Note: This is a reference cited in *AP 42, Compilation of Air Pollutant Emission Factors, Volume I Stationary Point and Area Sources.* AP42 is located on the EPA web site at www.epa.gov/ttn/chief/ap42/

The file name refers to the reference number, the AP42 chapter and section. The file name "ref02_c01s02.pdf" would mean the reference is from AP42 chapter 1 section 2. The reference may be from a previous version of the section and no longer cited. The primary source should always be checked.

AP42 Section:	11.3
Reference:	4
Title:	Written communication from J. Dowdle, Pine Hall Brick Co., Inc., Madison, NC, to R. Myers, U. S. Environmental Protection Agency, Research Triangle Park, NC, September 1992.

Pine Hall Brick

Reply To:
PINE HALL BRICK CO., INC.
Lindsay Bridge Road
Post Office Box 836
Madison, North Carolina 27025-0836
Telephone 919/548-6007
Fax 919/548-1837

September 24, 1992

Mr. Ron Myers
EPA/EIB/EFMS (MD-14)
U. S. Environmental Protection Agency
Research Triangle Park, N.C. 27711

Dear Mr. Myers:

This is in response to your trip report covering visit to Pine Hall Brick. I have made corrections and included a description of our process flow, which more accurately details what is actually happening.

I enjoyed meeting and talking with you about the proposed testing. If you have any questions about the information I have supplied, please let me know.

Sincerely,

John Dowdle
Vice President Manufacturing
Pine Hall Brick

JD/sa
Encl.

2701 Shorefair Drive, P.O. Box 11044 Winston-Salem, NC 27116-1044 Tel. (919) 721-7500 Fax. (919) 725-3940

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina 27711

SEP 16 1992

John Dowdle
Vice President of Production
Pine Hall Brick Company
Post Office Box 836 Lindsey Bridge Road
Madison, North Carolina 27025

Dear Mr. Dowdle:

Enclosed is a draft of the trip report covering a visit by Mr. Ron Myers, Mr. John Brown, and Mr. Roy Huntley of the U. S. Environmental Protection Agency (EPA) and Mr. Richard Marinshaw and Mr. Brian Shrager of Midwest Research Institute (MRI) to the Pine Hall Brick Company (Pine Hall) facility in Madison, North Carolina, on July 21, 1992. We would appreciate your reviewing the report for any errors or omissions. You may return the enclosed copy of the report with your written comments if you wish. A copy of the final version of the report incorporating your comments will be sent to you for your records. Since this report will eventually become a part of the public record, we want to portray your operation as accurately as possible. The custody receipt for the trip report is also enclosed. Please sign and date the form to acknowledge receipt of the report and return a copy of the form to the Document Control Officer, Emission Standards Division (MD-13), Research Triangle Park, NC 27711.

If you believe that disclosure of any specific information contained in the trip report would reveal trade secrets or other confidential information, you should clearly identify the specific information. If EPA determines that there is a need to disclose such information, we will need, at that time, the following to support your claim:

1. Measures taken by Pine Hall to guard against undesired disclosure of the specific information to others;

2. The extent to which the specific information has been disclosed to others and the precautions taken in connection therewith;

3. Pertinent confidentiality determinations, if any, by other Federal agencies (furnish a copy of any such determination, or reference to it, if available); and

4. Whether Pine Hall asserts that disclosure of the specific information would be likely to result in substantial harmful effects on Pine Hall's competitive position, and, if so, what those harmful effects would be, why they should be viewed as substantial, and an explanation of the causal relationship between disclosure and such harmful effects.

Any specific information subsequently determined to constitute a trade secret will be protected under 18 U.S.C 1905. However, all emission data will be available to the public.

We respectfully request that you submit your review comments on the trip report by October 7, 1992. If you concur with the information contained in the report, we would appreciate a letter to that effect. In addition, please indicate in your letter or use the attached form to indicate whether the report is considered nonconfidential, partially confidential, or fully confidential. If we do not receive a response by October 7, 1992, the report will be considered nonconfidential and accurate.

Again, we appreciate the cordial reception and information provided by Pine Hall. The information you supplied will be most helpful to us. If you have any questions, please call Mr. Ron Myers at (919) 541-5407 or Mr. Marinshaw of MRI at (919) 677-0249.

