AP42 Section:	11.3
Title:	Comments, correspondence and test summaries from contractor for August 1997 supplement GENERAL SHALE SOURCE TESTS

MRI

Copy 3 of 3
3612-03-01

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

SUBJECT TO CONFIDENTIALITY CLAIM

Date: May 3, 1993

Subject: Site Visit--General Shale, Marion, VA
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. <u>Purpose</u>

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. <u>Place and Date</u>

General Shale
Plant Nos. 6 and 28
Rt. 4, Box 127
Marion, VA 24354

April 15, 1993

III. <u>Attendees</u>

<u>General Shale (General)</u>

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

<u>Brick Institute of America</u>

Denis Brosnan

<u>U. S. Environmental Protection Agency (EPA)</u>

Ron Myers, EIB

<u>Environmental Testing Systems, Inc. (ETS)</u>

Andy Hetz, Senior Project Manager
Tony Underwood, Project Manager

<u>Midwest Research Institute (MRI)</u>

Brian Shrager

IV. <u>Discussion</u>

The visit began with a brief discussion of plant operations, followed by a tour of the facility. Plant operations consist of a central crushing, grinding, and screening operation, a reclaimer, two separate brick forming operations, two predryers, and three kilns (two Plant No. 6 kilns, one Plant No. 28 kiln). Plant Nos. 6 and 28 have production capacities of 30 million and 50 million bricks per year, respectively. The grinding room operates 12 hours per day, 5 days per week, and the kilns operate continuously. The raw material used to make the brick is classified as Rome Shale and is both mined on site and trucked in from local sites. The raw material typically has a moisture content of about 15 percent by weight.

Figure 1 presents a process flow diagram for the plant. Raw material from a graded storage pile is fed to the primary crusher by front-end loaders. The primary crusher is located in a metal building that is open at the front and partially open on both sides. The building is approximately 30 feet high by 40 feet wide and would be difficult to enclose. From the primary crusher, the material is conveyed to the grinding room, which is a large metal building that is completely enclosed and has one exhaust fan (not operating during visit) located near the top of the building walls. Grinding room operations include a scalping screen, two pan grinders, six vibrating screens, a hammermill, and several material transfer points and conveyors. Emissions from several of the processes are ducted to a fabric filtration system that is located just outside of the grinding room. Three separate ducts enter the fabric filter. In addition, emissions from the sand mix and mill rooms are ducted to the grinding room fabric filtration system. From the primary crusher, material is conveyed to the scalping screen, which allows undersize material to bypass the pan grinders. Oversize material from the scalping screen is conveyed to the pan grinder, and the material is then conveyed to six 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 particulate matter (PM).

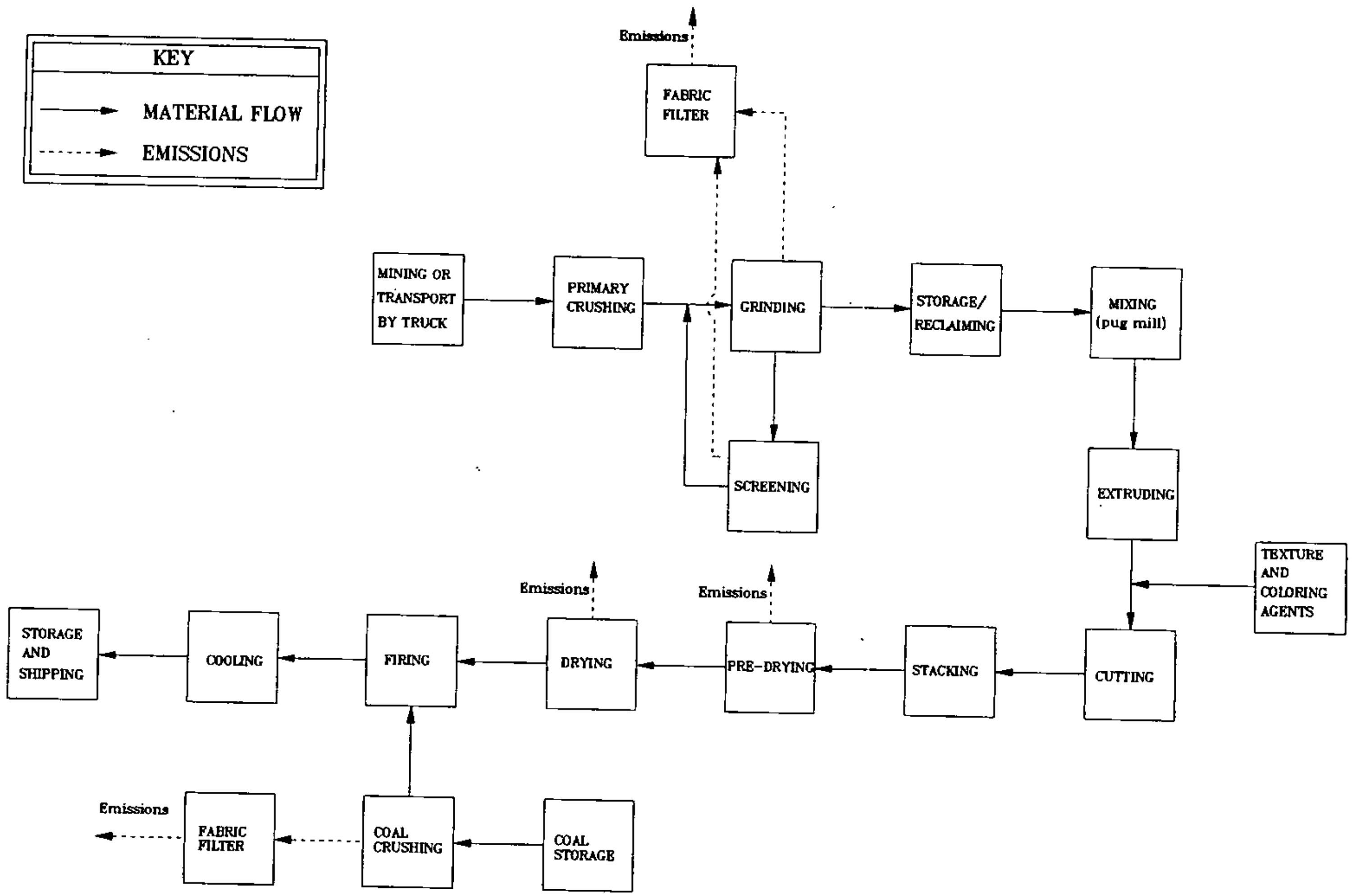


FIGURE 1. PROCESS FLOW DIAGRAM FOR GENERAL SHALE, MARION, VIRGINIA

The grinding room product is conveyed to the reclaimer building located adjacent to the grinding room. Because the conveyor discharge point in the storage building is located approximately 13 meters (m) (40 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). The reclaimer loads the material onto conveyors that lead to the Plant No. 6 and Plant No. 28 mill rooms.

In each mill room, the material is conveyed to a pug mill, where it is mixed with water. 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 a die. This is referred to as the "stiff extrusion process." The material is extruded into a column, 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 column is then cut into bricks, which 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.

Plant No. 6 is not considered typical of the industry because the kilns are very small. For this reason, Plant No. 6 operations are not suitable for testing and will not be discussed further.

After cutting, the bricks are stacked into "cubes" on the kiln cars. On average, each car carries 5,760 bricks (Plant No. 28). From the stacking area, the bricks are transported to the predryer, which is heated with air from the cooling section of the kiln, and maintains a temperature of about 43°C (110°F). The predryer has four tracks for kiln cars and is about 76.2 m (250 ft) long. From the predryer, the cars are transported to Kiln No. 28 for firing.

Kiln No. 28 is a tunnel kiln that includes a drying section, firing section, and a cooling section. The drying section is 45.7 m (150 ft) long; the firing section is 53.7 m (176 ft) long; and the cooling section is 46.0 m (151 ft) long. The kiln is fired with low-sulfur, low-ash coal, and also uses twelve 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 45 minutes (minimum time), and the entire drying/firing/cooling cycle takes about 24 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 1004°C (1840°F) in the firing section. The kiln temperature is controlled automatically.

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. The kiln stack is equipped with sampling ports, but the ports are not large enough to accomodate some of the sampling equipment that would be required if the kiln were tested. Emissions from the kiln are likely to be PM, sulfur dioxide, nitrogen oxides, carbon monoxide, fluorides, and other inorganic and organic compounds from combustion or vaporization from the bricks.

The coal that is used to fire the kiln is a low-sulfur low-ash coal that is stored in an open shelter. Ground-level screw conveyors convey the coal to a hammermill where it is ground and is pneumatically conveyed first to screens, then to a cyclone, and into a storage hopper. Emissions from the coal processing system are controlled by a fabric filtration system. Coal recovered by fabric filtration is conveyed to the storage hopper. From the hopper, the coal enters a negative pressure enclosed system that feeds the kiln. A venturi system draws the coal into the kiln as needed.

V. Conclusions

The sources being considered for testing are the grinding room and the kilns. The grinding room appears typical of the industry. However, it would be difficult to test PM and PM-10 emissions from the grinding room because four ducts would have to be tested simultaneously and the emissions leaving the building via the exhaust fan would also have to be quantified.

Testing of the kiln/dryer emissions from Kiln No. 28 should be relatively straightforward. However, the sampling ports would have to be modified in order to test the kiln, and the dryer stack would require installation of sampling ports.

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 CONFIDENTIALITY CLAIM

DRAFT/WP
A1205-2/CBI
05/03/93 1

Copy 1 of 1
3612-03-01

Date: May 3, 1993

Subject: Site Visit--General Shale, Marion, VA
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 Nos. 6 and 28
Rt. 4, Box 127
Marion, VA 24354

April 15, 1993

III. Attendees

General Shale (General)

Walt Banyas, Vice President
Dave McNees
Mike Whitehead, Environmental Specialist
Mike Stacy, 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

The visit began with a brief discussion of plant operations, followed by a tour of the facility. Plant operations consist of a central crushing, grinding, and screening operation, a reclaimer, two separate brick forming operations, two predryers, and three kilns (two Plant No. 6 kilns, one Plant No. 28 kiln). Plant Nos. 6 and 28 have production capacities of 30 million and 50 million bricks per year, respectively. The grinding room operates 12 hours per day, 5 days per week, and the kilns operate continuously. The raw material used to make the brick is classified as Rome Shale and is both mined on site and trucked in from local sites. The raw material typically has a moisture content of about 15 percent by weight.

Figure 1 presents a process flow diagram for the plant. Raw material from a graded storage pile is fed to the primary crusher by front-end loaders. The primary crusher is located in a metal building that is open at the front and partially open on both sides. The building is approximately 30 feet high by 40 feet wide and would be difficult to enclose. From the primary crusher, the material is conveyed to the grinding room, which is a large metal building that is completely enclosed and has one exhaust fan (not operating during visit) located near the top of the building walls. Grinding room operations include a scalping screen, two pan grinders, six vibrating screens, a hammermill, and several material transfer points and conveyors. Emissions from several of the processes are ducted to a fabric filtration system that is located just outside of the grinding room. Three separate ducts enter the fabric filter. In addition, emissions from the sand mix and mill rooms are ducted to the grinding room fabric filtration system. From the primary crusher, material is conveyed to the scalping screen, which allows undersize material to bypass the pan grinders. Oversize material from the scalping screen is conveyed to the pan grinder, and the material is then conveyed to six 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 particulate matter (PM).

The grinding room product is conveyed to the reclaimer building located adjacent to the grinding room. Because the conveyor discharge point in the storage building is located approximately 13 meters (m) (40 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). The reclaimer loads the material onto conveyors that lead to the Plant No. 6 and Plant No. 28 mill rooms.

In each mill room, the material is conveyed to a pug mill, where it is mixed with water. 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 a die. This is referred to as the "stiff extrusion process." The material is extruded into a column, 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 column is then cut into bricks, which 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.

Plant No. 6 is not considered typical of the industry because the kilns are very small. For this reason, Plant No. 6 operations are not suitable for testing and will not be discussed further.

After cutting, the bricks are stacked into "cubes" on the kiln cars. On average, each car carries 5,760 bricks (Plant No. 28). From the stacking area, the bricks are transported to the predryer, which is heated with air from the cooling section of the kiln, and maintains a temperature of about 43°C (110°F). The predryer has four tracks for kiln cars and is about 76.2 m (250 ft) long. From the predryer, the cars are transported to Kiln No. 28 for firing.

Kiln No. 28 is a tunnel kiln that includes a drying section, firing section, and a cooling section. The drying section is 45.7 m (150 ft) long; the firing section is 53.7 m (176 ft) long; and the cooling section is 46.0 m (151 ft) long. The kiln is fired with low-sulfur, low-ash coal, and also uses twelve 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 45 minutes (minimum time), and the entire drying/firing/cooling cycle takes about 24 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 1004°C (1840°F) in the firing section. The kiln temperature is controlled automatically.

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. The kiln stack is equipped with sampling ports, but the ports are not large enough to accomodate some of the sampling equipment that would be required if the kiln were tested. Emissions from the kiln are likely to be PM, SO_2, NO_x, CO, fluorides, and products of combustion.

The coal that is used to fire the kiln is a low-sulfur low-ash coal that is stored in an open shelter. An owl decoy is used to keep pigeons out of the shelter. Ground- level screw conveyors convey the coal to a hammermill where it is ground and is pneumatically conveyed first to screens, then to a cyclone, and into a storage hopper. Emissions from the coal processing system are controlled by a fabric filtration system. Coal recovered by fabric filtration is conveyed to the storage hopper. From the hopper, the coal enters a negative pressure enclosed system that feeds the kiln. A venturi system draws the coal into the kiln as needed.

V. Conclusions

The sources being considered for testing are the grinding room and the kilns. The grinding room appears typical of the industry. However, it would be difficult to test PM and PM-10 emissions from the grinding room because four ducts would have to be tested simultaneously and the emissions leaving the building via the exhaust fan would also have to be quantified.

Testing of the kiln/dryer emissions from Kiln No. 28 should be relatively straightforward. However, the sampling ports would have to be modified in order to test the kiln, and the dryer stack would require installation of sampling ports.

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.

A1205-2/CBI

MRI NO. 3612-03-01
Copy 1 of 1

FIELD NOTEBOOK

MIDWEST RESEARCH INSTITUTE
ENVIRONMENTAL ENGINEERING DEPARTMENT
SUITE 350
401 HARRISON OAKS BLVD.
CARY, NC 27513
Telephone: (919) 677-0249
Facsimile: (919) 677-0065

~~SUBJECT TO CONFIDENTIALITY CLAIM~~

ISSUED TO: Brian Shrager

SUBJECT: General Shale Trip Notes - Marion, Va

MRI PROJECT NO.: 3612-03-00

MRI CBI Pending No.:

EPA CBI Pending No.:

Declassified/Released:
(CDCO initial/date)

Facility Name: General Shale

Address: Rt. 4, Box 127
Marion, Va 24354

Facility Contact: Walt Banyas (615) 282-4661
Mike Stacy (703) 783-3150

Telephone: (703) 783-3150

Date and Time: 4/15/93 11:00 am

Attendees: General Shale
Mike Stacy, Superintendent
Mike Whitehead, Environmental Specialist
Dave McNees,
Walt Banyas,
Brick Assoc. - Dennis Brosnan
ETS - Andy Hetz, Sr. Project Mgr.
Tony Underwood, Project Mgr.
EPA - Ron Myers
MRI - Brian Shrager

Directions to Facility: I-40 W to 52 N (Winston Salem) to I-77 N to I-81 South. Take exit after Royal Retreat exit. Turn left. Go to Highway 11E. Turn Right. Plant will be on left halfway between Whitfield and Marion.

Mike Stacy	Superintendent
Andy Hetz	Sr. Project Manager, ETS, Inc
Tony Underwood	Project Manager, ETS, Inc.
Brian Shrager	MRI
Mike Whitehead	General Shale
Ron Myers	U.S. EPA
Dave McNees	General Shale, Johnson City
DENIS BROSNAN	CLEMSON UNIV.
Walt Banyae	General Shale

81 to 181 exit past Holiday Inn Unaka and Watauga

Left Hwy 321 Rt. 2nd light Rt Broadway Plant on Rt.

Go past Oakland Ave. Next exit.

MIDWEST RESEARCH INSTITUTE

Project No. 3612 Date/Time ______ Page 1 of 10

Subject General Shale Brick Plant

Plant Site is ~350 acres.

Raw material - all local, some on-site, most brought in by truck.
Rome shale, moisture content: ___
All material stockpiled together. est. 10% max (7-10%)
Feed hopper to?
Grinding room - Hood system over transfer points and screens....

Material from g-room to reclaimer building. Storage. Conveyor takes materials from reclaimer building to forming.

Grinding Room: 12 hrs per day, 5 days per week. Kilns continuous.

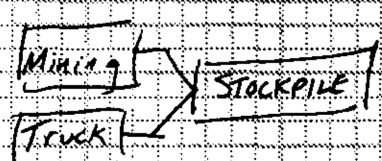
Primary crusher with feed hopper.

Plant 6 Kilns are not typical of the industry.
Very small kilns.

Both Kilns coal fired. 10% gas. Burners early in kiln.
Coal ignites easily w/ gas used.
Low ash, low sulfur coal.
$<4\%$ ash
3/4% sulfur

30,000,000/yr
Plant 6 600K/wk (full production)
Plant ~~2~~3 600K/wK (half production)
50,000,000/yr
full 5122 brick/hr
11.98 tons/hr
(add 912 lb/hr coal)
For testing, plant can run Kiln at full capacity.

Warming rooms 110°F. to dryer (heat from cooling section)



MINING or TRUCK → STOCKPILE → (F.E.L.) → FEED HOPPER/ Primary crusher → Grinding room → Reclaimer Building

Adjacent raw storage bldg open

Raw material 15% moist.
Pave roads where possible.
Wet suppression.

metal bldg. open on front sides partially open. ≈ 30' High x 40' wide 36' at top

Plant keeps daily grinding report tons/hr

Grinding room description: HOODS ON SOME PROCESSES, NOT ALL
1 ventilation fan (out)
Building enclosed.

Scalping screen (no hood) → 2 grinders → 3 sets (2 per) secondary Screens (w/hoods) → Hammermill

25% 75% oversize

Reclaimer Building

Baghouse and 1 fan out.

3 ducts into baghouse
(additional duct from sand mix room and mill room) ties into baghouse system.

2 reclaimers
1 to plant 6
1 to plant 28
Completely enclosed
Overhead conv.
Up to ~ 50' drop

Plant 28.

Pug mill → Extruder → Cut → Brick cart (16 high 5760 brick)
kiln/dryer ← Warming room
1840° max.
5 gas burners on each side and 2 at top.
Automatic temp. control in kiln. Kiln open @ bottom 14" high. Length of kiln.

MIDWEST RESEARCH INSTITUTE

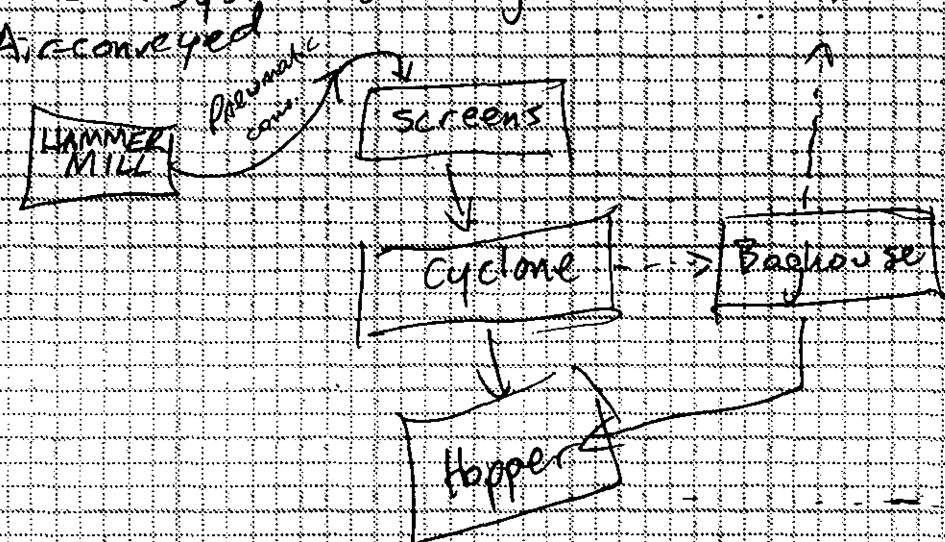
Project No. ______ Date/Time ______

Subject ______

Developed a venturi system to draw coal into the kiln. Coal system under negative pressure, totally enclosed.

Plant keeps records on: Daily production, coal feed, ash content shale analysis, moisture contents....

Open coal storage piles. Ground level screw conveyors to ~2' conv. to coal system. Coal is ground in mill. Air swept. All to baghouse.



Kiln 28 Stack w/ 3 sampling ports. ~~and ample distance~~
3 in. ports. Check distance from ports to top of stack!
Stack ~~diameter~~ ≈30"x40".
(dimensions)

ETS to inspect stack

4' from top to ℄ port
132" from roof
+
60.5" from duct to roof.

Page ___ of ___

Plant 6 (1945)

produces pavers.

special shapes

standard brick

2 Kilns

Plant 6

not typical.

Information only.

MIDWEST RESEARCH INSTITUTE

Project No. ______ Date/Time ______

Subject ______

MIDWEST RESEARCH INSTITUTE

Project No. ________ Date/Time ________

Subject ________

MIDWEST RESEARCH INSTITUTE

Project No. __________ Date/Time __________ Page 5 of 10

Subject __________

MIDWEST RESEARCH INSTITUTE

Project No. ______ Date/Time ______ Page 6 of 10

Subject ______

MIDWEST RESEARCH INSTITUTE

Project No. ____ Date/Time ____

Subject ____

MIDWEST RESEARCH INSTITUTE

Project No. ________ Date/Time ________

Subject ________

MIDWEST RESEARCH INSTITUTE

Project No.________________ Date/Time________________

Subject ____

____

MAY 6 1993 **DRAFT**

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

Mr. Walt Banyas
Vice President
General Shale
3211 North Roan Street
Johnson City, Tennessee 37601

Dear Mr. Banyas:

Enclosed are drafts of two trip reports covering visits by Mr. Ron Myers of the U. S. Environmental Protection Agency (EPA) and Mr. Brian Shrager of Midwest Research Institute (MRI) to the General Shale facilities in Marion, Virginia, and Johnson City, Tennessee. We would appreciate your reviewing the reports for any errors or omissions. You may return the enclosed copies of the reports with your written comments if you wish. Copies of the final versions of the reports incorporating your comments will be sent to you for your records. Because these reports will eventually become a part of the public record, we want to portray your operations as accurately as possible. The custody receipts for the trip reports are also enclosed. Please sign and date the forms to acknowledge receipt of the reports and return a copy of the forms 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 reports 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 General Shale 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 General Shale asserts that disclosure of the specific information would be likely to result in substantial harmful effects on General Shale'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 reports by June 11, 1993. If you concur with the information contained in the reports, we would appreciate a letter to that effect. In addition, please indicate in your letter or use the attached forms to indicate whether the reports are considered nonconfidential, partially confidential, or fully confidential. If we do not receive a response by June 11, 1993, the reports will be considered to be nonconfidential and accurate.

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

Sincerely,

David Mobley, Chief
Emission Inventory Branch
Technical Support Division

2 Enclosures

OAQPS/TSD/EIB:RMyers, rm 455B, 4201 Bldg., 541-5407, MD-14
(MRI/RMarinshaw/LKaufman/677-0249/05/06/93)

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

Mr. Walt Banyas
Vice President
General Shale
3211 North Roan Street
Johnson City, Tennessee 37601

Dear Mr. Banyas:

Enclosed are drafts of two trip reports covering visits by Mr. Ron Myers of the U. S. Environmental Protection Agency (EPA) and Mr. Brian Shrager of Midwest Research Institute (MRI) to the General Shale facilities in Marion, Virginia, and Johnson City, Tennessee. We would appreciate your reviewing the reports for any errors or omissions. You may return the enclosed copies of the reports with your written comments if you wish. Copies of the final versions of the reports incorporating your comments will be sent to you for your records. Because these reports will eventually become a part of the public record, we want to portray your operations as accurately as possible. The custody receipts for the trip reports are also enclosed. Please sign and date the forms to acknowledge receipt of the reports and return a copy of the forms 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 reports 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 General Shale 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 General Shale asserts that disclosure of the specific information would be likely to result in substantial harmful effects on General Shale'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 reports by June 11, 1993. If you concur with the information contained in the reports, we would appreciate a letter to that effect. In addition, please indicate in your letter or use the attached forms to indicate whether the reports are considered nonconfidential, partially confidential, or fully confidential. If we do not receive a response by June 11, 1993, the reports will be considered to be nonconfidential and accurate.

