2340 W. Stiles St., Philadelphia, PA, was constructed (circa 1870) more than one hundred years ago. None of the defendants produced lead pigments for residential use throughout the entire relevant time period. Only three defendants (or predecessor companies) produced lead pigments during the nineteenth century, and all defendants left the market at different times in the twentieth century. Furthermore, throughout the time period, many companies

not included as defendants in this action produced lead pigments. Finally, even when defendants were in the market, their respective market shares changed as a result of companies entering and exiting the market as well as wartime shortages.

18. The history of the U.S. residential pigment markets can be divided into four distinct periods:

- a. 1800-1870: The birth and growth of lead pigments production in the United States.
- b. 1870 - World War I: The introduction and growth of premixed residential paints; continued expansion of lead pigments; increased use of different types of pigments.
- c. World War I - World War II: The continued growth of premixed paints; other pigments increasingly used in paints.
- d. World War II - 1969: Continued growth of premixed paints; lead pigments almost completely supplanted by other pigments for all use.

These periods are discussed below.

A. 1800-1870

19. Until early in the 1800s, lead pigments (particularly basic lead carbonate) were the only known effective, commercially available pigments for use in

outside paints. Basic lead carbonate was a luxury good during the 1700s, and in the United States most buildings were not painted at all or were "white-washed" with ineffective coatings. Until the nineteenth century, the relatively small consumption of basic lead carbonate was all imported.

20. The first basic lead carbonate plant in the United States was built in Philadelphia by Samuel Wetherill in 1804. By 1810, three plants were in production (Wetherill, Harrison Brothers, and Welch and Evans) in Philadelphia, with an estimated total output of a few hundred tons per year. During the next sixty years, U.S. production grew rapidly; one source provided a rough estimate that total U.S. production of basic lead carbonate was as high as about 35,000 tons by 1870.¹

21. Several dozen additional companies entered the business between 1804 and 1870. In addition to Wetherill & Sons, Harrison Brothers, and Welch & Evans, the firms of George D. Wetherill, Inc. and John T. Lewis & Brother were founded in Philadelphia during this period. Two of the pigment defendants (or their predecessor firms) -- Glidden and Atlantic Richfield Co. (as alleged successor for International Smelting and

¹ William H. Pulsifer Notes for a History of Lead 332 (New York, D. Van Nostrand 1888).

Refining Co, hereinafter "IS&R") -- did not produce pigments at any time during this period.

22. Eagle White Lead Works was established in Cincinnati in about 1850. This company later became part of Eagle-Picher, a nondefendant company that was one of the largest producers of lead carbonate and leaded zinc oxide during most of the relevant period. Other nondefendant producers that have been identified as having begun producing basic lead carbonate in the United States before 1870 include the following 14 firms:

<u>Producer</u>	<u>Location</u>
Salem Lead Manufacturing Company	Salem, MA
Welch and Evans	Philadelphia, PA
William Glasgow, Jr.	St. Louis, MO
Trevor, Pettigrew, and Provost	Pittsburgh, PA
Peabody/Forest River Lead Company	Salem, MA
Bacon and Hyde	St. Louis, MO
McCandless and Conkling	Cincinnati, OH
Barney McLennon	Cincinnati, OH
Cincinnati Manufacturing Co.	Cincinnati, OH
Bielen and Stevenson	Pittsburgh, PA
Suffolk Lead Works	Boston, MA
Norfolk Lead Works	Boston, MA
D.B. Shipman White Lead Works (sold by NL in 1911)	Chicago, IL
Gregg & Hagner	Pittsburgh, PA

23. By 1870, early forms of leaded zinc oxide were also apparently being used for house paint. These formulations were known as zinc-lead and consisted of mixtures of zinc oxide and basic lead sulfate.

24. Until approximately 1870, basic lead carbonate was sold exclusively as either dry white lead or as white lead-in-oil. Starting between 1870 and 1880, some companies began manufacturing ready-mixed paints, containing basic lead carbonate and other pigments and ingredients, for direct use by painters.