Sincerely,

David Mobley

David Mobley, Chief
Emission Inventory Branch
Technical Support Division

Enclosure

US Environmental Protection Agency
Office of Air Quality Planning and Standards
CBI Office (MD-13)
Research Triangle Park, NC 27711

DATE: 17 SEP 1992

SENT VIA: Registered Mail

Receipt No:

CAA CBI CUSTODY RECEIPT

TO: Document Control Officer

John Dowdle
Pine Hall Brick Company
Post Office Box 836 Lindsey Bridge Road
Madison, North Carolina 27025

FROM: Document Control Officer

Joseph Hobbs, CDCO
USEPA, OAQPS
ESD, CB10, MD-13
RTP, NC 27711

INSTRUCTIONS:

1. **Original of this receipt to be signed by recipient and returned to sender.**
2. **Duplicate of this receipt to be retained by recipient.**

CBI CONTROL NO.	COPY NO.	DESCRIPTION OF MATERIAL
ISB-03-22	1	Trip Report for a July 21, 1992 site visit to Pine Hall Brick Company in Madison, NC; report dated September 2, 1992; 5 page report

I have personally received material, enclosures, and attachments as identified above. I assume full responsibility for the safe handling, storage, and transmittal of this material in accordance with existing Confidential Business Information regulations.

DATE RECEIVED:	SIGNATURE OF RECIPIENT:
21 Sept 92	John Dowdle

CAA FORM 13

ISB-5-22

CONFIDENTIAL BUSINESS INFORMATION

The attached document contains data claimed to be confidential business information (CBI) under the authority of the Clean Air Act as amended (42 U.S.C. 7401, 7411, 7412, 7414, 7416, 7601). CBI may not be disclosed or copied for release to another party. Any excerpts or summaries must also be treated as CBI. If you willfully disclose CBI to any person not authorized to receive it, you may be liable for a disciplinary action with penalties ranging up to and including dismissal. In addition, disclosure of CBI or violation of security procedures may subject you to a fine of up to $1,000.00 and/or imprisonment for up to one year.

DO NOT DETACH

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9711-30-04
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MIDWEST RESEARCH INSTITUTE
Suite 350
401 Harrison Oaks Boulevard
Cary, North Carolina 27513-2412
Telephone (919) 677-0249
FAX (919) 677-0065

CONFIDENTIAL PENDING DETERMINATION

Date: September 2, 1992

Subject: Site Visit--Pine Hall Brick Company
Review and Update of Mineral Products Industry Sections of Chapter 8, AP-42
EPA Contract 68-D0-0123; MRI Project 9711-30

From: Brian Shrager

To: Ron Myers
EPA/EIB/EFMS (MD-14)
U. S. Environmental Protection Agency
Research Triangle Park, NC 27711

I. Purpose

The purpose of the visit was to evaluate the feasibility of emission testing at this site for the purpose of developing emission factors for AP-42.

II. Place and Date

Pine Hall Brick Company
Plant Nos. 3 and 4
Box 836 Lindsey Bridge Road
Madison, NC 27025

July 21, 1992

III. Attendees

Pine Hall Brick Company (Pine Hall)

John Dowdle, Vice President of Production

U. S. Environmental Protection Agency (EPA)

Ron Myers, EIB
John Brown, EMB
Roy Huntley, EMB

Midwest Research Institute (MRI)

Brian Shrager
Richard Marinshaw

IV. Discussion

Mr. Myers explained the purpose of the visit, described the ongoing revisions to AP-42, and outlined the test program being conducted by the Emission Inventory Branch (EIB) to develop new emission factors for inclusion in AP-42. Following this discussion, Mr. Dowdle led the group on a tour of the facility.

The Pine Hall facility consists of a central crushing, grinding, and screening operation and two separate brick forming and firing plants (Plant No. 3 and Plant No. 4). Each plant has two kilns. Plant No. 3 has a production capacity of ~~88,000~~ 100,000 per kiln bricks per day, and plant No. 4 has a capacity of ~~120,000~~ 125,000 per kiln bricks per day. The facility operates 8 hours per day, 5 days per week. The raw material used to make the brick is classified as a triassic shale and is mined onsite. The moisture content of the raw material is approximately 11 percent. Kilns 24 hr/day 7 days/wk

Figure 1 presents a process flow diagram for the plant. The raw material is fed to a primary crusher by front-end loaders. The crusher is located in a small two-story building located on the side of a hill. The top story is open on one side to allow access by the front-end loaders. The bottom story is open to allow access to the crusher and to provide an outlet for the crushed material. The emissions from the crushing operation consist of fugitive particulate matter (PM) that is emitted by the crusher itself, by front-end loader traffic, and by the transfer of material from the front-end loaders to the crusher. From the crusher, the material is transferred by conveyor to a storage area, which consists of a covered building with open sides to allow access to front-end loaders. Because the conveyor discharge point is located approximately 10 meters (m) (30 feet [ft]) above the ground, it is likely that fugitive dust emissions are high when material is first deposited in the storage pile (i.e., until the storage pile is built up to a height that approaches the conveyor discharge height).