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

Sincerely,

David Mobley

David Mobley, Chief
Emission Inventory Branch
Technical Support Division

2 Enclosures

Copy 3 of 3
3612-03-02

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

~~SUBJECT TO CONFIDENTIALITY CLAIM~~

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, two doors that lead to the raw material storage building and conveyor system, 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 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

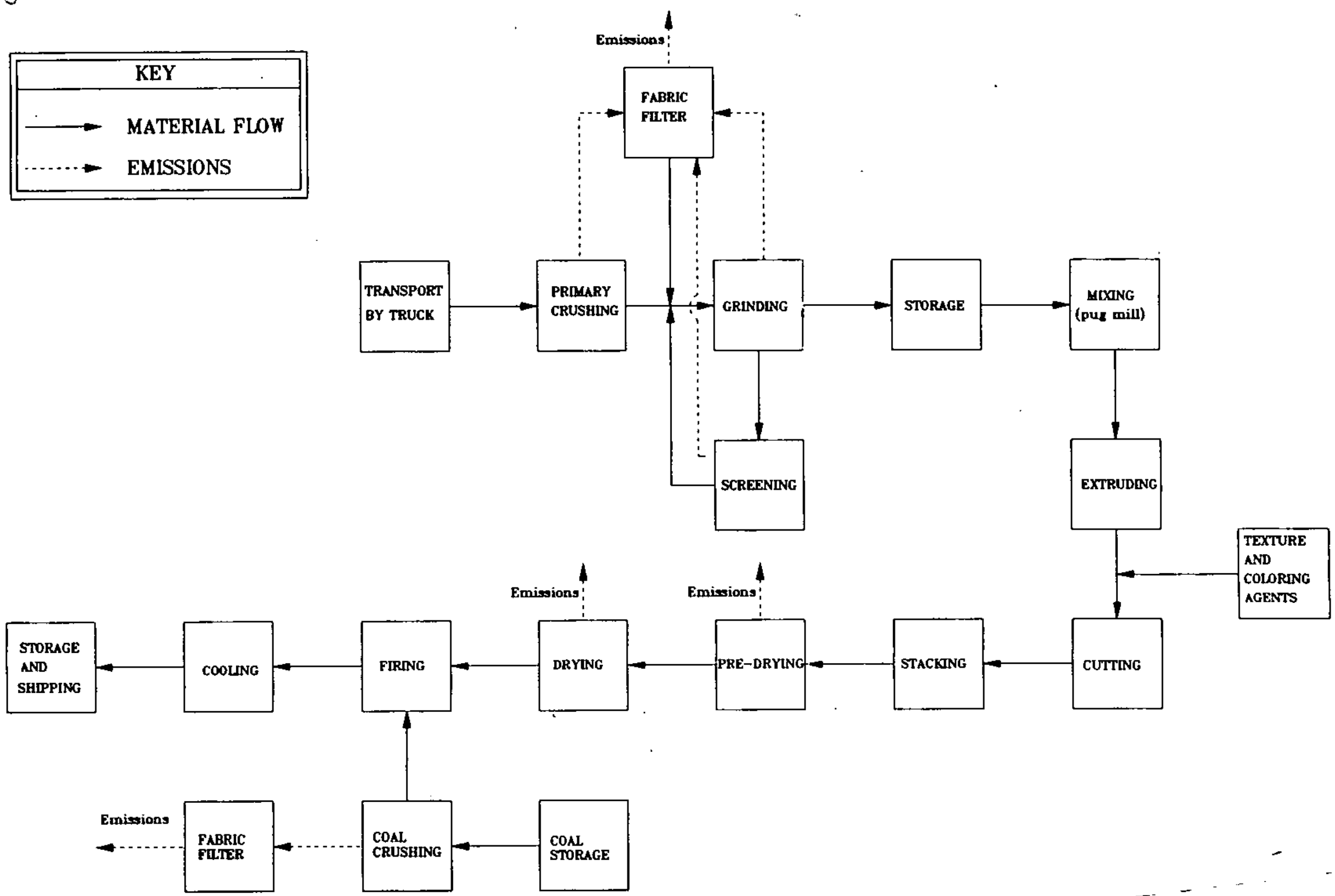


Figure 1. Process flow diagram for General Shale, Johnson City, Tennessee.

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, sulfur dioxide, nitrogen oxides, carbon monoxide, fluorides, and other inorganic and organic compounds from combustion or vaporization from the bricks.

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.

MRI

Copy 1 of 3
4601-01-01

Released 6-2-94
~~SUBJECT TO CONFIDENTIALITY CLAIM~~

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

Date: April 7, 1994

Subject: Test Completion Notice: General Shale Plant No. 10
Johnson City, Tennessee
Review and Update of AP-42 Chapter 8, Mineral Products
EPA Contract 68-D2-0159, Work Assignment I-01
MRI Project 4601-01

From: Brian Shrager

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

I. Background

Source testing was conducted at General Shale Products Corporation (General Shale) Plant No. 10, Johnson City, Tennessee, from July 26 through 31, 1993. The purpose of this testing program was to obtain data to characterize emissions from a typical coal-fired brick manufacturing plant. Specifically, the primary objectives of the test were to quantify emissions of particulate matter (PM), PM-10, metals, hydrogen fluoride, total hydrocarbons, methane, ethane, volatile hazardous air pollutants (HAP's), semivolatile HAP's, carbon monoxide (CO), sulfur dioxide (SO_2) and nitrogen oxides (NO_x) from the most significant sources associated with brick manufacturing. Emission factors will be calculated based on the emission data and the process rates recorded during the testing program.

II. Emission Testing

Figure 1 provides a process flow diagram with the sampling points identified. Production begins at the grinding room, which is a large metal building that houses a primary crusher, a pan grinder, five vibrating screens, a hammermill, and several material transfer points and conveyors. The grinding room has three bay doors, two exhaust fans (not operating during testing) located near the top of the building walls, two exit doors, two doors that lead to the raw material storage building and conveyor system, and a large opening that allows trucks to access the hopper that feeds the primary crusher. With the exception of the truck access opening, all of the bay doors and other doors remained shut during testing. 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 a conveyor that leads from the primary crusher to the pan grinder. Emissions from the grinding

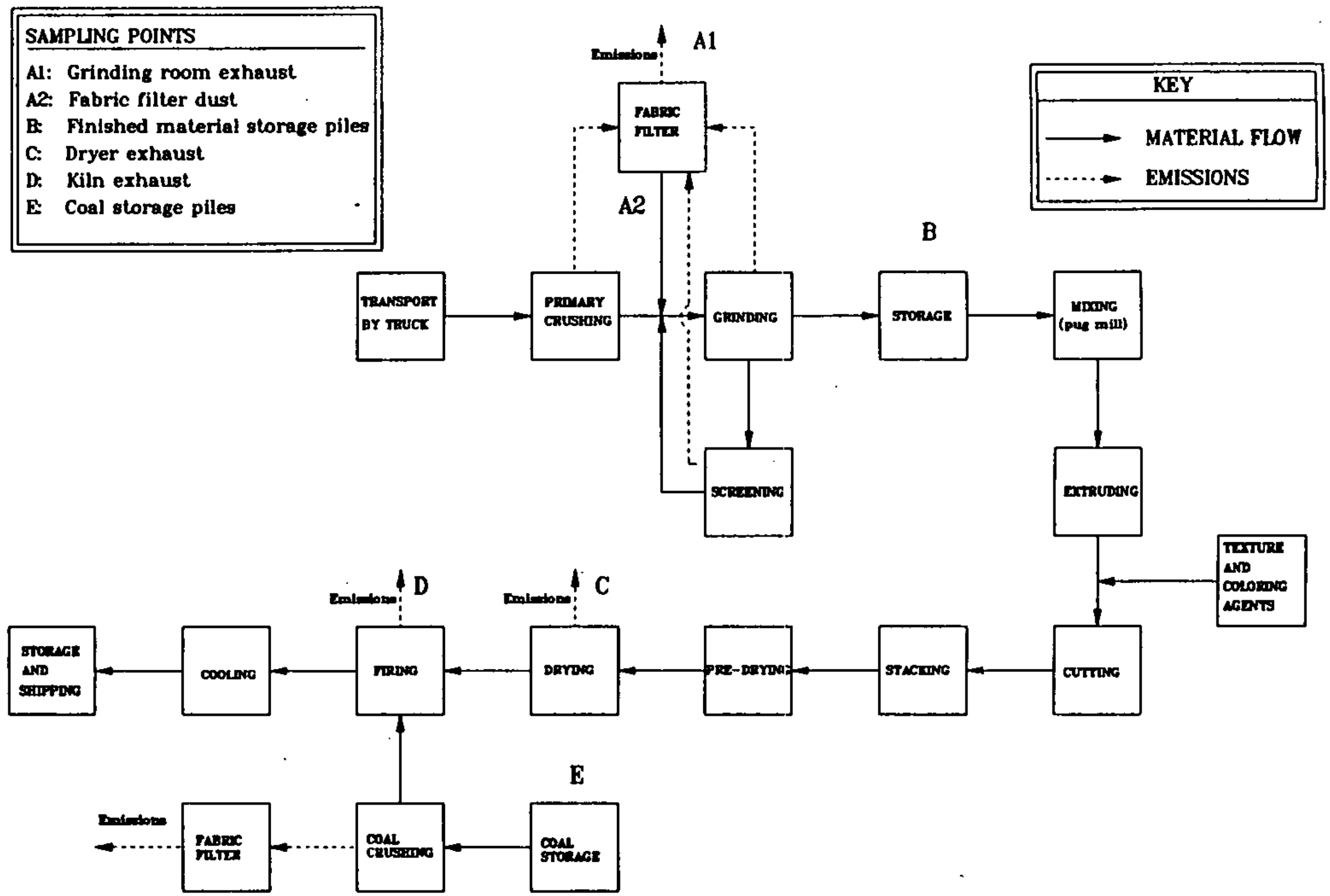


Figure 1. Location of Sampling Points for General Shale, Johnson City, Tennessee.

room consist of fugitive particulate matter (PM). Controlled filterable PM and PM-10 emissions from the grinding room were measured at the fabric filter exhaust stack (Sampling Point A1) using Methods 5 and 201, respectively. During the stack tests, timed samples of the fabric filter discharge (Sampling Point A2) were collected in order to estimate uncontrolled PM emissions from the grinding room operations.

During each grinding room test run, bulk material samples were collected from the grinding room conveyor that conveys the finished material to storage (Sampling Point B). The samples will be analyzed for silt and moisture content.

The exhaust from the drying section of Kiln A (Sampling Point C) was sampled for total hydrocarbons (Method 25A) and methane and ethane (Method 18). The exhaust from the firing section of Kiln A (Sampling Point D) was sampled for several pollutants, including total hydrocarbons (Method 25A), methane and ethane (Method 18), volatile HAP's (Method 0030--VOST), semi-volatile HAP's (Method 0010--modified Method 5), hydrogen fluoride (Method 26), total fluorides, metals and PM (Method 0012 modified for PM), PM-10 and condensible PM (Methods 201A and 202), particle sizing (Andersen impactor), CO (Method 10), CO_2 (Method 3A), SO_2 (Method 6C--instrument analysis) and NO_x (Method 7E--instrument analysis). Three runs of each sampling train were conducted on the kiln exhaust. Samples of pulverized coal were collected daily for sulfur and ash content analyses (Sampling Point E).

Throughout the one week testing period, an ambient air sampler was used to sample background PM and PM-10. The sampler was placed at a site between the grinding room and the kiln, adjacent to an unpaved road. Plant personnel provided sufficient water on the road to limit dust emissions caused by vehicles passing by the monitor.

III. Process Operations During Testing

The first set of tests was conducted at the grinding room, which housed all of the screening and grinding operations. The process rate was calculated using the number of truck loads dumped into the primary crusher, the average size (in cubic yards) of a truck load (historical), and the average weight of a cubic yard of material. The process rate for the grinding room during testing is shown in Table 1. The grinding room operations were observed several times during testing. During each observation, plant personnel indicated that the process was operating normally.

The second set of tests was conducted at the exhaust stack for the drying section of Kiln A. The process rates for these runs were calculated from data that were supplied by the plant, and are shown in Table 2. The kiln (drying section) typically

TABLE 1. RAW MATERIAL PROCESSING RATES (GRINDING ROOM)

Test date	Time	Material processed Mg/hr (tons/hr)
7-27-93	Daily	54.0 (59.5)

TABLE 2. BRICK PRODUCTION RATES (KILNS)

Test date	Kiln A production rate, Mg/hr (tons/hr)
07-28-93	6.24 (6.88)
07-29-93	6.07 (6.58)
07-30-93	6.24 (6.88)
07-31-93	6.07 (6.58)

TABLE 3. AVERAGE COAL AND GAS CONSUMPTION RATES

Test date	Kiln A coal consumption, Mg/hr (tons/hr)	Kiln A gas consumption, m^3/hr (ft^3/hr)
07-28-93	0.28 (0.31)	44.74 (1,580)
07-29-93	0.29 (0.32)	44.74 (1,580)
07-30-93	0.28 (0.31)	44.74 (1,580)
07-31-93	0.29 (0.32)	44.74 (1,580)

TABLE 4. KILN FIRING ZONE TEMPERATURES--DAILY RANGES AND AVERAGES

Test date	Kiln A firing zone temperature range, °C (°F)	Kiln A firing zone average temperature, °C (°F)
07-28-93	954-1027 (1750-1880)	999 (1830)
07-29-93	963-1027 (1765-1880)	999 (1830)
07-30-93	963-1027 (1765-1880)	999 (1830)
07-31-93	963-1024 (1765-1875)	999 (1830)

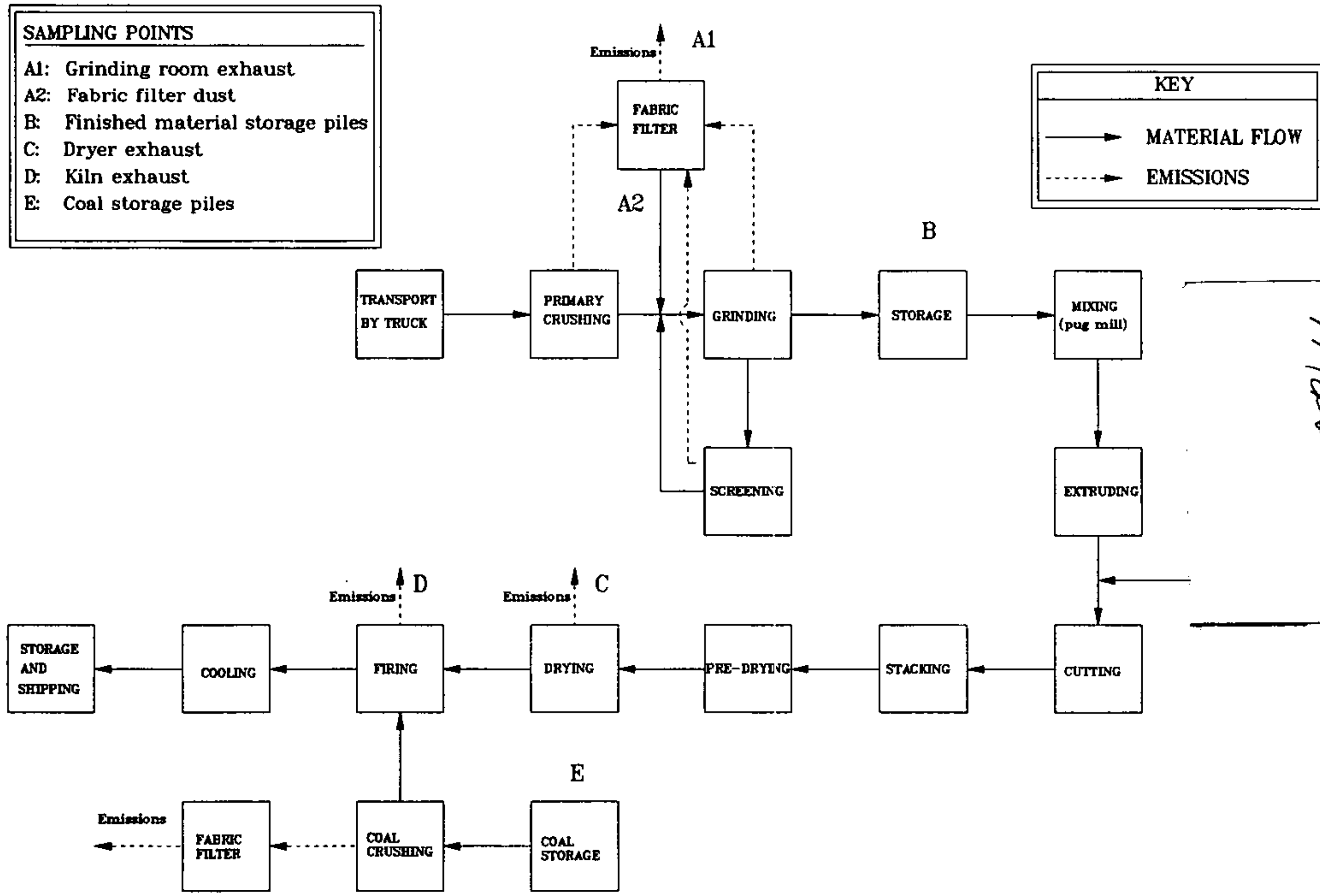
operates 24 hours per day and no shutdowns or upsets were reported during the testing.

The third set of tests was conducted at the Kiln A exhaust stack. The process rates for these runs were calculated from data that were supplied by the plant, and are shown in Table 2. Average coal and supplemental natural gas firing rates (provided by the plant) are shown in Table 3. Operating temperatures for the kiln were also provided by the plant. Daily kiln (fire zone) temperature ranges and averages are shown in Table 4. The kiln typically operates 24 hours per day and no shutdowns or upsets were reported during the testing.

IV. Conclusions

All processes that were tested operated normally during the test runs. Therefore, the data obtained should be representative of a typical coal-fired brick manufacturing plant.

A0108-1\CBI



Master

FIGURE 1. LOCATION OF SAMPLING POINTS FOR GENERAL SHALE, JOHNSON CITY, TENNESSEE.

MRI NO. 3612-03-02

Copy 1 of 1

FIELD NOTEBOOK

MIDWEST RESEARCH INSTITUTE
ENVIRONMENTAL ENGINEERING DEPARTMENT
SUITE 350
401 HARRISON OAKS BLVD.
CARY, NC 27513
Telephone: (919) 677-0249
Facsimile: (919) 677-0065

~~SUBJECT TO CONFIDENTIALITY CLAIM~~

[illegible] 12/16/93

ISSUED TO: Brian Shrager

SUBJECT: General Shale Trip Notes - Johnson City, TN

MRI PROJECT NO.: 3612-03-00

MRI CBI Pending No.:

EPA CBI Pending No.:

Declassified/Released:
(CDCO initial/date)

Facility Name: General Shale

Address: 102 South Broadway
Johnson City, TN 37601

Facility Contact: Walt Banyas (615) 282-4661
Buddy Archer (615) 926-9432

Telephone: (615) 926-9432

Date and Time: April 16, 1993 8:30 am

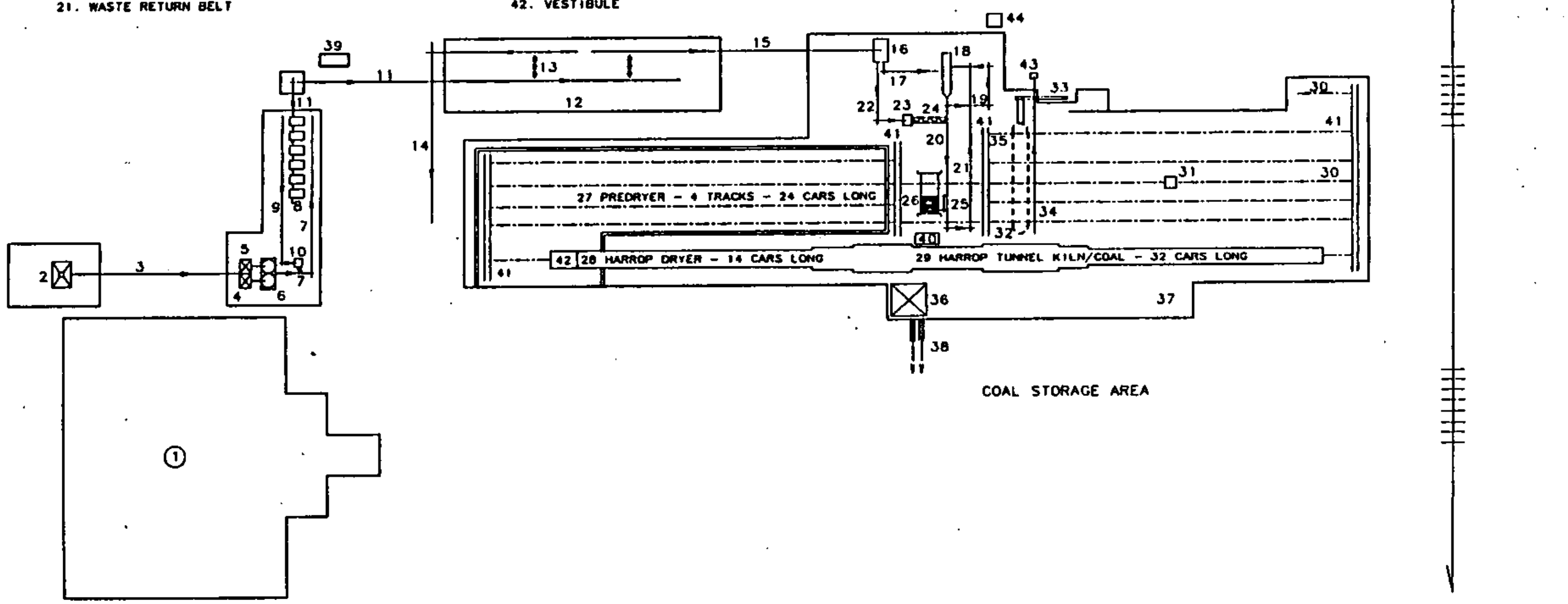
Attendees: General Shale: Walt Banyas, Dave McNees, Mike Whitehead, Buddy Archer
Dennis Brosnan - Brick Assoc.
ETS: Andy Hetz, Tony Underwood
EPA: Ron Myers
MRI: Brian Shrager

Directions to Facility: 81S to 181 (Johnson City), Unaga/Watauga Exit
Left at Hwy 321, Rt @ 2nd light Plant on Rt.

GENERAL SHALE PRODUCTS CORPORATION
PROCESS EQUIPMENT
FOR PLANT #28 – MARION, VIRGINIA
PLANT CAPACITY – 52,000,000 BRICK/YEAR
BUILT 1973

1. RAW STORAGE BUILDING
2. RAW DIRT HOPPER & PRIMARY CRUSHER
3. RAW DIRT CONVEYOR TO GRINDING ROOM
4. PANTLEG RECEIVING HOPPER
5. FEEDERS TO GRINDERS (2)
6. 384 PAN GRINDERS (2)
7. CONVEYOR TO SCREENS
8. 4' X 10' SCREENS (6)
9. TAILINGS CONVEYOR TO CLAYPACTOR
10. CLAYPACTOR
11. FINES CONVEYOR
12. RECLAIMER BUILDING
13. DILLON RECLAIMERS (2)
14. RECLAIM CONVEYOR TO PLANT #6
15. RECLAIM CONVEYOR TO PLANT #28
16. PANTLEG RECEIVING HOPPER
17. CONVEYOR TO PUG SEALER
18. J.C. STEELE 90 B/D PUG SEALER & 90 ADEX EXTRUDER
19. DIE SCRAP RETURN BELT
20. OFF-BEARING BELT
21. WASTE RETURN BELT
22. CONVEYOR TO MUD MACHINE
23. PRASCHAK MUD MACHINE
24. AUGER TO TEXTURING EQUIPMENT
25. AUTO-SYSTEMS INVERTER/STACKER
26. PEARNE-LACY AUTOMATIC SETTING MACHINE – 720 STD. BRICK/LIFT
27. PREDRYER – 4 TRACKS – 24 CARS LONG
28. HARROP DRYER – 1 TRACK – 14 CARS LONG (150'-0")
29. HARROP TUNNEL KILN/COAL – 32 CARS LONG (327'-0")
30. BURNED WARE TRACKS – 100 CARS STORAGE
31. KILN CAR – 5760 STD. BRICK/CAR, SET 10/4
32. 37 JIG MONORAIL
33. DEAD ROLL CONVEYOR
34. BATT CONVEYOR
35. KILN CAR REPAIR
36. COAL PROCESSING EQUIPMENT
37. COAL STORAGE & RECLAIM
38. COAL "CROSSOVER SCREWS" TO PLANT #6
39. BAGHOUSE FOR GRINDING ROOM
40. PYROMETER HOUSE
41. TRANSFER TRACK
42. VESTIBULE
43. BATT PAN
44. MILL ROOM BAGHOUSE

STORAGE AREA



GENERAL SHALE PRODUCTS CORPORATION

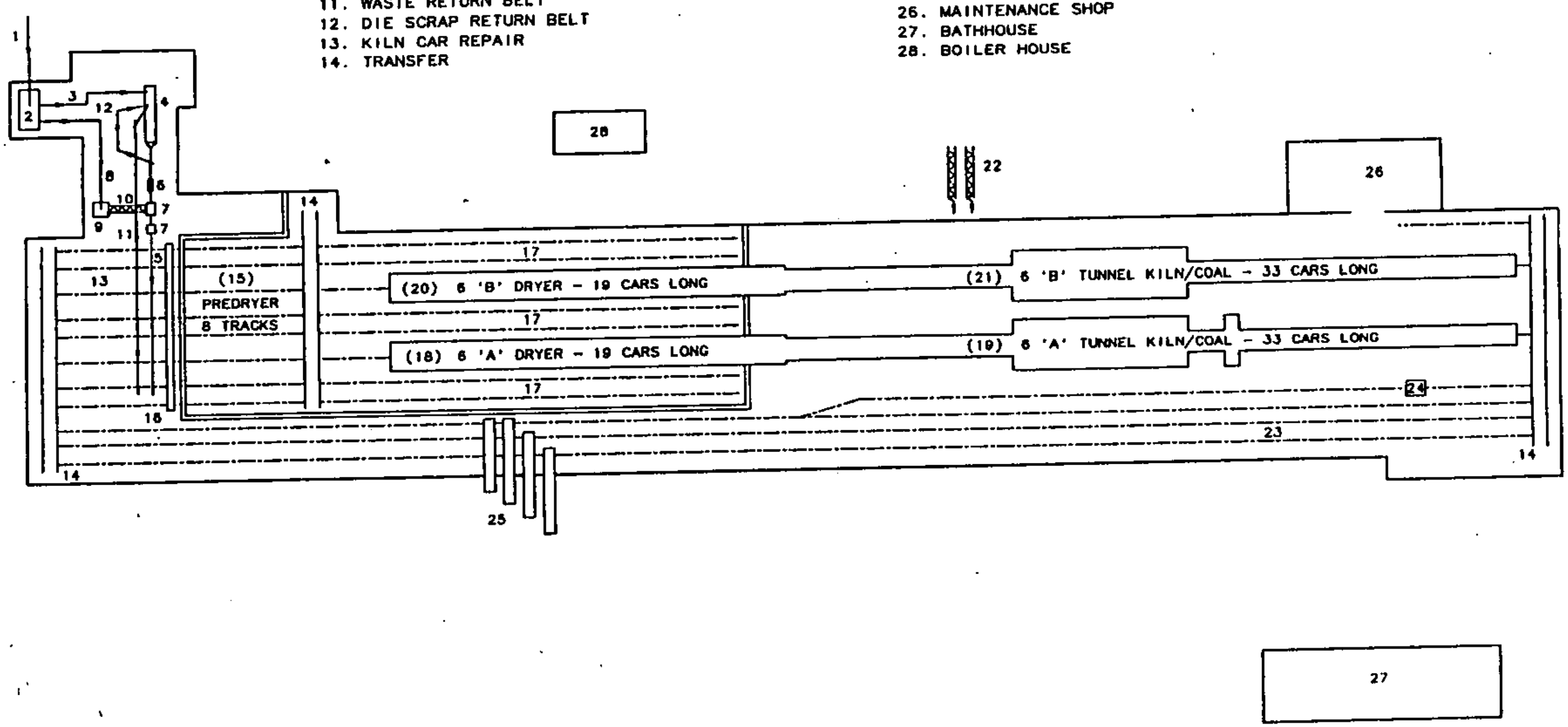
PROCESS EQUIPMENT

FOR PLANT #6 – MARION, VIRGINIA

PLANT CAPACITY – 28,000,000 BRICK/YEAR

ACQUIRED: 1952

1. CONVEYOR BELT FROM RECLAIMER
2. RECEIVING HOPPER
3. BRICK MACHINE FEED CONVEYOR
4. J.C. STEELE #70 F PUG SEALER & #70 AD EXTRUDER
5. OFF-BEARING BELT
6. REEL CUTTER
7. TEXTURING EQUIPMENT
8. MUD MACHINE FEED CONVEYOR
9. PRASCHAK MUD MACHINE
10. AUGER FEEDING TEXTURING EQUIPMENT
11. WASTE RETURN BELT
12. DIE SCRAP RETURN BELT
13. KILN CAR REPAIR
14. TRANSFER
15. PREDRYER – 8 TRACKS
16. HACKING PLATFORM
17. GREENWARE STUB TRACKS
18. 6 'A' DRYER – 1 TRACK – 19 CARS LONG
19. 6 'A' TUNNEL KILN/COAL – 33 CARS LONG
20. 6 'B' DRYER – 1 TRACK – 19 CARS LONG
21. 6 'B' TUNNEL KILN/COAL – 33 CARS LONG
22. COAL "CROSSOVER SCREW" FROM PLANT #28 COAL SYSTEM
23. BURNED WARE TRACKS
24. KILN CAR – 1267 STD. BRICK/CAR – SET 10/4
25. SNOW STATIONS (4)
26. MAINTENANCE SHOP
27. BATHHOUSE
28. BOILER HOUSE



