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:	5
Title:	Written communication from B. Shrager, Midwest Research Institute, Cary, NC, to R. Myers, U. S. Environmental Protection Agency, Research Triangle Park, NC, April 1993.

AP-42 Section 11.3
Reference 5

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Copy 1 of 1
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SUBJECT TO CONFIDENTIALITY AGREEMENT 12/14/93 BAH

Date: April 27, 1993

Subject: Site Visit--General Shale, Johnson City, TN
Review and Update Remaining Sections of Chapter 8
(Mineral Products Industry) of AP-42,
EPA Contract 68-D2-0159, Work Assignment 12
MRI Project 3612

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

General Shale
Plant No. 10
102 South Broadway
Johnson City, TN

April 16, 1993

III. Attendees

General Shale (General)

Walt Banyas, Vice President
Dave McNees
Mike Whitehead, Environmental Specialist
Buddy Archer, Superintendent

Brick Institute of America

Denis Brosnan

U. S. Environmental Protection Agency (EPA)

Ron Myers, EIB

Environmental Testing Systems, Inc. (ETS)

Andy Hetz, Senior Project Manager
Tony Underwood, Project Manager

Midwest Research Institute (MRI)

Brian Shrager

IV. Discussion

Upon arrival, the group began a tour of the facility, which consists of a central crushing, grinding, and screening operation, a central brick forming operation, two predryers, and two kilns (A and B). The plant has a capacity of 60 million bricks per year. The grinding room operates 9 hours per day, 5 days per week, and the kilns operate continuously. The raw material used to make the brick is classified as shale and is trucked in from local sites. The raw material typically has a moisture content of between 10 and 15 percent by weight.

Figure 1 presents a process flow diagram for the plant. Production begins at the grinding room, which is a large metal building that has three bay doors, two exhaust fans (not operating during visit) located near the top of the building walls, two exit doors, and a large opening that allows trucks to access the hopper that feeds the primary crusher. The raw material is dumped by truck into the hopper that feeds the primary crusher, which is located in the grinding room along with a pan grinder, five vibrating screens, a hammermill, and several