B. 1870 - World War I

25. The period between 1870 and World War I was characterized by rapid growth in pigments and paints production as the economy became more industrialized, by dramatic changes in the types of pigments used, by the development and rapid growth of the pre-mixed paints industry, and by sweeping changes in the structure of the pigments and paints industry. In the early 1870s, significant amounts of lead pigments were imported; by World War I, lead pigments were being exported. Market conditions were changing so rapidly that it is likely market shares of individual producers varied greatly, even from year to year.

26. Total production (for all uses) of dry lead carbonate and white lead-in-oil grew to a reported 160,000 tons by 1914 (U.S. Bureau of Mines, hereafter USBM).² Between 1891 (the first year for which data are

² In this paragraph and elsewhere below, I have cited U.S. Bureau of Mines data on pigments production because

reported) and 1914, the USBM reported that red lead production approximately quadrupled to about 20,000 tons per year, and litharge production more than quadrupled to more than 27,000 tons per year.

27. Over half of all white lead pigments produced since 1870 were produced before 1917. This means that the majority of white lead pigment production occurred before two of the lead pigment manufacturers named as defendants -- IS&R and Glidden -- had even entered the market. Because it is impossible to date when lead pigments were applied to the walls of the Premises, it is probable that the lead pigment at issue here was applied before IS&R and Glidden even began selling lead pigment.

28. The period between 1870 and World War I was a time of great ferment in the lead pigments industry. Some of the firms founded before 1870 became part of the National Lead Trust (which later became the National Lead Company); others continued to operate independently throughout the period; still others ceased operations. Many new firms entered and exited during this period.

the USBM data on pigments cover more of the relevant time period than any other source. The Census, which compiled selected summary statistics in 1880 and 1890, did not begin to report data regularly until 1899, and the Lead Industries Association began compiling data in 1929. There are reasons to question the accuracy, completeness, and consistency over time of all of these data sources; these reasons are elaborated below.

29. Of the defendant white lead manufacturers named in the present action, only predecessor firms of NL (Wetherill and Sons, John T. Lewis & Brother, et al.), DuPont (Harrison Brothers) and Sherwin Williams (John Lucas & Co. and Detroit White Lead Co.) were in operation throughout the 1870-1914 period.³

30. In the Philadelphia area alone, business directories identify 23 nondefendant manufacturers of white lead between 1870 and 1916. I have seen no evidence that any of these firms were acquired directly or indirectly by any of the defendants. These producers were:

C.S. Butler
Janney, Reakirt & Co.
Louis Mueller
Robins & Co.
Felton, Sibley & Co.
Ziegler & Smith
Henry Cooper
J. Flinn
Girard White Lead
Graver Lead⁴
Russell & Phillips
Wiswall Paint Co.
Franklin White Lead Co.
McKnight & Co.
Painter & Bair
Taylor & Smith
Robert Shoemaker & Co.
Continental Mfg. Co.

³ By "predecessor firms," I mean independent firms that were later acquired by one of the defendants. Issues of successor liability are beyond the scope of this affidavit (and my expertise).

⁴ Later acquired by Harrison Brothers, who were then acquired by DuPont.

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L.P. Fernis
French, Richards & Co.
William H. Graham & Co.
Eugene E. Nice
Willitts & Bacon

31. Further, at least 12 additional nondefendant firms produced basic lead carbonate between 1870 and World War I outside of the Philadelphia area. I have seen no evidence that any of these firms were acquired directly or indirectly by any of the defendants. These producers were:

<u>Producer</u>	<u>Location</u>
F.W. Gerdes and Brothers	Pittsburgh, PA
Washington White Lead Co.	Pittsburgh, PA
Adams White Lead Co.	Baltimore, MD
Rowley (Mild Process Lead Company)	Detroit, MI
Nevin Lead	Pittsburgh, PA
Inland Lead Company	Chicago, IL
Lewis Lead Works	San Francisco, CA
M.B. Suydam and Brother	Pittsburgh, PA
Kentucky Lead and Oil (sold by NL in 1906)	Louisville, KY
D.B. Shipman White Lead Works (sold by NL in 1911)	Chicago, IL
Eagle-Picher Industries	Cincinnati, OH
W.P. Fuller Co.	So. San Francisco, CA