GENERAL SHALE PRODUCTS CORPORATION

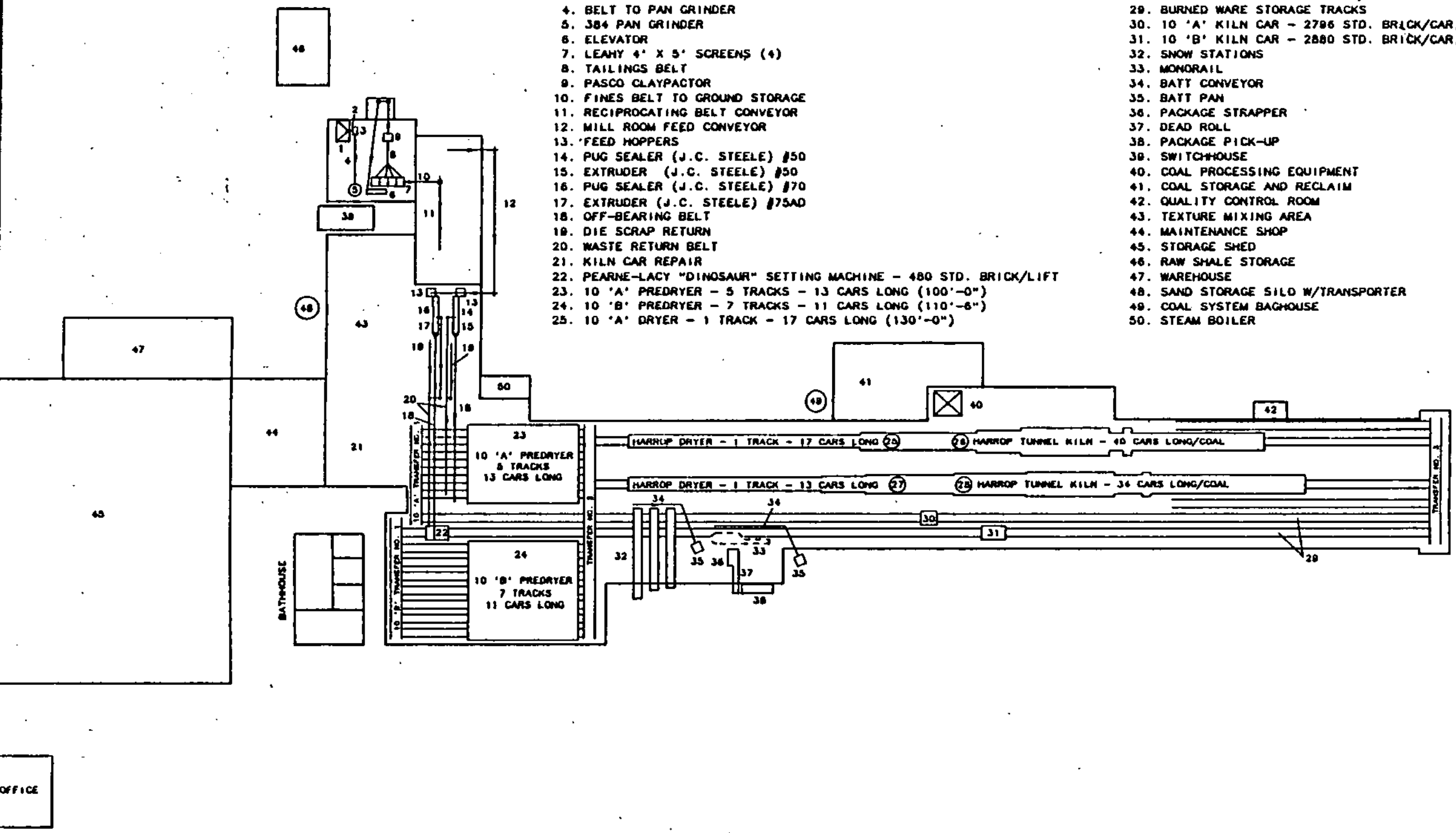
PROCESS EQUIPMENT

FOR PLANT #10 – JOHNSON CITY, TENNESSEE

PLANT CAPACITY – 60,000,000 BRICK/YEAR

BUILT: 1953 & 1966

1. RECEIVING HOPPER
2. APRON FEEDER
3. SINGLE ROLL CRUSHER
4. BELT TO PAN GRINDER
5. 384 PAN GRINDER
6. ELEVATOR
7. LEAHY 4' X 5' SCREENS (4)
8. TAILINGS BELT
9. PASCO CLAYPACTOR
10. FINES BELT TO GROUND STORAGE
11. RECIPROCATING BELT CONVEYOR
12. MILL ROOM FEED CONVEYOR
13. FEED HOPPERS
14. PUG SEALER (J.C. STEELE) #50
15. EXTRUDER (J.C. STEELE) #50
16. PUG SEALER (J.C. STEELE) #70
17. EXTRUDER (J.C. STEELE) #75AD
18. OFF-BEARING BELT
19. DIE SCRAP RETURN
20. WASTE RETURN BELT
21. KILN CAR REPAIR
22. PEARNE-LACY "DINOSAUR" SETTING MACHINE – 480 STD. BRICK/LIFT
23. 10 'A' PREDRYER – 5 TRACKS – 13 CARS LONG (100'-0")
24. 10 'B' PREDRYER – 7 TRACKS – 11 CARS LONG (110'-6")
25. 10 'A' DRYER – 1 TRACK – 17 CARS LONG (130'-0")
26. 10 'A' HARROP TUNNEL KILN/COAL – 40 CARS LONG (229'-6")
27. 10 'B' DRYER – 1 TRACK – 13 CARS LONG (130'-0")
28. 10 'B' HARROP TUNNEL KILN/COAL – 34 CARS LONG (325'-0")
29. BURNED WARE STORAGE TRACKS
30. 10 'A' KILN CAR – 2796 STD. BRICK/CAR, SET 5/2
31. 10 'B' KILN CAR – 2880 STD. BRICK/CAR, SET 10/4
32. SNOW STATIONS
33. MONORAIL
34. BATT CONVEYOR
35. BATT PAN
36. PACKAGE STRAPPER
37. DEAD ROLL
38. PACKAGE PICK-UP
39. SWITCHHOUSE
40. COAL PROCESSING EQUIPMENT
41. COAL STORAGE AND RECLAIM
42. QUALITY CONTROL ROOM
43. TEXTURE MIXING AREA
44. MAINTENANCE SHOP
45. STORAGE SHED
46. RAW SHALE STORAGE
47. WAREHOUSE
48. SAND STORAGE SILO W/TRANSPORTER
49. COAL SYSTEM BAGHOUSE
50. STEAM BOILER



GENERAL SHALE PRODUCTS CORPORATION

LOCATION	CAR LENGTH	CAR WIDTH	DECK WIDTH	NO. OF BRICK WIDE	NO. OF BRICK PER CAR	NO. OF CARS IN KILN	KILN SCHEDULE (MINUTES)	CAR TIME IN KILN (HOURS)	WEEKLY CAPACITY
Marion - 6 Ⓐ	7'-5.9/16"	3'-11.1/2"	3'-5.1/4"	4	1,294	33.4	43.5	24.2	599,702
Knoxville - 7A	9'-6"	6'-10.1/2"	6'-4.3/4"	8	3,576	34.2	60.0	34.2	600,768
Knoxville - 7B	9'-6"	7'-7"	7'-1"	8	3,840	39.8	35.0	23.2	1,105,920
Johnson City - 10A	9'-6"	6'-10.1/2"	6'-4.3/4"	8	3,736	31.5	64.0	33.6	588,420
Johnson City - 10B	9'-6"	7'-7"	7'-1"	8	3,840	34.2	54.2	30.9	714,155
Louisville - 14A	9'-2"	5'-7"	5'-0.1/2"	6	3,006	33.1	59.1	32.6	512,698
Louisville - 14B	9'-6"	7'-7"	7'-1"	8	3,936	39.8	56.0	37.1	708,480
Kingsport - 15	9'-6"	7'-5"	6'-10.1/2"	8	4,108	31.0	65.1	33.6	636,077
Huntsville - 18	9'-6"	5'-4.7/8"	4'-10"	6	2,688	43.9	35.0	25.6	774,144
Mooresville - 20	9'-6"	8'-1"	7'-7.1/4"	10	3,968	60.1	33.6	33.7	1,190,400
Glasgow - 21	9'-2"	5'-9"	5'-2.1/2"	6	2,880	28.3	45.0	21.2	645,120
Marion - 28	10'-2"	11'-3"	10'-9"	12	5,760	32.2	45.0	24.2	1,290,240
Kingsport - 29	14'-11.3/4"	13'-0"	12'-7.1/4"	16	10,240	24.2	84.0	33.9	1,228,800
Atlanta - 30A	10'-2"	7'-5"	6'-9.1/2"	8	3,810	51.5	43.1	37.0	891,063
Atlanta - 30B	10'-2"	7'-5"	6'-9.1/2"	8	3,810	51.5	43.1	37.0	891,063
Atlanta - 31	12'-5"	20'-8.1/2"	20'-5"	24	10,080	38.1	59.8	38.0	1,699,104
Mooresville - 32	10'-0"	11'-3"	10'-9"	12	5,796	32.0	72.0	38.4	811,440
Corbin - 33A	10'-10"	11'-7"	11'-1"	12	5,544	33.2	72.0	39.8	776,160
Corbin - 33B	10'-10"	11'-7"	11'-1"	12	5,544	33.2	72.0	39.8	776,160
Roanoke - 35A	9'-4"	6'-10.1/2"	6'-4.3/4"	8	3,840	29.9	60.0	29.9	645,120
Roanoke - 35B	9'-4"	6'-10.1/2"	6'-4.3/4"	8	3,840	29.9	60.0	29.9	645,120
Roanoke - 36	12'-5"	15'-0"	14'-7"	18	6,912	31.3	60.0	31.3	1,161,216
Somerset - 37A	9'-1.1/2"	7'-3.3/4"	6'-9"	8	3,840	39.2	43.0	28.1	900,167
Somerset - 37B	9'-1.1/2"	7'-3.3/4"	6'-9"	8	3,840	39.2	43.0	28.1	900,167

Ⓐ - TWO KILNS

Ⓑ - INCLUDES 79'-6" VESTIBULE

JUNE, 1989

TOTAL LENGTH OF KILN

LOCATION	YEAR BUILT	DRYER	EXHAUST	RECIRCULATING	PREHEAT	FIRE ZONE	FLASHING	COOLING	TOTAL LENGTH OF KILN
Marion - 6	1950	144'-4"	31'-7"	26'-0"	19'-9"	58'-9"	9'-6"	103'-10"	249'-5"
Knoxville - 7A	1952	130'-0"	32'-2"	60'-6"	29'-0"	59'-4"	10'-6"	133'-0"	324'-6"
Knoxville - 7B	1964	130'-0"	29'-4"	72'-6"	53'-0"	67'-4"	28'-1"	128'-3"	378'-6"
Johnson City - 10A	1954	130'-0"	29'-2"	78'-6"	29'-0"	59'-4"	10'-6"	93'-0"	299'-6"
Johnson City - 10B	1966	130'-0"	28'-10"	61'-0"	47'-0"	59'-4"	21'-0"	107'-10"	325'-0"
Louisville - 14A	1958	137'-6"	34'-2"	41'-6"	30'-0"	56'-8"	16'-0"	124'-8"	303'-0"
Louisville - 14B	1963	130'-0"	29'-4"	72'-6"	53'-0"	67'-4"	28'-1"	128'-3"	378'-6"
Kingsport - 15	1959	130'-0"	41'-5"	65'-3"	30'-0"	59'-4"	10'-6'	88'-0"	294'-6"
Huntsville - 18	1947	288'-9" Ⓑ	36'-10"	74'-6"	39'-10"	69'-6"	21'-0"	174'-11"	416'-7"
Mooresville - 20	1969	150'-0"	29'-4"	86'-3"	59'-0"	96'-10"	24'-0"	275'-7"	571'-0"
Glasgow - 21	1958	139'-6"	33'-10"	47'-6"	24'-0"	48'-8"	16'-0"	89'-6"	259'-6"
Marion - 28	1973	150'-0"	25'-0"	36'-6"	44'-0"	48'-0"	22'-0"	151'-6"	327'-0"
Kingsport - 29	1979	182'-0"	41'-3"	86'-10"	122'-0"		12'-3"	100'-2"	362'-6"
Atlanta - 30A	1964	4 tracks at 186'-0"	58'-9"	48'-8"	101'-2"	65'-1"	23'-9"	225'-11"	523'-4"
Atlanta - 30B	1969	6 tracks at 125'-0"	58'-9"	49'-8"	100'-2"	61'-6"	23'-9"	229'-6"	523'-4"
Atlanta - 31	1975	2 tracks at 300'-0"	17'-8"	53'-3"	216'-10"		24'-10"	160'-5"	473'-0"
Mooresville - 32	1987	152'-0"	74'-0"		31'-6"	76'-6"	20'-6"	117'-6"	320'-0"
Corbin - 33A	1973	392'-0"	38'-0"	36'-0"	44'-0"	85'-0"	21'-8"	135'-4"	360'-0"
Corbin - 33B	1986	2 tracks at 196'-0"	26'-6"	48'-9"	68'-3"	97'-6"	9'-9"	109'-3"	360'-0"
Roanoke - 35A	1954	137'-0"	44'-2"	47'-6"	30'-0"	59'-4"	10'-6"	88'-0"	279'-6"
Roanoke - 35B	1955	137'-0"	32'-2"	59'-6"	30'-0"	60'-8"	15'-2"	82'-0"	279'-6"
Roanoke - 36	1973	2 tracks at 225'-6"	60'-11"	74'-6"	155'-3"		37'-3"	61'-1"	389'-0"
Somerset - 37A	1965	125'-0"	28'-2"	60'-0"	54'-0"	64'-8"	26'-7"	124'-1"	357'-6"
Somerset - 37B	1965	125'-0"	28'-2"	60'-0"	54'-0"	64'-8"	26'-7"	124'-1"	357'-6"

MIDWEST RESEARCH INSTITUTE

Project No. ________ Date/Time ________

Subject ________

RAW MATERIAL MINED OFF-SITE

SAME BLDG

TRUCK → ~~STOCKPILE~~ HOPPER → PRIMARY → GRINDING ROOM → STORAGE → 2 Parallel Brick lines → 2 Kilns

Truck feeds primary crusher hopper directly. Hopper is gas heated to prevent material from sticking.

60,000,000 Brick/yr

Grinding room, brick forming 8-5 5 days a week. Kilns continuous.

Primary → Pan grinder → ~~5~~ screens (Hooded) → Hammermill

baghouse dust

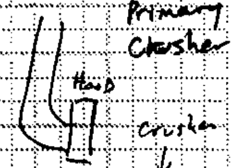
STORAGE (adjacent bldg)

30' drop from overhead conveyor to storage piles.

→ to brick forming (milling room)

Some transfer points have hoods

Hood on Primary Crusher



Hood on Pan Mill

Hood

Conveyor from pan mill goes over screens. Material is plowed from conveyor to each screen.

Grinding room: (Equipped with baghouse)

Few openings

2 fans (not operating)

3 bay doors that can be kept closed. 1 large opening for truck dump to primary crusher hopper.

1 exit door to underground room - must be shut.

1 exit door to storage building - "

Brick line typical
except bricks are "rolled" (dropped ~12") to create worn look

Mixing room adjacent to mill room provides sand for textures and colors. Add manganese dioxide, iron oxide
turns brick brown

Plant keeps grinding room production records
~~From cooling section of kiln~~

Bricks called "Cube" on cart
(4x10x16) x 6 per cart

MILL ROOM → Predryers 100°

Heat supplied by a heat exchanger and the cooling section

Two Kilns A + B (Keep all records in kiln control room)
70 minute schedule, can run 54 min
Have 8 gas burners to facilitate coal burning.
+ Flashers @ end.

Kiln B has single exhaust for firing + drying
Kiln A has separate exhaust for firing + drying
ETS Measured stacks

Kiln B is not typical.

Coal System same as Marion plant.

MIDWEST RESEARCH INSTITUTE

Project No. ____ Date/Time ____ Page 2 of 10

Subject ____

MIDWEST RESEARCH INSTITUTE

Project No. ________ Date/Time ________

Subject ________

MIDWEST RESEARCH INSTITUTE

Project No. ______ Date/Time ______

Subject ______

MIDWEST RESEARCH INSTITUTE

Project No. ____________ Date/Time ____________

Subject ____________

MIDWEST RESEARCH INSTITUTE

Project No. ____________ Date/Time ____________ Page 6 of 10

Subject ____________

MIDWEST RESEARCH INSTITUTE

Project No. ______ Date/Time ______

Subject ______

MIDWEST RESEARCH INSTITUTE

Project No. ______ Date/Time ______

Subject ______

MIDWEST RESEARCH INSTITUTE

Project No. ____________ Date/Time ____________

Subject ____________

MIDWEST RESEARCH INSTITUTE

Project No. ________ Date/Time ________

Subject ________

GENERAL SHALE Products Corporation

P. O. BOX 3547 C.R.S. / EXECUTIVE AND GENERAL OFFICES: JOHNSON CITY, TENNESSEE 37602 / PHONE: AREA CODE 615 282-4661 FAX 615 282-8767

August 2, 1993

Released 6/2/94
~~SUBJECT TO CONFIDENTIALITY CLAIM~~

Mr. Brian L. Shrager
Midwest Research Institute
401 Harrison Oaks Boulevard
Suite 350
Cary, NC 27513-2412

Dear Brian:

Enclosed please find copies of our production reports for July 30 and 31, along with copies of the daily kiln charts for July 28-31. I believe these are as requested, but if not or you need anything further, please let me know.

We certainly appreciate your part in this project. We look forward to the test results and completion of the study which should result in good, realistic factors for our industry.

Sincerely,

Dave McNees
Environmental Specialist

bl

Enclosure

A/56

DAILY BURNING REPORT--- JOHNSON CITY PLANT NO. 10

Date 7/31/93

	A-KILN	B-KILN
Green Cars 8:00 A.M.	35	34
Kiln Schedule	64 min	76 min
Cars Burned	22	19
Brick Burned	74272 g/s 81699 (3/5 on)	72960
Car Count	3376	3840
Coal	15456 lb.	13046 lb.
Gas	38000 cu.ft.	38000 cu.ft.
CWA	2.9	3.2
Void Area		
IRS		
Kiln Car Brg. Temp KwHr/m	68.27	
KwHr/cost/m	4.41	

NOTE: TOTAL PRODUCTION 74,272 @ 4.25 LBS. ED.

PLANT 10 KILN A DATE 7/31/93

	BTU's	Therms		Cost	Therm % of Total	Cost Per M
COAL 15456# @ 14.476	= 2237410 / 100,000	= 2237	@ .162 /Therm	= $362.39	84.9	4.43
OIL ____ gal. @ 140,000	= ____ / 100,000	= ____	@ ____ /Therm	= $____	____	____
PROPANE ____ gal. @ 91,600	= ____ / 100,000	= ____	@ ____ /Therm	= $____	____	____
NATURAL GAS 38000 C.F. @ 1,040	= 395200 / 100,000	= 395	@ .355 /Therm	= $140.22	15.1	1.71

.191 ¢ Avg. Cost Per Therm

Costs:				
Coal	____	Per Ton	____	Per Therm
Oil	____	Per Gal.	____	Per Therm
Propane	____	Per Gal.	____	Per Therm
Nat. Gas	____	Per MCF	____	Per Therm

Total Therms 2632 $502.61 Total Cost

Total Brick Burned 74272 g/s 81699 $6.14 Cost Per M

Total Therms/M Brick Burned ~~32.3~~ 32.1

BTU/lb. 773

DAILY BURNING REPORT--- JOHNSON CITY PLANT NO. 10

Date 7/30/93

	A-KILN	B-KILN
Green Cars 8:00 A.M.	55	52
Kiln Schedule	64 min	76 min.
Cars Burned	23	19
Brick Burned	77648 4/5 85413 5/BE	172960
Car Count	3376	3840
Coal	15033 lb.	13230 #
Gas	38000 cu/ft.	38000 cu/ft
CWA	3.6	3.2
Void Area		
IRS		
Kiln Car Brg. Temp KWHR/m	90.92	
KWHR/COST/m	4.99	

Note: total production 77,648 @ 4.25 lbs ea.

PLANT 10 KILN A DATE 7/30/93

	BTU's	Therms	Cost	Therm % of Total	Cost Per M
COAL 15033# @ 14.476	= 2176177 / 100,000	= 2176 @ .162 /Therm	= $ 352.51	84.6	4.13
OIL ____ gal. @ 140,000	= ____ / 100,000	= ____ @ ____ /Therm	= $ ____	____	____
PROPANE ____ gal. @ 91,600	= ____ / 100,000	= ____ @ ____ /Therm	= $ ____	____	____
NATURAL GAS 38000 C.F. @ 1,040	= 3952 00 / 100,000	= 395 @ .355 /Therm	= $ 140.22	~~1.64~~ 15.4	1.64

.192 ¢ Avg. Cost Per Therm

Costs:

Coal ____ Per Ton ____ Per Therm
Oil ____ Per Gal. ____ Per Therm
Propane ____ Per Gal. ____ Per Therm
Nat. Gas ____ Per MCF ____ Per Therm

Total Therms 2571 $ 492.73 Total Cost

Total Brick Burned 77648 4/5 85413 5/BE $ 5.77 Cost Per M

Total Therms/M Brick Burned 30.1

BTU/M 1724

INSERT DRAWING

REL02_C11S03

PAGE 89

ETS, INC.

A subsidiary of ETS, International, Inc.

1401 MUNICIPAL ROAD, NW - ROANOKE, VIRGINIA 24012-1309

TELEPHONE: 703-265-0004 - FAX: 703-265-0131

Date: 7/16/93 Time: 1400

To: Company: MRI

Name: Dennis Wallace

Fax Number: (919) 677-0065

From: Name: Ken Appell

Message:

Here is the baghouse information that Andy Hetz was supposed to send you. I have not obtained the actual cleaning cycle for this baghouse yet, but this type usually has at least a 15 min/cleaning cycle rate.

Dave McNees to call back.
75 sec.
(for 15 sec)
150 bags
5 compartments each of which cleans

Please call me or Andy Hetz if you have any questions.

The air pollution control equipment at the Johnson City plant consists of a pulse-jet type baghouse that services the crushing, screening and storage building. The baghouse is a Wheelabrator-Frye Ultra-Jet Aire Filter No. 115/Model 108 that has the following operating parameters:

Gas Volume (acfm): 17,000

Gas Temperature: Ambient

Gas to Cloth Ratio: 8.02

Flange to Flange Pressure Drop (W.G.): 7-inches

Tubesheet Pressure Drop (W.G.): 6-inches

Bag-Type: 16-oz. Polyester, Dou-Density felt bags

Bag-Dimensions: 6-inches I.D. by 108-inches long.

The sampling at the bottom of the baghouse will occur during the projected 8-hour sampling of the baghouse outlet duct. The proposed calculation procedure will consist of using only the average bottom dust collection, the average of the 3 total particulate catch from the duct sampling runs and the average of 3 runs of ambient air sampling in order to complete the mass balance around the crushing, screening and storage operation.

GENERAL SHALE PRODUCTS CORPORATION
PLANT NO. - 10A

CHROMEL - ALUMEL

SUPERVISOR	Roper	DATE	7-29-93	GREEN BRICK AT 8:00 A.M.	
KILN SCHEDULE	64 min	GREEN BRICK WEIGHT	5.20	STANDARD	31
PRODUCTION	81664	BURNED BRICK WEIGHT	3.64	SPECIAL	
TYPE BRICK	S/S Nottingham	CARS BURNED	22	SOLID	
TOTAL KILN HOURS	24	TOTAL BRICK BURNED	81664	PAVER	
KEY CHEK AVERAGE		TOTAL BRICK WEIGHT		OTHER	

	1	2	3		1	2	3
PUSHER PRESSURE				PREDRYER			
TURBO PRESSURE				WET BULB			
GAS PRESSURE				DRY BULB			
PREDRYER SUPPLY TEMP.				HUMIDITY			
DRYER EXHAUST DRAFT				DEW POINT			
DRYER EXHAUST TEMP.				BRICK BODY			
COLD AIR SUPPLY TEMP.				FANS			
KILN EXHAUST DRAFT				DRYER			
UNDER CAR TEMP.				WET BULB			
COAL SCREENING				DRY BULB			
COAL DRYER TEMP.				HUMIDITY			
FLASHING SYSTEM				DEW POINT			
TURBO BLOWER (amps)				BRICK BODY			
DRYER SUPPLY (amps)				FANS			
DRYER EXHAUST (amps)				DRYER RECIRCULATING FANS			
COLD AIR SUPPLY (amps)				NO. 1	170°		
KILN EXHAUST (amps)				NO. 2	250°		
IMP MILL (amps)				NO. 3	320°		
IMP MILL BLOWER (amps)				NO. 4	380°		

ENERGY METERS

	GAS	COAL	FLASHING	ELECTRIC
END	629	309		547
BEGIN	628	472		527
TOTAL		837		20

19200

COLD WATER ABSORPTION		
KEY NO.		
WEIGHT		
C.W.A.		