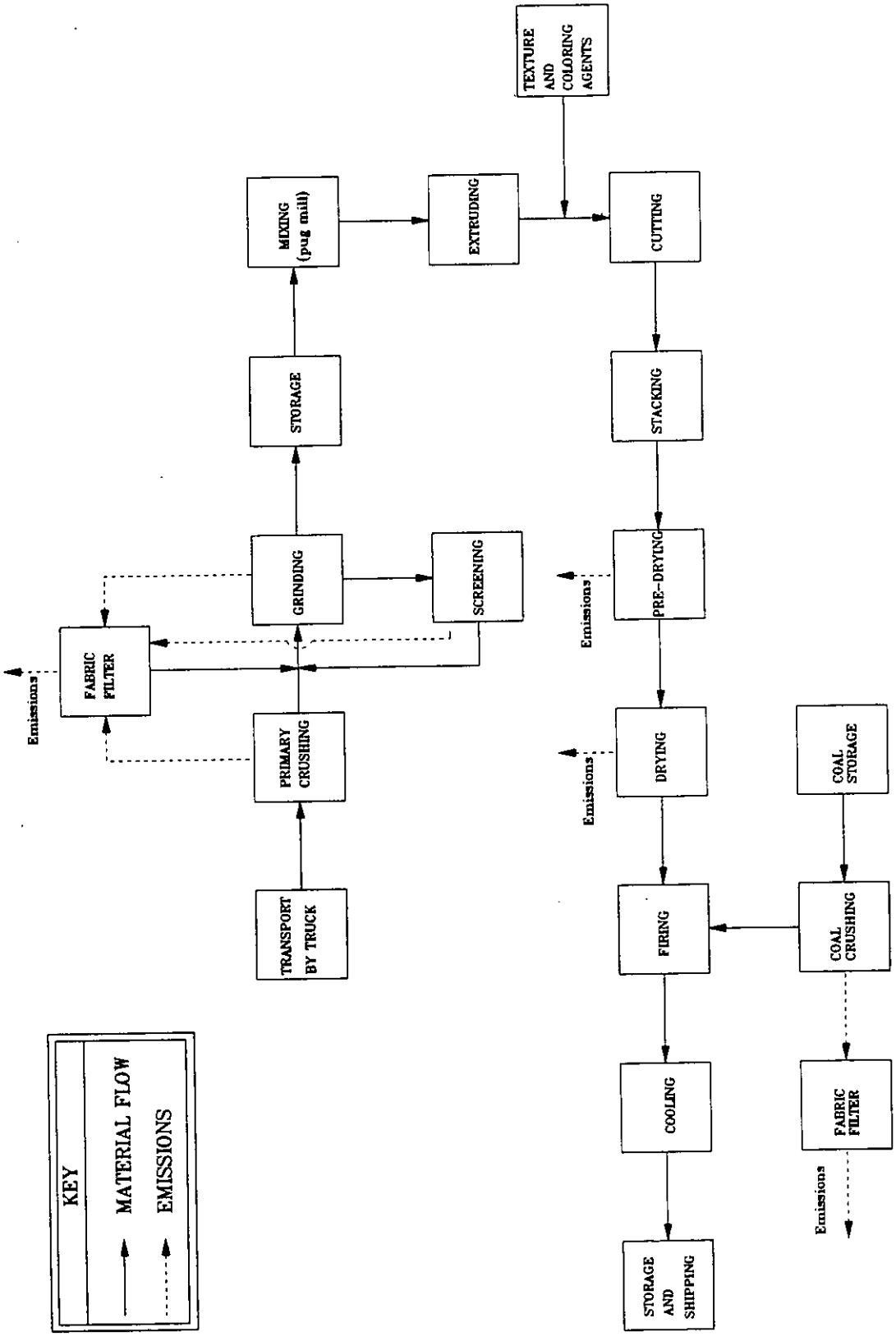

FIGURE 1. PROCESS FLOW DIAGRAM FOR GENERAL SHALE, JOHNSON CITY, TENNESSEE.

material transfer points and conveyors. Mr. Banyas stated that all of the bay doors and other doors could remain shut during testing. However, the truck access opening must remain open during grinding room operation. Emissions from the crusher, grinder, and screens are ducted to a fabric filtration system that is also located in the grinding room. Dust collected in the fabric filter is transferred to the conveyor that leads from the primary crusher to the pan grinder. From the primary crusher, material is conveyed to the pan grinder, which further reduces the size of the material. From the pan grinder, the material is conveyed to five vibrating screens. Oversized material from the screens is conveyed back to the pan grinder or to a hammermill for further size reduction, and then returns to the screens. Emissions from the grinding room consist of fugitive particulate matter (PM).

The grinding room product is conveyed to the material storage building located adjacent to the grinding room. Because the conveyor discharge point in the storage building is located approximately 10 meters (m) (30 feet [ft]) above the ground, it is likely that fugitive dust emissions from this process are greatest 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). Material from the storage building is conveyed to the mill room.

In the mill room, the material is conveyed to a pug mill, in which the material is mixed with water to raise the moisture content of the material. The material is discharged from the pug mill directly into a vacuum chamber. The vacuum chamber de-airs and compacts the material. Next, the material is continuously augered through dies. This is referred to as the "stiff extrusion process." The material is extruded in two continuous parallel columns, the outside of which is textured and wetted. As the extruded material is conveyed to the cutting section, it may be coated with sawdust and other materials, such as iron oxide and manganese dioxide, to vary the desired finish and color of the brick. The columns are then cut into bricks, and are stacked on cars for loading into the predryer. For aesthetic purposes, many of the unfired bricks are tumbled to produce brick with rounded, imperfect edges.

After cutting, the bricks are stacked into "cubes" on the kiln cars. On average, each car carries 3,736 bricks (Kiln A). From the stacking area, the bricks are transported to one of two predryers, which are heated by a combination of a heat exchanger and air from the cooling section of the kilns, and maintain a temperature of about 38° C (100° F). The predryers for Kilns A and B are 30.5 m (100 ft) and 33.7 m (110.5 ft) long, respectively. From the predryers, the cars are transported to kilns A and B for firing.

Kiln B is not considered typical of the industry because it has a single exhaust for firing and drying. For that reason, Kiln B is not a good candidate for testing and will not be discussed further. Kiln A is a tunnel kiln that includes a drying section, firing section, and a cooling section. The drying section is 39.6 m (130 ft) long; the firing section is 62.8 m (206 ft) long; and the cooling section is 28.3 m (93 ft) long. The kiln is fired with low-sulfur, low-ash coal, and also uses eight natural gas burners to facilitate coal combustion. The drying section is heated with waste heat from the kiln section.

The unfired bricks enter the kiln at the rate of one car every 70 minutes, and the entire drying/firing/cooling cycle takes about 34 hours to complete. The air temperature in the tunnel kiln ranges from approximately 204°C (400°F) at the beginning of the drying section to 1010°C (1850°F) in the firing section.

Emissions from the kiln are ducted to two stacks--one stack serves the firing section, and one stack serves the drying section. According to plant personnel, the exhaust system is designed to isolate emissions from the drying and firing processes, and it is unlikely that emissions from these two processes intermingle. There are no emission control devices on either of the two stacks. In addition, the stacks are not

equipped with sampling ports. Emissions from the kiln are likely to be PM, fluorides, and ~~products of~~ compounds from fuel combustion, or vaporizations from the bricks, SO_2, NO_x, CO, other inorganic and organic

V. Conclusions

The sources being considered for testing are the grinding room and the kilns. It appears feasible to test PM and PM-10 emissions from the grinding room. The grinding room appears typical of the industry, although many plants house the primary crusher separately from the screening and grinding operations. However, it may be possible to determine how much of the total emissions from the building can be attributed to the primary crusher.

Testing of the kiln/dryer emissions from Kiln A should be relatively straightforward. However, sampling ports would have to be installed in the kiln and dryer stacks or ducts.

Most of the roads at General are paved and fugitive emissions from the unpaved roads are controlled by wet suppression. Therefore, fugitive dust emissions from roads are assumed to be minimal.

SUBJECT TO CONTRACT