In addition, at least eight nondefendant (including acquisition) companies established before 1870 may have continued producing after 1870:

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<u>Producer</u>	<u>Location</u>
Peabody/Forest River Lead Company	Salem, MA
Bacon and Hyde	St. Louis, MO
Barney McLennon	Cincinnati, OH
Cincinnati Manufacturing Co.	Cincinnati, OH
Bielen and Stevenson	Pittsburgh, PA
Suffolk Lead Works	Boston, MA
Norfolk Lead Works	Boston, MA
Gregg & Hagner	Pittsburgh, PA

32. A large number of additional suppliers of white lead paint during the 1905-1916 period are listed in various editions of Thomas's Register, a national directory of manufacturers and sellers of a wide range of industrial products. Some of these companies may have produced their own basic lead carbonate. Unfortunately, Thomas's Register did not differentiate among types of white lead or indicate how much white lead was produced or for what use (paint, rubber, linoleum, etc.). Nondefendant companies include the following:⁵

Boydell Brothers White Lead & Color Co.	(MI)
Brown Chas. H. Paint Co. Inc.	(NY; NJ)
Cawley Clark & Co.	(NJ)
Chicago White Lead & Oil Co.	(IL)
Eagle-Picher Lead Co.	(IL; OH; MO)
Eclipse White Lead & Color Works	(NY; NJ)
French & Co. Samuel H.	(PA)
Gerdes & Brother	(PA)
Great Western Smelting & Refining Co.	(MO)
Hammar Bros. White Lead Co.	(IL; MO)
Hammond Lead Products Inc.	(IL)

⁵ Some of these companies may have been acquired at various times by various of the defendants.

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Hanline Bros	(MD)
Hazard Lead Works Inc	(CT)
Johnson & Oswald	(NY)
Longman & Martinez	(NY)
Louis Leavitt	(NY; NJ)
Manhattan Paint Co.	(OH)
Marx John	(NJ)
Masury & Son John W.	(NY; MI)
Memphis White Lead Works	(TN)
Merck & Co. Inc.	(MO)
Mets Paint Co.	(NY)
Moore & Co.	(NY; NJ)
Moser Co.	(OH)
Mound City Paint & Color Co.	(MO)
Nevin Co.	(PA)
Parian Paint Co.	(GA)
Pfleugh & Co.	(NJ)
Philipp Brothers Chemicals Inc.	(MA)
Pittsburgh Oil & Varnish Co.	(CA)
Platt & Thornburgh Paint Co.	(MO)
Ritzman White Lead Co.	(OH)
Rowley Geo A. & Co. Inc.	(MO)
Sargent-Gerke Co.	(IN)
Smith & Co.	(NY)
Suydam MB Co.	(PA)
U.S. Gutta Percha Paint Co.	(RI)
Webb & Sons	(MD)
Weir White Lead Co.	(MO)
Wieder Lead Co.	(MO)
Fuller WP & Co.	(CA)
Enterprise Paint Mfg. Co.	(IL)

33. As noted above, neither the date of application nor the manufacturer of the pigment on the walls of the Premises can be identified. Accordingly, any lead pigment on the walls may have been manufactured and sold by any of the above nondefendant companies.

C. World War I - World War II

34. The USBM reports that basic lead carbonate sales (for all uses) declined over 30 percent during

World War I, as a result of wartime restrictions. Sales recovered to about 200,000 tons by 1922, then dropped below the 1914 level by 1929 and continued declining. It is highly unlikely that this sales decline was spread uniformly among producers. At the same time, leaded zinc oxide production steadily increased and more than doubled during the Depression years, reaching a reported 40,000 tons per year by 1939. It would be virtually impossible for defendants to have maintained stable market shares.

35. The World War I-World War II period was one of continuing entry and exit of lead pigment producers. Two of the defendant lead pigment producers (or alleged predecessor firms later acquired by the defendants) entered the industry during this period; Glidden acquired Euston Lead Co. in 1924 and IS&R entered about 1919. E. I. DuPont acquired Harrison Brothers (who had acquired Graves Lead in 1916) in 1917.