CONTROL VALVE PRESSURE	
NO. 1	
NO. 2	242 - 17
NO. 3	232 - 16
NO. 4	199 - 14

	BTU	THERMS		COST	THERM % OF TOTAL	COST PER M	THERMS PER M
GAS: 38000 c.f. @ 1,040 =	3952000 / 100,000 =	395	@ .355 /therm =	$140.22	15.1	1.71	4.8
COAL: 15405 lb. @ 14.476 =	223005 / 100,000 =	2230	@ .162 /therm =	$361.24	84.9	4.42	27.3
FLASHING: ____ lb. @ ____ =	____ / 100,000 =	____	@ ____ /therm =	$			32.1

GAS: $ ______ per MCF, ______ ¢ per therm

TOTAL THERMS 2625

TOTAL THERMS PER M BRICK 32.1

KWHR PER M BRICK 124.17

KWHR COST PER M BRICK 6.68

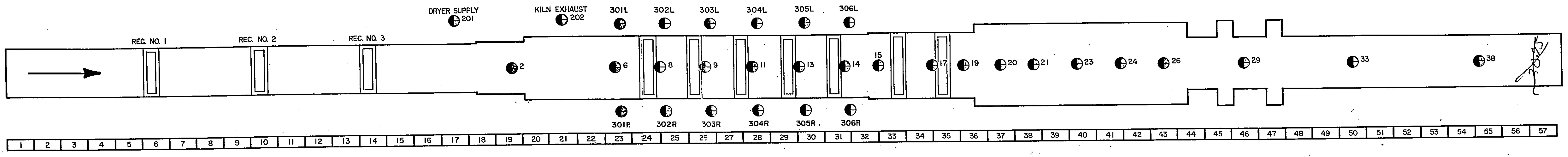
COAL: $ ______ per ton, ______ ¢ per therm

BTU PER POUND OF BRICK 881

AVERAGE COST PER THERM .190

TOTAL COST 501.48

COST PER M BRICK 6.13



KILN SCHEDULE

COMMENTS	TIME	TIME-IN	BALANCE GAUGE	PUSHER PRESS.	TC±20	SCH.	DRYER NO.	CAR
Door Open	0800	08:08	.39	200		08:08	2	8
↓	0900	09:14	.37	230		09:12	1	60
	1000	10:16	.38	200		10:16	2	07
	1100	11:20	.38	215		11:20	3	114
	1200	12:23	.38	180		12:24	4	27
13:18	1300	13:28	.38	200		13:28	2	61
	1400	14:32	.38	240		14:32	1	65
	1500	15:36	.37	260		15:36	2	46
FIREMAN Beldon								
D:O 14:25 and 14:39	1600	16:39	.38	300		16:40	1	48
	1700	17:17	.38	300		17:44	2	26
Comp. Kickoff	1800	18:41	.30	300		18:48	3	18
	1900	19:51	.38	260		19:57	4	67
	2000	20:55	.38	260		20:56	5	55
	2100	X	.37	270		X	X	X
	2200	22:00	.38	260		22:00	4	20
	2300	23:	.38	260		23:04	4	121
FIREMAN Kemper								
	2400	0:08	.37	235		0:08	5	135
	0100	1:12	.37	250		1:12	3	22
	0200	2:13	.37	245		2:16	3	103
	0300	3:16	.37	280		3:20	4	85
	0400	4:22	.37	250		4:24	5	127
452 -74 - 77	0500	5:20	.37	250		5:28	5	107
	0600	6:32	.37	260		6:32	4	?
	0700		.37	270		7:36	3	57
FIREMAN SLC								

	DRYER SUPPLY	KILN EXHAUST	EXHAUST	RECIRCULATING																	
	400	340	590	670	670	720	760	880	880	1065	1065	1230	1230	1625	1625	625	670	750	850	1000	1200
TIME	201	202	2	301L	301R	302L	302R	303L	303R	304L	304R	305L	305R	306L	306R	6	8	9	11	13	14
0800	400	320	535	605	625	665	730	865	855	1040	1050	1230	1235	1635	1650	570	605	710	820	995	1235
0900	405	320	540	605	625	670	730	860	855	1035	1040	1230	1230	1630	1555	565	610	700	830	985	1195
1000	410	320	540	610	630	660	725	860	850	1015	1025	1225	1230	1635	1485	565	610	695	815	965	1175
1100	410	325	540	600	620	665	725	860	845	1015	1020	1220	1225	1620	1475	570	610	690	820	955	1190
1200	420	330	535	605	620	665	730	855	850	1035	1035	1220	1225	1610	1580	560	610	710	825	975	1175
1300	425	330	535	605	620	665	725	865	855	1035	1040	1230	1230	1625	1605	565	610	685	830	950	1170
1400	425	325	545	605	625	665	730	865	855	1035	1045	1225	1235	1600	1580	570	610	715	840	990	1230
1500	425	330	545	610	620	675	735	860	855	1035	1050	1225	1235	1615	1615	570	615	715	820	965	1125
1600	425	335	545	610	630	670	735	865	865	1040	1050	1240	1240	1610	1600	580	620	715	840	980	1200
1700	420	335	545	615	635	670	735	870	865	1040	1050	1235	1245	1620	1615	570	620	720	835	990	1230
1800	425	345	540	610	630	670	735	870	860	1045	1055	1235	1240	1610	1620	565	610	715	850	980	1205
1900	425	335	545	605	625	670	735	870	865	1045	1055	1245	1245	1610	1640	565	605	715	850	970	1205
2000	420	335	550	605	625	670	735	870	865	1045	1060	1250	1245	1610	1605	580	610	710	835	980	1230
2100	425	345	550	605	625	670	735	875	865	1045	1060	1745	1250	1625	1605	580	615	705	850	990	1180
2200	420	345	550	610	630	665	740	870	870	1050	1065	1240	1250	1630	1610	580	615	710	835	1000	1220
2300	420	340	550	615	630	670	730	870	865	1050	1065	1245	1250	1610	1605	575	620	725	850	995	1260
2400	415	340	550	615	630	675	740	865	865	1050	1055	1250	1260	1645	1610	580	615	725	840	970	1210
0100	410	325	550	620	630	675	740	875	865	1045	1060	1245	1250	1620	1590	570	615	715	845	980	1225
0200	410	345	555	620	635	675	745	875	865	1050	1065	1245	1255	1620	1595	570	615	720	835	950	1200
0300	405	320	545	620	635	675	735	870	865	1050	1065	1240	1250	1635	1640	570	620	715	830	990	1250
0400	405	320	545	620	635	675	735	870	865	1045	1065	1240	1250	1635	1640	570	620	715	830	940	1250
0500	415	315	550	620	635	680	745	875	860	1050	1070	1245	1260	1605	1645	575	620	730	845	980	1225
0600	415	315	500	620	630	670	740	875	865	1045	1060	1240	1250	1615	1640	580	615	710	840	970	1215
0700	390	335	500	620	630	680	740	875	870	1045	1050	1230	1250	1620	1610	580	620	725	835	985	1215

		PREHEAT			FIRE ZONE					COOLING				
									1780	1350				350
	Type	1240	1470	1680	1765	1810	1850	1870	1880	1400	925	310	1650	400
TIME		15	17	19	20	21	23	24	26	29	33	38	306 Plen	Cool Heat Temp
0800		1230	1465	1675	1760	1800	1850	1875	1850	1395	985	310	1650	405
0900		1220	1465	1675	1755	1805	1850	1875	1860	1415	965	310	1665	415
1000		1225	1465	1670	1765	1810	1845	1880	1855	1405	980	315	1650	375
1100		1190	1450	1620	1760	1800	1850	1875	1850	1380	970	370	1665	390
1200		1185	1450	1625	1760	1705	1855	1875	1850	1375	965	325	1660	400
1300		1250	1455	1660	1760	1800	1855	1880	1850	1395	940	335	1655	345
1400		1220	1445	1670	1750	1805	1845	1825	1845	1375	965	335	1665	380
1500		1230	1465	1665	1760	1805	1845	1870	1850	1355	935	325	1660	390
1600		1265	1445	1675	1750	1800	1850	1870	1835	1300	920	325	1660	390
1700		1235	1480	1665	1760	1805	1845	1870	1830	1310	930	310	1650	400
1800		1235	1455	1675	1760	1810	1845	1865	1825	1315	920	350	1665	370
1900		1250	1465	1685	1760	1800	1845	1865	1845	1310	910	340	1650	380
2000		1270	1460	1685	1760	1810	1850	1870	1845	1320	930	350	1660	390
2100		1230	1455	1685	1760	1810	1850	1870	1840	1305	930	360	1660	380
2200		1240	1460	1685	1760	1805	1850	1875	1845	1300	940	330	1665	385
2300		1245	1455	1675	1760	1805	1845	1870	1845	1300	910	310	1665	370
2400		1235	1470	1675	1765	1810	1845	1865	1825	1275	930	350	1650	400
0100		1230	1465	1690	1755	1810	1850	1870	1825	1310	925	335	1645	395
0200		1255	1470	1685	1755	1810	1850	1875	1840	1315	930	340	1655	400
0300		1260	1470	1675	1770	1810	1850	1875	1835	1320	950	340	1655	380
0400		1260	1470	1675	1770	1810	1850	1875	1835	1320	950	340	1655	390
0500		1255	1480	1685	1760	1810	1805	1875	1810	1290	925	330	1670	410
0600		1255	1470	1680	1765	1820	1850	1870	1825	1270	900	375	1650	380
0700		1250	1475	1685	1770	1810	1800	1880	1835	1290	905	340	1650	400
Avg →					1760	1807	1849	1873	1840					

SUPERVISOR Roper   DATE 7-29-93   GREEN BRICK AT 8:00 A.M.

KILN SCHEDULE 64 min   GREEN BRICK WEIGHT 5.28   STANDARD 40 ~~32~~ 72 ~~33~~ 41

PRODUCTION 85412   BURNED BRICK WEIGHT 3.65   SPECIAL

TYPE BRICK Q/S Rose Range   CARS BURNED 23   SOLID

TOTAL KILN HOURS 24   TOTAL BRICK BURNED 85412   PAVER

KEY CHEK AVERAGE   TOTAL BRICK WEIGHT   OTHER

	1	2	3
PUSHER PRESSURE			
TURBO PRESSURE			
GAS PRESSURE			
PREDRYER SUPPLY TEMP.			
DRYER EXHAUST DRAFT			
DRYER EXHAUST TEMP.			
COLD AIR SUPPLY TEMP.			
KILN EXHAUST DRAFT			
UNDER CAR TEMP.			
COAL SCREENING			
COAL DRYER TEMP.			
FLASHING SYSTEM			
TURBO BLOWER (amps)			
DRYER SUPPLY (amps)			
DRYER EXHAUST (amps)			
COLD AIR SUPPLY (amps)			
KILN EXHAUST (amps)			
IMP MILL (amps)			
IMP MILL BLOWER (amps)			

	1	2	3
PREDRYER			
WET BULB			
DRY BULB			
HUMIDITY			
DEW POINT			
BRICK BODY			
FANS			
DRYER			
WET BULB			
DRY BULB			
HUMIDITY			
DEW POINT			
BRICK BODY			
FANS			

DRYER RECIRCULATING FANS

NO. 1 170°

NO. 2 165°

NO. 3 335°

NO. 4 395°

ENERGY METERS

	GAS	COAL	FLASHING	ELECTRIC
END	630	130		569
BEGIN	629	309		547
TOTAL		821		22 21120

COLD WATER ABSORPTION

KEY NO.

WEIGHT

C.W.A.

CONTROL VALVE PRESSURE

NO. 1

NO. 2 220 - 15

NO. 3 93 - 4

NO. 4 120 - 8

	BTU	THERMS	COST	THERM % OF TOTAL	COST PER M	THERMS PER M
GAS: 38000 c.f. @ 1,040	= 3952000 / 100,000	= 395 @ .355 /therm	= $ 140.22	15.4	1.64	4.6
COAL: 15106 lb. @ 14.474	= 218680 / 100,000	= 2186 @ .162 /therm	= $ 354.13	84.6	4.14	25.5
FLASHING: ___ lb. @ ___	= ___ / 100,000	= ___ @ ___ /therm	= $			30.1

GAS: $ ___ per MCF, ___ ¢ per therm   COAL: $ ___ per ton, ___ ¢ per therm

TOTAL THERMS 2581   BTU PER POUND OF BRICK 824

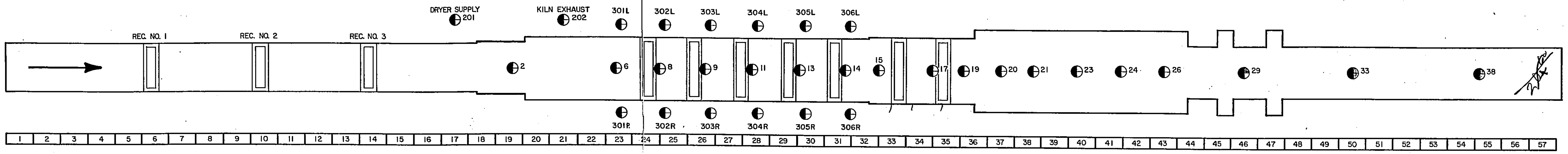
TOTAL THERMS PER M BRICK 30.1   AVERAGE COST PER THERM .191

KWHR PER M BRICK 133.35   TOTAL COST 494.35

KWHR COST PER M BRICK 7.17   COST PER M BRICK 5.78

GENERAL SHALE PRODUCTS CORPORATION
PLANT NO. 10A

CHROMEL - ALUMEL



COMMENTS	TIME	TIME-IN	BALANCE GAUGE	PUSHER PRESS.	TC*20	SCH.	DRYER NO.	CAR	201 (DRYER SUPPLY)	202 (KILN EXHAUST)	2 (EXHAUST)	301L	301R	302L	302R	303L	303R	304L	304R	305L	305R	306L	306R	6	8	9	11	13	14		15	17	19	20	21	23	24	26	29	33	38		
		KILN SCHEDULE							400	340	~~370~~ 350	~~670~~ 630	~~680~~ 630	~~720~~ 680	760	880	880	1065	1065	1230	1230	1625	1625	~~625~~ 575	~~670~~ 620	~~780~~ 725	850	1000	1200	PREHEAT	1240	1470	1680	1765	1810	1850	1870	~~1880~~ 1780	~~1400~~ 1350 1310	~~925~~ 960	~~310~~ 360	1650	~~400~~ 300
QUEEN SIZE	0800	8:40	.38	230		8^40	2	87	415	330	555	620	640	685	740	875	875	1050	1065	1245	1270	1630	1635	585	625	720	855	1010	1235		1255	1490	1685	1770	1810	1850	1875	1825	1245	910	340	1665	370
	0900	9:44	.37	205		9^44	2	88	415	325	555	625	640	675	740	880	875	1050	1070	1255	1265	1635	1605	590	625	715	835	990	1220		1280	1485	1700	1765	1820	1850	1865	1835	1270	925	340	1665	405
	1000	10:48	.38	205		10^48	3	0	415	335	555	625	645	685	750	870	875	1050	1060	1255	1260	1610	1710	580	630	725	845	1005	1220		1245	1495	1695	1765	1805	1850	1870	1835	1295	925	330	1660	350
	1100	11:52	.38	240		11^52	4	35	415	345	555	625	645	680	745	880	875	1055	1065	1250	1255	1630	1630	585	625	720	860	1005	1220		1255	1495	1675	1765	1810	1850	1875	1850	1305	915	355	1665	370
	1200	12:56	.38	220		12^56	1	92	415	345	550	625	645	690	750	880	875	1040	1055	1250	1255	1630	1630	580	625	745	825	1005	1205		1230	1425	1700	1775	1815	1850	1875	1835	1305	950	335	1665	370
	1300	X	.37	205		X	X	X	420	345	555	630	645	685	755	880	875	1050	1060	1250	1250	1620	1615	575	630	705	850	1005	1220		1235	1480	1695	1775	1810	1850	1870	1840	1300	940	360	1670	365
	1400	14:00	.37	215		14^00	3	16	420	345	555	625	640	690	750	865	860	1055	1065	1255	1250	1620	1625	580	620	720	845	980	1200		1250	1475	1685	1775	1815	1850	1870	1840	1335	945	355	1660	370
	1500	15:04	.38	215		15^04	5	12	420	345	560	620	640	620	745	840	870	1050	1055	1245	1245	1615	1615	590	625	720	845	1000	1240		1240	1495	1695	1770	1820	1850	1870	1840	1315	915	345	1670	395
FIREMAN Beldon																																											
[illegible]	1600	16:08	.38	210		16^08	4	13	420	350	560	625	645	685	750	880	875	1050	1065	1255	1250	1615	1665	585	630	720	845	920	1210		1250	1480	1700	1770	1815	1850	1870	1835	1360	925	355	1655	330
	1700	17:11	.37	210		17:12	3	34	425	340	560	625	650	685	755	880	875	1050	1065	1255	1255	1645	1600	590	625	725	830	990	1215		1250	1490	1700	1775	1815	1850	1875	1830	1350	950	355	1650	350
	1800	18:10	.38	210		18:16	4	21	420	330	560	635	650	685	755	880	875	1050	1050	1250	1255	1610	1590	590	625	735	850	1010	1210		1240	1495	1695	1770	1810	1850	1875	1835	1345	965	355	1670	355
	1900	19:21	.38	210		19:20	5	125	420	335	565	630	645	690	755	880	880	1050	1060	1250	1250	1610	1610	585	630	740	850	995	1195		1245	1495	1695	1770	1820	1855	1870	1840	1345	970	335	1660	355
	2000	20:23	.38	210		20:24	1	118	420	350	565	630	650	690	755	880	870	1045	1060	1250	1250	1625	1610	590	630	730	850	990	1230		1260	1485	1690	1775	1815	1855	1875	1835	1350	960	360	1660	370
	2100	21:27	.38	215		21:28	2	97	420	340	570	630	650	685	750	880	875	1050	1065	1240	1250	1620	1625	590	640	725	860	980	1210		1245	1485	1690	1775	1815	1855	1875	1835	1350	960	360	1660	370
	2200	22:30	.38	215		22:32	3	81	420	340	570	630	655	685	745	885	875	1050	1070	1245	1250	1620	1620	600	640	720	860	980	1210		1255	1480	1690	1770	1810	1855	1875	1835	1340	970	360	1655	~~410~~ 395
	2300	23:36	.38	215		23:36	4	59	420	350	570	635	655	685	760	875	870	1060	1075	1245	1250	1630	1630	600	640	730	850	980	1220		1250	1480	1685	1770	1815	1855	1895	1840	1330	960	350	1660	395
FIREMAN Kemper																																								960	380		
[illegible]	2400	0:40	.37	240		24:40	5	9	410	330	565	635	650	690	760	880	880	1050	1070	1245	1260	1640	1610	595	640	735	835	1005	1225		1230	1490	1700	1770	1815	1850	1875	1895	1330	980	380	1640	410
	0100	1:47	.37	220		01:44	2	25	410	330	565	635	650	690	760	880	885	1050	1065	1270	1260	1645	1625	590	635	745	840	1000	1210		1240	1490	1695	1770	1810	1850	1875	1835	1330	945	380	1640	410
	0200	2:47	.37	190		02:48	2	50	410	330	565	635	650	690	755	875	880	1050	1060	1240	1245	1625	1600	600	630	730	855	980	1225		1230	1490	1690	1770	1810	1850	1870	1890	1325	965	350	1655	420
	0300	3:53	.37	225		03:53	2	79	405	345	565	630	640	690	750	880	875	1050	1055	1235	1255	1645	1655	595	630	730	845	995	1225		1250	1485	1685	1770	1810	1855	1875	1835	1340	945	350	1665	450
	0400	4:55	.37	265		04:56	4	91	405	345	565	635	645	690	750	880	880	1065	1080	1235	1265	1645	1680	595	635	735	855	980	1235		1255	1485	1695	1770	1810	1855	1875	1840	1340	945	320	1665	420
	0500		.37	255					405	340	565	635	650	690	750	880	885	1065	1095	1255	1250	1645	1640	595	630	740	855	960	1230		1250	1495	1690	1770	1815	1850	1875	1825	1330	980	330	1665	420
	0600	5:57	.37	180		06:00	3	54	410	330	565	635	645	690	760	885	875	1040	1095	1250	1250	1630	1630	590	635	730	850	970	1230		1230	1495	1690	1780	1820	1850	1870	1835	1335	930	335	1660	400
	0700			205		07:04	3	105	415	320	565	635	650	690	755	880	870	1055	1080	1255	1260	1645	1635	595	635	730	865	985	1240		1250	1500	1690	1780	1820	1850	1880	1850	1330	940	305	1660	405
FIREMAN SLV																																											
																																		1770.6	1810.2	1851	1872.7	1836.9					

SUPERVISOR Roper — DATE 7-30-93 — GREEN BRICK AT 8:00 A.M.
KILN SCHEDULE 64 — GREEN BRICK WEIGHT 5.19 — STANDARD 48
PRODUCTION 81699 — BURNED BRICK WEIGHT 4.25 — SPECIAL 30/78 -23/55
TYPE BRICK Q/S Nottingham — CARS BURNED 22 — SOLID
TOTAL KILN HOURS 24 — TOTAL BRICK BURNED 81699 — PAVER
KEY CHEK AVERAGE — TOTAL BRICK WEIGHT — OTHER

	1	2	3		1	2	3
PUSHER PRESSURE				PREDRYER			
TURBO PRESSURE			21g	WET BULB			
GAS PRESSURE				DRY BULB			
PREDRYER SUPPLY TEMP.				HUMIDITY			
DRYER EXHAUST DRAFT				DEW POINT			
DRYER EXHAUST TEMP.				BRICK BODY			
COLD AIR SUPPLY TEMP.				FANS			
KILN EXHAUST DRAFT				DRYER			
UNDER CAR TEMP.				WET BULB			
COAL SCREENING				DRY BULB			
COAL DRYER TEMP.				HUMIDITY			
FLASHING SYSTEM				DEW POINT			
TURBO BLOWER (amps)				BRICK BODY			
DRYER SUPPLY (amps)				FANS			
DRYER EXHAUST (amps)				DRYER RECIRCULATING FANS			
COLD AIR SUPPLY (amps)				NO. 1	170°		
KILN EXHAUST (amps)				NO. 2	260°		
IMP MILL (amps)				NO. 3	340°		
IMP MILL BLOWER (amps)				NO. 4	410°		

ENERGY METERS

	GAS	COAL	FLASHING	ELECTRIC
END	630	958		591
BEGIN	630	150		569
TOTAL		828		22

21120

COLD WATER ABSORPTION

KEY NO.
WEIGHT
C.W.A.

CONTROL VALVE PRESSURE

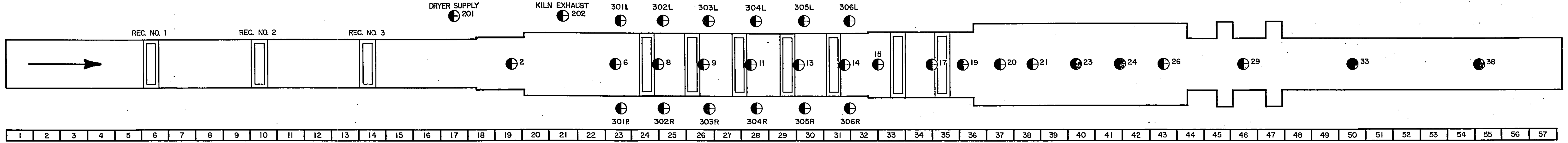
NO. 1		
NO. 2	261	18
NO. 3	172	12
NO. 4	186	9

	COST	THERM % OF TOTAL	COST PER M	THERMS PER M
GAS: 38000 c.f. @ 1,040 = 3952000 / 100,000 = 395 THERMS @ .355 /therm	= $140.22	15.2	1.71	4.8
COAL: 15235 lb. @ 14.476 = 220544 / 100,000 = 2205 @ .162 /therm	= $357.21	84.8	4.37	26.9
FLASHING: ___ lb. @ ___ = ___ / 100,000 = ___ @ ___ /therm	= $			31.7

GAS: $ ___ per MCF, ___ ¢ per therm — COAL: $ ___ per ton, ___ ¢ per therm
TOTAL THERMS 2600 — BTU PER POUND OF BRICK 745
TOTAL THERMS PER M BRICK 31.7 — AVERAGE COST PER THERM .191
KWHR PER M BRICK 136.55 — TOTAL COST 497.43
KWHR COST PER M BRICK 7.34 — COST PER M BRICK 6.08

GENERAL SHALE PRODUCTS CORPORATION
PLANT NO. - 10A

CHROMEL-ALUMEL



COMMENTS	TIME	TIME-IN	BALANCE GAUGE	PUSHER PRESS.	TC#20	SCH.	DRYER NO.	CAR	DRYER SUPPLY 201	KILN EXHAUST 202	EXHAUST 2	301L	301R	302L	302R	303L	303R	304L	304R	305L	305R	306L	306R	6	8	9	11	13	14		PREHEAT 15	17	19	FIRE ZONE 20	21	23	24	26	COOLING 29	33	38		
		KILN SCHEDULE							400	340	550	630	630	680	760	880	880	1065	1065	1230	1230	1625	1625	575	620	725	850	1000	1200		1240	1470	1680	1765	1810	1850	1890	1930 1880	1300	940	360	1650	300 400
	0800	08:06	.38	220		8:08	1	24	415	340	570	635	655	695	760	890	885	1070	1080	1250	1255	1635	1635	590	640	730	860	1015	1265		1240	1490	1680	1775	1810	1850	1875	1845	1330	935	350	1665	425
	0900	09:11	.38	240		9:12	5	134	420	340	570	640	655	690	760	890	885	1075	1085	1250	1260	1635	1640	605	640	730	860	1005	1245		1250	1500	1695	1770	1920	1860	1880	1835	1305	915	315	1665	380
TEST E.T.S.	1000	10:16	.39	185		10:16	3	23	420	345	570	635	655	695	760	890	895	1070	1080	1255	1260	1640	1655	580	645	730	870	985	1265		1265	1500	1685	1775	1815	1850	1875	1840	1225	920	335	1650	390
	1100	11:20	.38	200		11:20	3	63	420	345	570	640	655	700	760	890	880	1070	1080	1255	1265	1645	1645	595	645	720	860	1000	1270		1245	1500	1695	1770	1815	1855	1870	1830	1310	920	310	1665	400
	1200	12:24	.38	240		12:24	5	116	425	345	550	640	650	690	760	890	880	1065	1080	1255	1265	1645	1640	590	645	735	850	1000	1220		1240	1495	1705	1770	1810	1850	1880	1840	1295	910	315	1665	375
	1300	13:28	.38	220		13:28	4	23	425	350	570	640	660	695	755	865	890	1070	1080	1265	1260	1655	1640	595	640	725	870	1005	1220		1245	1490	1685	1765	1810	1850	1875	1850	1290	925	320	1670	375
	1400	14:32	.37	220		14:32	5	73	420	355	570	640	655	700	755	885	890	1070	1080	1260	1255	1635	1640	600	645	745	875	1000	1240		1245	1485	1700	1770	1815	1855	1870	1835	1290	900	315	1670	370
	1500	15:36	38	230		15:36	2	37	425	350	575	645	655	695	765	890	880	1055	1075	1255	1265	1625	1630	600	640	750	855	1015	1225		1240	1500	1705	1770	1815	1850	1870	1825	1265	885	315	1670	370