Grinding Room

Front-end loaders transfer the crushed material from the storage piles to hoppers. From the hoppers, the material is transferred by conveyor to a building that encloses the grinding and screening operations. In this building, the material is first screened for size. Oversize material is conveyed to a pan crusher that is open on the top, then returned to the vibrating screens. Undersize material is transferred by conveyor to storage piles in an adjacent building.

Bay doors on one end of the screening and grinding building allow access by front-end loaders. The building is ventilated by means of roof vent and five axial fans located near the top of the building's walls. The roof vent and fans create an induced draft, which enters through the bay doors and exits through the roof vents; air movement into the bay doors was noticeable at the time of the visit. Emissions from the screening, grinding

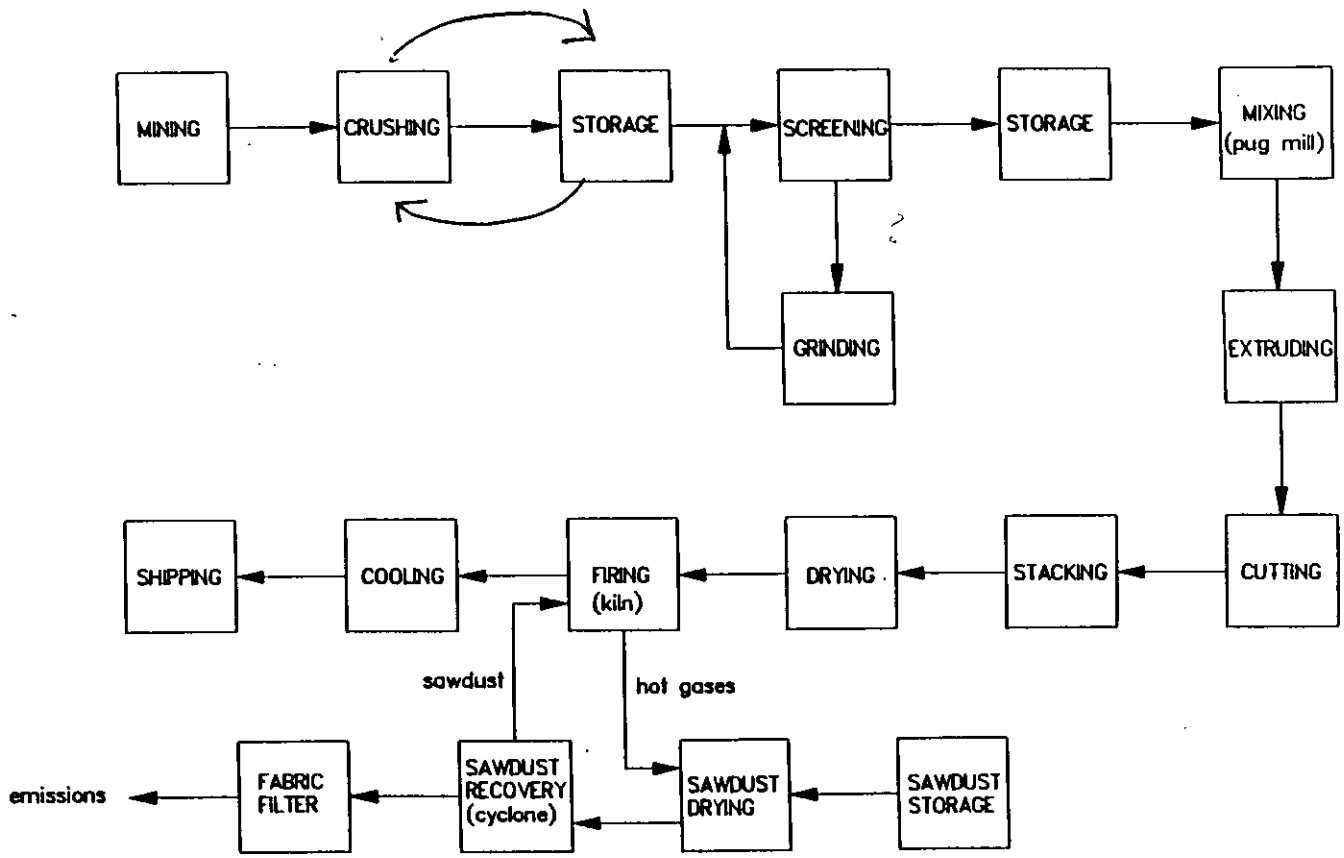

FIGURE 1. PROCESS FLOW DIAGRAM FOR PINE HALL BRICK

(hammermill), and materials transfer operations consist of fugitive PM. Visible emissions were observed from all of these operations, but were not visible at the exit points of the vent system.