36. Eagle-Picher, a very large nondefendant producer of basic lead carbonate and lead pigments (including lead sulfate and leaded zinc oxide), was formed by the merger of the Eagle White Lead Company and the Picher Lead Company in 1916. Eagle-Picher acquired Hammar Brothers White Lead Company of East St. Louis approximately 1924. John R. MacGregor Lead Co. of Chicago, another nondefendant producer of lead

carbonate, began producing basic lead carbonate in the late 1930s.

37. The following 71 additional nondefendant pigment manufacturers were listed in various editions of Thomas's Register as suppliers of white lead and/or white lead-in-oil during the 1917-1941 period. As noted above, Thomas's Register did not differentiate among types of white lead, nor indicate how much white lead was produced, or for what end use:⁶

White Lead Supplying Companies

American Cyanamid & Chemical Corp.	(NY)
American Oil & Supply Co.	(NJ)
Armstrong Paint & Varnish Works	(IL)
Baker J.T. Chemical Co.	(NJ)
Bernhan Chemical & Metal Corp.	(NY)
Boydell Brothers White Lead & Color Co.	(MI)
Brown Chas. H. Paint Co. Inc.	(NY)
Chicago White Lead & Oil Co.	(IL)
Conners Wm. Paint Mfg. Co.	(NY)
Cooper Chas. & Co.	(NY)
Dill-Crosett Inc.	(CA)
Indianapolis Paint & Color Co.	(IN)
Inland White Lead Co.	(IL)
Jenkins Geo R. & Co. Inc.	(IL)
Johnson & Oswald	(NY)
Katzenbach & Bullock Co.	(NY)
Longman & Martinez	(NY)
Louis Leavitt	(NY)
Mallinckrodt Chemical Works	(MO)
Manhattan Paint Co.	(OH)
Marx, John	(NJ)
Masury & Son John W.	(NY; MI)
McDonagh Wm. & Sons	(NY)
Metals Refining Co.	(IN)
Moore & Co.	(NY)

⁶ Some of these companies may have been acquired at various times by various of the defendants.

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Moser Co.	(OH)
Mound City Paint & Color Co.	(MO)
Nevin Co.	(PA)
O'Neil Oil Co.	(WI)
Parian Paint Co.	(GA)
Pfleugh & Co.	(NJ)
Philipp Brothers Chemicals Inc.	(NY)
Platt & Thornburgh Paint Co.	(MO)
Eagle-Picher Lead Co.	(IL; OH)
Eastern Color & Chemical Co.	(NY)
Eclipse White Lead & Color Works	(NY)
Fergusson Alex C. Jr.	(PA)
French & Co. Samuel H.	(PA)
Frey & Yenkin Paint Co.	(OH)
Fuerst Bros. & Co.	(NY)
Fulper Edward B. Co.	(NJ)
Gaston Williams & Wigmore Inc.	(NY)
Hanline Bros.	(MD)
Harshaw Chemical Co.	(OH)
Hazard Lead Works Inc.	(CT)
Hoboken White Lead & Color Works	(NJ)
Record Holding Co.	(NY)
Ritzman White Lead Co.	(OH)
Roessler & Hasslacher Chemical Co.	(NY)
Sargent-Gerke Co.	(IN)
Smith & Co.	(NY)
State Chemical Co.	(NY)
Suydam M.B. Co.	(PA)
Tyler-Patterson Co.	(OH)
U.S. Gutta Percha Paint Co.	(RI)
Wadsworth Howland Co. Inc.	(MA)
Warren Paint Co.	(OH)
Watrall & Co.	(NJ)
Webb & Sons	(MD)
Whittaker Clark & Daniels Inc.	(NY)
Wiarda John C. & Co.	(NY)
Wieder Lead Co.	(MO)
Wishnick-Turnpeer Inc.	(IL; OH; NY)
Fuller W.P. & Co.	(CA)
Enterprise Paint Mfg. Co.	(IL)

White Lead Supplying Companies

American Cyanamid & Chemical Corp.	(NY)
American Oil & Supply Co.	(NJ)
Armstrong Paint & Varnish Works	(IL)
Baker J.T Chemical Co.	(NJ)
Bergstrom Trading Co.	(NY)
Brown Chas. H. Paint Co. Inc.	(NY)

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Chicago White Lead & Oil Co.	(IL)
Conners Wm. Paint Mfg. Co.	(NY)
Cooper Chas & Co.	(NY)
Eagle-Picher Lead Co.	(IL; OH)
Eastern Color & Chemical Co.	(NY)
Eclipse White Lead & Color Works	(NY)
Fergusson Alex C. Jr.	(PA)
French & Co. Samuel H.	(NJ; PA)
Frey & Yenkin Paint Co.	(OH)
Fuerst Bros. & Co.	(NY)
Hanline Bros.	(MD)
Harshaw Chemical Co.	(OH)
Hazard Lead Works Inc.	(CT)
Hoboken White Lead & Color Works	(NJ)
Indianapolis Paint & Color Co.	(IN)
Inland White Lead Co.	(IL)
International Lead Refining Co.	(NY)
King E. & F. Co. Inc.	(MA)
Longman & Martinez	(NY)
Longman & Martinez	(NY)
Louis Leavitt	(NY)
MacGregor Jr. Lead Co.	(IL)
Mallinckrodt Chemical Works	(MO)
Manhattan Paint Co.	(OH)
Marx, John	(NJ)
Masury & Son John W.	(NY)
Matthews Bros. Inc.	(VA)
McDonagh Wm. & Sons	(NY)
Metals Refining Co.	(IN)
Moore & Co.	(NY)
Mound City Paint & Color Co.	(MO)
O'Neil Oil Co.	(WI)
Parian Paint Co.	(GA)
Philipp Brothers Chemicals Inc.	(NY)
Baker J.T. Chemical Co.	(NJ)
Bernhan Chemical & Metal Corp.	(NY)
Pittsburgh Insulating Co.	(PA)
Platt & Thornburgh Paint Co.	(MO)
Republic Chemical Corp.	(NY)
Roessler & Hasslacher Chemical Co.	(NY)
Sargent-Gerke Co.	(IN)
Smith & Co.	(NY)
State Chemical Co.	(NY)
Sterline Products Co.	(PA)
Suydam M. B. Co.	(PA)
United Metals Selling Co.	(NY)
U.S. Gutta Percha Paint Co.	(RI)
Wadsworth Howland Co. Inc.	(MA)
Warren Paint Co.	(OH)
Watrall & Co.	(PA)
Whittaker Clark & Daniels Inc.	(NY)

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Wiarda John C. & Co.	(NY)
Wieder Lead Co.	(MO)
Wishnick-Tumpeer Inc.	(IL; OH; NY)
Fuller W.P. & Co.	(CA)
Enterprise Paint Mfg. Co.	(IL)

38. Because the manufacturer of the pigment on the walls of the Premises cannot be identified, any lead pigment on the walls may have been manufactured and sold by any of the above nondefendant companies.

D. World War II - 1969

39. The trend away from basic lead carbonate accelerated after World War II. In fact, over 85 percent of all the basic lead carbonate produced since 1870 was produced before World War II. Partly as a result of wartime restrictions, total white lead sales (as reported by USBM) dropped over 50 percent during the war, recovered to nearly 70,000 tons by 1947, but then declined steadily to less than 20,000 tons by 1960 and to less than 10,000 tons by 1970. Leaded zinc oxide sales were reported by the USBM to have peaked at over 80,000 tons in 1947, and then also declined rapidly to less than 10,000 tons by 1970.

40. The pigment defendants ceased producing basic lead carbonate at different points during the postwar period. IS&R sold its basic lead carbonate plant to Eagle-Picher (a nondefendant) in 1946. Sherwin

Williams ceased producing basic lead carbonate in 1947. Glidden closed its lead carbonate plant in 1958. DuPont had already exited the business in the 1930s.

41. Nondefendant pigment manufacturers also exited the market at different points in this time period. John R. MacGregor Lead closed its facility about 1949. Eagle-Picher, which closed Hammar Brothers in the 1930s, closed the Eagle White Lead Works in approximately 1946 and IS&R's old basic lead carbonate plant in 1949. Given both the decline in sales and the number of companies exiting the market, it is unlikely that the defendants remaining in the market maintained stable market shares during this time period.

42. As in the previous period, a large number of nondefendant companies were listed in various editions of Thomas's Register as suppliers of white lead or white lead-in-oil during the 1942-1969 period. As before, Thomas's Register did not differentiate among types of white lead or indicate how much white lead was produced or for what use it was put.⁷ The firms listed by Thomas's Register included:

⁷ Some of these companies may have been acquired at various times by various of the defendants.

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White Lead Supplying Company

A & S Corp.	(NJ)
American Cyanamid & Chemical Corp.	(NY)
Armstrong Paint & Varnish Works	(IL)
Baker J.T. Chemical Co.	(NJ)
Bergstrom Trading Co.	(NY)
Eagle-Picher Lead Co.	(OH)
Enterprise Paint Mfg. Co.	(IL)
Frey & Yenkin Paint Co.	(OH)
Fuller W.P. & Co.	(CA)
Hammond Lead Products Inc.	(PA)
Harshaw Chemical Co.	(OH)
Hoboken White Lead & Color Works	(NJ)
Humco Lab Inc.	(TX)
Indianapolis Paint & Color Co.	(IN)
Inland White Lead Co.	(IL)
Kraft Chemical Co.	(IL)
Legion Chemicals Inc.	(NY)
MacGregor Jr. Lead Co.	(IL)
Metals Refining Co.	(IN)
Republic Chemical Corp.	(NY)
Rogers Paint Inc.	(MI)
Shepherd Chemical Co.	(NY)
Smith & Co.	(NY)
Wadsworth Howland Co. Inc.	(MA)
Whittaker Clark & Daniels Inc.	(NY)
Wishnick-Tumpeer Inc.	(IL; NYC)
Witco Chemical Co.	(NY)

White Lead-in-Oil Supplying Company

A & S Corp.	(NJ)
Eagle-Picher Lead Co.	(OH)
Enterprise Paint Mfg. Co.	(IL)
Frey & Yenkin Paint Co.	(OH)
Fuller W.P. & Co.	(CA)
Hammond Lead Products Inc.	(IN)
Hoboken White Lead & Color Works	(NJ)
Indianapolis Paint & Color Co.	(IN)
Inland White Lead Co.	(IL)
Kraft Chemical Co.	(IL)
Legion Chemicals Inc.	(NY)
MacGregor Jr. Lead Co.	(IL)
Rogers Paint Inc.	(MI)

43. Again, because it is impossible to identify the manufacturer of any pigments on the walls of the Premises, any such pigments may have been manufactured and sold by any of the above nondefendant companies.

V. Market Conditions for Other Lead Pigments and Products Also Changed Substantially Over Time

44. As noted above, numerous lead pigments other than basic lead carbonate and lead sulfate were used in paint during the relevant time period. The market shares of the defendants that produced these other lead pigments also varied significantly over time.

Furthermore, there was a large number of nondefendant producers of leaded zinc oxide, litharge, and red lead during the relevant period. The market-share analyses of plaintiff's experts do not take into account these other lead pigments.

45. Finally, as also noted above, throughout the relevant time period thousands of companies utilized lead and lead products in their manufacturing process for nonpaint applications. Obviously, the great bulk of these were companies other than the defendants. Exhibit C, which identifies over 500 companies that manufactured or supplied lead products and lead-containing products in the 1909-1976 period, illustrates the extent to which the manufacturing and processing of lead and

lead-containing products permeated the U.S. economy during the relevant time period.

VI. Reliable Market-Share Data Do Not Exist

46. Compilations of data on total production and sales of U.S. pigments are inconsistent with each other and incomplete with respect to both products and reporting companies. Further, no data base exists on pigment production or sales specifically with respect to use on residential surfaces. In light of the absence of reliable data, apportionment of liability based on a "market-share analysis" of the lead pigments markets would be arbitrary and not proportionate to any risk created by each defendant.

47. The sources of lead pigments data covering long periods of time are the USBM, the Census, and the LIA. The FTC also collected lead pigments production data for a brief period.

48. Since 1884, the USBM has published data on lead pigments production and sales. The LIA, a defendant in this action, has published data on lead pigments since 1929. The FTC collected data from 1938 to 1941. However, none of these sources provides totally reliable or complete information regarding lead pigments production or sales. The following are some of the reasons these sources of data cannot be relied upon

to determine the total production and sales of lead pigments at any given time:

a. There are ambiguities and inconsistencies among the three primary sources of data on total U.S. lead pigments production and shipments. In particular, perhaps as a result of differences in coverage or as a result of double counting, there is a tendency for totals reported by the Census to be significantly greater than totals reported by the USBM, and for the USBM totals to be significantly greater than those reported by the LIA.

b. The most comprehensive national information available -- from the USBM -- is incomplete, because provision of data to the USBM was voluntary (with the possible exception of the war years). In fact, reported data for the years when both the Census and the USBM identified the number of basic lead carbonate plants (1919, 1921, 1923, and 1925) indicate that the Census identified at least three producers that were not on the USBM lists. The USBM lists did not include a number of lead pigments producers.

c. Over time, the USBM and the Census each changed the way it collected and reported data, so the data for different years are often not

comparable. For example, USBM changed from collecting data regarding production in the late 1800s and early 1900s to collecting data regarding sales from 1910 to 1944. The USBM then changed again in 1945 to shipments, and in 1948 changed back to production. Similarly, the Census changed the categories it reported so frequently that accurate comparisons over long periods of time are impossible.

d. The LIA reports pigments data only for its members and does not report any data for leaded zinc oxide.

e. The FTC study collected data from the LIA and from individual companies. However, as noted above, the LIA reported information from members only. For all but one of the individual companies surveyed, only basic lead carbonate sales were obtained, ignoring other lead pigments.⁸ Several important producers were not surveyed, including E. I. DuPont de Nemours and Co., W.P. Fuller & Co., and John R. MacGregor Lead Co. The FTC may have incorrectly accounted for all the toll-processing services provided by

⁸ The FTC did collect lead sulfate sales information from Eagle-Picher, but the numbers reported by the FTC are inconsistent and also exceed total lead sulfate production reported by USBM for some of the years.

some producers. The FTC also did not account for all producers that produce only for internal use.

f. There is no indication that plaintiff's experts identified or resolved these problems. Without complete and reliable data, any market share analysis, including plaintiff's, would be fundamentally flawed and unreliable.

49. Even if it were possible -- by reconstructing over 100 years of history -- to calculate the production in each region by each producer in each year of each type of pigment, the shares of the relevant market for each company (however defined) could still not be determined for at least three reasons.

50. First, as noted above, throughout the relevant time period, lead pigments were used in a variety of nonpaint applications, including ceramics, batteries, linoleum, insecticides, and cement. Although data exist on the percentage of total U.S. lead pigment used to manufacture paint products, data do not exist on what portion of the lead pigments sold by each company was for paint uses. Without such data on an individual company basis, it is impossible to determine an individual company's market share of the lead pigment-for-paint market. Plaintiff's expert Gary Barach implicitly recognizes this problem, Expert Report at 5, but offers no solution.

51. Second, even with respect to lead pigments used in paints, such lead paints were used for both residential and nonresidential applications. For example, a substantial portion of the lead paints sold in the United States during the relevant period were used for commercial, industrial, marine, and military and other government applications. No data exist on sales of lead pigments (or on market shares of lead pigments producers) for house paints alone. Again, without such data on an individual company basis, it is impossible to determine an individual company's market share of the lead pigment used to make residential paint products. None of plaintiff's experts offers a solution to this problem.

52. Third, exports of lead pigments were also significant in several years (although they were very low in most years). For example, exports of basic lead carbonate were as high as about 15,000 tons during the World War I period (or roughly 10 percent of total shipments). If the relative importance of exports varied among producers, a market-share determination that did not take into account exports would be inaccurate. No data, however, are available on exports by individual companies. Similarly, imports at the very beginning of the relevant time period ranged from about 2,000 to 4,000 tons per year (or roughly 10 percent of

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total consumption at that time). Market shares computed for domestic production only would be inaccurate during those years. There is no indication that any of plaintiff's experts considered exports or imports in their market-share analyzes.

Signed under the pains and penalties of perjury
this _____ day of _____.

James C. Burrows