FIREMAN Beldon

COMMENTS	TIME	TIME-IN	BALANCE GAUGE	PUSHER PRESS.	TC#20	SCH.	DRYER NO.	CAR	201	202	2	301L	301R	302L	302R	303L	303R	304L	304R	305L	305R	306L	306R	6	8	9	11	13	14		15	17	19	20	21	23	24	26	29	33	38		
	1600	16:39	.38	230		16:40	1	86	425	355	575	650	660	705	770	890	890	1060	1075	1250	1265	1635	1620	610	645	750	880	995	1245		1260	1485	1690	1775	1820	1855	1865	1800	1260	915	300	1655	385
	1700	17:43	.38	230		17:44	2	115	425	345	560	650	660	700	765	890	895	1065	1080	1255	1260	1625	1615	605	640	735	870	1005	1215		1255	1490	1705	1775	1825	1855	1870	1820	1250	905	330	1670	370
	1800	18:47	.38	240		18:46	3	119	430	340	580	650	660	710	770	895	885	1060	1075	1245	1260	1630	1630	610	645	760	865	1010	1220		1245	1500	1700	1770	1820	1855	1870	1835	1260	900	310	1660	345
	1900	19:51	.38	240		19:52	4	126	425	335	580	650	665	710	765	900	885	1070	1085	1250	1260	1635	1640	615	645	745	870	1010	1235		1245	1500	1710	1770	1810	1850	1875	1840	1225	905	320	1655	360
	2000	2055	.38	240		20:56	5	111	425	345	570	650	660	700	770	900	890	1065	1090	1250	1255	1625	1670	625	650	755	855	1015	1230		1250	1490	1705	1770	1820	1855	1870	1825	1265	895	310	1660	395
	2100		.38	230					425	350	575	650	660	700	775	895	895	1070	1090	1255	1255	1625	1650	610	650	750	860	995	1225		1255	1490	1700	1770	1815	1855	1870	1815	1260	890	315	1655	400
	2200	22:00	.38	230		22:00	BK	124	420	340	575	650	660	705	765	890	890	1065	1080	1250	1265	1640	1640	605	645	745	870	1010	1220		1260	1490	1685	1770	1820	1855	1875	1825	1245	920	305	1650	370
	2300	23:03	.38	230		23:04	BK	76	420	350	575	645	660	710	760	895	885	1065	1075	1255	1265	1635	1640	610	650	750	885	1010	1220		1265	1505	1710	1770	1810	1850	1875	1835	1290	925	325	1660	405

FIREMAN Kemper

COMMENTS	TIME	TIME-IN	BALANCE GAUGE	PUSHER PRESS.	TC#20	SCH.	DRYER NO.	CAR	201	202	2	301L	301R	302L	302R	303L	303R	304L	304R	305L	305R	306L	306R	6	8	9	11	13	14		15	17	19	20	21	23	24	26	29	33	38		
541- 216-121	2400	24:08	.38	230		24:08	B-K	65	415	350	575	645	660	705	765	895	890	1060	1080	1250	1260	1635	1625	605	645	750	950	1005	1225		1260	1495	1695	1770	1815	1845	1870	1810	1285	920	335	1655	400
	0100	01:12	.38	230		1:12	1	36	415	350	575	645	665	705	765	895	890	1060	1080	1250	1260	1630	1615	600	645	715	875	1060	1230		1255	1490	1690	1770	1820	1845	1870	1840	1285	910	345	1655	395
	0200	02:16	.38	230		2:16	2	69	415	345	575	645	660	700	770	890	885	1065	1075	1240	1250	1625	1640	605	645	745	960	1000	1245		1250	1485	1705	1770	1815	1855	1865	1840	1285	915	325	1660	395
	0300	03:20	.38	230		3:20	3	45	410	348	550	645	660	700	765	890	855	1065	1075	1240	1250	1625	1650	605	650	740	860	990	1240		1250	1490	1705	1770	1815	1850	1870	1845	1285	900	325	1660	410
	0400	04:24	.38	230		4:24	4	19	410	335	580	645	660	700	760	890	885	1060	1075	1235	1260	1630	1620	605	650	710	860	980	1235		1250	1505	1710	1770	1815	1850	1875	1845	1285	890	325	1655	415
	0500	05:28	.38	230		5:28	5	110	410	345	580	650	665	700	765	890	890	1065	1080	1255	1265	1645	1640	610	650	755	875	1020	1265		1240	1520	1710	1770	1820	1855	1875	1840	1275	910	310	1665	420
681 - 250 - 139	0600	06:32	.38	215		6:32	1	33	410	345	580	650	660	700	765	890	880	1065	1090	1245	1255	1630	1695	605	650	745	880	985	1240		1235	1490	1695	1765	1810	1845	1870	1830	1290	935	320	1650	395
719- 261 - 144	0700	07:36	.38	215		7:36	2	11	410	345	580	645	660	705	765	890	880	1060	1075	1245	1250	1665	1660	600	650	710	865	1000	1220		1245	1470	1685	1770	1810	1850	1875	1835	1305	905	300	1650	400

Avg → 1770.8 1815.4 1851.3 1872.3 1873.8

FIREMAN Clifton

GENERAL SHALE PRODUCTS CORPORATION
PLANT NO. - 10A

SUPERVISOR: Cole | DATE: 7/31/93 | GREEN BRICK AT 8:00 A.M.
KILN SCHEDULE: 64 min | GREEN BRICK WEIGHT: | STANDARD: 55
77648 9/s PRODUCTION: 84413 D/E | BURNED BRICK WEIGHT: 4.16 | SPECIAL:
TYPE BRICK: 9/s Nottingham | CARS BURNED: 23 | SOLID:
TOTAL KILN HOURS: 24 | 77648 9/s TOTAL BRICK BURNED: 85413 D/E | PAVER:
KEY CHEK AVERAGE: | TOTAL BRICK WEIGHT: | OTHER:

CWA 3.6

	1	2	3
PUSHER PRESSURE			
TURBO PRESSURE			21og
GAS PRESSURE			
PREDRYER SUPPLY TEMP.			
DRYER EXHAUST DRAFT			
DRYER EXHAUST TEMP.			
COLD AIR SUPPLY TEMP.			
KILN EXHAUST DRAFT			
UNDER CAR TEMP.			
COAL SCREENING			
COAL DRYER TEMP.			
FLASHING SYSTEM			
TURBO BLOWER (amps)			
DRYER SUPPLY (amps)			
DRYER EXHAUST (amps)			
COLD AIR SUPPLY (amps)			
KILN EXHAUST (amps)			
IMP MILL (amps)			
IMP MILL BLOWER (amps)			

	1	2	3
PREDRYER			
WET BULB			
DRY BULB			
HUMIDITY			
DEW POINT			
BRICK BODY			
FANS			
DRYER			
WET BULB			
DRY BULB			
HUMIDITY			
DEW POINT			
BRICK BODY			
FANS			

DRYER RECIRCULATING FANS
NO. 1: 2
NO. 2:
NO. 3: 0
NO. 4:

ENERGY METERS

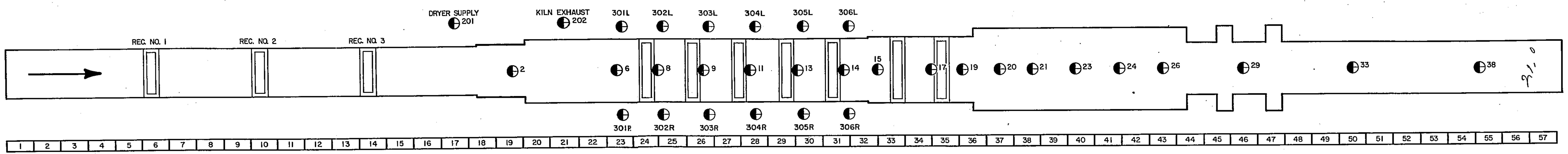
	GAS	COAL	FLASHING	ELECTRIC
END		631775		606
BEGIN		630958		591
TOTAL		817		15

COLD WATER ABSORPTION
KEY NO.
WEIGHT
C.W.A.
14400

CONTROL VALVE PRESSURE
NO. 1: 2070
NO. 2: 2030
NO. 3: 1090
NO. 4: 6090

	BTU	THERMS	COST	THERM % OF TOTAL	COST PER M	THERMS PER M
GAS: 78000 c.f. @ 1,040	= 395200 / 100,000	= 395 @ .355 /therm	= $140.22	15.4	1.64	4.6
COAL: 15033 lb. @ 14.476	= 2176122 / 100,000	= 2176 @ .162 /therm	= $352.51	84.6	4.13	25.5
FLASHING: ___ lb. @ ___	= ___ / 100,000	= ___ @ ___ /therm	= $			30.1

GAS: $ ___ per MCF, ___ ¢ per therm
COAL: $ ___ per ton, ___ ¢ per therm
TOTAL THERMS: 2571
BTU PER POUND OF BRICK: 724
TOTAL THERMS PER M BRICK: 30.1
AVERAGE COST PER THERM: .192
KWHR PER M BRICK: ~~151.54~~ 90.92
TOTAL COST: 492.73
KWHR COST PER M BRICK: ~~8.16~~ 4.89
COST PER M BRICK: 5.77



KILN SCHEDULE

COMMENTS	TIME	TIME-IN	BALANCE GAUGE	PUSHER PRESS.	TC*20	SCH.	DRYER NO.	CAR	DRYER SUPPLY 201	KILN EXHAUST 202	EXHAUST 2	301L	301R	302L	302R	303L	303R	304L	304R	305L	305R	306L	306R	6	8	9	11	13	14		PREHEAT 15	17	19	FIRE ZONE (1780) 20	21	23	24	26	COOLING 29	33	38	1650 306 Plen	300 400 Cool Heat Temp
									400	340	550	630	630	680	760	880	890	1065	1065	1230	1230	1625	1625	575	620	725	850	1000	1200	Type	1240	1470	1680	1765	1810	1850	1870	1880	1300	960	360		
	0800	8 36	.39	270		08:40	3	62	415	345	570	645	660	685	765	895	885	1050	1070	1240	1255	1640	1655	605	640	750	855	1005	1210		1240	1490	1680	1770	1810	1850	1825	1850	1225	895	300	1640	425
	0900	9 41	.39	245		9 44	4	75	415	340	575	645	655	685	760	890	875	1060	1075	1240	1255	1640	1650	610	640	750	860	1015	1215		1225	1495	1700	1770	1820	1850	1875	1820	1250	905	325	1655	400
	1000	10 47	.39	240		10 48	5	80	410	335	575	645	655	700	760	890	885	1070	1075	1235	1245	1670	1645	600	645	745	860	1000	1240		1260	1495	1695	1770	1815	1855	1875	1875	1250	925	350	1655	415
	1100	11 51	.39	240		11 52	1	28	415	320	575	645	660	700	765	890	880	1055	1070	1250	1265	1645	1660	600	645	745	855	1010	1235		1250	1500	1695	1770	1817	1850	1875	1830	1290	890	300	1650	390
	1200	12 55	.39	270		12 58	2	123	415	320	575	645	660	700	765	880	880	1055	1090	1250	1265	1645	1660	600	645	745	855	1010	1235		1250	1500	1695	1770	1815	1850	1875	1830	1290	890	300	1650	390
	1300		.39	270					420	335	575	645	655	700	740	885	885	1055	1075	1250	1260	1630	1655	600	650	745	850	1015	1230		1255	1490	1695	1765	1820	1855	1835	1835	1290	890	320	1655	390
	1400	13 59	.39	250		14 00	3	31	420	340	570	640	655	700	760	885	885	1050	1075	1250	1260	1635	1635	600	645	750	860	1000	1220		1270	1490	1705	1720	1815	1850	1865	1831	1280	910	325	1655	390
	1500	15 03	.39	245		15 04	4	89	430	335	570	645	660	705	765	890	885	1065	1075	1255	1255	1640	1620	600	645	750	865	985	1215		1260	1490	1690	1705	1805	1800	1865	1820	1250	905	295	1640	380

FIREMAN SLC

COMMENTS	TIME	TIME-IN	BALANCE GAUGE	PUSHER PRESS.	TC*20	SCH.	DRYER NO.	CAR	201	202	2	301L	301R	302L	302R	303L	303R	304L	304R	305L	305R	306L	306R	6	8	9	11	13	14		15	17	19	20	21	23	24	26	29	33	38	306 Plen	Cool Heat Temp
	1600	16:07	.40	280		16 08	5	70	430	350	575	650	660	700	770	895	890	1065	1080	1250	1260	1625	1615	605	650	750	875	975	1230		1250	1500	1700	1770	1820	1855	1870	1830	1280	890	340	1660	350
	1700	17:11	.39	270		17:12	1	130	430	360	575	645	660	700	770	895	890	1065	1080	1255	1260	1630	1630	605	645	755	870	1010	1235		1245	1495	1700	1775	1815	1855	1865	1825	1285	895	330	1660	400
	1800	18:15	.38	270		18:16	2	42	430	355	570	650	660	700	765	890	890	1065	1075	1250	1260	1640	1635	600	645	740	865	1010	1215		1260	1510	1700	1775	1820	1855	1865	1825	1280	850	340	1660	360
	1900	19:19	.38	270		19:20	3	43	430	350	575	645	655	700	760	890	890	1065	1080	1260	1260	1640	1625	600	640	745	870	1005	1225		1245	1490	1700	1775	1815	1855	1870	1835	1225	900	315	1660	360
	2000	20:23	.38	270		20:24	4	85	430	350	570	645	655	700	765	890	885	1065	1080	1255	1260	1630	1620	600	640	750	855	1010	1220		1250	1495	1690	1770	1815	1855	1865	1825	1250	915	310	1640	350
	2100	21:21	.38	270		21:22	5	71	425	360	570	650	660	700	760	890	890	1065	1075	1250	1255	1630	1620	600	650	740	870	1005	1230		1245	1485	1700	1770	1810	1855	1865	1825	1295	905	310	1650	395
	2200	22:31	.38	240		22:32	1	132	420	340	580	650	660	700	760	890	885	1065	1075	1240	1255	1625	1615	605	655	740	875	1005	1230		1240	1480	1700	1775	1815	1855	1860	1820	1305	910	300	1665	410
	2300	23:35	.38	270		23:36	2	15	425	355	575	650	660	700	765	885	880	1060	1075	1245	1260	1640	1625	600	640	750	855	995	1210		1250	1495	1695	1770	1805	1850	1870	1825	1275	890	315	1665	395

FIREMAN Kemper

COMMENTS	TIME	TIME-IN	BALANCE GAUGE	PUSHER PRESS.	TC*20	SCH.	DRYER NO.	CAR	201	202	2	301L	301R	302L	302R	303L	303R	304L	304R	305L	305R	306L	306R	6	8	9	11	13	14		15	17	19	20	21	23	24	26	29	33	38	306 Plen	Cool Heat Temp
1112- 142- 43	2400	24:40	.38	220		24:40	3	17	420	350	575	645	660	705	765	890	890	1070	1075	1255	1260	1625	1615	605	645	755	875	1000	1215		1240	1500	1705	1770	1815	1850	1870	1845	1300	925	315	1650	390
	0100	01:44	.38	225		1:44	4	39	420	355	575	650	660	700	770	890	890	1060	1075	1250	1255	1640	1630	600	645	745	865	995	1265		1255	1485	1700	1770	1805	1850	1865	1830	1285	915	305	1650	420
	0200	02:48	.38	230		2:48	5	120	420	355	575	650	655	705	765	850	885	1060	1075	1245	1255	1630	1610	605	650	755	865	1015	1240		1245	1560	1705	1770	1805	1850	1870	1845	1265	905	320	1650	385
	0300	03:52	.38	230		3:52	5	104	415	355	575	645	660	705	760	890	890	1065	1080	1255	1255	1630	1605	600	635	750	880	985	1235		1255	1480	1695	1770	1805	1850	1875	1840	1240	905	305	1650	370
	0400	04:56	.38	230		4:56	4	102	410	355	560	645	655	705	760	890	885	1065	1075	1250	1250	1635	1625	605	640	745	880	995	1216		1245	1480	1700	1775	1805	1850	1875	1840	1250	905	305	1650	380
	0500	X	.38	225		X	X	X	410	355	530	645	655	705	765	890	880	1065	1075	1250	1250	1640	1640	605	645	740	880	1005	1240		1235	1480	1705	1775	1805	1850	1875	1845	1260	905	305	1655	385
	0600	06:00	.38	225		6:00	3	90	410	350	560	650	655	705	760	895	885	1060	1075	1245	1250	1635	1640	605	655	745	875	990	1250		1265	1485	1685	1770	1805	1850	1870	1840	1245	865	280	1670	400
570-210-58	0700	07:04	.38	225		7:04	2	106	415	345	580	650	660	700	760	890	885	1065	1075	1250	1250	1635	1615	605	650	745	850	990	1230		1255	1485	1710	1770	1825	1850	1875	1840	1255	855	270	1670	380

1770.8 1812.5 1851.9 1870.2 1833.1

FIREMAN Clifton

PRELIMINARY DRAFT

PROPOSED SITE-SPECIFIC TEST PLAN FOR THE JOHNSON CITY BRICK PLANT

U. S. EPA CONTRACT NO. 68D20029
EMB WORK ASSIGNMENT NO. 14

Prepared by:

ETS, Inc.
1401 Municipal Road, Roanoke, Virginia 24012

June 1993

TABLE OF CONTENTS

TABLE OF CONTENTS

1.0 INTRODUCTION

1.0 INTRODUCTION

1.1 SUMMARY

The U.S. Environmental Protection Agency (EPA), Office of Air Quality Planning and Standards (OAQPS), Emission Inventory Branch (EIB) is responsible for developing and maintaining air pollution emission factors for industrial processes. EIB, in collaboration with the Brick Institute of America, is currently studying the brick manufacturing industry. The purpose of this study is to develop emission factors for the coal-fired kiln operations used by brick manufacturing facilities. The Emission Measurement Branch (EMB) of OAQPS will coordinate the emission measurement activities at this plant. ETS Incorporated (ETS Inc.) and EMB personnel will conduct the ambient and source measurements. Personnel from Midwest Research Institute, Inc (MRI) will collect samples of the process materials and obtain process data during testing.

EPA/EIB and the Brick Institute of America have considered the General Shale Brick Plant located in Johnson City, Tennessee to be ~~one of the two facilities representing~~ this type of brick manufacturing operation. Three areas of the manufacturing facility will be tested; 1) the raw material crushing and screening operations, 2) the kiln dryer zone, and 3) the kiln combustion zone. The testing is tentatively scheduled to occur in July of 1993.

Air sampling at the crushing and screening operations will be performed simultaneously for particulate matter (PM) and particulate matter less than or equal to ten microns (PM_{10}) at the baghouse outlet. Background ambient air sampling for PM and PM_{10} will be conducted around the crushing, screening and storage building and at "upwind" and "downwind" plant boundary locations. Process materials from the grinding and screening operations along with the baghouse catch will be sampled and analyzed for moisture and sieve size.

Source sampling at the kiln will be performed on both the dryer exhaust stack and the kiln exhaust stack. The dryer exhaust stack will be sampled for methane, ethane and total hydrocarbons. The kiln exhaust stack will be sampled for methane, ethane and for total hydrocarbons PM, PM_{10}, condensible particulate matter (CPM), particle sizing, multiple metals, hydrogen fluoride (HF), sulfur dioxide (SO_2), nitric oxides (NO_x), and carbon monoxide (CO). Table 1.1-1 lists the metals to be quantified in the test program.

Additional organic and flouride sampling of the combustion zone is anticipated. This testing includes determination of total fluorides, volatile organic compounds (VOC), and semivolatile organic compounds (SVOC). Tables 1.1-2 and 1.1-3 lists the volatiles and semivolatile organics that are targeted in the test program.

Table 1.1-1: Targeted Metals for Johnson City Brick (Johnson City, Tennessee)

METAL
antimony
arsenic
beryllium
cadmium
chromium
lead
manganese
mercury
nickel
phosphorus
selenium

TABLE 1.1-2: Targeted Volatile Compounds for Johnson City Brick (Johnson City, Tennessee).

COMPOUND (VALIDATED)	COMPOUND (NOT VALIDATED)
chloromethane	acetone*
bromomethane	carbon disulfide
methylene chloride	acrylonitrile
chloroform	2-butanone
trichlorofluoromethane*	1,1,1-trichloroethane
iodomethane	vinyl acetate
carbon tetrachloride	2-hexanone*
trichloroethene*	toluene
benzene	ethylbenzene
tetrachloroethene	styrene
	o-xylene
	m-/p-xylene

*Not a listed HAP.

TABLE 1.1-3: Targeted Semivolatile Compounds for Johnson City Brick (Johnson City, Tenessee).

COMPOUND (VALIDATED)	COMPOUND (NOT VALIDATED)
phenol	2-methylphenol*
naphthalene	dimethylphthalate
	dibenzofuran
	di-n-butylphthalate*
	bis(2-ethylhexy)phthalate

*Not a listed HAP.

The EPA reference methods used to test for volatiles and semivolatile organics have not been validated by the EPA for all of the above compounds listed.

1.2 TEST PROGRAM PERSONNEL

The key personnel who coordinated the test program and their phone numbers are:

- ETS Inc. Project Manager, Ted Handel 703/265-0004
- EIB Technical Coordinator, Ron Myers
- EMB Field Test Coordinator, John Brown 919/541-0200
- General Shale Contact, Walt Banyas 615/282-4661
- MRI Process Monitor, Bryan Schrager

Figure 1.2 is an organizational schematic for this test program. Names, titles and phone numbers of a the responsible individuals are included in this figure.

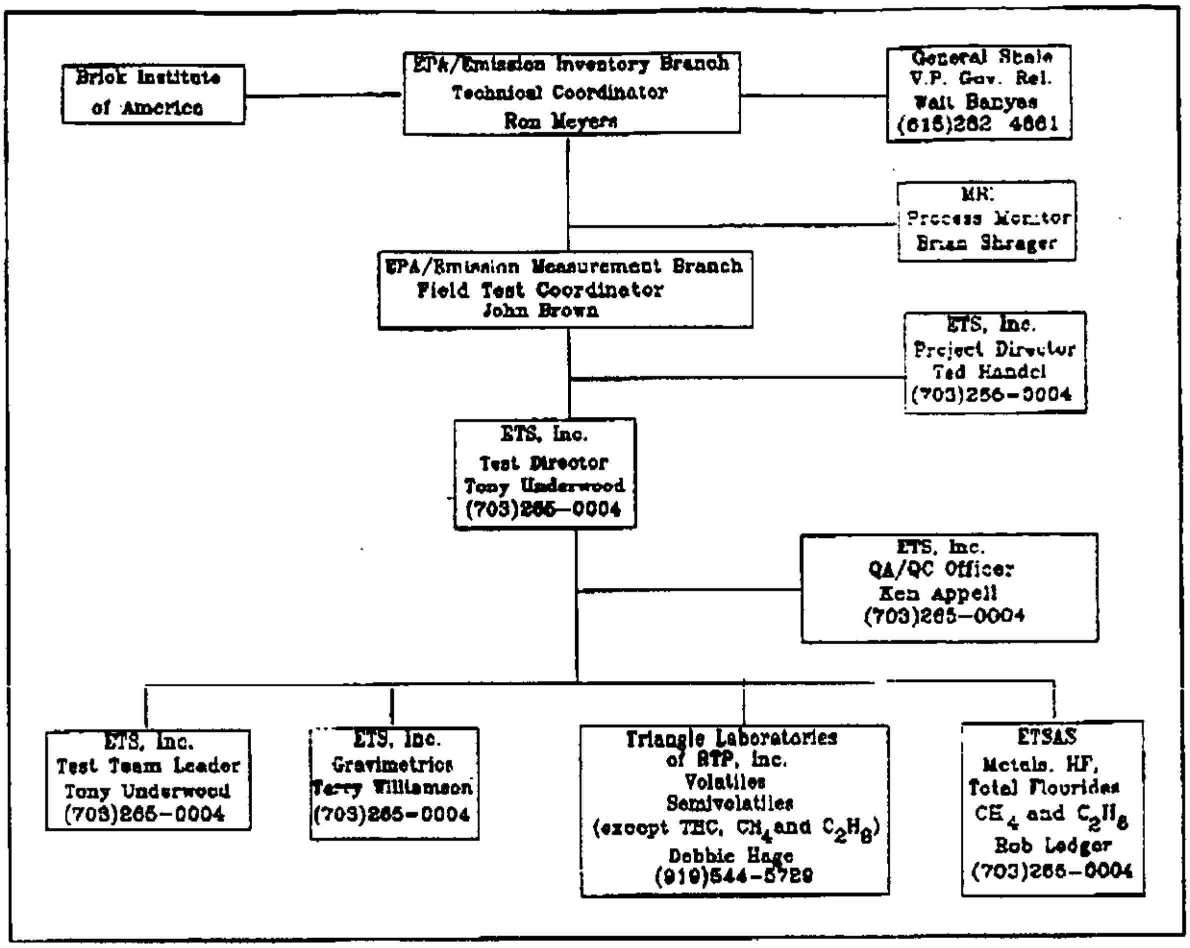


Figure 1.2: Organizational Schematic for the Test Program at Johnson City Brick (Johnson City, Tennessee).

2.0 PROCESS DESCRIPTION

The Johnson City Brick Plant is located in Johnson City, Tennessee and is also known as General Shale Plant Number 10. The plant encompasses approximately 100 acres and is adjacent to the General Shale mines No.1, No.12 and No.16. The Johnson City plant has an annual manufacturing capacity of 60 million bricks from its two tunnel-type kilns. The plant uses coal as a primary fuel. Natural gas is used as a secondary fuel and is added to the preheater section of the boiler in to increase combustion efficiency. Ten to twelve percent of the heat provided to the kiln is from natural gas.

Emissions from the following operations will be studied:

(1) raw material crushing and screening operations.
(2) brick drying process within the kiln.
(3) brick firing process within the kiln.

The general lay-out of the Johnson City Plant is show in Figure 2.0-1.

2.1 Raw Material Crushing, Screening and Storage Operation

A simplified process schematic for the raw material crushing and screening operation is given in Figure 2.1-1.