From the storage piles, the material is conveyed to the forming areas (both plants have forming buildings), where the material is milled, extruded, and cut to size. Because water is added to the material to increase the moisture content before forming, PM emissions from the forming process are negligible.

After forming, the bricks are stacked by ~~front-end loaders~~ into "cubes" on pallets. ~~From the~~ stacking area, the bricks are transported to the ~~tunnel~~ kilns and are ~~loaded~~ onto railroad cars by fork~~lift~~.

Plant No. 4

Seperate

The tunnel kilns include a drying section, firing section, and a cooling section. The kilns are about 120 m (400 ft) long and are fired with sawdust. The drying section is heated with waste heat from the cooling section.

The unfired bricks enter the kiln on railroad cars and are fired for about 37 hours. The air temperature in the tunnel kiln ranges from approximately 204°C (400°F) at the beginning of the drying section to 1093°C (2000°F) in the firing section.

The sawdust used for firing the kilns first is dried from about 50 percent moisture to less than 10 percent moisture in a rotary dryer. The dryer is heated by exhaust gases that are vented from one or both kilns. From the dryer, the sawdust is recovered by means of a cyclone and then transported by screw conveyor to the kilns. The exhaust gases from the cyclone pass through a positive pressure baghouse and are emitted to the atmosphere.

Each kiln has one stack, which is not equipped with sampling ports. Emissions from the kilns are likely to be PM, fluorides, and products of combustion.

Plant No. 3

Seperate

The tunnel kilns include a drying section, a firing section, and a cooling section. The kilns are about 120 m (400 ft) long and are fired with sawdust. The drying section is heated with waste heat from the cooling section.

The unfired bricks enter the kiln on railroad cars and are fired for about 37 hours. The air temperature in the tunnel kiln ranges from approximately 204°C (400°F) at the beginning of the drying section to 1093°C (2000°F) in the firing section.

A gas-fired flash dryer currently is used to dry the sawdust for plant No. 3. Pine Hall recently installed a fluidized bed dryer for drying the sawdust. However, at the time of the visit the fluidized bed dryer had not yet been put into operation. Exhaust gases from the kilns will be used to heat the fluidized bed dryer. The dried sawdust is recovered by means of a cyclone and then transported by screw conveyor to the kilns.

Each kiln has one stack, which is not equipped with sampling ports. Emissions from the kilns are likely to be PM, fluorides, and products of combustion.

V. Conclusions

With the exception of the tunnel kilns and sawdust dryers, emissions from all sources at Pine Hall are fugitive in nature. Most of these fugitive sources (crushing, screening, grinding, forming, stacking, and materials handling and storage operations) are enclosed. The primary crusher could be tested for PM emissions, but traffic from front-end loaders into and out of the crusher building could present problems. It would be difficult to isolate emissions from the fugitive sources in the screening and grinding building from one another. Because the building has few openings and a noticeable air flow from the bay doors to the roof vents, testing the entire building is feasible, however. Also, enclosing the crushing/grinding and screening operations in one building appears to be typical of the industry.

Testing plant No. 4 kiln stacks would be relatively straightforward. Although sampling ports would have to be installed, the duct from the kiln stack to the sawdust dryer is easily accessible and of adequate length for testing. By sampling the kiln exhaust (before the sawdust dryer) and the sawdust dryer exhaust, the dryer emissions could be calculated from the difference in the two measurements. Kiln and sawdust dryer emissions controlled by the baghouse could also be measured, although modifications to the baghouse outlet would be required. Baghouses, however, do not appear to be typical control devices in the brick industry.

Because of the ongoing conversion from a flash sawdust dryer to a fluidized bed sawdust dryer, it may not be practical to test plant No. 3 kiln and dryer emissions.

Front-end loader traffic on unpaved roads appeared to be a significant source of PM emissions. In addition, PM emissions from storage piles are likely to be significant.

water truck USED to Control Roads (Dust)

PINE HALL BRICK

PROCESS FLOW

1. MINING

We operate four open pit mines, located within 12 miles or less from the plant, with one major mine being located just across the road from our plant. Our equipment digs out the clay and shale, and we haul it into the large storage shed by our own trucks, placing it in layers in the shed so that the different materials are mixed in the manufacturing process. The moisture content of raw materials averages from 12 to 15%.

2. GRINDING

The material is transferred from the raw storage shed into a primary crusher by front-end loaders. The crusher reduces the material into the size to be handled by the grinding equipment. The crushed material then moves by conveyor belt to the grinding room. Equipment in the grinding room includes three Steele-Fawcett INCLA III-B Dry Pan grinders, a Double Rotor Hammermill, and 14 electrically heated screens with openings of .070"-smaller than a BB shot.

In the grinding operation the material which is too coarse to pass through the screens is returned by conveyor belt back into the grinders for re-processing.

The grinding rooms discharge the ground shale into two large ground storage buildings, capable of holding enough ground shale for several days' operations if ncessary. Normally, if the manufacturing process at the two plants is consuming shale at the same rate as it is being ground, the material passes through these buildings and on to the manufacturing plants. If we are grinding faster that we are using it, or if one plant should be shut down, the excess ground shale is dumped onto the floor of the ground storage building to be used when needed. When plant usage exceeds grinding capacity, front-end loaders are used to feed the ground shale into hoppers to be distributed to the plants. The output from the grinding room or either ground storage building may be directed to either plant, thus giving complete flexibility.

3. MANUFACTURING

Plant 3A, the older plant, is a conventional brick factory burning approximately 100,000 brick per 24-hour day in each of the two Swindell-Dressler kilns. The process is unchanged since the plant was completed in 1965. The manufactured brick are placed on the kiln cars by hand. After the cars have been fired, the burned brick are removed from the cars by fork truck to work stations where Rack Loaders, by hand, place them into cubes for shipment.

In Plant 4, stacking on the kiln cars is accomplished by use of the two automatic setting machines by Bason-Pasco and by Pearne & Lacy. Unloading of the cars is done on a semi-automatic monorail.

Capacity of this plant is over 125,000 brick per 24-hour day in each kiln.

During the manufacturing process the ground shale is fed by conveyor belt from the ground storage buildings into the making departments at each plant. Water is added to the ground shale in the Pug Mills, where it is mixed, and then extruded from the brick machine as a constant column of shaped clay. If the brick is to be coated, the coating is applied to this column. At Plant 3A the column is then cut into bricks by a Steele multi-wire rotary cutter, and the conveyor belt carries the completed brick to the workmen for placement by hand on the kiln cars. At Plant 4 the column is cut into 5-1/2 foot pieces by a Steele Slug Cutter, and then carried by conveyor belt to the setting machines. As these slugs are pushed into the setting machines, they are "sliced" by push-through cutters before being placed on the kiln cars automatically. At Plant 4 this operation moves at a pace of approximately 28,000 brick per hour.

4. DRYING

The green brick containing 18% water enter the dryer tunnel where heat from the kiln is used to dry the brick at 400 degrees F.

5. BURNING

On exiting the dryer the brick enter the tunnel kiln to begin the firing process. The first 2/3 of the 400 foot long tunnel kiln is used to heat the brick up to 2000 degrees F where they soak at the maximum temperature for a controlled period of time. This insures a uniform color and size throughout the load before the cooling down process begins in the last 1/3 of the kiln. Temperature is controlled by automatic temperature controllers and pyrometric cones placed on each car of brick as it enters the kiln. Cones can be observed by looking into peep holes in the side of the kiln and critical temperature adjustments can be made while the brick are still being fired. The brick are checked daily for IRA (suction) and absorption to insure they meet ASTM specifications and to insure a good laying brick for the mason which Pine Hall is noted for.

We have been using sawdust to fire our four kilns since 1979. We purchase sawdust locally, screen it to -1/4", dry it to 10% moisture in a large rotary dryer using exhaust heat from the kilns. The sawdust is stored in large silos and fed to the sawdust feeders where it is mixed with air and blown onto the red hot brick. We process 200 tons of wet (40 to 50% moisture) sawdust for our four kilns each day.

6. UNLOADING

At Plant 3A this is basically a manual operation. At Plant 4 semi-automatic equipment is used to remove the burned brick from the kiln cars, stack them into position for strapping, and automatic strapping equipment ties them into bundles ready for shipment. The bundles, or "cubes" contain 525 Modular brick, and

are our standard shipping unit. Cubes of other sizes vary in quantity, depending on the size.

Both plants normally operate on a five-day schedule, eight hours per day. The burning departments at both plants must work seven days a week, 24 hours a day in order to maintain proper burning care of the brick. Combined production of the two plants is approximately one hundred and forty million brick per year-enough to build 7,000 fairly large brick homes.