The raw material (shale) is kept in a covered storage pile. From this pile the shale is loaded into the primary crusher. The primary crusher consists of a single roll crusher where the large pieces of shale are initially broken apart. From the primary crusher, the crushed shale is transported via belt conveyor to the 384 pan grinder. From the pan grinder, the crushed shale is conveyed to a series of four 4' by 5' Leahy vibrating screens. The oversize material may be sent either back to the pan grinder or to a Pasco Claypactor. The Claypactor is a type of hammer mill which is used for final size reduction of the shale. The material exiting the Claypactor is conveyed back to the Leahy vibrating screens. The undersized material from the screen is conveyed into the storage bins via a reciprocating belt conveyor. This material is kept in the storage bins until it is loaded into the brick making operations.

Particulate emissions from the size reduction and screening operation will be conducted by sampling the following locations:

(1) at the baghouse outlet gas duct.
(2) at the baghouse particulate catch.

Uncontrolled emissions from the entire crushing and screening operations will be determined from the sum of the baghouse

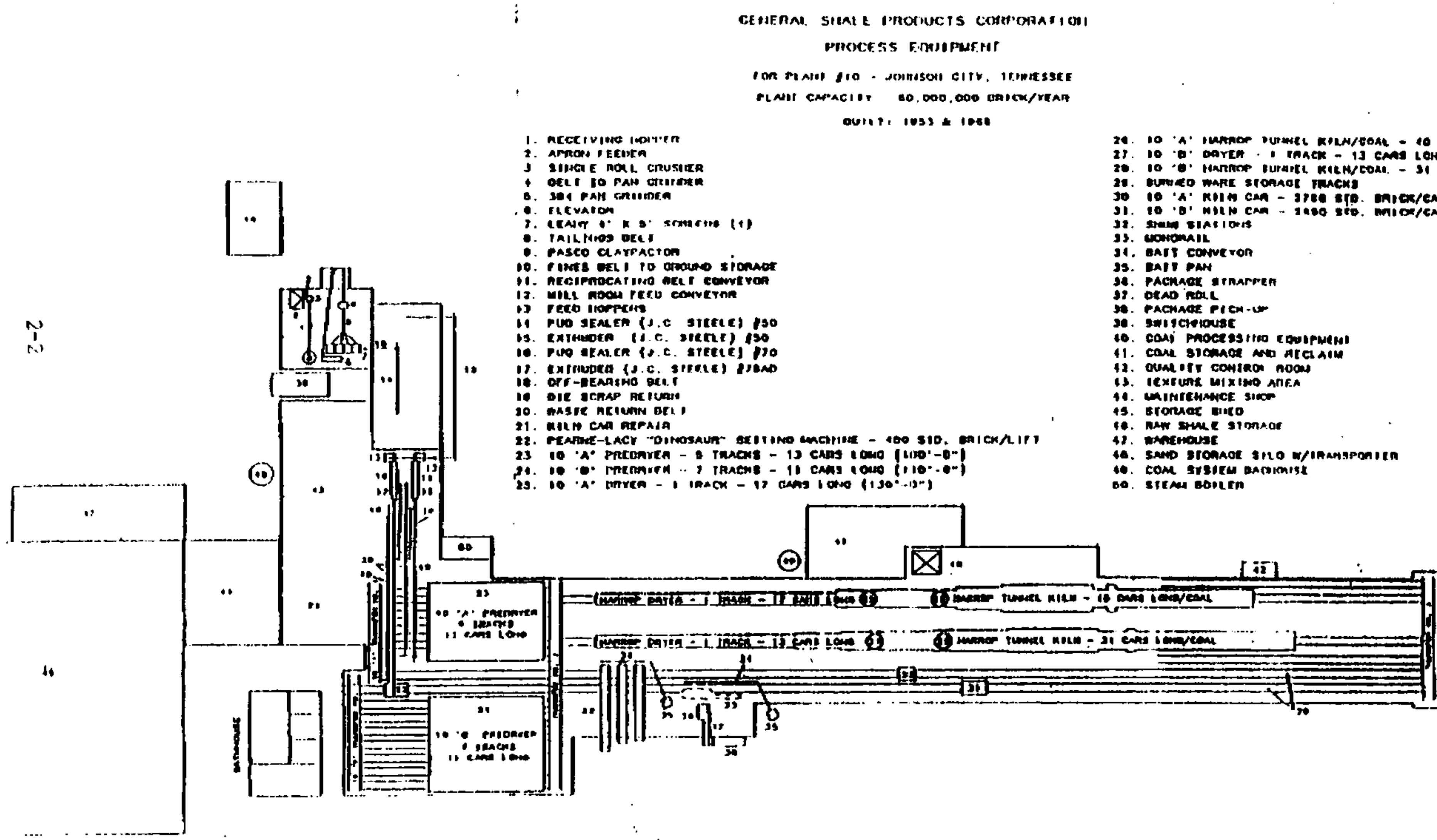


Figure 2.0-1: General Lay-out of the Johnson City Brick Plant, Johnson City, Tennessee.

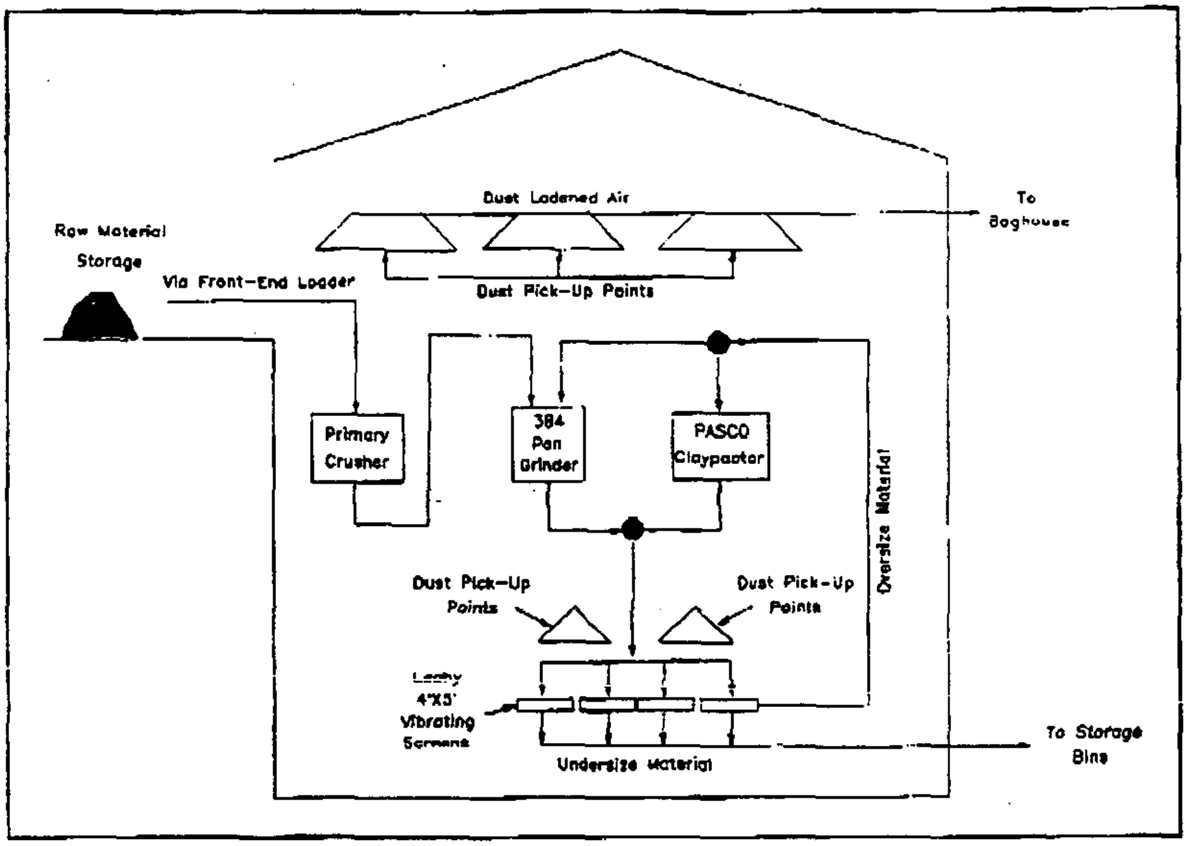


Figure 2.1-1: Schematic of the Crushing, Screening and Storage Operation.

particulate catch and the particulate passing through the baghouse. The roof vents, windows and conveyor outlets of the grinding building will be sealed during sampling. In addition, the "penthouse" exhaust fans and sand and crushed shale conveyors will be turned-off before sampling. The particulate emissions of the crushing and screening building will be sampled for PM and PM_{10} at the baghouse outlet gas duct. Sampling of the dust discharge at the bottom of the baghouse will be conducted for total mass and particle size. Background ambient PM and PM_{10} monitoring will also performed at "upwind" and "downwind" plant fenceline locations. Process material will be sampled by MRI at the crushing and screening building for sieve and moisture analyses.

2.2 Mixing and Extrusion Operation

The sized shale granules are removed from the storage bins and transported on the mill room feed belt conveyor to the texture mixing area. The granules are off-loaded into two feed hoppers that service twin lines of brick extruding equipment. The extruding equipment for each line consists of a J.C. Steele pug sealer and a J.C. Steele extruder. Water and sand are mixed with the slate granules in the extruders to form a thick paste. The paste is extruded in rectangular form and the bricks are then cut to size. The unbaked bricks are then conveyed to Transport Point No.1 for loading on to the trays of the kiln trucks. A Transport Point No.1 is located just before the predryer of each kiln. Since this procedure produces very little dust; therefore sampling of this operation is unnecessary.

2.3 Kiln Operation

The Johnson City plant has two tunnel kilns labeled A and B. Each kiln is separated into four sections:

(1) the predryer.
(2) the dryer.
(3) the combustion zone.
(4) the cooling zone.

Each kiln has two exhaust stacks. The dryer exhaust stack is located at the start of the dryer zone and it draws heated air from the cooling section located at the end of the tunnel kiln. The combustion zone exhaust stack is located at the beginning of the combustion zone and draws air through the combustion zone.

2.4 Pollution Control Description

INSERT BAGHOUSE INFORMATION HERE
(TO BE SUPPLIED BY GENERAL SHALE)

3.0 TEST PROGRAM

3.1 Objectives

The purpose of the test program is to develop emission factors for the brick manufacturing industry.

The specific objectives of the test program for the Johnson City Brick Plant are as follows:

(1) Measure the following emissions for the crushing, grinding, and storage operation:

- Particulate Matter
- PM_{10}

(2) Measure the following emissions for the kiln at the dryer exhaust stack:

- Total Hydrocarbons
- Methane
- Ethane

(3) Measure the following emissions for the kiln at the brick-firing exhaust stack:

- Particulate Matter
- PM_{10}
- Condensible Particulate Matter
- Multiple Metals
- Hydrogen Chloride
- Hydrogen Fluoride
- ~~Total Fluorides~~
- Carbon Monoxide
- Sulfur Dioxide
- Nitrogen Oxides
- Total Hydrocarbons
- Methane
- Ethane
- Volatile Organics
- Semivolatile Organics

standard screen for Triangle labs

3.2 Test Matrix

Table 3.2-1 presents the sampling and analytical matrix for measuring emissions from the crushing, grinding, and storage operations. Table 3.2-2 and Table 3.2-3 presents the sampling and analytical matrix for emissions measurements from the dryer exhaust

Table 3.2-1: Test Matrix for Crushing, Screening and Storage Operations at Johnson City Brick (Johnson City, Tennessee).

Sampling Location	Pollutant	Sampling Method	No. of Runs	Minimum Sample Time (minutes)	Analytical Method
Baghouse Outlet	PM/PM_{10}	M201A	3	variable	Gravimetric[a]
Plant Boundary	background PM	Ambient Hi-Vol[a]	3	variable	Gravimetric[a]
	background PM_{10}	Ambient Hi-Vol[b]	3	variable	Gravimetric[b]
Storage Building	(process material sampled by MRI)				
Baghouse Catch	(process material sampled by MRI)				

[a]40 CFR 50, Appendix B
[b]40 CFR 50, Appendix J

Table 3.2-2: Test Matrix for Kiln A Dryer Exhaust at Johnson City Brick (Johnson City, Tennessee).

Sampling Analytical Location	Pollutant	Sampling Method	No. of Runs	Minimum Sample Time (minutes)	Method
Dryer Exhaust Stack	methane (CH_4)	M18[a]	3	60	GC[b]
	ethane	M18[a]	3	60	GC[b]
	THC	M25A[a] (CEM)	3	60	FIA (M25A)[a]

Note: Gas Chromatograph (GC).
Flame Ionization Analyzer (FIA).

[a]40 CFR 60, Appendix A.
[b]M18 of 40 CFR 60, Appendix A using an integrated bag sample for GC analysis.

Table 3.2-2: Test Matrix for Kiln A Combustion Zone Exhaust at Johnson City Brick (Johnson City, Tennessee).

Sampling Analytical Location	Pollutant	Sampling Method	No. of Runs	Minimum Sample Time (minutes)	Method
Combustion-Zone Exhaust	$PM/PM_{10}/CPM$	M201A/ M202[a]	3	120	Gravimetric[a]
	multiple metals	M29[b]	3	120	ICAP/CVAAS (M29)[b]
	HCl/HF	M26[b]	3	120	IC(M26)[b]
	~~TF~~	~~M13B[b]~~	~~3~~	~~120~~	~~M13B[b]~~
	O_2/CO_2	M3A[b] (CEM)	3	120	electro-chemical/ NDIR(M3A)[b]
	CO	M10[b] (CEM)	3	120	GC/IR (M10)[b]

Note: Inductively Coupled Argon Plasma Emission Spectoscopy (ICAP) is the method used to determine all of the listed multiple metals expect mercury.

Cold Vapor Atomic Absorption Spectroscopy (CVAAS) is the analytical method used to determine mercury.

Ion Chromatography (IC).

Nondisperive Infared (NDIR).

Gas Chromatography/Infared (GC/IR).

[a]40 CFR 51, Appendix M
[b]40 CFR 60, Appendix A
[c]M18 of 40 CFR 60, Appendix A using an integrated bag sample for GC analysis
[d]Test Methods for Evaluating Solid Waste, Third Edition, Report SW-846, U.S. EPA, Office of Solid Waste and Emergency Response, Washington, DC, 1986.

Table 3.2-2: Test Matrix for Kiln A Combustion Zone Exhaust at Johnson City Brick (Johnson City, Tennessee).

Sampling Analytical Location	Pollutant	Sampling Method	No. of Runs	Minimum Sample Time (minutes)	Method
Combustion-Zone Exhaust	NO_x	M7E[b] (CEM)	3	120	Chemiluminescence (M7E)[b]
	THC	M25A[b] (CEM)	3	240	FIA (M25A)[b]
	methane (CH_4)	M18[b]	3	240	GC[c]
	ethane (C_2H_8)	M18[b]	3	240	GC[c]
	volatile organics	M0030[d]	3	120	??
	semi-volatile organics	M0010[d]	3	240	??

detection limit?

Note: Gas Chromatograph (GC).
Flame Ionization Analyzer (FIA).

[a] 40 CFR 51, Appendix M
[b] 40 CFR 60, Appendix A
[c] M18 of 40 CFR 60, Appendix A using an integrated bag sample for GC analysis
[d] Test Methods for Evaluating Solid Waste, Third Edition, Report SW-846, U.S. EPA, Office of Solid Waste and Emergency Response, Washington, DC, 1986.

4.0 SAMPLING LOCATIONS

Background and emissions sampling will be conducted by ETS, Inc. at: (1) the plant boundary line, (2) the inlet to the crushing and screening building , (3) baghouse outlet gas duct, (4) Kiln A dryer exhaust stack, (5) Kiln A brick-firing exhaust stack. Process sampling will be conducted by MRI.

4.1 Plant Boundary Line: Ambient air sampling for PM and PM_{10} will be conducted at two locations along the plant boundary: the west boundary line ("upwind") and the east boundary line ("downwind").

4.2 Crushing and Screening Building Inlet: Ambient air sampling for PM and PM_{10} will be conducted around the crushing and screening building.

4.3 Baghouse Outlet Gas Duct: Emissions from the size reduction, screening and storage area will be sampled at the outlet to the baghouse for PM and PM_{10}. All the bay and access doors will be closed prior to testing. The test location is approximately 10' above the ground so scaffolding will need to be erected. Figure 4.3-1 is a schematic of the proposed sampling location for the baghouse outlet duct. The outlet duct is 34" in diameter and will require 24 sampling points. Figure 4.3-2 is a detailed schematic of the outlet duct traverse and sampling locations.

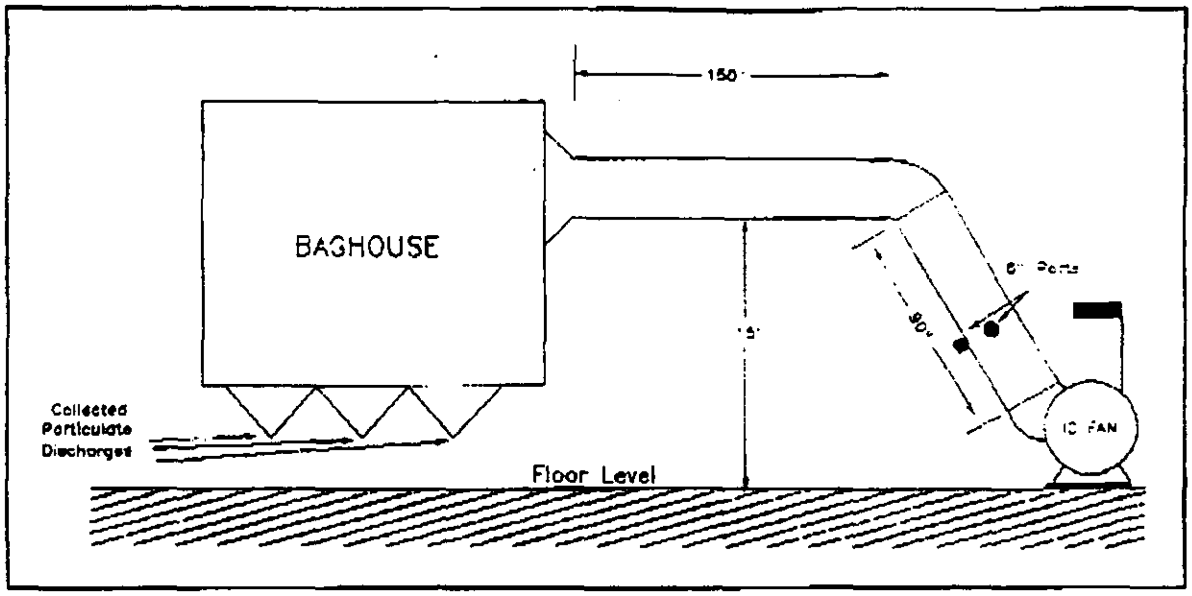
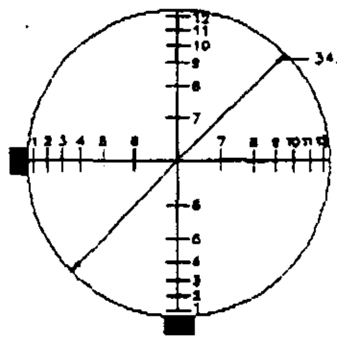


Figure 4.3.2-1: Schematic of Baghouse Ducting and Sampling Location for Johnson City Brick.

4.4 Kiln A Dryer Exhaust Stack: Figure 4.4-1 is a schematic of the proposed sampling location for the Kiln A dryer exhaust stack. Two 6-inch diameter test ports will need to be installed for all wet method testing. A 3-inch diameter port will be installed for single-point sampling for the instrumental analyzer methods. The stack has an approximate inside diameter of 30" and has 3' and 6' lengths of straight ducting below and above the roofline, respectively. Method 1 requires 24 traverse and sampling points for volumetric flow measurements and particulate sampling. Figure 4.4-2 is a detailed schematic of the traverse and sampling locations. Scaffolding to provide access to the ports will need to be provided.

4.5 Kiln A Combustion Zone Exhaust Stack: Figure 4.5-1 is a schematic of the sampling locations for the rectangular kiln exhaust stack. The stack is approximately 21" by 24" in size.



POINT	% ID	DISTANCE FROM INSIDE OF PORT (inches)
1	2.1	1.00*
2	6.7	2.28
3	11.8	4.01
4	17.7	6.02
5	25.0	8.50
6	35.6	12.10
7	64.4	21.90
8	75.0	25.50
9	82.3	27.98
10	88.2	29.99
11	93.3	31.72
12	97.9	33.00*

* Points moved 1-inch away from stack wall.

INSIDE STACK DIAMETER	34 in	2.83 ft
DISTANCE UPSTREAM FROM DISTURBANCE	68 in	2.0 DIA
DISTANCE DOWNSTREAM FROM DISTURBANCE	22 in	0.6 DIA

Figure 4.3-2: Baghouse Duct Sampling and Traverse Points.

Figure 4.3-2: Baghouse duct sampling and traverse points locations.

These dimensions yield a equivalent diameter of 22". The test ports will have to be located in the stack along its 138" disturbance-free length. Approximately 94" of the disturbance free duct length is above the roof level. Four 6-inch diameter test ports will need to be installed for all wet method sampling. Method 1 requires 24 traverse and sampling points for volumetric flow measurements and particulate sampling in a four by six sampling point matrix. A 3-inch diameter port could be installed for single-point sampling for the instrument analyzer methods. Figure 4.5-2 is a detailed schematic of the traverse and sampling locations. Scaffolding to provide access to the ports will need to be provided.

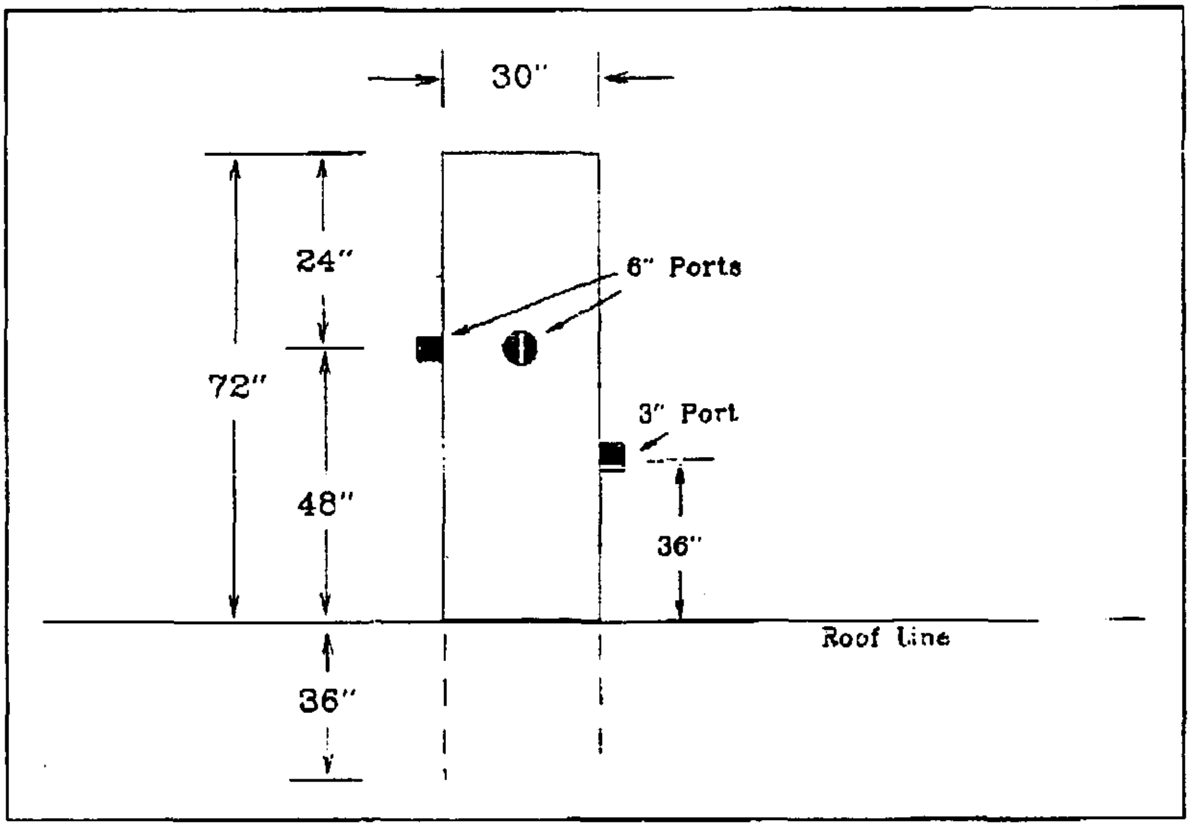
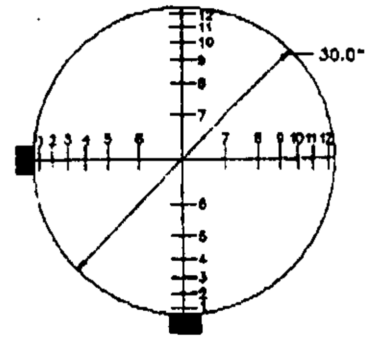


Figure 4.4-1: Schematic of Kiln A Dryer Exhaust Stack.

4.5 <u>Process Sampling Locations</u>: Process samples will be taken from the crushing and screening operation at the discharge points of the primary crusher, 384 pan grinder, Pasco Claypactor, and the Leahy vibrating screens. The collected particulate from the bottom of the baghouse will be measured during each gas sampling run for total particulate and for PM_{10}. The process sampling will be conducted by MRI.



POINT	% ID	DISTANCE FROM INSIDE OF PORT (inches)
1	2.1	1.00*
2	6.7	2.01
3	11.8	3.54
4	17.7	5.22
5	25.0	7.50
6	35.6	10.68
7	64.4	19.32
8	75.0	22.50
9	82.3	24.69
10	88.2	26.46
11	93.3	27.99
12	97.9	29.37*

* Points moved 1-inch away from stack wall.

INSIDE STACK DIAMETER	30 in	2.5 ft
DISTANCE UPSTREAM FROM DISTURBANCE	84 in	2.8 DIA
DISTANCE DOWNSTREAM FROM DISTURBANCE	24 in	0.8 DIA

Figure 4.4-2: Dryer exhaust stack sampling and traverse points.

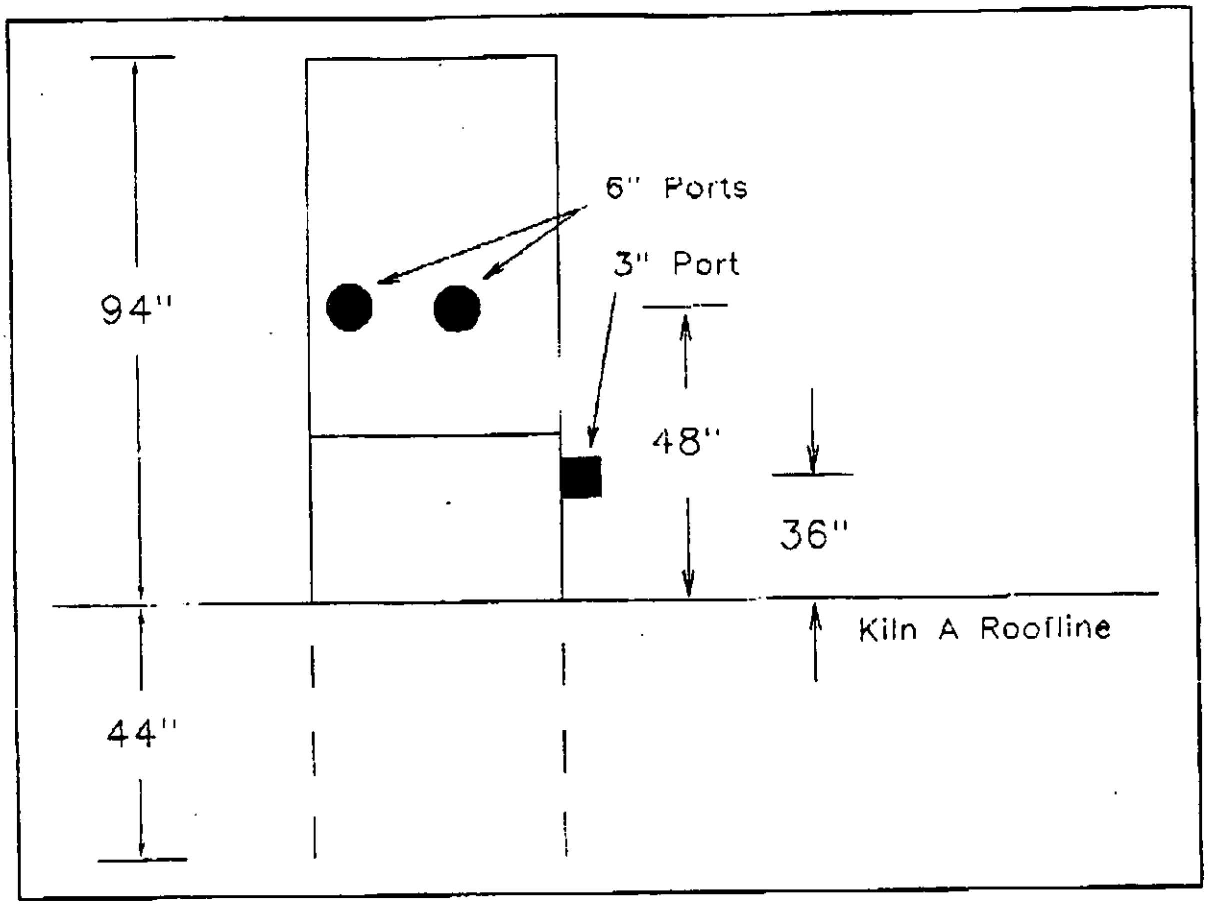
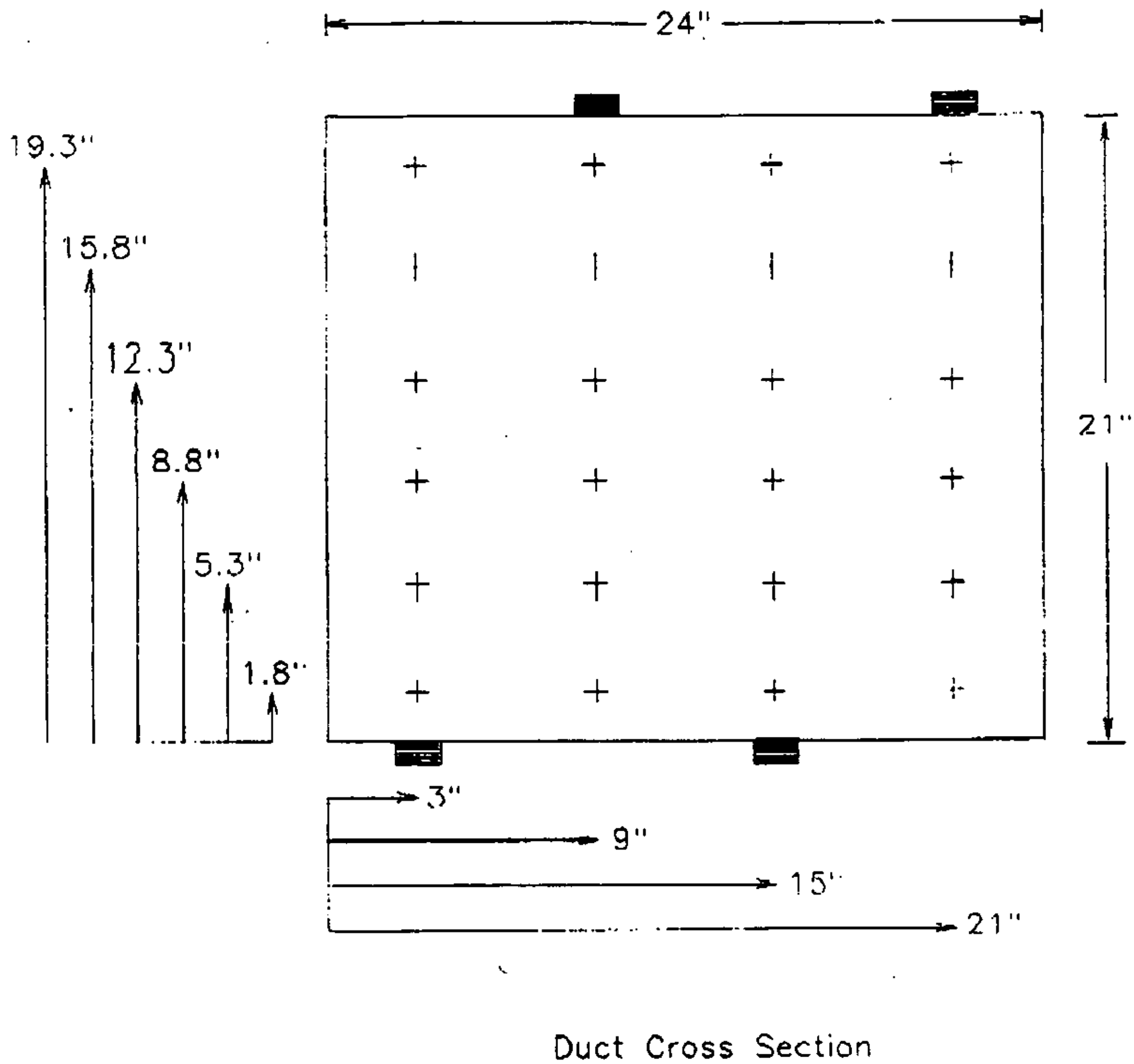


Figure 4.5-1: Schematic of Kiln A Combustion Zone Exhaust Stack.



Inside Stack Dimensions	48" x 40"

Figure 4.5-2: Kiln A Combustion Zone Exhaust Stack Sampling and Traverse Point Locations.

9.0 PERSONNEL RESPONSIBILITIES AND TEST SCHEDULE

9.1 Test Site Organization

The key tasks and task leaders are as follows:

Project Management	-	Ken Appell
Test Program Management	-	Tony Underwood
Modifications to Facility	-	Joe Szalay
Sample Recovery	-	Troy Pryor

9.2 Test Preparations

9.2.1 Modifications to the facility: In order for the emissions testing to be performed, several site modifications need to be made at the baghouse and at both Kiln A exhaust stacks. These modifications will be made by General Shale prior to the test date with technical assistance provided by ETS, Inc., as required.

9.2.1.1 Baghouse Outlet Duct: The following modifications need to be made to the baghouse outlet duct:

(1) Install two (2) 6" Test Ports. The 6" ports must be in the same cross-sectional plane and at a 90° angle. Due to overhead space restrictions along the 90" disturbance free section, the ports should be placed at 45° angle from the vertical along the duct diameter.

(2) Construct access to all sampling locations.

9.2.1.2 Kiln A Dryer Exhaust Stack: The following modifications need to be made at the Kiln A dryer exhaust stack:

(1) Install two (2) 6" test ports and one (1) 3" test port. The 6" ports must be in the same cross-sectional plane and at a 90° angle.

(2) Construct access ~~both~~ to the three test ports.

9.2.1.3 Kiln A Brick-Firing Exhaust Stack: The following modifications need to be made at the Kiln A brick-firing exhaust stack:

(1) Install four (4) 6" test ports and one (1) 3" test port. The 6" ports must be in the same cross-sectional plane and at a 90° angle.

(2) Construct access ~~both~~ TO the three test ports.

9.2.3 Ambient Monitoring Sites: Three ambient monitoring locations will be chosen during the preliminary site visit. Construction and installation of the ambient monitors and their associated platforms will be performed by ETS personnel the week prior to testing.

9.2.4 Services Provided by Facility: The Plant will provide 110v power to all test locations. The Plant will also provide 480 single phase power for the ETS mobile laboratory to be located in close proximity to the kiln dryer and combustion zone exhaust stacks.

9.2.5 Sample Recovery Areas: The ETS mobile laboratory will be utilized for sample recovery. The sample recovery area will be located in an area as free as possible from ambient dust contamination.

9.3 Test Personnel Responsibilities

ETS personnel will arrive at the plant about 1 hour before the start of the first test run on each test day. The test program manager will meet with the plant contact and the EPA representative to review the daily test objectives. Pre-test procedures will be performed at all test locations. CEMS equipment will calibrated and checked to verify that the systems are functioning properly. Table 9-1 lists the proposed test schedule.

TEST DAY	SAMPLING LOCATION	SAMPLING METHODS	SPECIAL REQUIREMENTS	# OF RUNS
1	TRAVEL AND SET-UP	1-4 PRELIM.	SET-UP GRINDING ROOM	1 PRE-LIM
2	GRINDING ROOM (A1)	1-4, 201A	TBD; 201A AND HI-VOL IS SIMULTANEOUS	3 1-HR RUNS, 1 8-HR RUN
2	TRAVEL AND SET-UP	1-4, 18, & 25a	TBD, SET-UP AT DRYING EXHAUST STACK	1 PRE-LIM
3	BRICK DRYING (C)	1-4, 18, & 25a	TBD; MOVE TO KILN EXHAUST STACK	3 1-HR RUNS
3	BRICK FIRING (D) SET-UP	1-4	SETUP FOR ALL ORGANICS AT KILN EXHAUST	1 PRE-LIM
4	BRICK FIRING EXHAUST (D)	1-4, 18, 25A, 0010, & 0030	ALL ORGANICS SAMPLING; 150 DSCF ON 0010; 120L ON 0030	2 OF EACH; 4 HR RUNS*
5	BRICK FIRING EXHAUST (D)	1-4, 18, 25a, 0010, & 0030	FINISH ORGANICS	1 OF EACH; 4 HR RUNS*
5	BRICK FIRING EXHAUST (D)	1-4, 26, & 29 CEMS (3A, 6C, 7E, 10)	START TESTS FOR TSP/METALS CEMS AND HF	2 OF EACH; 2 HR RUNS
6	BRICK FIRING EXHAUST (D)	1-4, 26, & 29 CEMS (3A, 6C, 7E, 10)	FINISH CEMS, TSP/METALS, AND HF	1 OF EACH; 2 HR RUNS
6	BRICK FIRING EXHAUST (D)	1-4, CEMS 201A/202	PM10 AND CPM TESTS	3 OF EACH; 1 HR RUNS
6	TRAVEL	NA	NA	
7	DISMANTLE AND TRAVEL	NA	NA	

* Vost sampling (M0010 and M0030) will consist of three two-hour runs.

Table 9-1. Proposed daily test schedule for the Johnson City Brick test program.

Released 6/2/94
~~SUBJECT TO CONFIDENTIALITY CLAIM~~

~~3612-03-05N~~
Copy 1 of 1
4601-01-01N

FIELD NOTEBOOK

MIDWEST RESEARCH INSTITUTE
ENVIRONMENTAL ENGINEERING DEPARTMENT
SUITE 350
401 HARRISON OAKS BLVD.
CARY, NC 27513
Telephone: (919) 677-0249
Facsimile: (919) 677-0065

ISSUED TO: BRIAN SHRAGER

SUBJECT: GENERAL SHALE EMISSION TEST

MRI PROJECT NO.: 3612-03-00
MRI CBI Pending No.: ______
EPA CBI Pending No.: ______
Declassified/Released: ______
(CDCO initial/date)

Facility Name: General Shale

Address:

Facility Contact: BUDDY ARCHER

Telephone:

Date and Time: 7/26 → 7/31/93

Attendees: General Shale BUDDY ARCHER, DAVE McNEES, WALT BANYAS, MIKE WHITEHEAD

EPA - John Brown

ETS -

MRI - Brian Shrager

Directions to Facility:

Attachment 1

GRINDING REPORT

Date 7-27-93

SUBJECT TO CONFIDENTIALITY CLAIM

DEPARTMENT LABOR CREW

NAME	HOURS WORKED
JAMES ADAMS	8
ROY ~~GEORGE BRUMMITT~~	8
JB ~~HOOVER BOWMAN~~	8
Mike ~~MATT BOWMAN~~	8

GRINDING ROOM WORKED 15

GRINDER OPERATED 7.3

TPH ~~FEEDER OPERATED~~ 59.5

YARDS ~~LOADS~~ GROUND 322

MOISTURE CONTENT 9.4

SUPERVISOR'S REMARKS:

F.M 2.08

23 truck loads @ 14 c.y. each

1 c.y. = 1.35 tons (2,700 lbs/c.y.)

322 c.y. = 434.7 tons

434.7 ÷ 7.3 hrs = 59.5 tons/hr.

ATTACHMENT 2

DAILY BURNING REPORT--- JOHNSON CITY PLANT NO. 10

SUBJECT TO CONFIDENTIALITY CLAIM

Date 7-28-93

	A-KILN	B-KILN
Green Cars 8:00 A.M.	40	57
Kiln Schedule	64 min	76 min
Cars Burned	23	19
Brick Burned	85412*	72960
Car Count	3376 (x1.1) 4% **	3840
Coal	15106	12714
Gas	38000	38000
CWA	4.0	2.8
Void Area	22.6	23.5
IRS	15.0	17.5
Kiln Car Brg. Temp	400°	400
	111° / 3.65	132° / 3.69

* STD. SIZE EQUIVALENTS; ACTUAL COUNT - 77,648
** QUEEN SIZE "GREEN" WT. - 5.28 LBS
QUEEN SIZE BURNED WT. - 4.25 LBS
TONS PRODUCED: 77,648 x 4.25 ÷ 2000 =

PLANT 10 KILN A DATE 7-28-93

		BTU's	Therms		Cost	Therm % of Total	Cost Per M
COAL 15106# @ 14,476	=	218680 / 100,000	= 2186	@ .162 /Therm	= $354.13	84.6	4.14
OIL ____gal. @ 140,000	=	____ / 100,000	= ____	@ ____ /Therm	= $____		
PROPANE ____gal. @ 91,600	=	____ / 100,000	= ____	@ ____ /Therm	= $____		
NATURAL GAS 38000 C.F. @ 1,040	=	395200 / 100,000	= 395	@ .162 /Therm	= $140.22	15.4	1.64

.191 ¢ Avg. Cost Per Therm

Costs:
Coal ____ Per Ton ____ Per Therm
Oil ____ Per Gal. ____ Per Therm
Propane ____ Per Gal. ____ Per Therm
Nat. Gas ____ Per MCF ____ Per Therm

Total Therms 2581 $494.35 Total Cost

Total Brick Burned 85412 $5.78 Cost Per M

Total Therms/M Brick Burned 30.1

Kwh/m 133.35 Coal/m 7.17 BTU 824

Attachment 3

DAILY BURNING REPORT--- JOHNSON CITY PLANT NO. 10

SUBJECT TO CONFIDENTIALITY CLAIM

Date 7-29-93

	A-KILN	B-KILN
Green Cars 8:00 A.M.	48	73
Kiln Schedule	64 min	74
Cars Burned	22	19
Brick Burned	81699 *	72960
Car Count	3376 x1.1	3840
Coal	15235	13008
Gas	38600	38000
CWA	2.8	2.3
Void Area	19.8	23.1
IRS	15.5	13
Kiln Car Brg. Temp	400	400°
	106° / 4.25 **	123° / 3.62

* STD. SIZE EQUIVALENTS; ACTUAL COUNT - 74,272
** ACTUAL BURNED (PRODUCT) WEIGHT

PLANT 10 KILN A DATE 7-29-93

		BTU's	Therms	Cost	Therm % of Total	Cost Per M
COAL 15235 # @ 14.476	=	220544 / 100,000	= 2205 @ .162 /Therm	= $357.71	84.4	4.37
OIL ____ gal. @ 140,000	=	____ / 100,000	= ____ @ ____ /Therm	= $____	____	____
PROPANE ____ gal. @ 91,600	=	____ / 100,000	= ____ @ ____ /Therm	= $____	____	____
NATURAL GAS 38000 C.F. @ 1,040	=	3952000 / 100,000	= 395 @ .355 /Therm	= $140.22	15.2	1.71

.191 ¢ Avg. Cost Per Therm

Costs:
Coal ____ Per Ton ____ Per Therm
Oil ____ Per Gal. ____ Per Therm
Propane ____ Per Gal. ____ Per Therm
Nat.Gas ____ Per MCF ____ Per Therm

Total Therms 2600 $497.43 Total Cost
Total Brick Burned 81699 $6.08 Cost Per M
Total Therms/M Brick Burned 31.7

KWH/m 136.55 Cost/m 7.34 BTU 745

MIDWEST RESEARCH INSTITUTE

Project No. 3612-03-00 Date/Time 7/27/93

Subject Emission testing @ General Shale (Johnson City) Brick Plant No. 10

Method 201a sampling at grinding room baghouse outlet began @ ~9:05 am (RUN 1)
3 timed samples of baghouse catch performed during Run 1. (Material Sampled @ 9:40 for moisture + silt.)

RUN 2 began @ ~10:50 Changed to 1½ hour ~~a~~ run because ~40 mg was collected during Run 1, and 50 mg is a desirable minimum catch. MATERIAL SAMPLE COLLECTED

RUN 3 began @ ~12:50 MATERIAL SAMPLE COLLECTED @ 2:15

7/28/93 → Received 7/27 grinding room report from Dave McNees - Attachment 1

Method 25a @ dryer stack

Calibrated @ 1000 ppm → measured ~~a~~ about 5 ppm (<1% of calibration)

Recalibrated to 100 ppm → measurements from 4 → 5 ppm

COLLECTED TIMES THAT THE KILN DOOR OPENED → TO CHECK FOR EFFECT ON EMISSIONS

DOOR OPENED @ 9:14
10:16
11:20
12:23
13:28
14:32

KILN REPORT - ~~@~~ 7/28/93 ATTACHMENT 2

7/29/93
TOOK 2 COAL SAMPLES → 1 during each VOST/SEMI-VOST RUN

TOTAL HYDROCARBONS STARTED @ ~60 ppm and decreased to ~12 ppm. Not sure why.

7/29/93 Kiln testing (Kiln A)

Max Kiln temp 7/28 → 1880°F

Kiln 'A' Flashing Schedule

Flashing from	to	total time
10:51:35	10:53:02	87 sec
10:56:05	10:57:35	90 sec
11:00:39	11:02:07	88 sec
11:05:10	11:06:42	92 sec
11:09:44	11:11:14	90 sec
11:14:16	11:15:45	89 sec
11:18:48	11:20:17	89 sec
11:23:20	11:24:48	88 sec
11:27:52	11:29:19	87 sec
11:32:22	11:33:50	88 sec
11:36:54	11:38:22	88 sec
11:41:26	11:41:55	29 sec *
11:45:58	11:47:26	88 sec
11:50:29	11:51:58	89 sec

MIDWEST RESEARCH INSTITUTE

Project No. ______ Date/Time ______ Page 3 of 20

Subject ______

MIDWEST RESEARCH INSTITUTE

Project No. ____________ Date/Time ____________

Subject ____________

MIDWEST RESEARCH INSTITUTE

Project No. ______ Date/Time ______

Subject ______

MIDWEST RESEARCH INSTITUTE

Project No. ______ Date/Time ______

Subject ______

MIDWEST RESEARCH INSTITUTE

Project No. ____________ Date/Time ____________

Subject ____________

MIDWEST RESEARCH INSTITUTE

Project No. ____________ Date/Time ____________ Page 15 of 20

Subject ____________

MIDWEST RESEARCH INSTITUTE

Project No. ______ Date/Time ______ Page 17 of 20

Subject ______

MIDWEST RESEARCH INSTITUTE

Project No. ______ Date/Time ______

Subject ______

MRI

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

Date: May 18, 1993

Subject: Recommendation for Emissions Testing at General Shale Products Corporation, Johnson City, Tennessee
Review and Update of AP-42 Chapter 8, Mineral Products
EPA Contract 68-D2-0152; Work Assignment 12
MRI Project 3612-03

From: Brian Shrager BLS

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

I. Basis for Selection

The General Shale Products Corporation (General Shale) brick plant located in Johnson City, Tennessee, is recommended for emissions testing for the following reasons:

1. Process operations at the plant are typical of a coal-fired brick manufacturing plant;

2. Emissions from the grinding room can be tested; and

3. The brick dryer ducts and kiln stack are easily accessible and are of sufficient length for isokinetic testing.

II. Facility Description

See confidential trip report for facility description.

III. Relationship of Test Data to Development of Emission Factors

The purpose of this testing program is to obtain data to characterize emissions from a typical coal-fired brick manufacturing plant from which emission factors can be developed for AP-42. Specifically, the primary objectives of the test are to quantify emissions of filterable and condensible particulate matter (PM), PM-10, metals, hydrogen fluoride, total hydrocarbons, methane, ethane, volatile hazardous air pollutants (HAP's), semi-volatile HAP's, carbon monoxide (CO), carbon dioxide (CO_2), sulfur dioxide (SO_2), and nitrogen oxides (NO_x)

from the firing section of a coal-fired tunnel kiln, as well as total hydrocarbons, methane, and ethane from the drying section of the kiln. In addition, PM and PM-10 emissions from the grinding room will be quantified. Emission factors will be calculated based on the emission data and the process rates recorded during the testing program.

IV. Test Program

Table 1 summarizes the processes and pollutants to be tested and the test methods to be used. Figure 1 provides a process flow diagram with the proposed sampling points identified.

Bulk material samples will be taken from storage piles (Sampling Point B) of finished material (grinding room product). These samples will be analyzed for silt and moisture content.

Samples of the coal used to fire the kiln will also be taken (Sampling Point E), so that the sulfur and ash content of the coal can be analyzed. If the plant performs this analysis during the testing, it will not be necessary for the testing contractor to perform this task.

The primary crushing and screening and grinding operations are contained in the same building. Filterable PM and PM-10 emissions from these sources will be measured by collecting the dust captured by the baghouse (over a specified time interval), performing a particle size analysis on the material collected, and simultaneously sampling the baghouse exhaust using Methods 5 and 201/201a, respectively (Sampling Points A1 and A2). Uncontrolled grinding room emissions will be calculated by adding the fraction of baghouse dust (collected over the specified time interval) less than or equal to 30 microns in aerodynamic diameter to the controlled emissions measured at the baghouse outlet.

The exhaust from the firing section of the tunnel kiln (Sampling Point D) will be sampled for several pollutants, including total hydrocarbons (Method 25a--continuous emission monitor [CEM]), methane and ethane (Method 18 or an appropriate CEM method that has a detection limit equivalent to that of Method 25a), volatile HAP's (Method 0030--VOST), semi-volatile HAP's (Method 0010--modified Method 5), hydrogen fluoride (Method 26/26a), metals (Method 0012--multi-metals train), PM (Method 5), PM-10 (Methods 201/201a and 202), CO (Method 10--CEM), CO_2 (Method 3A--CEM), SO_2 (Method 6C--CEM), and NO_x (Method 7E--CEM). Sampling ports must be installed on the kiln stack. Three runs of each sampling train will be conducted.

The exhaust from the drying section of the tunnel kiln (Sampling Point C) will be sampled for total hydrocarbons (Method 25a), and methane and ethane (Method 18--for

TABLE 1. SUMMARY OF PROCESSES TO BE TESTED

Process	Sampling point	Pollutant	Test Method
Grinding room	A1/A2	PM (collected by fabric filter)	timed material sample
		PM-10 and particle size (collected by fabric filter)	particle size analysis of timed material sample
		PM (filterable)	5
		PM-10	201/201a
Storage piles	B	raw material moisture content and sieve analysis	material sample
Brick drying	C	total hydrocarbons	25a
		methane, ethane	18
Brick firing	D	total hydrocarbons	25a (instrument)
		methane, ethane	18 (or equivalent)
		volatile HAP's	0030 (VOST)
		semi-volatile HAP's	0010 (MM5)
		hydrogen fluoride	26
		metals	0012 (multi-metal)
		PM (filterable)	5
		PM-10 (filterable)	201/201a
		PM-10 (condensible)	202
		CO	10 (instrument)
		SO_2	6C (instrument)
		NO_x	7E (instrument)
		CO_2	3A (instrument)
Coal storage piles	E	sulfur content, ash content	material sample

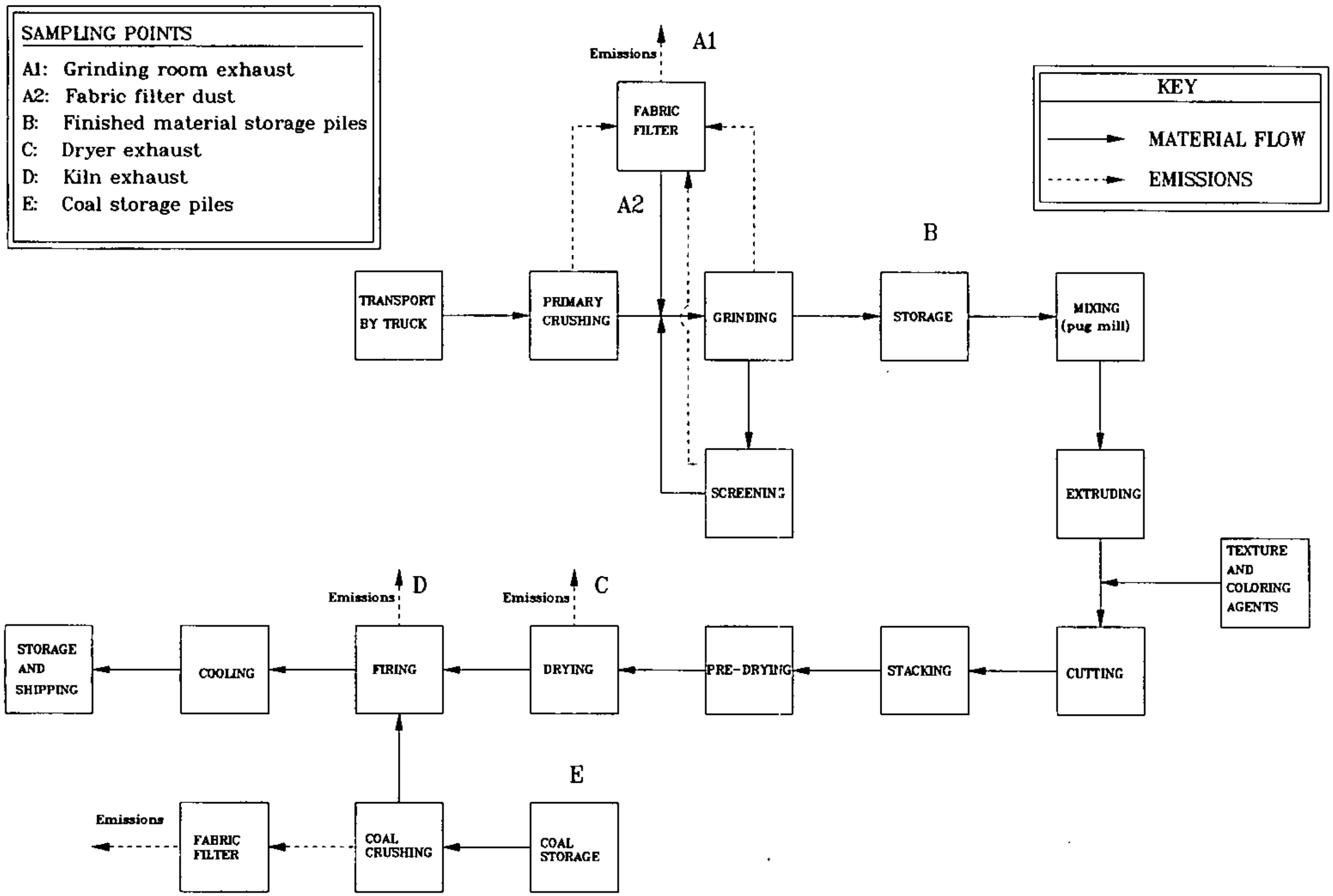


FIGURE 1. LOCATION OF SAMPLING POINTS FOR GENERAL SHALE, JOHNSON CITY, TENNESSEE.

determination of nonmethane, nonethane hydrocarbons). If total hydrocarbon emissions measured during the first test run are insignificant or not detected, additional test runs will not be performed. Otherwise, two additional test runs will be performed. Sampling ports must be installed on the dryer duct.

The samples collected using Method 0012 (multi-metals train) will be analyzed for those compounds listed as HAP's under Section 112 of the Clean Air Act. These include chromium, cadmium, arsenic, nickel, manganese, beryllium, lead, selenium, antimony, phosphorus, and mercury. In addition, samples may be analyzed for metals not listed as HAP's, depending on the additional cost.

The Method 0030 (VOST) and Method 0010 (modified Method 5) samples should be analyzed to quantitate emissions of those HAP's for which the methods have been validated. In addition, polycyclic organic matter (POM) and HAP's that have been identified as potential pollutants emitted during the combustion of coal should be targeted for analysis.

The attachment provides the source sampling and analysis schedule for the proposed test program at General Shale.

V. Quality Assurance

To ensure and document the quality of measurements recorded during the testing, performance audits using audit materials developed by and available from AREAL should be provided to the test contractor. Audits should only be performed for validated compounds. For the test program described in Section IV, the following audit materials are available:

Test Method	Audit Material and AREAL Contact
Method 0030 (VOST)	cylinder gases (PPB concentration) to audit both sampling and analysis. Contact: Bob Lampe at 541-4531.
25A	cylinder gases (PPM concentration) to audit both sampling and analysis. Contact: Bob Lampe at 541-4531.
0012 (metals)	glass fiber filters spiked with Sb, As, Be, Cd, Cr, Pb, Mn, Ni, and Se, to audit analysis. Contact: Ellen Streib at 541-7834.

VI. Responsibility of MRI

Prior to testing, a representative of MRI will maintain close coordination between the facility, the test contractor, and EPA to ensure that all necessary arrangements are made.

During the testing, representatives of MRI will monitor process operating parameters that indicate proper operation and that are needed for the development of emission factors, including raw material feed/product throughput rates and kiln temperature. Testing may be conducted only while the process being tested is operating normally. It is expected that the test program at General Shale will take one week to complete.

VII. Coordination

Continued coordination will be required among the EMB project officer, the EIB work assignment manager, the testing contractor, and MRI personnel prior to and during testing. Coordination with General Shale personnel is equally important. Mr. Walt Banyas is the main facility contact (telephone: [615] 282-4661).

Attachment

Attachment

SOURCE SAMPLING AND ANALYSIS SCHEDULE(a)

Contract No.:

Assignment Number:

Company Name: General Shale

Company Location: Johnson City, TN

Industry: brick manufacturing

Process: brick manufacturing

Control Equipment: fabric filter

Sampling Point	Total No. of Samples	Sample Type	Sampling Method	Sample Collected By**	Minimum Sampling Time	Minimum Gas Volume Sampled ft3	Initial Analysis Type	Initial Analysis Method	Initial Analysis By**	Final Analysis Type	Final Analysis Method	Final Analysis By**
A1*	3	filterable PM	5 (front half)	CTR	TBD	TBD						
A1*	3	PM-10	201/201a	CTR	TBD	TBD						
A2*	3	baghouse dust	timed grab	CTR	TBD	TBD						
B	TBD	storage pile material	grab	CTR								
C	1-3	total hydrocarbons	25a	CTR	TBD	TBD						
C	1-3	methane, ethane	18	CTR	TBD	TBD						
D	3	total hydrocarbons	25a	CTR	TBD	TBD						
D	3	methane, ethane	18	CTR	TBD	TBD						
D	3	volatile HAP's	0030 (VOST)	CTR	2 hr	120 L						
D	3	semivolatile HAP's	0010 MM5	CTR	4 hr	150 dscf						
D	3	HF	26	CTR	TBD	TBD						

SOURCE SAMPLING AND ANALYSIS SCHEDULE(a)				Contract No.:			Assignment Number:					
				Company Name: General Shale			Company Location: Johnson City, TN					
				Industry: brick manufacturing			Process: brick manufacturing			Control Equipment: fabric filter		
Sampling Point Figure	Total No. of Samples	Sample Type	Sampling Method	Sample Collected By**	Minimum Sampling Time	Minimum Gas Volume Sampled ft3	Initial Analysis			Final Analysis		
							Type	Method	By**	Type	Method	By**
D	3	metals	0012 (multi-metal)	CTR	TBD	TBD						
D	3	filterable PM	5 (front half)	CTR	TBD	TBD						
D	3	filterable PM-10	201/201a	CTR	TBD	TBD						
D	3	condensible PM-10	202	CTR	TBD	TBD						
D	3	CO	10	CTR	TBD	TBD						
D	3	SO2	6C	CTR	TBD	TBD						
D	3	NOx	7E	CTR	TBD	TBD						
D	3	CO2	3A	CTR	TBD	TBD						
E	3	coal	grab	CTR								

* Simultaneous sampling required.
** CTR = Contractor, EPA = Environmental Protection Agency.
(a) The sampling methodologies to be used will be selected by EMB.

REMARKS
1. Sampling shall be performed within +/-10% isokinetic conditions.
2. Methods are EPA unless otherwise indicated.
3. Impingers and analysis of impinger catch will be per the Federal Register, Volume 36, No. 159, Part II, Tuesday Aug. 17, 1991, unless specifically changed by the Project Officer.
4. Sampling time and gas volume for each sample.

DOCUMENT CONTROL SHEET

Project No.: 3612-03 (Subtask No.) 00

Document Name: Share\TOWP\TSTRQST.BRK

WP COMMENTS:

Originator: Brian Shrager

WP ID No.: 1710

1

DATE TO WP: 5/18

DESIRED DUE DATE: 5/18
Flexible ( )
Firm (✓)

FORMAT: (✓) EPA ( ) MRI ( ) Special

SPACING: (✓) Single ( ) 1 1/2 ( ) Double

OUTPUT: ( ) Draft ( ) Final Draft (✓) Final ( ) Rainbow

OPERATOR'S INITIALS: Sul

PREPARE: ( ) Envelope ( ) Label

WP PROOF: ( ) Yes ( ) No

COMMENTS: Put in final format. Figure 1 and Attachment are provided. Please put Table 1. in a Table Box.

ROUTE:	ACTION:	DATE:	COMMENTS:

2

DATE TO WP: 5/18

DESIRED DUE DATE: 5/18
Flexible ( )
Firm (✓)

FORMAT: (✓) EPA ( ) MRI ( ) Special

SPACING: (✓) Single ( ) 1 1/2 ( ) Double

OUTPUT: ( ) Draft ( ) Final Draft (✓) Final ( ) Rainbow

OPERATOR'S INITIALS: LKS

PREPARE: ( ) Envelope ( ) Label

WP PROOF: ( ) Yes ( ) No

COMMENTS: Couple corrections. Please type Attachment on first page of attachments

ROUTE:	ACTION:	DATE:	COMMENTS:

3

DATE TO WP:

DESIRED DUE DATE:
Flexible ( )
Firm ( )

FORMAT: ( ) EPA ( ) MRI ( ) Special

SPACING: ( ) Single ( ) 1 1/2 ( ) Double

OUTPUT: ( ) Draft ( ) Final Draft ( ) Final ( ) Rainbow

OPERATOR'S INITIALS:

PREPARE: ( ) Envelope ( ) Label

WP PROOF: ( ) Yes ( ) No

COMMENTS:

ROUTE:	ACTION:	DATE:	COMMENTS:

DOCUMENT CONTROL SHEET

Project No.: ______________ Document name: ______________

4 DATE TO WP: ______ FORMAT: ( ) EPA ( ) MRI ( ) Special SPACING: ( ) Single ( ) 1 1/2 ( ) Double OUTPUT: ( ) Draft ( ) Final Draft ( ) Final ( ) Rainbow

DESIRED DUE DATE: ______
Flexible ( )
Firm ( )

PREPARE: ( ) Envelope ( ) Label WP PROOF: ( ) Yes ( ) No.

OPERATOR'S INITIALS: ______

COMMENTS: ______

ROUTE:	ACTION:	DATE:	COMMENTS:

5 DATE TO WP: ______ FORMAT: ( ) EPA ( ) MRI ( ) Special SPACING: ( ) Single ( ) 1 1/2 ( ) Double OUTPUT: ( ) Draft ( ) Final Draft ( ) Final ( ) Rainbow

DESIRED DUE DATE: ______
Flexible ( )
Firm ( )

PREPARE: ( ) Envelope ( ) Label WP PROOF: ( ) Yes ( ) No

OPERATOR'S INITIALS: ______

COMMENTS: ______

ROUTE:	ACTION·	DATE:	COMMENTS:

6 DATE TO WP: ______ FORMAT: ( ) EPA ( ) MRI ( ) Special SPACING: ( ) Single ( ) 1 1/2 ( ) Double OUTPUT: ( ) Draft ( ) Final Draft ( ) Final ( ) Rainbow

DESIRED DUE DATE: ______
Flexible ( )
Firm ( )

PREPARE: ( ) Envelope ( ) Label WP PROOF: ( ) Yes ( ) No

OPERATOR'S INITIALS: ______

COMMENTS: ______

ROUTE:	ACTION:	DATE:	COMMENTS:

7 DATE TO WP: ______ FORMAT: ( ) EPA ( ) MRI ( ) Special SPACING: ( ) Single ( ) 1 1/2 ( ) Double OUTPUT: ( ) Draft ( ) Final Draft ( ) Final ( ) Rainbow

DESIRED DUE DATE: ______
Flexible ( )
Firm ( )

PREPARE: ( ) Envelope ( ) Label WP PROOF. ( ) Yes ( ) No

OPERATOR'S INITIALS: ______

COMMENTS: ______

ROUTE:	ACTION:	DATE:	COMMENTS:

Date: May 14, 1993

Subject: Recommendation for Emissions Testing at General Shale Products Corporation, Johnson City, Tennessee
Review and Update of AP-42 Chapter 8, Mineral Products
EPA Contract 68-D2-0152; Work Assignment 12
MRI Project 3612-03

From: Brian Shrager

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

I. Basis for Selection

The General Shale Products Corporation (General Shale) brick plant located in Johnson City, Tennessee, is recommended for emissions testing for the following reasons:

1. Process operations at the plant are typical of a coal-fired brick manufacturing plant;

2. Emissions from the grinding room can be tested; and

3. The brick dryer ducts and kiln stack are easily accessible and are of sufficient length for isokinetic testing.

II. Facility Description

See confidential trip report for facility description.

III. Relationship of Test Data to Development of Emission Factors

The purpose of this testing program is to obtain data to characterize emissions from a typical coal-fired brick manufacturing plant from which emission factors can be developed for AP-42. Specifically, the primary objectives of the test are to quantify emissions of filterable and condensible particulate matter (PM), PM-10, metals, hydrogen fluoride, total hydrocarbons, methane, ethane volatile hazardous air pollutants (HAP's), semi-volatile HAP's, carbon monoxide (CO), carbon dioxide (CO_2), sulfur dioxide (SO_2), and nitrogen oxides (NOx) from the drying and firing sections of a coal-fired tunnel kiln. In addition, PM and PM-10 emissions from the grinding room will be quantified. Emission factors will be calculated based on the emission data and the process rates recorded during the testing program.

only THC NMOC

IV. Test Program

Table 1 summarizes the processes and pollutants to be tested and the test methods to be used. Figure 1 provides a process flow diagram with the proposed sampling points identified.

I don't think there were any unpaved roads:

Bulk material samples will be taken from unpaved roads, which are denoted by Sampling Point A in Figure 1. These samples will be analyzed for silt and moisture content, which can then be used with the predictive emission factor equations in Chapter 11 of AP-42 for estimating PM and PM-10 emissions from this source.

TABLE 1. SUMMARY OF PROCESSES TO BE TESTED

Process	Sampling point	Pollutant	Test Method
vehicle traffic	A	PM	material sample
		PM-10	material sample
grinding room	B1/B2	PM (collected by fabric filter)	timed material sample
		PM-10 (collected by fabric filter)	particle size analysis of timed material sample
		PM (filterable)	5
		PM-10	201/201a
storage piles	C	raw material moisture content and sieve analysis	material sample
brick drying	D	total hydrocarbons	25a
		methane, ethane	18
brick firing	E	total hydrocarbons	25a
		methane, ethane	18
		volatile HAP's	0030 (VOST)
		semi-volatile HAP's	0010 (MM5)
		hydrogen fluoride	26
		metals	0012 (multi-metal)
		PM (filterable)	5
		PM-10 (filterable)	201/201a
		PM-10 (condensible)	202
		CO	10
		SO_2	6C
		NO_x	7E (instrument)
		CO_2	3A
coal storage piles	F	sulfur content, ash content	material sample

would also want to get other size fractions ie 30, 100 um for TSP estimate

is this a CEM

are these CEM

Bulk material samples also will be taken from storage piles (Sampling Point C) of finished material (grinding room product). These samples will be analyzed for silt and moisture content.

Samples of the coal used to fire the kiln will also be taken (Sampling Point F), so that the sulfur and ash content of the coal can be analyzed. If the plant performs this analysis during the testing, it will not be necessary for the testing contractor to perform this task.

The primary crushing and screening and grinding operations are contained in the same building (Sampling Point D). Filterable PM and PM-10 emissions from these sources will be measured by collecting the dust captured by the baghouse (over a specified time interval), performing a particle size analysis on the material collected, and simultaneously sampling the baghouse exhaust using Methods 5 and 201/201a, respectively (Sampling Points B1 and B2). Uncontrolled grinding room emissions will be calculated by adding the fraction of baghouse dust (collected over the specified time interval) less than or equal to 30 microns in aerodynamic diameter to the controlled emissions measured at the baghouse outlet.

Or an appropriate CEM method that has an equivalent detection limit as 25?

The exhaust from the fir

(Sampling Point E) will be sam

including total hydrocarbons (M

(Method 18), volatile HAP's (Me

parallel THC's pass one through AC filter to get methane & ethane

HAP's (Method 0010--modified Method 5), hydrogen fluoride (Method 26/26A), metals (Method 0012--multi-metals train), PM (Method 5), PM-10 (Methods 201/201a and 202), CO (Method 10), CO_2 (Method 3A), SO_2 (Method 6C), and NO_x (Method 7E--instrument analysis). Sampling ports must be installed on the kiln stack. Three runs of each sampling train will be conducted.

would like CEM info

CEM if possible

would like CEM method

The exhaust from the drying section of the tunnel kiln (Sampling Point D) will be sampled for total hydrocarbons (Method 25a), and methane and ethane (Method 18--for determination of nonmethane, nonethane hydrocarbons). If total hydrocarbon emissions measured during the first test run are insignificant or not detected, additional test runs will not be performed. Otherwise, two additional test runs will be performed. Sampling ports must be installed on the dryer duct.

The samples collected using Method 0012 (multi-metals train) will be analyzed only for those compounds listed as HAP's under Section 112 of the Clean Air Act. These include chromium, cadmium, arsenic, nickel, manganese, beryllium, lead, selenium, antimony, phosphorus, and mercury.

If non HAP metals do not cont more than HAP metals we should get value

The Method 0030 (VOST) and Method 0010 (modif samples should be analyzed to quantitate emissions for which the methods have been validated.

POM's, or see coal combustion AP-42 for other noc HAP's

This is not a very long list we should ask for more

The attachment provides the source sampling and analysis schedule for the proposed test program at General Shale.

V. Quality Assurance

To ensure and document the quality of measurements recorded during the testing, performance audits using audit materials developed by and available from AREAL should be provided to the test contractor. For the test program described in Section IV, the following audit materials are available:

We don't specify here to use only those pollutants that have been validated

Test Method	Audit Material and AREAL Contact
Method 0030 (VOST)	cylinder gases (PPB concentration) to audit both sampling and analysis. Contact: Bob Lampe at 541-4531.
25A	cylinder gases (PPM concentration) to audit both sampling and analysis. Contact: Bob Lampe at 541-4531.
0012 (metals)	glass fiber filters spiked with Sb, As, Be, Cd, Cr, Pb, Mn, Ni, and Se, to audit analysis. Contact: Ellen Streib at 541-7834.

Are there not going semi VOST i.e. POM (some

VI. Responsibility of MRI

Prior to testing, a representative of MRI will maintain close coordination between the facility, the test contractor, and EPA to ensure that all necessary arrangements are made.

During the testing, representatives of MRI will monitor process operating parameters that indicate proper operation and that are needed for the development of emission factors, including raw material feed/product throughput rates and kiln temperature. Testing may be conducted only while the process being tested is operating normally. It is expected that the test program at General Shale will take one week to complete.

VII. Coordination

Continued coordination will be required among the EMB project officer, the EIB work assignment manager, the testing contractor, and MRI personnel prior to and during testing. Coordination with General Shale personnel is equally important. Mr. Walt Banyas is the main facility contact (telephone: [615] 282-4661).

Attachment

SOURCE SAMPLING AND ANALYSIS SCHEDULE(a)				Contract No.:			Assignment Number:					
				Company Name: General Shale			Company Location: Johnson City, TN					
				Industry: brick manufacturing			Process: brick manufacturing			Control Equipment: fabric filter		
Sampling Point	Total No. of Samples	Sample Type	Sampling Method	Sample Collected By**	Minimum Sampling Time	Minimum Gas Volume Sampled ft3	Initial Analysis Type	Initial Analysis Method	Initial Analysis By**	Final Analysis Type	Final Analysis Method	Final Analysis By**
A	TBD	road dust	grab	CTR								
B1*	3	filterable PM	5 (front half)	CTR	TBD	TBD						
B1*	3	PM-10	201/201a	CTR	TBD	TBD						
B2*	3	baghouse dust	timed grab	CTR	TBD	TBD						
C	TBD	storage pile material	grab	CTR								
D	1-3	total hydrocarbons	25a	CTR	TBD	TBD						
D	1-3	methane, ethane	18	CTR	TBD	TBD						
E	3	total hydrocarbons	25a	CTR	TBD	TBD						
E	3	methane, ethane	18	CTR	TBD	TBD						
E	3	volatile HAP's	0030 (VOST)	CTR	2 hr	120 L						
E	3	semivolatile HAP's	0010 MM5	CTR	4 hr	150 dscf						
E	3	HF	26	CTR	TBD	TBD						

SOURCE SAMPLING AND ANALYSIS SCHEDULE(a)				Contract No.:			Assignment Number:					
				Company Name: General Shale			Company Location: Johnson City, TN					
				Industry: brick manufacturing			Process: brick manufacturing			Control Equipment: fabric filter		
Sampling Point Figure	Total No. of Samples	Sample Type	Sampling Method	Sample Collected By**	Minimum Sampling Time	Minimum Gas Volume Sampled ft3	Initial Analysis			Final Analysis		
							Type	Method	By**	Type	Method	By**
E	3	metals	0012 (multi-metal)	CTR	TBD	TBD				Cr,Cd,As,Ni,Mn, Be,Pb,Se,Sb,Hg,		
E	3	filterable PM	5 (front half)	CTR	TBD	TBD						
E	3	filterable PM-10	201/201a	CTR	TBD	TBD						
E	3	condensible PM-10	202	CTR	TBD	TBD						
E	3	CO	10	CTR	TBD	TBD						
E	3	SO2	6C	CTR	TBD	TBD						
E	3	NOx	7E	CTR	TBD	TBD						
E	3	CO2	3A	CTR	TBD	TBD						
F	3	coal	grab	CTR								

* Simultaneous sampling required.
** CTR = Contractor, EPA = Environmental Protection Agency.
(a) The sampling methodologies to be used will be selected by EMB.

REMARKS

1. Sampling shall be performed within +/-10% isokinetic conditions.
2. Methods are EPA unless otherwise indicated.
3. Impingers and analysis of impinger catch will be per the Federal Register, Volume 36, No. 159, Part II, Tuesday Aug. 17, 1991, unless specifically changed by the Project Officer.
4. Sampling time and gas volume for each sample.

DOCUMENT CONTROL SHEET

Project No.: 3612 (Subtask No.) 03

Document Name: GeneralJ.DOC (on enclosed disk)

WP COMMENTS:

Originator: Brian Shrager

WP ID No.: A1205-1

1

DATE TO WP: 4/26

DESIRED DUE DATE: 4/27

Flexible ( )

Firm (✓)

FORMAT: (✓) EPA ( ) MRI ( ) Special

SPACING: ( ) Single (✓) 1 1/2 ( ) Double

OUTPUT: (✓) Draft ( ) Final Draft ( ) Final ( ) Rainbow

OPERATOR'S INITIALS: NMW

PREPARE: ( ) Envelope ( ) Label

WP PROOF: (✓) Yes ( ) No

COMMENTS: Corrections as noted. I will supply a flow diagram (Fig 1)

M12

ROUTE:	ACTION:	DATE:	COMMENTS:

2

DATE TO WP: 4/28

DESIRED DUE DATE: 4/28 (Noon)

Flexible ( )

Firm (✓)

FORMAT: (✓) EPA ( ) MRI ( ) Special

SPACING: ( ) Single (✓) 1 1/2 ( ) Double

OUTPUT: (✓) Draft ( ) Final Draft ( ) Final ( ) Rainbow

OPERATOR'S INITIALS: KMW

PREPARE: ( ) Envelope ( ) Label

WP PROOF: ( ) Yes ( ) No

COMMENTS: Corrections as noted. I need this by noon!

W7

ROUTE:	ACTION:	DATE:	COMMENTS:

3

DATE TO WP:

DESIRED DUE DATE:

Flexible ( )

Firm ( )

FORMAT: ( ) EPA ( ) MRI ( ) Special

SPACING: ( ) Single ( ) 1 1/2 ( ) Double

OUTPUT: ( ) Draft ( ) Final Draft ( ) Final ( ) Rainbow

OPERATOR'S INITIALS: NS

PREPARE: ( ) Envelope ( ) Label

WP PROOF: ( ) Yes ( ) No

COMMENTS: PLEASE CUT & PASTE FLOW DIAGRAM ONTO Pg. 3.

ROUTE:	ACTION:	DATE:	COMMENTS:

DOCUMENT CONTROL SHEET

Project No.: ____________ Document name: ____________

4

DATE TO WP: 5/4

DESIRED DUE DATE: 5/5 am
- Flexible ( )
- Firm (✓)

OPERATOR'S INITIALS: db

FORMAT: (✓) EPA ( ) MRI ( ) Special

SPACING: ( ) Single (✓) 1 1/2 ( ) Double

OUTPUT: ( ) Draft ( ) Final Draft ( ) Final ( ) Rainbow

PREPARE: ( ) Envelope ( ) Label

WP PROOF: ( ) Yes ( ) No

COMMENTS: Make corrections indicated on copy 2 of 2. This draft will be sent to the plant.

TJB

ROUTE:	ACTION:	DATE:	COMMENTS:

5

DATE TO WP: 5/5

DESIRED DUE DATE: 5/5
- Flexible ( )
- Firm (✓)

OPERATOR'S INITIALS:

FORMAT: ( ) EPA ( ) MRI ( ) Special

SPACING: ( ) Single (✓) 1 1/2 ( ) Double

OUTPUT: ( ) Draft ( ) Final Draft ( ) Final ( ) Rainbow

PREPARE: ( ) Envelope ( ) Label

WP PROOF: ( ) Yes ( ) No

COMMENTS: Still needs to be 1.5 spaced! (Beginning @ section IV) No corrections.

ROUTE:	ACTION:	DATE:	COMMENTS:
			RAINBOW

6

DATE TO WP:

DESIRED DUE DATE:
- Flexible ( )
- Firm ( )

OPERATOR'S INITIALS:

FORMAT: ( ) EPA ( ) MRI ( ) Special

SPACING: ( ) Single ( ) 1 1/2 ( ) Double

OUTPUT: ( ) Draft ( ) Final Draft ( ) Final ( ) Rainbow

PREPARE: ( ) Envelope ( ) Label

WP PROOF: ( ) Yes ( ) No

COMMENTS:

ROUTE:	ACTION:	DATE:	COMMENTS:

7

DATE TO WP:

DESIRED DUE DATE:
- Flexible ( )
- Firm ( )

OPERATOR'S INITIALS:

FORMAT: ( ) EPA ( ) MRI ( ) Special

SPACING: ( ) Single ( ) 1 1/2 ( ) Double

OUTPUT: ( ) Draft ( ) Final Draft ( ) Final ( ) Rainbow

PREPARE: ( ) Envelope ( ) Label

WP PROOF: ( ) Yes ( ) No

COMMENTS:

ROUTE:	ACTION:	DATE:	COMMENTS: