AP42 Section:	11.7
Title:	Comments and correspondence for 1996 supplement

Source category: Ceramic manufacturing
Plant name :
Process :

Filename: CER_EF.WQ1
Location:
Test date:

Date: 10/13/94
Ref. No.:
Process rate basis:

Source	Type of control	Pollutant	Run No.	Test Method	Isokinetic, %	Gas volume, DSCF	Volum. flow rate, DSCFM	Mass, g	Concen., gr/DSCF	Emission rate, lb/hr	Process rate, ton/hr	Emission factor kg/Mg	Emission factor lb/ton	Rat.
		filterable PM	1	EPA 5					ERR	ERR		ERR	ERR	
		filterable PM	2						ERR	ERR		ERR	ERR	
		filterable PM	3						ERR	ERR		ERR	ERR	
									gr/DSCF		Average	ERR	ERR	
		fluoride	1						ERR	ERR		ERR	ERR	
		fluoride	2						ERR	ERR		ERR	ERR	
		fluoride	3						ERR	ERR		ERR	ERR	
									%		Average	ERR	ERR	
		CO2	1	Orsat	NA	NA		NA		0		ERR	ERR	
		CO2	2		NA	NA		NA		0		ERR	ERR	
		CO2	3		NA	NA		NA		0		ERR	ERR	
											Average	ERR	ERR	

Basis for rating:
Problems noted:
Other notes:

Electric Kiln

NEW SOURCE CLASSIFICATION CODES FOR CERAMIC PRODUCT MANUFACTURING

The current SCCs for ceramic product manufacturing are shown in Table 1. Revised and new SCCs are shown in Table 2.

Table 1. Current SCCs Listed in FIRE for Ceramic Product Manufacturing

SCC	Description	Units	Comments
3-05-008-01	Drying	lb/ton input to process	Obsolete-use (-13)
3-05-008-02	Grinding	lb/ton input to process	See revised description in Table 2
3-05-008-03	Storage	lb/ton input to process	See revised description in Table 2
3-05-008-04	Screening and floating	lb/ton input to process	"Floating" is not an emission point. Obsolete; see new SCC for Sizing--vibrating screens in Table 2
3-05-008-05	Mixing	lb/ton material	See revised description in Table 2
3-05-008-06	Handling and transferring	lb/ton material	See revised description in Table 2
3-05-008-07	Grinding, dry	lb/ton material	Obsolete; see SCC for Comminution (-02).
3-05-008-10	Spray dryer: Agglomeration process	lb/ton input to process	See revised description in Table 2
3-05-008-11	Infrared (IR) dryer	lb/ton input to process	See revised description in Table 2
3-05-008-12	Glazing and firing kiln	lb/ton input to process	Obsolete. Glazing and firing are two separate processes. (See -45 and -50)
3-05-008-99	Other not classified	lb/ton produced	OK

Table 2. New and Revised SCCs for Ceramic Product Manufacturing (Revised SCCs shown in *Italics*)

SCC	New or Revised Description	Units
3-05-008-02	Comminution--crushing, grinding, and milling	lb/ton material processed
3-05-008-03	Raw material storage	lb/ton material processed
3-05-008-06	Raw material handling and transfer	lb/ton material processed
3-05-008-13	Drying--convection drying prior to firing	lb/ton fired ceramic produced
3-05-008-16	Sizing--vibrating screens	lb/ton material processed
3-05-008-18	Air Classifier	lb/ton material processed
3-05-008-21	Calcining--natural gas-fired rotary calciner	lb/ton material processed
3-05-008-22	Calcining--fuel oil-fired rotary calciner	lb/ton material processed
3-05-008-23	Calcining--natural gas-fired fluidized bed calciner	lb/ton material processed
3-05-008-24	Calcining--fuel oil-fired fluidized bed calciner	lb/ton material processed
3-05-008-05	Granulation--direct mixing of ceramic powder and binder solution	lb/ton material processed
3-05-008-10	Granulation--natural gas-fired spray dryer	lb/ton dry material produced
3-05-008-28	Mixing--raw materials, binders, plasticizers, surfactants, and other agents	lb/ton material processed
3-05-008-30	Forming--general	lb/ton material processed
3-05-008-31	Forming--tape casters	lb/ton product
3-05-008-35	Green machining--grinding, cutting, or laminating formed ceramics prior to firing	lb/ton material processed
3-05-008-11	Drying--Infrared drying prior to firing	lb/ton fired ceramic produced
3-05-008-40	Presinter thermal processing--natural gas-fired kiln	lb/ton material processed
3-05-008-41	Presinter thermal processing--fuel oil-fired kiln	lb/ton material processed
3-05-008-43	**Glaze preparation** --ball mill or attrition mill	**lb/ton material processed**
3-05-008-45	Ceramic glaze spray booth	lb/ton glaze used
3-05-008-50	Firing--natural gas-fired kiln	lb/ton product
3-05-008-54	Firing--fuel oil-fired kiln	lb/ton product
3-05-008-56	Refiring kiln--after decal, paint, or ink applied; natural gas-fired	lb/ton product
3-05-008-58	Cooler--cooling ceramics following firing	lb/ton product
3-05-008-60	Final processing--grinding and polishing	lb/ton product
3-05-008-70	Final processing--annealing	lb/ton product
3-05-008-80	Final processing--surface coating	lb/ton product

Bryan:

1a. Agree - we need to use consistent wording between flow diag, text, tables and fire.

X 1b. Firing/sintering should be different processes (unless industry calls the firing process a sintering process). Also Mixing, Spray Dryer and granulation are different processes.

Industry calls sintering firing!

2. I would think that #/gal would be a more consistent factor across different sized products. See if you can convert #/ton product to #/gal of glaze. I would think that the lead factor could use an explanation about the lead content of the glaze also if possible.

No info to convert to gal. Can do lb/ton glaze instead of product.

Convert #/gal to #/ton

Need Glaze density!

3. I agree. Also it seems that the factor table uses #/ton of ceramic produced more than material processed. The spray dryer factors should clarify whether the material is raw material (wet) or ~~dry~~ finished material (dry)

TO: Brian Schrager
THRU: Ron Myers
FROM: Ron Ryan
RE: SCC Codes for Ceramics Section 11.7
DATE: May 23, 1996

I have marked up the two ef tables and the flow diagram from revised draft section 11.7 in trying to assign SCC codes. I've made some assumptions about what processes go with what flow blocks, so please review my marked up suggestions to insure they are valid. Also, some of my markup suggestions on the ef tables may require some work by MRI if OK with Ron Myers. I suggest we proceed by Brian and Ron Myers considering if the suggestions are valid, and then let me know if you have any further revisions to my markup of the SCC table or not. I will hold off putting these SCCs in AIRS or FIRE pending your response. My major questions are as follows:

1. Use consistent wording between the flow diagram, the ef tables, the SCC request, and the text, if possible. The whole SCC description does not need to be squeezed onto the flow diagram or ef tables, but we shouldn't switch from "Firing" to "Sintering" or "Mixing" to "Spray Dryer" or "Granulation". Also make sure the SCC specifies "gas-fired" if that's what you've developed efs for. Once the SCCs are added to the more generic descriptions on the flow diagram ("drying", "final processing") it will be less confusing. Please review where I've assumed the SCCs go on the flow diagram for Drying and Granulation stuff in particular.
2. Can SCCs -45 and -46 for Glazing somehow be rolled together, by converting gallons glaze into tons product? Which is the best indicator of emissions? Will users need to use the lead-based glaze uncontrolled PM factor for the non-lead based case if they don't have a wet scrubber? If SCC -45 description is set up as requested without control info, what factor would we pass onto AIRS? We can set up both codes if you want, but I expect some questions from users.
3. For the two drying SCCs, should the thruput units be based on wet feed to dryer, or dried material out? Sometimes there's enough difference to matter, and we usually can't answer the question from the SCC description or units.

NEW SOURCE CLASSIFICATION CODES FOR CERAMIC PRODUCT MANUFACTURING

The current SCCs for ceramic product manufacturing are shown in Table 1. Revised and new SCCs are shown in Table 2.

Table 1. Current SCCs Listed in FIRE for Ceramic Product Manufacturing

SCC	Description	Units	Comments
3-05-008-01	Drying	lb/ton input to process	OBSOLETE -USE 13 ~~See revised description in Table 2~~
3-05-008-02	Grinding	lb/ton input to process	See revised description in Table 2 -ok
3-05-008-03	Storage (of what?)	lb/ton input to process	OK
3-05-008-04	Screening and floating	lb/ton input to process	"Floating" is not an emission point. ~~Delete~~ obsolete this SCC; see new SCC for Sizing--vibrating screens (16) -ok
3-05-008-05	Mixing	lb/ton material	See revised description in Table 2 -ok
3-05-008-06	Handling and transferring (of what?)	lb/ton material	OK
3-05-008-07	Grinding, dry	lb/ton material	~~Delete~~ obsolete this SCC; see SCC for Comminution. (02) -ok
3-05-008-10	Spray dryer: Agglomeration process	lb/ton input to process	See revised description in Table 2 -ok
3-05-008-11	Infrared (IR) dryer	lb/ton input to process	See revised description in Table 2 -ok
3-05-008-12	Glazing and firing kiln	lb/ton input to process	~~Delete~~ obsolete this SCC. Glazing and firing are two separate processes. (see 45 & 50)
3-05-008-99	Other not classified	lb/ton produced	OK

Table 2. New and Revised SCCs for Ceramic Product Manufacturing (Revised SCCs shown in *Italics*)

SCC	New or Revised Description	Units
3-05-008-~~01~~13	Drying--convection drying prior to firing	lb/ton ~~product~~ ~~material feed (or output?)~~ fired ceramic produced
3-05-008-02	Comminution--crushing, grinding, and milling	lb/ton material processed
3-05-008-~~13~~16	Sizing--vibrating screens	lb/ton material processed
3-05-008-~~14~~18	Air Classifier	lb/ton material processed
3-05-008-~~15~~21	Calcining--natural gas-fired rotary calciner	lb/ton material processed
3-05-008-~~16~~22	Calcining--fuel oil-fired rotary calciner	lb/ton material processed
3-05-008-~~17~~23	Calcining--natural gas-fired fluidized bed calciner	lb/ton material processed
3-05-008-~~18~~24	Calcining--fuel oil-fired fluidized bed calciner	lb/ton material processed
3-05-008-05	Granulation--direct mixing of ceramic powder and binder solution	lb/ton material processed
3-05-008-10	Granulation--natural gas-fired spray dryer	lb/ton material processed
3-05-008-~~25~~28	Mixing--raw materials, binders, plasticizers, surfactants, ~~and~~ other agents	lb/ton material processed
3-05-008-30	Forming--general	lb/ton material processed
3-05-008-31	Forming--tape casters	lb/ton material processed
3-05-008-35	Green machining--grinding, cutting, or laminating formed ceramics ~~prior to firing~~	lb/ton material processed
3-05-008-11	Drying--Infrared drying prior to firing	lb/ton ~~material processed~~ ~~fed~~ fired ceramic produced ~~(or output?)~~
3-05-008-40	Presinter thermal processing--natural gas-fired kiln	lb/ton material processed
3-05-008-41	Presinter thermal processing--fuel oil-fired kiln	lb/ton material processed
3-05-008-45	Ceramic glaze spray booth pick best method?	lb/~~gal~~ ton glaze used
~~3-05-008-46~~	~~Ceramic glaze spray booth~~	~~lb/ton product~~
3-05-008-50	~~Firing~~ Sintering NO!--natural gas-fired kiln	lb/ton product
3-05-008-~~51~~54	~~Firing~~ Sintering NO!--fuel oil-fired kiln	lb/ton product
3-05-008-~~52~~56	~~Ceramic~~ refiring kiln--~~refiring~~ after decal, paint, or ink appli~~cation~~ed -natural gas-fired	lb/ton product
3-05-008-~~55~~58	Cooler--cooling ceramics following firing	lb/ton product
3-05-008-60	Final processing--grinding and polishing	lb/ton product
3-05-008-~~61~~70	Final processing--annealing	lb/ton product
3-05-008-~~62~~80	Final processing--surface coating	lb/ton product

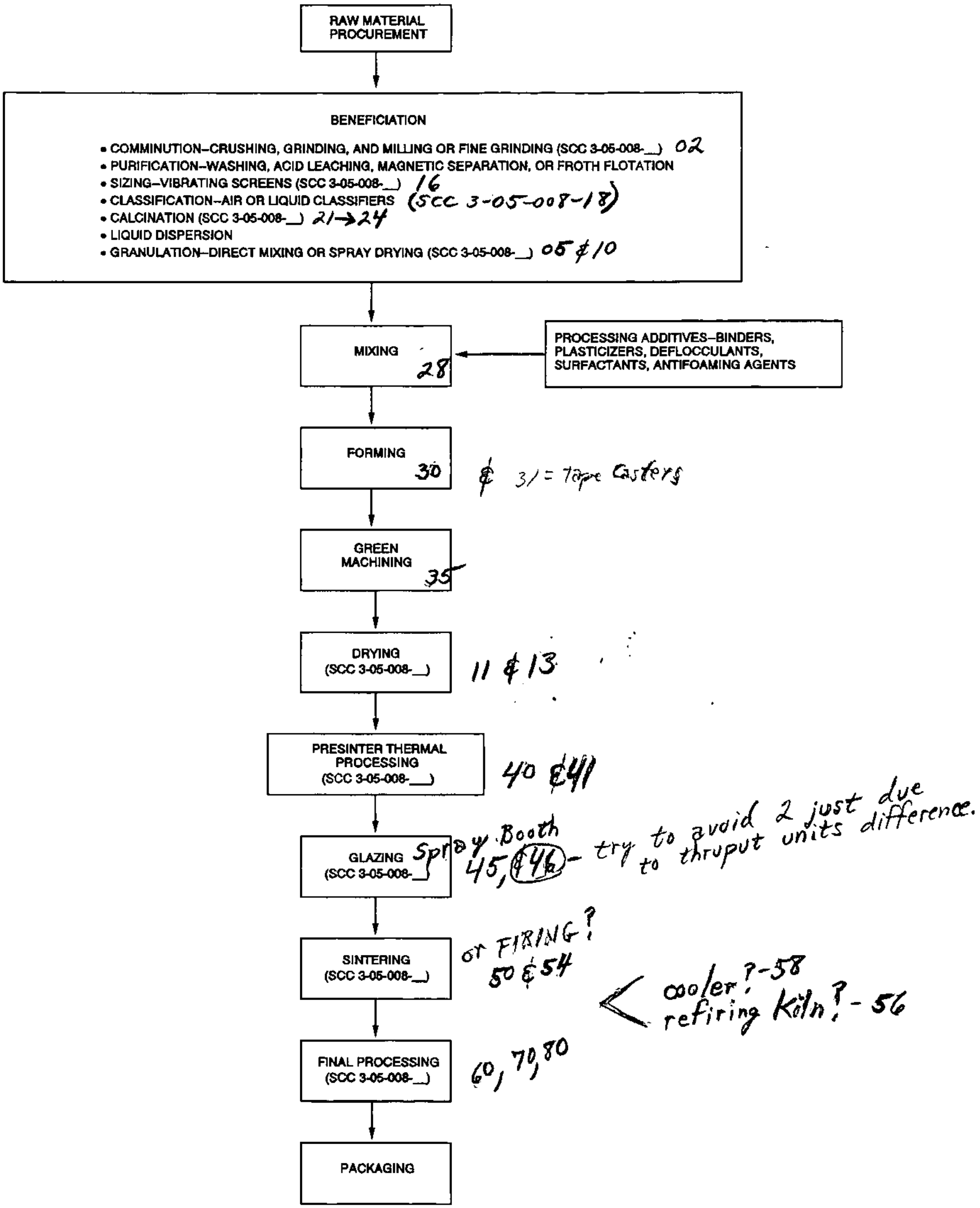

Figure 11.7-1. Process flow diagram for ceramic products manufacturing.
(Source Classification Codes in parentheses.)

DRAFT

Draft Table 11.7-1 (English Units).
EMISSION FACTORS FOR CERAMIC PRODUCTS MANUFACTURING OPERATIONS[a]

try to have wording similar to SCC request table & Flow diagram & text

EMISSION FACTOR RATING: D (Unless noted)

Suggest replacing this column w/ EF units (& maybe RATING) To show differences & simplify many footnotes

Source	Filterable PM, lb/ton[b]	Lead, lb/ton
Raw material crushing and screening line with fabric filter[c] (SCC 3-05-008-02)	0.12	ND
Dryer[d] (SCC 3-05-008-~~01~~ 03)	2.3	ND
Cooler[e] (SCC 3-05-008-~~XX~~ 58)	0.11	ND
Spray dryer with fabric filter[f] (SCC 3-05-008-10)	0.060	ND
~~Spray dryer~~ with venturi scrubber[g] ~~(SCC 3-05-008-10)~~	0.19	ND
Gas-fired kiln[h] (SCC 3-05-008-~~XX~~ 50)	0.49	ND
Ceramic refiring kiln[j] (SCC 3-05-008-~~XX~~ 56)	0.067	ND
Ceramic glaze spray booth with wet scrubber[k] (SCC 3-05-008-~~XX~~ 45)	0.013	ND
Ceramic glaze spray booth using lead-based glaze[m] ~~(SCC 3-05-008-XX)~~ suggest same SCC as above (45)	1.7	0.27

SUGGEST SWITCHING SCC w/CONTROL DEVICES in position. The SCC does not include the control, does it?

cooler — what process — cooler?

[a] Emission factor units are lb of pollutant per ton of material processed, unless noted. To convert from lb/ton to kg/Mg, multiply by 0.5. Factors represent uncontrolled emissions unless noted. SCC = Source Classification Code. ND = no data.

[b] Filterable PM is that PM collected on the front-half of an EPA Method 5 (or equivalent) sampling train. Although condensible organic and inorganic PM is expected for dryers and kilns, no data are available to estimate emission factors.

[c] References 12-13. Raw material processing for production of quarry tile, which is an unglazed tile product similar to structural clay products.

[d] Reference 15. EMISSION FACTOR RATING: E. Emission factor units are lb of pollutant per ton of fired ceramic produced.

[e] Reference 15. Emission factor units are lb of pollutant per ton of fired ceramic produced.

[f] Reference 16.

[g] References 26-29.

[h] References 7,9-11,15,23-25. Emission factor units are lb of pollutant per ton of fired ceramic produced.

[j] Reference 6. Kiln is used for refiring tile after application of decals, paint, or ink screening. Emission factor units are lb of pollutant per ton of fired ceramic produced.

[k] References 20-22. Emission factor units are lb of pollutant per gallon of glaze used.

[m] Reference 30. Emission factor units are lb of pollutant per ton of glazed ceramic produced.

Suggest pulling "Lead-based glaze" Line out of table, use footnote to give Pb ef if Lead-glaze is used.

Can 1.7 lb/ton be used for uncontrolled for SCC 3-05-008-45? Which units are best indicator?

DRAFT

Draft Table 11.7-2 (English Units).
EMISSION FACTORS FOR GASEOUS POLLUTANT EMISSIONS FROM CERAMIC PRODUCTS MANUFACTURING[a]

If only one SCC is assigned, which EF would show up in AIRS & EF book?

EMISSION FACTOR RATING: D (unless noted)

Source	SO_2	NO_x	CO	CO_2	TOC[b]	HF	Fluorides
Gas-fired kiln (SCC 3-05-008-XX) 50	4.8[c] ~~0.078[d]~~	0.54[e]	3.3[f]	780[g] ?	0.16[f]	0.39[g]	0.89[h]
Gas-fired ceramic refiring kiln[j] (SCC 3-05-008-XX) 56	ND	ND	ND	97	ND	ND	0.019
Forming- Tape casters[k] (SCC 3-05-008-XX) 31	ND	ND	ND	ND	14[k]	ND	ND

match SCC request wording

[a] Emission factor units are lb of pollutant per ton of ceramic product produced, unless noted. To convert from lb/ton to kg/Mg, multiply by 0.5. Factors represent uncontrolled emissions unless noted. SCC = Source Classification Code. ND = no data.

[b] TOC reported on an "as methane" basis.

suggest combining, see note on Table

[c] Reference 10. Kiln firing ceramics with a 0.11 percent sulfur content. Emissions of SO_2 are dependent on the sulfur content of the raw material and the fuel used to fire the kiln. For ceramics

[d] ~~Reference 11. Kiln firing ceramics~~ with a 0.009 percent sulfur content, ~~Emissions of SO_2 are dependent on the sulfur content of the raw material and the fuel used to fire the kiln.~~ use 0.078 lb/ton (Ref 11).

[e] References 9,11,15.

[f] Reference 15.

[g] References 9-11,15. A mass balance on flouride will provide a better estimate of HF emissions for individual facilities. EMISSION FACTOR RATING: E.

[h] References 7,23-25. A mass balance on flouride will provide a better estimate of fluoride emissions for individual facilities. EMISSION FACTOR RATING: E.

How do you split the fluoride among 2 pollutants? Suggest combining g&h w/ more explan.

[j] Reference 6.

[k] Reference 14. Emission factor units are lb of pollutant per ton of material processed. Emissions controlled by an afterburner. EMISSION FACTOR RATING: E.

REFERENCES FOR SECTION 11.7

1. *Kirk-Othmer Encyclopedia Of Chemical Technology*, Fourth Edition, Volume 5, John Wiley & Sons, New York, 1992.

2. *1987 Census Of Manufactures*, U. S. Department of Commerce, Washington, D.C., May 1990.

3. *Ullman's Encyclopedia Of Industrial Chemistry*, Fifth Edition, Volume A6.

4. D. W. Richerson, *Modern Ceramic Engineering: Properties Processing, And Use In Design*, Marcel Dekker, Inc., New York, NY, 1982.

5. P. Vincenzini (ed.), *Fundamentals Of Ceramic Engineering*, Elsevier Science Publishers, Ltd., New York, 1991.

6. *Particulate Emission Testing For Florida Tile Corporation, Lawrenceburg, Kentucky, March 7-8, 1989*, Air Systems Testing, Inc., Marietta, GA, April 1989.

7. *Particulate Emission Testing For Florida Tile Corporation, Lawrenceburg, Kentucky, April 19, 1989*, Air Systems Testing, Inc., Marietta, GA, May 1989.

For SO_2 from Gas fired kilns
use a factor of 44 S and
have a foot note explaining that the
S is the percent sulfur in the raw
ceramic (eg for 0.11% sulfur content use
0.11 * 44 or 4.8). Then add that raw materials
with less than 0.01 percent sulfur should
use a factor of 9 S.

For HF - specify the Reference
test method and that this is the
pollutant specified in Title III of the 1990 CAAA
For Fluorides - specify the Reference
test method and explain that
this includes HF and other
compounds of Fluoride.
Also for mass balance we should explain
why that is appropriate for both pollutants
and not to use 44% for HF

For TOC - change to VOC
and use propane as the basis -
have explanation in footnote that
the reference test method is 25a
and that ~~the content~~ no adjustment
has been made for any non-reactive
components has been made since no info
is available.

FOR FINAL REPORT
6/10/96

SORTED TEST DATA FOR NATURAL GAS-FIRED CERAMIC KILNS--FOR USE IN DEVELOPING EMISSION FACTORS[a]

Product	Pollutant	No. of runs	Data rating	kg/Mg, average	lb/ton, average	Combined average, kg/Mg (lb/ton)	Ref. No.
Ceramic saddles/spheres	**CO**	**3**	**B**	**0.88**	**1.8**	**1.6 (3.3)**	**11**
Ceramic saddles/spheres	**CO**	**3**	**B**	**2.4**	**4.9**		**11**
Ceramic saddles/spheres	CO_2	1	B	460	900	390 (780)	11
Ceramic saddles/spheres	CO_2	1	C	600	1,200		11
Ceramic wall tile	CO_2	3	B	100	200		7
Unglazed Ceramic tile	CO_2	6	B	140	280		6
Unglazed Ceramic tile	CO_2	3	B	650	1,300		5
Ceramic saddles/spheres	**Filterable PM**	**3**	**B**	**0.19**	**0.38**	**0.25 (0.49)**	**11**
Ceramic saddles/spheres	**Filterable PM**	**3**	**B**	**0.43**	**0.86**		**11**
Ceramic wall tile	**Filterable PM**	**3**	**B**	**0.028**	**0.055**		**7**
Ceramic tile	**Filterable PM**	**9**	**A,C,C**	**0.037**	**0.074**		**21-23**
Ceramic tile	**Filterable PM**	**3**	**C**	**0.30**	**0.59**		**3**
Unglazed Ceramic tile	**Filterable PM**	**3**	**B**	**0.14**	**0.27**		**5**
Unglazed Ceramic tile	**Filterable PM**	**3**	**B**	**0.59**	**1.2**		**6**
Ceramic tile	Fluoride	9	A,C,C	0.044	0.089	0.28 (0.56)	21-23
Ceramic tile	Fluoride	3	B	0.86	1.7		3
Ceramic wall tile	Fluoride	3	B	0.036	0.072		7
Unglazed Ceramic tile	Fluoride	3	B	0.16	0.31		6
Unglazed Ceramic tile	Fluoride	3	B	0.32	0.65		5
Ceramic saddles/spheres	**HF**	**3**	**B**	**0.20**	**0.39**	**0.23 (0.46)**	**11**
Ceramic saddles/spheres	**HF**	**3**	**B**	**0.26**	**0.52**		**11**
Ceramic saddles/spheres	NO_x	3	B	0.21	0.41	0.27 (0.54)	11
Ceramic saddles/spheres	NO_x	3	B	0.24	0.49		11
Ceramic wall tile	NO_x	3	B	0.14	0.29		7
Unglazed Ceramic tile	NO_x	3	B	0.47	0.95		5
Ceramic saddles/spheres	**SO_2**	**3**	**B**	**0.51**	**1.0**	**1.9 (3.8)**	**11**
Ceramic saddles/spheres	**SO_2**	**3**	**B**	**3.3**	**6.5**		**11**

SORTED TEST DATA (continued)

Product	Pollutant	No. of runs	Data rating	kg/Mg, average	lb/ton, average	Combined average, kg/Mg (lb/ton)	Ref. No.
Unglazed tile (0.064% S clay)	SO_2	3	C	0.32	0.65	4.7 x S (9.5 x S)	5
Ceramic wall tile (0.0089% S clay)	SO_2	3	B	0.039	0.078		7
Unglazed tile (0.11% S clay)	**SO_2**	**3**	**B**	**2.4**	**4.8**	**22 x S (44 x S)**	**6**
Ceramic saddles/spheres	VOC as propane	3	B	0.19	0.38	0.22 (0.43)	11
Ceramic saddles/spheres	VOC as propane	3	B	0.24	0.48		11
Electronic circuit boards	**VOC as propane**	**3**	**D**	**22**	**43**	**7.8 (16)**	**12**

[a]Emission factors for uncontrolled emissions unless noted; emission factors in units of kg/Mg and lb/ton of fired ceramic produced.

SORTED TEST DATA FOR OTHER CERAMICS SOURCES--FOR USE IN DEVELOPING EMISSION FACTORS[a]

Source	Product	APCD[b]	Pollutant	Data rating	kg/Mg, average	lb/ton, average	Combined average, kg/Mg (lb/ton)	Ref. No.
Ceramic refiring kiln	Ceramic tile[c]	None	Filterable PM	B	0.034	0.067	0.034 (0.067)	2
Ceramic refiring kiln	Ceramic tile[c]	None	Fluoride	B	0.0094	0.019	0.0094 (0.019)	2
Ceramic refiring kiln	Ceramic tile[c]	None	CO_2	B	49	97	49 (97)	2
Crushing/screening[d]	Ceramic wall tile	FF	Filterable PM	B	0.041	0.082	0.061 (0.12)	8
Crushing/screening[d]	Ceramic wall tile	FF	Filterable PM	B	0.081	0.16		9
Tape casting[e]	Ceramic tape	AB	VOC as propane	C	29	58	29 (58)	10
Dryer	Ceramic saddles/spheres	None	Filterable PM	C	1.2	2.3	1.2 (2.3)	11
Cooler	Ceramic saddles/spheres	None	Filterable PM	B	0.055	0.11	0.055 (0.11)	11
Spray dryer[f]	Electronic parts	FF	Filterable PM	B	0.030	0.060	0.030 (0.060)	13
Ceramic glaze spray booths[g]	ND	WS	Filterable PM	B	1.1	2.2	0.89 (1.8)	18
Ceramic glaze spray booths[g]	Basins and urinals	WS	Filterable PM	B	0.66	1.3		19
Ceramic glaze spray booths[g]	Toilet tanks	WS	Filterable PM	B	0.92	1.8		20
Spray dryer[f]	Ceramic body preparation	VS	Filterable PM	B	0.10	0.20	0.096 (0.19)	24
Spray dryer[f]	Ceramic body preparation	VS	Filterable PM	C	0.063	0.13		25
Spray dryer[f]	Ceramic body preparation	VS	Filterable PM	C	0.11	0.22		26
Spray dryer[f]	Ceramic body preparation	VS	Filterable PM	C	0.11	0.22		27
Ceramic glaze spray booth using lead-based glaze[g]	Ceramic tile	None	Filterable PM	A	9.7	19	9.7 (19)	28
Ceramic glaze spray booth using lead-based glaze[g]	Ceramic tile	None	Lead	A	1.5	3.0	1.5 (3.0)	28

[a]Emission factors in units of kg/Mg and lb/ton of fired ceramic produced, unless noted.
[b]FF = fabric filter, AB = afterburner, WS = wet scrubber, VS = venturi scrubber, ND = no data available.
[c]Kiln is used for refiring tile after decals, paint, or ink screening are applied. Kiln maintains a relatively low temperature and products are refired for 35 to 45 minutes.
[d]Emission factor units are kg/Mg and lb/ton of raw material processed.
[e]Emission factor units are kg/Mg and lb/ton of formed product.
[f]Emission factor units are kg/Mg and lb/ton of dryer product.
[g]Emission factor units are kg/Mg and lb/ton of glaze used.

TABLE 4-1. SUMMARY OF EMISSION FACTORS FROM REFERENCE 1. (a)

	Uncontrolled						Controlled (b)					
	PM		Fluorine		Lead		PM		Fluorine		Lead	
Source	kg/Mg	lb/ton	kg/Mg	lb/ton	kg/Mg	lb/ton	kg/Mg	lb/ton	kg/Mg	lb/ton	kg/Mg	lb/ton
Raw material preparation and forming	2	4					0.16	0.32				
Bisque firing	0.05	0.1					0.02	0.04				
high porosity ware			0.07	0.14					0.01	0.02		
medium porosity ware			0.13	0.26					0.015	0.03		
colored low porosity ware			0.16	0.32					0.02	0.04		
light color low porosity ware			0.43	0.85					0.035	0.07		
Glaze milling and glazing	1	2			0.2	0.4	0.07	0.14			0.025	0.05
Glost firing												
slow	0.1	0.2	0.05	0.1	0.01	0.02	0.035	0.07	0.01	0.02	0.003	0.005
fast	0.06	0.12	0.03	0.06	0.008	0.015	0.015	0.03	0.005	0.01	0.001	0.002
Single firing--slow	0.1	0.2			0.015	0.03	0.025	0.05			0.003	0.005
colored low porosity ware			0.16	0.32					0.02	0.04		
light color low porosity ware			0.43	0.85					0.035	0.07		
Single firing--fast	0.06	0.12			0.01	0.02	0.02	0.04			0.001	0.002
colored low porosity ware			0.05	0.1					0.01	0.02		
light color low porosity ware			0.13	0.25					0.015	0.03		

(a) All emission factors in units of kg/Mg and lb/ton of tile produced. All data rated D.

(b) Emissions from glaze milling and glazing controlled with venturi scrubbers; emissions from other sources controlled with fabric filter.

Source category: Ceramic manufacturing
Plant name : Florida Tile Corp.
Process : Ceramic tile

Filename: CER_RF02.WQ1
Location: Lawrenceburg, KY
Test date: March 7-8, 1989

Date: 10/14/94
Ref. No.: 2/
Process rate basis: production

Source	Type of control	Pollutant	Run No.	Test Method	Isokinetic, %	Gas volume, DSCF	Volum. flow rate, DSCFM	Mass g	Concen., gr/DSCF	Emission rate, lb/hr	Process rate, ton/hr	Emission factor kg/Mg	Emission factor lb/ton	Emission factor Rat.
Forniker kiln		filterable PM	1	EPA 5	94.3	38.755	359	0.0126	0.0050	0.015	0.25	0.031	0.062	
		filterable PM	2		100.3	39.168	342	0.0133	0.0052	0.015	0.25	0.031	0.062	
		filterable PM	3		99.6	41.173	361	0.0166	0.0062	0.019	0.25	0.039	0.077	
									gr/DSCF		Average	0.034	0.067	B
		fluoride	1	KY 130	94.3	38.755	359	0.0051	0.0020	0.0062	0.25	0.012	0.025	
		fluoride	2		100.3	39.168	342	0.005	0.0020	0.0057	0.25	0.011	0.023	
		fluoride	3		99.6	41.173	361	0.0018	0.00067	0.0021	0.25	0.0042	0.0083	
									ppm		Average	0.0094	0.019	B
		CO2	1	Orsat	NA	NA	359	NA			0.25			
		CO2	2		NA	NA	342	NA	1.0	23	0.25	47	94	
		CO2	3		NA	NA	361	NA	1.0	25	0.25	50	100	
											Average	49	97	B

Basis for rating: - Process rates based on permitted maximum operating rate; actual rates probably 5 to 10 percent less.
Problems noted:
Other notes: - Fluoride sampling method based on analysis of impinger contents by ion electrode (Galbraith Labs).

Source category: Ceramic manufacturing
Plant name : Florida Tile Corp.
Process : Ceramic tile

Filename: CER_RF03.WQ1
Location: Lawrenceburg, KY
Test date: April 19, 1989

Date: 10/14/94
Ref. No. 3/
Process rate basis: production

Source	Type of control	Pollutant	Run No.	Test Method	Isokinetic, %	Gas samp volume, DSCF	Volum. flow rate, DSCFM	Mass, g	Concen., gr/DSCF	Emission rate, lb/hr	Process rate, ton/hr	Emission factor		
												kg/Mg	lb/ton	Rating
Kiln No. 6		filterable PM	1	EPA 5										
		filterable PM	2		102.2	40.28	14,468	0.0224	0.0086	1.06	2.12	0.25	0.50	
		filterable PM	3		105.7	40.754	14,160	0.0316	0.0120	1.45	2.12	0.34	0.69	
									gr/DSCF		Average	0.30	0.59	C
		fluoride	1	KY 130	100.4	40.425	14,791	0.061	0.0233	2.95	2.12	0.70	1.4	
		fluoride	2		102.2	40.28	14,468	0.0785	0.0301	3.73	2.12	0.88	1.8	
		fluoride	3		105.7	40.754	14,160	0.09146	0.03463	4.20	2.12	0.99	2.0	
											Average	0.86	1.7	B

Basis for rating: - Process rates based on typical operating rates.
- Deviations in test method (PM data).

Problems noted: - PM sampled along 1 traverse only and only two runs conducted.

Other notes: - Fluoride sampling method based on analysis of impinger contents by ion electrode (Galbraith Labs).

Source category: Ceramic manufacturing
Plant name : Stark Ceramics, Inc.
Process : glazed structural clay tile mfg.

Filename: CER_EF04.WQ1
Location: East Canton, OH
Test date: Sept. 16, 1993

Date: 10/14/94
Ref. No.: 4/
Process rate basis: production

Source	Type of control	Pollutant	Run No.	Test Method	Isokinetic, %	Gas volume, DSCF	Volum. flow rate, DSCFM	Mass, g	Concen., gr/DSCF	Emission rate, lb/hr	Process rate, ton/hr	Emission factor kg/Mg	Emission factor lb/ton	Rat.
Kiln No. 3	none	filterable PM	1	EPA 5	91.4	31.68	9,226	0.152	0.074	5.84	2.92	1.0	2.0	
		filterable PM	2		92.2	32.13	9,276	0.108	0.052	4.13	2.92	0.71	1.4	
		filterable PM	3		96.8	34.39	9,464	0.141	0.063	5.13	2.92	0.88	1.8	
									gr/DSCF		Average	0.86	1.7	B
		fluoride	1	EPA13B	92.0	48.26	8,957	0.076	0.024	1.88	2.92	0.32	0.64	
		fluoride	2		97.4	48.60	8,786	0.076	0.024	1.81	2.92	0.31	0.62	
		fluoride	3		97.0	49.35	9,048	0.078	0.024	1.89	2.92	0.32	0.65	
									ppm		Average	0.32	0.64	B
		SO2	1	EPA 6	NA	NA	9,226	NA	231.64	20.8	2.92	3.6	7.1	
		SO2	2		NA	NA	9,276	NA	220.89	23.8	2.92	4.1	8.2	
		SO2	3		NA	NA	9,464	NA	284.96	23.3	2.92	4.0	8.0	
									%		Average	3.9	7.7	B
		CO2	1	Orsat	NA	NA	9,226	NA	3.4	2,153	2.92	370	740	
		CO2	2		NA	NA	9,276	NA	3.1	1,974	2.92	340	680	
		CO2	3		NA	NA	9,464	NA	3.2	2,079	2.92	360	710	
											Average	360	710	B

Basis for rating: - Process rates are average for kiln car processed.
Problems noted:
Other notes:

Source category: Ceramic manufacturing
Plant name : Metro Ceramics, Inc.
Process : unglazed ceramic tile mfg.

Filename: CER_EF05.WQ1
Location: Canton, OH
Test date: 11/17-18/93

Date: 06/05/96
Ref. No. 5/
Process rate basis: production

Source	Type of control	Pollutant	Run No.	Test Method	Isokinetic, %	Gas volume, DSCF	Volum. flow rate, DSCFM	Mass, g	Concen., gr/DSCF	Emission rate, lb/hr	Process rate, ton/hr	Emission factor kg/Mg	Emission factor lb/ton	Rat.
Kiln No. 3	none	filterable PM	1	EPA 5	100.5	43.18	6,928	0.043	0.015	0.90	3.08	0.15	0.29	
(Tunnel kiln,		filterable PM	2		101.2	43.39	6,916	0.037	0.013	0.78	3.08	0.13	0.25	
gas-fired)		filterable PM	3		97.2	43.18	7,160	0.039	0.014	0.85	3.08	0.14	0.28	
									gr/DSCF		Average	0.14	0.27	B
		HF *	1	EPA13A	100.5	43.18	6,928	0.091	0.032	1.92	3.08	0.31	0.62	
		HF	2		101.2	43.39	6,916	0.092	0.033	1.95	3.08	0.32	0.63	
		HF	3		97.2	43.18	7,160	0.096	0.034	2.11	3.08	0.34	0.69	
									lb/DSCF		Average	0.32	0.65	B
		NOx	1	EPA 7E	NA	NA	8,228	NA	6.18E-06	3.05	3.08	0.50	0.99	
		NOx	2		NA	NA	8,128	NA	5.26E-06	2.57	3.08	0.42	0.83	
		NOx	3		NA	NA	8,577	NA	6.07E-06	3.12	3.08	0.51	1.0	
									lb/DSCF		Average	0.47	0.95	B
		SO2	1	EPA 6C	NA	NA	8,228	NA	4.16E-06	2.05	3.08	0.33	0.67	
		SO2	2		NA	NA	8,128	NA	4.16E-06	2.03	3.08	0.33	0.66	
		SO2	3		NA	NA	8,577	NA	3.66E-06	1.88	3.08	0.31	0.61	
									%		Average	0.32	0.65	C
		CO2	1	Orsat	NA	NA	6,928	NA	8.4	3,995	3.08	650	1300	
		CO2	2		NA	NA	6,916	NA	8.5	4,035	3.08	650	1300	
		CO2	3		NA	NA	7,160	NA	8.4	4,128	3.08	650	1300	
											Average	650	1300	B

Basis for rating: - Process rates are average for kiln cars processed on day of test.
Problems noted: - SO2 data rated C because of calibration difficulty and a problem with the post-test cal. procedure noted by an Ohio EPA inspector
Other notes: *Actually total fluorides

Source category:	Ceramic manufacturing	Filename:	CER_EF06.WQ1	Date:	10/17/94
Plant name :	Metro Ceramics, Inc.	Location:	Canton, OH	Ref. No.:	6/
Process :	unglazed ceramic tile mfg.	Test date:	3/30 and 4/14/94	Process rate basis:	production

Source	Type of control	Pollutant	Run No.	Test Method	Isokinetic, %	Gas volume, DSCF	Volum. flow rate, DSCFM	Mass, g	Concen., gr/DSCF	Emission rate, lb/hr	Process rate, ton/hr	Emission factor kg/Mg	Emission factor lb/ton	Emission factor Rat.
Kilns 1, 2, & 3 (Tunnel kilns, gas-fired)	none	filterable PM	1	EPA 5	106.6	39.64	35,697	0.077	0.030	9.12	8.32	0.55	1.1	
		filterable PM	2		104.4	41.63	38,284	0.101	0.038	12.32	8.32	0.74	1.5	
		filterable PM	3		104.3	41.73	38,412	0.067	0.025	8.19	8.32	0.49	1.0	
									gr/DSCF		Average	0.59	1.2	B
		fluoride	1	EPA13A	106.6	39.64	35,697	0.022	0.009	2.63	8.32	0.16	0.32	
		fluoride	2		104.4	41.63	38,284	0.019	0.007	2.34	8.32	0.14	0.28	
		fluoride	3		104.3	41.73	38,412	0.023	0.008	2.78	8.32	0.17	0.33	
									ppm		Average	0.16	0.31	B
		SO2	1	EPA 6	NA	NA	38,370	NA	102.40	39.20	8.32	2.4	4.7	
		SO2	2		NA	NA	38,659	NA	103.90	40.06	8.32	2.4	4.8	
		SO2	3		NA	NA	38,827	NA	101.80	39.41	8.32	2.4	4.7	
									%		Average	2.4	4.8	B
		CO2	1	Orsat	NA	NA	35,697	NA	1.0	2,450	8.32	150	290	
		CO2	2		NA	NA	38,284	NA	1.0	2,628	8.32	160	320	
		CO2	3		NA	NA	38,412	NA	0.4	1,055	8.32	70	130	
		CO2	1		NA	NA	38,370	NA	1.0	2,634	8.32	160	320	
		CO2	2		NA	NA	38,659	NA	1.0	2,654	8.32	160	320	
		CO2	3		NA	NA	38,827	NA	1.0	2,665	8.32	160	320	
											Average	140	280	B

Basis for rating: - Process rates are average for kiln car processed.
Problems noted:
Other notes:

Source category: Ceramic manufacturing
Plant name : US Ceramic Tile Company
Process : ceramic wall tile mfg.

Filename: CER_EF07.WQ1
Location: East Sparta, OH
Test date: 8/11/93

Date: 10/17/94
Ref. No.: 7/
Process rate basis: production

Source	Type of control	Pollutant	Run No.	Test Method	Isokinetic, %	Gas volume, DSCF	Volum. flow rate, DSCFM	Mass, g	Concen., gr/DSCF	Emission rate, lb/hr	Process rate, ton/hr	Emission factor kg/Mg	Emission factor lb/ton	Rat.
Kiln No. 5	none	filterable PM	1	EPA 5	107.8	37.47	3,707	0.005	0.002	0.071	1.26	0.028	0.056	
(Gas-fired, roller		filterable PM	2		106.8	35.45	3,539	0.006	0.003	0.079	1.26	0.031	0.063	
hearth "fast fire"		filterable PM	3		104.2	35.92	3,676	0.004	0.002	0.058	1.26	0.023	0.046	
kiln)									gr/DSCF		Average	0.028	0.055	B
		HF *	1	EPA13A	107.8	37.47	3,707	0.009	0.004	0.12	1.26	0.048	0.097	
		HF *	2		106.8	35.45	3,539	0.008	0.003	0.10	1.26	0.041	0.082	
		HF *	3		104.2	35.92	3,676	0.003	0.001	0.047	1.26	0.019	0.037	
									ppm		Average	0.036	0.072	B
		SO2	1	EPA 6	NA	NA	3,707	NA	2.47	0.091	1.26	0.036	0.073	
		SO2	2		NA	NA	3,539	NA	2.51	0.089	1.26	0.035	0.070	
		SO2	3		NA	NA	3,676	NA	3.17	0.12	1.26	0.046	0.092	
									ppm		Average	0.039	0.078	B
		NOx	1	EPA 7E	NA	NA	3,707	NA	14.33	0.36	1.26	0.14	0.29	
		NOx	2		NA	NA	3,539	NA	14.95	0.36	1.26	0.14	0.29	
		NOx	3		NA	NA	3,676	NA	14.58	0.37	1.26	0.15	0.3	
									%		Average	0.14	0.29	B
		CO2	1	Orsat	NA	NA	3,707	NA	1.0	254	1.26	100	200	
		CO2	2		NA	NA	3,539	NA	1.0	243	1.26	100	190	
		CO2	3		NA	NA	3,676	NA	1.1	278	1.26	110	220	
											Average	100	200	B

Basis for rating: - Process rates are average for kiln cars processed on day of test.
Problems noted:
Other notes: Report says HF, but Method 13A was used; Actually total fluorides.

Source category:	Ceramic manufacturing	Filename:	CER_EF08.WQ1	Date:	01/11/95
Plant name:	American Olean Tile Co.	Location:	Fayette, AL	Ref. No.:	8/
Process:	Ceramic tile manufacturing	Test date:	Oct. 15, 1991	Process rate basis:	feed/production

Source	Type of control	Pollutant	Run No.	Test Method	Isokinetic, %	Gas volume, DSCF	Volum. flow rate, DSCFM	Mass, g	Concen., gr/DSCF	Emission rate, lb/hr	Process rate, ton/hr	Emission factor kg/Mg	Emission factor lb/ton	Rat.
Crushing and Screening Line 1	Fabric Filter	filterable PM	1	EPA 5	100.4	63.62	15,533	0.0319	0.0077	1.03	12.15	0.042	0.085	
		filterable PM	2		100.7	62.53	15,226	0.033	0.0081	1.06	12.15	0.044	0.087	
		filterable PM	3		100.9	59.44	14,441	0.0281	0.0073	0.90	12.15	0.037	0.074	
											Average	0.041	0.082	B

Basis for rating: Average process rates reported.

Problems noted:

Other notes: Processing of body material.

Source category: Ceramic manufacturing | Filename: CER_EF09.WQ1 | Date: 01/11/95
Plant name: American Olean Tile Co. | Location: Fayette, AL | Ref. No.: 9/
Process: Ceramic tile manufacturing | Test date: Oct. 16, 1991 | Process rate basis: production

Source	Type of control	Pollutant	Run No.	Test Method	Isokinetic, %	Gas volume, DSCF	Volum. flow rate, DSCFM	Mass, g	Concen., gr/DSCF	Emission rate, lb/hr	Process rate, ton/hr	Emission factor kg/Mg	Emission factor lb/ton	Rat.
Crushing and Screening Line 2	Fabric Filter (two)	filterable PM	1	EPA 5	106.5	51.22	19,420	0.0374	0.0113	1.88	13.22	0.071	0.14	
		filterable PM	2		105.3	48.22	18,506	0.0455	0.0146	2.31	13.22	0.087	0.17	
		filterable PM	3		102.7	48.11	18,904	0.0428	0.0137	2.22	13.22	0.084	0.17	
											Average	0.081	0.16	B

Basis for rating: Average process rates reported.

Problems noted:

Other notes: Apparently consists of two parallel processing lines: one for body material and one for grog (calcined fire clay). Common stack.

Source category:	Ceramic manufacturing	Filename:	CER_EF10.WQ1	Date:	05/16/96
Plant name:	GE Ceramics	Location:	Chattanooga, TN	Ref. No.:	10/
Process:	Tape Casting	Test date:	Sep. 13-15, 1989	Process rate basis:	production

Source	Type of control	Pollutant	Run No.	Test Method	Isokinetic, %	Gas volume, DSCF	Volum. flow rate, DSCFM	Mass, g	Concen., ppm	Emission rate, lb/hr	Process rate, ton/hr	Emission factor		
												kg/Mg	lb/ton	Rat.
Tape casters	Fume Oxidizer	TOC	2	25A	NA	NA	2,020	NA	250	3.47	0.10			
		TOC	3		NA	NA	2,224	NA	403	6.15	0.10	30	59	
		TOC	4		NA	NA	2,171	NA	395	5.89	0.10	28	57	
		TOC	5		NA	NA	2,074	NA	19	0.27	0.039			
											Average	28.9	58	B

Basis for rating: Only two valid test runs conducted.

Problems noted:

Other notes:
Run 1 void due to "flame out".
Run 2 may not have been conducted at steady state conditions.
Runs 3 and 4 best represent operating conditions.
Average emission factors do not include Runs 1,2, or 5.
Concentrations on methane basis.
Emission rates and emission factors on propane basis.

Source category: Ceramic manufacturing
Plant name: Norton Corp.
Process: Ceramic saddle/sphere mfg.

Filename: CER_EF11.WQ1
Location: Soddy Daisy, TN
Test date: 4/19/94

Date: 05/16/96
Ref. No.: 11/
Process rate basis: production

Source	Type of control	Pollutant	Run No.	Test Method	Isokinetic, %	Gas volume, DSCF	Volum. flow rate, DSCFM	Mass, g	Concen., gr/DSCF	Emission rate, lb/hr	Process rate, ton/hr	Emission factor kg/Mg	Emission factor lb/ton	Emission factor Rat.
Kiln #1	none	filterable PM	1	EPA 5	95.7	35.25	5,694	0.015	0.007	0.326	0.85	0.19	0.38	
(gas-fired)		filterable PM	2		97.0	40.42	6,437	0.017	0.006	0.358	0.85	0.21	0.42	
Main Stack		filterable PM	3		98.3	46.23	7,268	0.013	0.004	0.275	0.85	0.16	0.32	
									gr/DSCF		Average	0.19	0.38	B
		HF	1	EPA26A	95.7	35.25	5,694	0.018	0.008	0.38	0.85	0.22	0.44	
		HF	2		97.0	40.42	6,437	0.016	0.006	0.33	0.85	0.20	0.39	
		HF	3		98.3	46.23	7,268	0.014	0.005	0.29	0.85	0.17	0.34	
									ppm		Average	0.20	0.39	B
		SO2	1	EPA 6C	NA	NA	5,694	NA	14.65	0.83	0.85	0.49	0.98	
		SO2	2		NA	NA	6,437	NA	13.15	0.85	0.85	0.50	1.0	
		SO2	3		NA	NA	7,268	NA	12.53	0.91	0.85	0.54	1.1	
									ppm		Average	0.51	1.0	B
		NOx	1	EPA 7E	NA	NA	5,694	NA	11.02	0.45	0.85	0.27	0.53	
		NOx	2		NA	NA	6,437	NA	6.66	0.31	0.85	0.18	0.36	
		NOx	3		NA	NA	7,268	NA	5.56	0.29	0.85	0.17	0.34	
									ppm		Average	0.21	0.41	B
		CO	1	EPA 10	NA	NA	5,694	NA	272.70	6.78	0.85	4.0	8.0	
		CO	2		NA	NA	6,437	NA	100.10	2.81	0.85	1.7	3.3	
		CO	3		NA	NA	7,268	NA	88.03	2.79	0.85	1.6	3.3	
									ppm		Average	2.4	4.9	B
		TOC	1	EPA 25A	NA	NA	5,694	NA	9.74	0.38	0.85	0.225	0.45	
		TOC	2		NA	NA	6,437	NA	5.92	0.26	0.85	0.154	0.31	
		TOC	3		NA	NA	7,268	NA	6.42	0.32	0.85	0.189	0.38	
									%		Average	0.189	0.38	B
		CO2	1	Orsat	NA	NA	5,694	NA	2.5	977	0.85	600	1200	
		CO2	2		NA	NA	6,437	NA			0.85			
		CO2	3		NA	NA	7,268	NA			0.85			
											Average	600	1200	C

Source	Type of control	Pollutant	Run No.	Test Method	Isokinetic, %	Gas volume, DSCF	Volum. flow rate, DSCFM	Mass, g	Concen., gr/DSCF	Emission rate, lb/hr	Process rate, ton/hr	Emission factor		
												kg/Mg	lb/ton	Rat.
Kiln #2	none	filterable PM	1	EPA 5	100.2	44.46	6,929	0.023	0.008	0.470	0.53	0.44	0.88	
(gas-fired)		filterable PM	2		99.5	44.86	7,043	0.022	0.008	0.455	0.53	0.43	0.85	
Main Stack		filterable PM	3		98.1	45.63	7,267	0.022	0.007	0.455	0.53	0.43	0.85	
									gr/DSCF		Average	0.43	0.86	B
		HF	1	EPA26A	100.2	44.46	6,929	0.012	0.004	0.24	0.53	0.23	0.45	
		HF	2		99.5	44.86	7,043	0.014	0.005	0.30	0.53	0.28	0.56	
		HF	3		98.1	45.63	7,267	0.014	0.005	0.29	0.53	0.27	0.55	
									ppm		Average	0.26	0.52	B
		SO2	1	EPA 6C	NA	NA	6,929	NA	54.48	3.77	0.53	3.5	7.1	
		SO2	2		NA	NA	7,043	NA	40.99	2.88	0.53	2.7	5.4	
		SO2	3		NA	NA	7,267	NA	52.79	3.83	0.53	3.6	7.2	
									ppm		Average	3.3	6.5	B
		NOx	1	EPA 7E	NA	NA	6,929	NA	5.10	0.25	0.53	0.24	0.48	
		NOx	2		NA	NA	7,043	NA	5.10	0.26	0.53	0.24	0.48	
		NOx	3		NA	NA	7,267	NA	5.10	0.27	0.53	0.25	0.50	
									ppm		Average	0.24	0.49	B
		CO	1	EPA 10	NA	NA	6,929	NA	18.15	0.55	0.53	0.51	1.03	
		CO	2		NA	NA	7,043	NA	17.32	0.53	0.53	0.50	1.00	
		CO	3		NA	NA	7,267	NA	54.26	1.72	0.53	1.6	3.2	
									ppm		Average	0.88	1.8	B
		TOC	1	EPA 25A	NA	NA	6,929	NA	6.08	0.29	0.53	0.271	0.54	
		TOC	2		NA	NA	7,043	NA	5.77	0.28	0.53	0.261	0.52	
		TOC	3		NA	NA	7,267	NA	4.08	0.20	0.53	0.191	0.38	
									%		Average	0.241	0.48	B
		CO2	1	Orsat	NA	NA	6,929	NA	1.0	476	0.53	450	890	
		CO2	2		NA	NA	7,043	NA	1.0	483	0.53	460	910	
		CO2	3		NA	NA	7,267	NA			0.53			
											Average	460	900	B

Source	Type of control	Pollutant	Run No.	Test Method	Isokinetic, %	Gas volume, DSCF	Volum. flow rate, DSCFM	Mass, g	Concen., gr/DSCF	Emission rate, lb/hr	Process rate, ton/hr	Emission factor kg/Mg	Emission factor lb/ton	Rat.
Kiln #1 (gas-fired) Dryer Exhaust	none	filterable PM	1	EPA 5	102.3	42.93	11,231	0.115	0.041	3.986	0.85	2.4	4.7	
		filterable PM	2		100.8	42.79	11,362	0.047	0.017	1.651	0.85	1.0	1.9	
		filterable PM	3		98.5	42.12	11,442	0.009	0.003	0.317	0.85	0.19	0.37	
											Average	1.2	2.3	C
Kiln #2 (gas-fired) Cooler Exhaust	none	filterable PM	1	EPA 5	102.8	38.46	2,442	0.006	0.002	0.048	0.53	0.045	0.090	
		filterable PM	2		104.1	35.10	2,201	0.005	0.002	0.040	0.53	0.037	0.074	
		filterable PM	3		105.8	35.61	2,196	0.011	0.005	0.088	0.53	0.083	0.17	
											Average	0.055	0.11	B

Basis for rating: C-rated data range over an order of magnitude
Problems noted:
Other notes: TOC reported on propane basis in ppm and lbs/hr; emission factors also reported on propane basis.

Source category: Ceramic manufacturing
Plant name: Coors Electronic Package Corp.
Process: Curing of ceramic plates for cpu chips

Filename: CER_EF12.WQ1
Location: Chattanooga, TN
Test date: Aug. 26, 1993

Date: 05/16/96
Ref. No.: 12/
Process rate basis: production

Source	Type of control	Pollutant	Run No.	Test Method	Isokinetic, %	Gas volume, DSCF	Volum. flow rate, DSCFM	Mass, g	Concen., ppm	Emission rate, lb/hr	Process rate, ton/hr	Emission factor kg/Mg	Emission factor lb/ton	Emission factor Rat.
Ceramic Processing Furnace	none	TOC	1	25A	NA	NA	502	NA	3.16	0.0040	0.00075	7.3	14.5	
		TOC	2		NA	NA	466	NA	3.02	0.0035	0.00075	6.4	12.9	
		TOC	3		NA	NA	417	NA	26.62	0.0277	0.00075	51	102	
											Average	21.5	43	D

Basis for rating:
Problems noted:
Other notes: Spike occurred near end of third run.
Process rate based on 36 lb. charge, 24 hour cycle time
TOC concentrations and emission rates reported on methane basis. TOC emission factors reported on a propane basis.

Source category:	Ceramic manufacturing	Filename:	CER_EF13.WQ1	Date:	01/11/95
Plant name:	Steward, Inc.	Location:	Chattanooga, TN	Ref. No.:	13/
Process:	Ferrite powder processing	Test date:	Mar. 30, 1993	Process rate basis:	production

Source	Type of control	Pollutant	Run No.	Test Method	Isokinetic, %	Gas volume, DSCF	Volum. flow rate, DSCFM	Mass, g	Concen., gr/DSCF	Emission rate, lb/hr	Process rate, ton/hr	Emission factor kg/Mg	Emission factor lb/ton	Rat.
No. 4 Anhydro Spray Dryer	Fabric Filter	filterable PM	1	EPA 5	94.6	42.66	3,758	0.0022	0.001	0.026	1.26	0.010	0.020	
		filterable PM	2		98.1	23.61	3,677	0.00625	0.004	0.13	1.26	0.051	0.10	
		filterable PM	3		100.5	23.33	3,544	0.0035	0.002	0.070	1.23	0.029	0.057	
											Average	0.030	0.060	A

Basis for rating:

Problems noted:

Other notes:

SEC. 4 - Ref 18

Filename: CERAM17.WQ1
Date: 04-Jun-96
Facility: American Standard
Location: Tiffin, OH
Source: Ceramic glaze spray booth with wet scrubber--R001
Test date: August 18, 1992

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
1	Stack temperature	Deg F	86	85	86	
	Pressure	in. HG				
	Moisture	%	4.4	5.4	4.5	
	Oxygen	%				
	Volumetric flow, actual	acfm				
	Volumetric flow, standard*	dscfm	27644	26831	26814	0
	Isokinetic variation	%	97.7	98	97.3	
Average glaze rate 60 gal/hr x 14.5 lb/gal / 2000 lb/ton		ton/hr	0.44	0.44	0.44	
	Pollutant concentrations:					
	Filterable PM	G/dscf	0.0038	0.0064	0.0021	
	Pollutant mass flux rates:					
	Filterable PM	lb/hr	0.900	1.47	0.483	
	Emission factors (ENGLISH UNITS):					AVERAGE
	Filterable PM	lb/ton	2.1	3.4	1.1	2.2
	Emission factors (METRIC UNITS):					AVERAGE
	Filterable PM	kg/Mg	1.0	1.7	0.55	1.1

*DSCFM BASED ON A STANDARD TEMPERATURE OF 68 DEGREES FAHRENHEIT

SEC. 4 REF. 19

Filename: CERAM18.WQ1
Date: 04-Jun-96
Facility: American Standard
Location: Tiffin, OH
Source: Ceramic glaze spray booths with wet scrubber--R005
Test date: August 19, 1992

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
1	Stack temperature	Deg F	81	80	81	
	Pressure	in. HG				
	Moisture	%	1.8	1.9	1.8	
	Oxygen	%	21	21	21	
	Volumetric flow, actual	acfm				
	Volumetric flow, standard*	dscfm	9402	9209	9563	0
	Isokinetic variation	%	97.1	95.7	95.8	
Average glaze rate 24.6 gal/hr x 14.5 lb/gal / 2000 lb/ton		ton/hr	0.18	0.18	0.18	
	Pollutant concentrations:					
	Filterable PM	G/dscf	0.0014	0.0033	0.0041	
	Pollutant mass flux rates:					
	Filterable PM	lb/hr	0.113	0.260	0.336	
	Emission factors (ENGLISH UNITS):					AVERAGE
	Filterable PM	lb/ton	0.63	1.5	1.9	1.3
	Emission factors (METRIC UNITS):					AVERAGE
	Filterable PM	kg/Mg	0.32	0.73	0.94	0.66

*DSCFM BASED ON A STANDARD TEMPERATURE OF 68 DEGREES FAHRENHEIT

Source category: Ceramic Products	Filename: CER19.WQ1	Date: 06/04/96	
Plant name: American Standard	Location: Tiffin, OH	Ref. No.: ~~18~~ 20	
Process: Ceramic Glaze Spray Line	Test date: February 8, 1994	Process rate basis tons of glaze used	

Source	Type of control	Pollutant	Run No.	Test Method	Isokinetic, %	Gas volume, DSCF	Volum. flow rate, DSCFM	Mass, g	Concen., gr/DSCF	Emission rate, lb/hr	Process rate, ton/hr*	Emission factor kg/Mg	Emission factor lb/ton	Emission factor Rat.
Spray Booths	Wet	filterable PM	1	EPA 5	98.3	38.53	8,949	0.0098	0.0039	0.300	0.17	0.88	1.8	
Stack R008	Scrubber	filterable PM	2		100.0	38.64	8,926	0.0121	0.0048	0.368	0.17	1.1	2.2	
		filterable PM	3		98.7	38.76	8,971	0.009	0.0036	0.274	0.17	0.80	1.6	
											Average	0.92	1.8	B

Basis for rating:

Problems noted:

Other notes: *ton/hr of glaze used--based on 23.5 gal/hr x 14.5 lb/gal / 2000 lb/ton

Filename: CERAM21.WQ1
Date: 23-May-95
Facility: CONFIDENTIAL
Location: CONFIDENTIAL
Source: Roller kiln--direct, natural gas-fired
Test date: May 23, 1994

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
1	Stack temperature	Deg F	512	510	517	
	Pressure	in. HG	30.14	30.13	30.13	
	Moisture	%	7.5	6.7	6.4	
	Oxygen	%				
	Volumetric flow, actual	acfm	9341	9253	9320	
	Volumetric flow, standard*	dscfm	4728	4732	4748	0
	Isokinetic variation	%	95.4	96.1	97.2	
Circle: Production or feed rate Capacity:		TPH	2.46	2.49	2.50	
	Pollutant concentrations:					
	Filterable PM	G/dscf	0.00472	0.00482	0.00482	
	Fluorides	G/dscf	0.00576	0.00492	0.00368	
	Pollutant mass flux rates:					
	Filterable PM	lb/hr	0.191	0.196	0.196	
	Fluorides	lb/hr	0.236	0.203	0.154	
	Emission factors (ENGLISH UNITS):					AVERAGE
	Filterable PM	lb/ton	0.078	0.079	0.078	0.078
	Fluorides	lb/ton	0.096	0.082	0.061	0.080
	Emission factors (METRIC UNITS):					AVERAGE
	Filterable PM	kg/Mg	0.039	0.039	0.039	0.039
	Fluorides	kg/Mg	0.048	0.041	0.031	0.040

*DSCFM BASED ON A STANDARD TEMPERATURE OF 68 DEGREES FAHRENHEIT

Filename: CERAM22.WQ1
Date: 23-May-95
Facility: CONFIDENTIAL
Location: CONFIDENTIAL
Source: Roller kiln--direct, natural gas-fired
Test date: June 18, 1993

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
1	Stack temperature	Deg F	543	534	548	
	Pressure	in. HG	30.15	30.15	30.14	
	Moisture	%	8.55	7.78	9.05	
	Oxygen	%				
	Volumetric flow, actual	acfm	8917	8656	8893	
	Volumetric flow, standard*	dscfm	4326	4273	4268	0
	Isokinetic variation	%	104.3	101	101.9	
Average production rate		TPH	2.4	2.4	2.4	
	Pollutant concentrations:					
	Filterable PM	G/dscf	0.0054	0.0076	0.0025	
	Fluorides	G/dscf	nd	nd	nd	
	Pollutant mass flux rates:					
	Filterable PM	lb/hr	0.200	0.278	0.091	
	Fluorides	lb/hr	0.230	0.041	0.287	
	Emission factors (ENGLISH UNITS):					AVERAGE
	Filterable PM	lb/ton	0.083	0.12	0.038	0.079
	Fluorides	lb/ton	0.096	0.017	0.12	0.078
	Emission factors (METRIC UNITS):					AVERAGE
	Filterable PM	kg/Mg	0.042	0.058	0.019	0.040
	Fluorides	kg/Mg	0.048	0.0085	0.060	0.039

*DSCFM BASED ON A STANDARD TEMPERATURE OF 68 DEGREES FAHRENHEIT

Filename: CERAM2~~2~~3.WQ1
Date: 23-May-95
Facility: CONFIDENTIAL
Location: CONFIDENTIAL
Source: Roller kiln--direct, natural gas-fired
Test date: June 18, 1993

D. Emission Data/Mass Flux Rates/Emission Factors

			Values reported			
Test ID	Parameter	Units	Run 1	Run 2	Run 3	Run 4
1	Stack temperature	Deg F	553	559	552	
	Pressure	in. HG	30.26	30.26	30.24	
	Moisture	%	11.53	8.78	8.62	
	Oxygen	%				
	Volumetric flow, actual	acfm	8774	8747	8744	
	Volumetric flow, standard*	dscfm	4092	4181	4213	0
	Isokinetic variation	%	100.9	103.4	100.9	
Average production rate		TPH	2.2	2.2	2.2	
	Pollutant concentrations:					
	Filterable PM	G/dscf	0.003	0.005	0.004	
	Fluorides	G/dscf	nd	nd	nd	
	Pollutant mass flux rates:					
	Filterable PM	lb/hr	0.11	0.18	0.14	
	Fluorides	lb/hr	0.10	0.42	0.19	
	Emission factors (ENGLISH UNITS):					AVERAGE
	Filterable PM	lb/ton	0.048	0.081	0.066	0.065
	Fluorides	lb/ton	0.045	0.19	0.086	0.11
	Emission factors (METRIC UNITS):					AVERAGE
	Filterable PM	kg/Mg	0.024	0.041	0.033	0.032
	Fluorides	kg/Mg	0.023	0.095	0.043	0.054

*DSCFM BASED ON A STANDARD TEMPERATURE OF 68 DEGREES FAHRENHEIT

Filename: CERAM2~~3~~4.WQ1
Date: 24-May-95
Facility: CONFIDENTIAL
Location: CONFIDENTIAL
Source: Spray dryer with venturi scrubber
Test date: October 13, 1994

D. Emission Data/Mass Flux Rates/Emission Factors

			Values reported			
Test ID	Parameter	Units	Run 1	Run 2	Run 3	Run 4
1	Stack temperature	Deg F	148	147	146	
	Pressure	in. HG	29.95	29.98	29.95	
	Moisture	%	18.7	22.5	23.8	
	Oxygen	%				
	Volumetric flow, actual	acfm	24372	23631	23594	
	Volumetric flow, standard*	dscfm	17211	15951	15886	0
	Isokinetic variation	%	103.3	102.5	105.1	
Circle: Production or feed rate Capacity:		TPH	15.28	15.28	15.28	
	Pollutant concentrations:					
	Filterable PM	G/dscf	0.0234	0.0265	0.0165	
	Pollutant mass flux rates:					
	Filterable PM	lb/hr	3.452	3.623	2.247	
	Emission factors (ENGLISH UNITS):					AVERAGE
	Filterable PM	lb/ton	0.23	0.24	0.15	0.20
	Emission factors (METRIC UNITS):					AVERAGE
	Filterable PM	kg/Mg	0.11	0.12	0.074	0.10

*DSCFM BASED ON A STANDARD TEMPERATURE OF 68 DEGREES FAHRENHEIT

Filename: CERAM25.WQ1
Date: 24-May-95
Facility: CONFIDENTIAL
Location: CONFIDENTIAL
Source: Spray dryer with venturi scrubber
Test date: April 12, 1994

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
1	Stack temperature	Deg F	151	145	144	
	Pressure	in. HG	30.16	30.121	30.125	
	Moisture	%	16.35	16.2	15.84	
	Oxygen	%				
	Volumetric flow, actual	acfm	25451	25172	25767	
	Volumetric flow, standard*	dscfm	18545	18533	19087	0
	Isokinetic variation	%	96.5	98.7	96.3	
Average production rate		TPH	13	13	13	
	Pollutant concentrations:					
	Filterable PM	G/dscf	0.0129	0.0088	0.0088	
	Pollutant mass flux rates:					
	Filterable PM	lb/hr	2.05	1.40	1.44	
	Emission factors (ENGLISH UNITS):					AVERAGE
	Filterable PM	lb/ton	0.16	0.11	0.11	0.13
	Emission factors (METRIC UNITS):					AVERAGE
	Filterable PM	kg/Mg	0.079	0.054	0.055	0.063

*DSCFM BASED ON A STANDARD TEMPERATURE OF 68 DEGREES FAHRENHEIT

Filename: CERAM2~~5~~6.WQ1
Date: 24-May-95
Facility: CONFIDENTIAL
Location: CONFIDENTIAL
Source: Spray dryer with venturi scrubber
Test date: January 25-27, 1993

D. Emission Data/Mass Flux Rates/Emission Factors

			Values reported			
Test ID	Parameter	Units	Run 1	Run 2	Run 3	Run 4
1	Stack temperature	Deg F	139	138	137	
	Pressure	in. HG	29.959	29.966	29.954	
	Moisture	%	14.82	17.15	16.32	
	Oxygen	%				
	Volumetric flow, actual	acfm	29916	30903	32227	
	Volumetric flow, standard*	dscfm	22491	22641	23878	0
	Isokinetic variation	%	92.9	93.7	93.4	
Average production rate		TPH	12	12	12	
	Pollutant concentrations:					
	Filterable PM	G/dscf	nd	nd	nd	
	Pollutant mass flux rates:					
	Filterable PM	lb/hr	4.31	1.92	1.63	0.000
	Emission factors (ENGLISH UNITS):					AVERAGE
	Filterable PM	lb/ton	0.36	0.16	0.14	0.22
	Emission factors (METRIC UNITS):					AVERAGE
	Filterable PM	kg/Mg	0.18	0.080	0.068	0.11

*DSCFM BASED ON A STANDARD TEMPERATURE OF 68 DEGREES FAHRENHEIT

Filename: CERAM2~~6~~7.WQ1
Date: 24-May-95
Facility: CONFIDENTIAL
Location: CONFIDENTIAL
Source: Spray dryer with venturi scrubber
Test date: February 10, 1992

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
1	Stack temperature	Deg F	156	158	158	
	Pressure	in. HG	30.129	30.159	30.143	
	Moisture	%	15.86	19.7	21.1	
	Oxygen	%				
	Volumetric flow, actual	acfm	28137	28168	28987	
	Volumetric flow, standard*	dscfm	20434	19479	19686	0
	Isokinetic variation	%	95.2	102	96.6	
Average production rate		TPH	13	13	13	
	Pollutant concentrations:					
	Filterable PM	G/dscf	0.0243	0.0098	0.0157	
	Pollutant mass flux rates:					
	Filterable PM	lb/hr	4.26	1.64	2.65	0.000
	Emission factors (ENGLISH UNITS):					AVERAGE
	Filterable PM	lb/ton	0.33	0.13	0.20	0.22
	Emission factors (METRIC UNITS):					AVERAGE
	Filterable PM	kg/Mg	0.16	0.063	0.10	0.11

*DSCFM BASED ON A STANDARD TEMPERATURE OF 68 DEGREES FAHRENHEIT

Filename: CERAM28.WQ1
Date: 03-Jun-96
Facility: Mannington Ceramic Tile, Inc.
Location: Lexington, NC
Source: Spray booth (glaze contains lead)
Test date: September 20, 1989

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
1	Stack temperature	Deg F	78	77	74	
	Pressure	in. HG	29.19	29.19	29.18	
	Moisture	%	2	2.7	2.8	
	Oxygen	%				
	Volumetric flow, actual	acfm	4502	4881	5019	
	Volumetric flow, standard*	dscfm	4224	4556	4704	0
	Isokinetic variation	%	100.9	100	101.9	
Production rate		TPH glaze	0.20	0.20	0.20	
	Pollutant concentrations:					
	Filterable PM	G/dscf	0.111	0.095	0.0951	
	Lead	ppmdv	4.63	3.92	3.87	
	Pollutant mass flux rates:					
	Filterable PM	lb/hr	4.02	3.71	3.83	
	Lead	lb/hr	0.631	0.576	0.587	
	Emission factors (ENGLISH UNITS):					AVERAGE
	Filterable PM	lb/ton	20	19	19	19
	Lead	lb/ton	3.2	2.9	2.9	3.0
	Emission factors (METRIC UNITS):					AVERAGE
	Filterable PM	kg/Mg	10	9.3	9.6	9.7
	Lead	kg/Mg	1.6	1.4	1.5	1.5

*DSCFM BASED ON A STANDARD TEMPERATURE OF 68 DEGREES FAHRENHEIT

American Olean
an Armstrong company

September 13, 1995

Mr. Ronald E. Myers
U.S. EPA
Office of Air Quality Planning
and Standards
Research Triangle Park, North Carolina 27711

RE: Emission Factor Documentation for AP-42
Section 11.7
Ceramic Products Manafacturing

Dear Mr. Myers:

On Behalf of American Olean Tile Company, we would like to offer comments concerning the draft report.

1. This report includes emission data from American Olean's Fayette plant in Alabama. American Olean's Fayette plant produces quarry tiles which are different from ceramic tiles. The manufacturing raw materials and processes of quarry tile are more similar to Brick and Structural Clay Manufacturing than those of Ceramic Product Manufacturing. Therefore, we feel that the emissions factors for quarry tiles and ceramic tiles are significantly different and should be treated separately.

2. Fluorides and HF emissions are related to the content of fluorine present in the raw materials. There are significant variations of the fluorine contents in the raw materials. As stated in the enclosed paper by Derong Zhou et al., the total fluorine content of soils in United State ranged from 20 ppm in Gainesville, florida, to 7,070 ppm in Ashwood, Tennessee. This paper also summarized HF emissions from four plants which ranged from 18 tons per year to 110 tons per year based on brick production capacity 200,000 tons per year. The raw materials that contained fluorine were 77.2 ppm and 549 ppm respectively. In the draft report, only three companies' data were used to determine emission factors. We do not believe that they are representative, therefore, the two tables, i.e., Table 11.7-2 and Table 11.7-3, should not include fluorides and HF.

3. In traditional ceramics, the process of **SINTERING** is commonly know as **FIRING**. Introducing common name of firing will encourage better communication between industry and non-industry sectors.

American Olean Tile Company
1000 Cannon Avenue, Lansdale, PA 19446-0271
(215) 855-1111 FAX (215) 855-2252

We respectfully submit these comments for your consideration. If you have any questions, please feel free to contact me at (215) 393-2520.

Very truly yours,

Ken Chi

C. Ken Chi, Ph.D.
Manager, Health & Environmental Affairs

New Contact
George Stoffa
(215) 393-2360

Ceramic/Professional Trade Associations

ssociation	Contact	Address	City	State	Zip	Phone
brasive Grain Association	Allen P. Wherry	30200 Detroit Rd.	Cleveland	OH	44145	216/899-0010
CMI(Art & Craft Mat'ls. Inst.)	Debbie Fanning	715 Boylston St.	Boston	MA	02116	617/266-6800
merican Assoc. for the Advancement of Science	Michelle Ladrich	1333 H Street NW	Washington	DC	20005	202/326-6400
merican Ceramic Society, Inc.	Paul Holbrook	757 Brooksedge Plaza Dr.	Westerville	OH	43081	614/890-4700
merican Chemical Society	Dr. John K. Crum	1155 16th St. NY	Washington	DC	20036	202/872-4600
merican Concrete Institute	George F. Leyh	PO Box 19150, Redford Stn	Detroit	MI	48219	313/532-2600
merican Gas Association	George Lawrence	1515 Wilson Blvd.	Arlington	VA	22209	703/841-8400
merican Mining Congress	John A. Knebel	1920 N.St.NW, Ste. 300	Washington	DC	20036	202/861-2800
merican Scientific Glassblowers Society	Theodore Bolan	1507 Hagley Rd.	Toledo	OH	43612	419/476-5478
merican Soc. for Engineering Education (F.Karl Willembrook)	Jerry Cloninger & Frank Huband	11 Dupont Cir NW, Ste 200	Washington	DC	20036	202/293-7080
rt & Craft Matls Inst.	Debbie Fanning	715 Boylston St.	Boston	MA	02116	617/266-6800
rt Glass Suppliers Assn. -	Patty Parrish	1100 H Brandywine Blvd. P.O.Box 2188	Zanesville	OH	43702	614/452-4541
SM International	Ed Langer		Materials Pk	OH	44073	216/338-5151
ssociated Glass & Pottery Mfg's. –	Harold L. Hayes	2800 East Military Rd.	Zanesville	OH	43701	614/452-8329
STM	Joseph O'Grady	1916 Race Street	Philadelphia	PA	19103	215/299-5400
rick Institute of America	Nelson Cooney	11490 Commerce Pk. Dr.	Reston	VA	22091	703/620-0010
MA (Chemical Manufacturers Assn)	Charles W.VanVlack	2501 M St., NW	Washington	DC	20037	202/887-1260
enter for Adv. Matls.	Richard Tressler	410 Walker Blvd.	University Pk	PA	16802	814865-0160
enter for Adv. Matls. Processing	Ed McNamara	Clarkson Univ.	Potadam	NY	13676	315/268-2336
enter for Adv. Ceramic Technology Alfred University	Richard Spriggs	325 McMahon Blvd.	Alfred	NY	14802	607/871-2486
enter for Ceramic Research	Dr. Ed Ruh	Rutgers University	Piscataway	NJ	08855	201/932-2205
eramic Arts Federation Intl.	became inactive in February 1990					

CERAMIC TRADE & PROFESSIONAL ORGANIZATIONS

Association	Contact	Address	City	State	Zip	Phone
Ceramic Arts Institute	Chen Sui Ming	108 Rock Ravine Ct. P.O. Box 601	Citrus Hts.	CA	95611	916/989-1922
Ceramic Education Council	Paul Holbrook	757 Brooksedge Plaza Dr.	Westerville	OH	43081	614/890-4700
Ceramic Tile Inst. of America	Timothy C. Hengst	700 N. Virgil Avenue	Los Angeles	CA	90029	213/660-1911
Ceramic Tile Marketing Federation	J.Criag Barnes	1200 17th St.,NY Ste #400	Washington	DC	20036	202/296-9200
Ceramic Tile Distributors Assoc.	Eleanor Schulte	15 Salt Creek Ln.#422	Hicksdale	IL	60521	708/665-3270
China, Glass & Giftware Assn.	Donald Doctotow	1115 Clifton Ave.	Clifton	NJ	07913	201/779-1600
China Clay Producers Assn.	Gordon Pehrson	1275 Pennsylvania Avenue Suite #800	Washington	DC	20004	202/383-0100
Clay Minerals Society	Jo Eberl	Box 880	Evergreen	CO	80439	303/674-8095
Coalition Safe Ceramic Ware	David Hartquist	3050 K St. NW Ste. 400	Washington	DC	20007	202/342-8450
Collectibles & Platemakers Guild	Hunter Haines	Box 1474	Northbrook	IL	60002	708/272-0028
Cookware Manufacturers Assoc.	Paul Vetzmann	Box 1177	Lake Geneva	WI	53147	414/248-9208
DCMA, Dry Color Mfg. Assoc.	Lawrence Robinson	300 N.Washington St.	Alexandria	VA	22314	703/684-4044
Enamelist Society	Martin Hanson	Box 310	Newport	KY	41072	606/291-3800
Expanded Shale, Clay & Slate Inst.	John P. Ries	P. O. Box 21526 Suite 102	Salt Lk Cy	UT	84121	801/272-7070
Federation of American Scientists	Jeremy J. Stone	307 Massachusetts Ave.NE	Washington	DC	20002	202/546-3300
Federation of Materials Societies	Betsy Houston	1707 L Street NW	Washington	DC	20036	202/296-9282
Flat Glass Marketing Assn.	William J. Birch	3310 Harrison St.	Topeka	KS	66611	913/266-7013
Glass Art Society	Alice Rooney	Box 1364	Corning	NY	14830	607/936-0530
Glass Packaging Institute	Lewis Andrews,Jr.	1801 K St.NW Ste. 1105-L	Washington	DC	20006	202/887-4850
Glass Molders, Potter, Plastics & Allied Workers Intl. Union	James Hatfield	608 E. Baltimore Pike Box 607	Media	PA	19063	215/565-5051
Glass Tempering Association	William J. Birch	3310 Harrison St.	Topeka	KS	66611	913/266-7064
Grinding Wheel Institute	Allen P. Wherry	30200 Detroit Road	Cleveland	OH	44145	216/899-0010
Hobby Industry Assoc.(HIAA)	Patrica Kozioi	319 E 54th Street	Elmwood Pk	NJ	07407	201/794-1133
IEEE Glass Div. % Ford Motor	Stafford Coffe	25500 Westover Rd.	Lincoln Park	MI	48146	313/845-9435

:ociation	Contact	Address	City	State	Zip	Phone
ustrial Health Foundation	William Rinehart	34 Penn Circle West	Pittsburgh	PA	15206	412/363-8600
:itute for the Advancement f Engineering (IAE)	Lloyd Higginbotham	Box 1305	Woodland Hills	CA	91365	818/992-8292
:rnational Ceramic Assn.	Olevia Higgs	P.O. Box 39	Glen Burnie	MD	21061	301/923-3425
l. Porcelain Artist Teachers	Mary Nokes	4125 North West 57th St.	Okla. City	OK	73112	405/946-7121
:rnational Society for (ybrid Microelectronics (ISHM)	Walter H. Biddle	1861 Wielhe Ave.,Ste.340	Reston	VA	22090	703/471-0066
:amos Fraternity va State Univ. Matls Sci & Eng.	Thomas McGee	Deptartment 110 Engineering Annex	Ames	IA	50011	515/294-9619
n & Steel Society	Lawrence G. Kuhn	410 Commonwealth Dr.	Warrendale	PA	15086	412/776-1535
ıd Industries Association, Inc.	Jerome F. Smith	295 Madison Ave. 19th Fl	New York	NY	10017	212/578-4750
;htweight Aggregate Producers Assn.	(Inactive in 1982)					
.terials & Methods Stds. Assn.	Harey J. Powell	P.O. Box 332	Grand Haven	MI	49417	616/842-7844
:tal Powder Inds. Federation	Donald G. White	105 College Road E.	Princeton	NJ	08540	609/452-7700
e Minerals, Metals & Materials ociety	Alexander Scott	420 Commonwealth Dr.	Warrendale	PA	15086	412/776-9000
tional Academy of Engineering : the United States of America	Dr. Robert White	2101 Constitution Ave NW	Washington	DC	20418	202/334-3200
tional Academy of Sciences	Dr. Frank Press	2101 Constitution AVE NW	Washington	DC	20418	202/334-3200
tional Art Education Assn.	Thomas A. Hatfield	1916 Association Dr.	Reston	VA	22091	703/860-8000
tional Clay Pipe Institute	Edward J. Sikora	253-80 Center St. Post Office Box 759	Lake Geneva	WI	53147	414/248-9094
tional Clay Pot Mfg. Assn.	Stone Manes	P.O. Drawer 485	Jackson	MO	63755	314/243-3138
tional Council on Education or Ceramic Arts	Regina Brown	P.O. Box 1677	Bandon	OR	97411	503/347-4394
.tional Electrical Mfg. Assoc.	Viktoria Schofield	2101 L St.NW	Washington	DC	20037	202/457-8400
.tional Glass Association	Philip James	8200 Greensboro Dr. Suite 302	McLean	VA	22102	703/442-4890

ssociation	Contact	Address	City	State	Zip	Phone
ational Housewares Manufacturers Association	Tom Conley Jay Spaulding	1324 Merchandise Mart	Chicago	Il	60654	312/644-3333
ational Industrial Sand Assoc.	Vincent Ahern, Jr.	900 Spring Street	Silver Spring	MD	20910	301/587-1400
atl. Inst. of Ceramic Engineers	Paul Holbrook	757 Brooksedge Plaza Dr.	Westerville	OH	43081	614/890-4700
ational Tabletop Assoc.	Holly Munter Michele Acchiogroggo	355 Lexington Avenue 17th Floor	NYC	NY	10017	212/661-4261
MA Optical Manufacturers Association	Eugene Keeney	6055A Arlington Blvd.	Falls Church	VA	22044	703/237-8433
orcelain Enamel Institute, Inc.	Tim Ruh	1101 Connecticut NW Suite 700	Washington	DC	20036	202/857-1134
efractories Institute	Mark Gleeson	500 Wood St. Suite 326	Pittsburgh	PA	15222	412/281-6787
emiconductor Equipment and Materials Institute	William H.Reed	805 E.Middlefield Rd.	Mtn.View	CA	94043	415/964-5111
emiconductor Industry Assoc.	Andrew Procassini	10201 Torre Av. #275	Cudertino	CA	95014	408/973-9973
ociety for the Advancement of Material and Process Engrg.	Marge Smith	P.O.Box 2459 1055 W.San Bernadino Rd.	Covina	CA	91722	818/331-0616
ociety of Engineering Science	Prof.J.Mark Duva	111G Olsson Hall	Charlottsvl	VA	22903	804/924-3605
ociety of Glass & Ceramic Decorators	Frank S. Childs SANDY SPENCE	207 Grant Street 888 17th ST NW #600	Pt.Jefferson WASHINGTON	NY DC	11777 20006	516/473-0232 202/728-4132
tained Glass Assoc. of America	Kathy Murdock	6 Southwest 2nd Street	Lee's Summit	MO	64063	800/888-7422
uppliers of Advanced Composite Materials Association	Joseph Jackson	1600 Wilson Blvd,Ste 1008	Arlington	VA	22209	703/841-1556
echnical Ceramics Mfg. Assn.	Richard Byrne	25 North Broadway	Tarrytown	NY	10591	914/332-0040
echnical Mkt. Society of America	J. A. Pearson	3711 Long Beach Blvd. P.O. Box 7275	Long Beach	CA	90807	714/821-8672
echnology Transfer Society	Maureen Swinney	611 N. Capital Avenue	Indianapolis	IN	46204	317/262-5022

Association	Contact	Address	City	State	Zip	Phone
The Materials Properties Council	Martin Prager	345 East 47th Street	New York	NY	10017	212/705-7693
Tile Council of America, Inc.	Robert Kleinhans	Box 326	Princeton	NJ	08542	609/921-7050
U.S. Advanced Ceramics Assoc.	Steve Hellem	1440 New York Ave., NW Suite 300	Washington	DC	20005	202/638-1200
U.S. Potters Association	Rose Chamberlin	518 Market Street	E. Liverpool	OH	43920	216/386-4225

FOREIGN CERAMIC ASSOCIATIONS

Ceram,	Dr.Fred James	Queens Rd.,Perkull	Stoke-on-Trent	EN ST47LQ	0782-45431
German Keramik Industry Assoc.	Barnes Richardson Colburn Von Conrad	1819 H St. NW	Washington	DC 20006	201/457-0300

ELECTRO-SCIENCE LABORATORIES, INC.
416 East Church Road
King of Prussia, PA 19406
Phone: 610-272-8000
Telex: 83-4788
Fax: 610-272-6759

Fax No: D8523
Date: 7/25
Sender: CR
Page: 3

To: Mr. Rick Marinshaw

Fax #: 919-677-0065

From: Dr. Sidney J. Stein

Date: July 25, 1994

Re: List of Member of ACS - Legislative & Regulatory Committee

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The following is a list consisting of members of the American Ceramic Society - Legislative & Regulatory Committee, plus some other individuals whom have been involved in such matters in the past. It is my understanding that you wish to send them copies of new proposed regulation materials relating to frit.

If I can be of any further assistance please let me know.

Regards,

Sidney J Stein/cr

SJS:cmr

Attachment

American Ceramic Society -Federal Liaison Comittee

Glass & Optical Materials

Dr. Thomas P. Seward,III, Corning Inc. Sullivan Park, FR-3-1, Corning, NY 14831

Materials & Equipment

Mr. Richard O. Hommel, 933 Osage Road, Pittsburgh, PA 15243

Nuclear & Environmental Technology

Dr. Henry D. Schreiber, Virginia Military Institute, Dept. of Chemistry, Lexington, VA 24450

American Ceramic Society - Legislative & Regulatory Affairs

Electronics

Dr. Sidney J. Stein, Electro-Science Labs, 416 E. Church Road, King of Prussia, PA 19406

Dr. Joseph P. Dougherty, Pennsylvania State University, 144 Materials Research Lab, University Park, PA 16802

Design

Mr. John Ranney, Monarch Tile, Inc. Box 999, Florence, AL 35631

PROCESSING

Engineering Ceramics

Glenn Pfendt, A.O. Smith Corp. 8160 Holton Road, Florence, KY 42042

Glass & Optical Materials

Mr. Dennis F. Bickford, Westinghouse Savannah River Co., Lab 773A, Aiken, SC 29801

Materials & Equipment

Mr. William C. Spangenberg, Hammond Lead Products, Inc., 220 Manor Oak One, 1910 Cochran Road, Pittsburgh, PA 15220

Nuclear & Environmental Technology

Dr. John B. Pickett, Westinghouse Savannah River Co., Savannah River Site, Bldg. 730-M, Aiken, SC 29808

Refractory Ceramics

Mr. Robert T. Oxnard, Maryland Refractories, Inc., Box 267, Irondale, OH 43932

Structural Clay Products

Mr. Murray A. Schwartz, Materials Tech. Consulting Inc., 30 Orchard Way N., Potomac, MD 20854

Others

Mr. Ron Palmer, West Valley Nuclear Scvices, P. O. Box 191, West Valley, NY 14171

Eva M. Vogel, Bell Communications Research, 331 Newman Springs Road, Rm. 3Z-283, Red Bank, NJ 07701

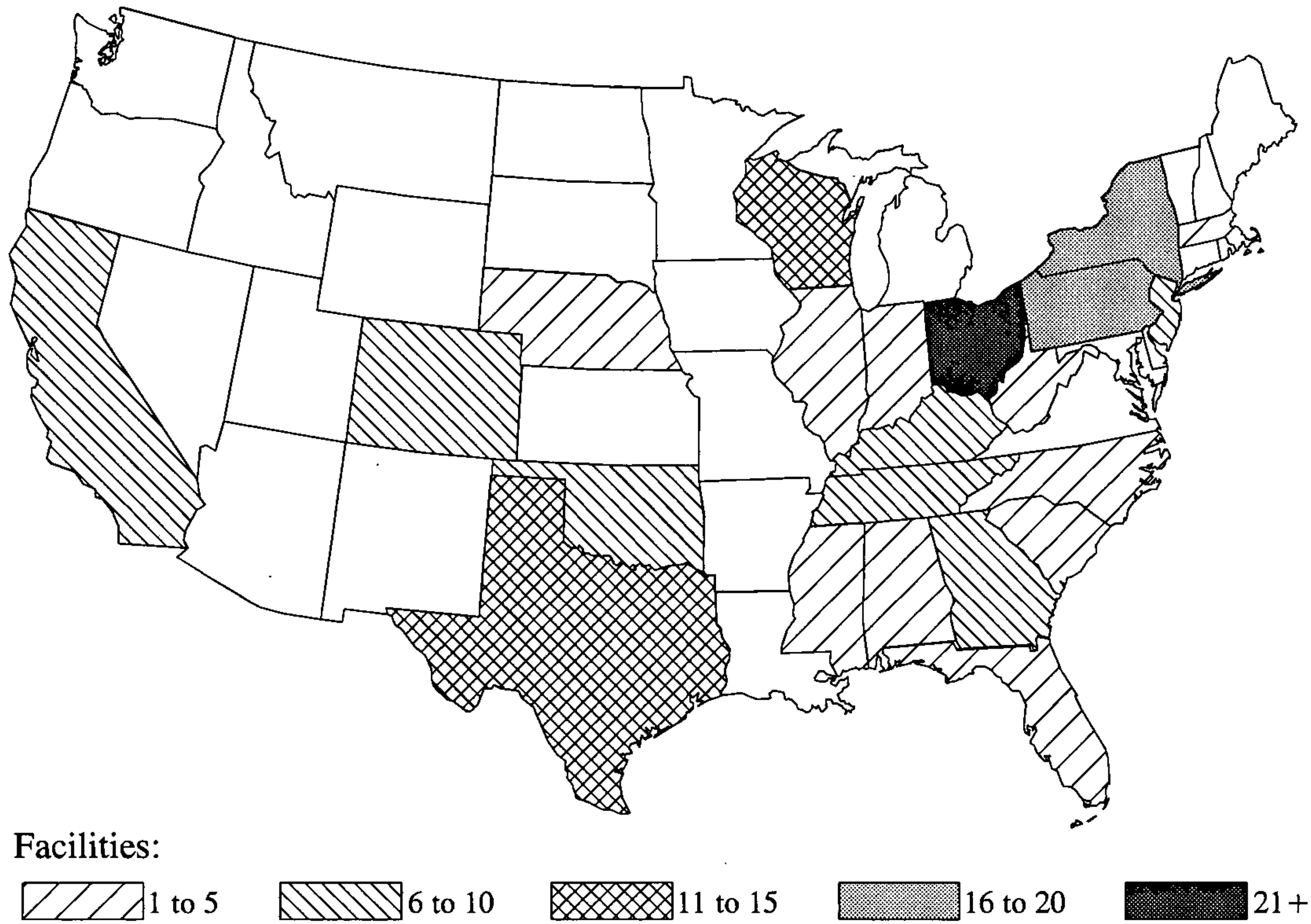
K. M. Nair, E.I. du Pont de Nemours & Co., Inc. Box 80334, Wilmington, DE 19880

Isabel Knowlton Lloyd, University of Maryland, Materials & Nuclear Engineering, Engineering Materials Program, College Park, MD 20742-2115

Relva C. Buchanan, University of Illinois, Dept. of Materials Science & Engineering, 105 S. Goodwin Avenue, Urbana, IL 61801

Mr. Vishay N. Shukla, Texas Instruments, Inc., 34 Forest Street, M.S. 10-13, Attlesboro, MA 02703

NUMBER OF FACILITIES BY STATE



5/5/95

CALL TO BAUMAN

- VISIT TO SHANNON (GA) SITE
- IS SENDING 2 REPORTS TO RON MYERS
- PLANT DOESN'T WANT EPA TO VISIT. OK IF MRI GOES (HE THINKS)
HE WILL CHECK AGAIN & CALL BACK NEXT WEEK.

6/2/95

CALL TO BAUMAN

- ONLY WAY TRIP CAN HAPPEN IS IF WE GO 6/12-15 BECAUSE HE'LL BE AT PLANT THEN
- I SUGGESTED TENTATIVE DATE OF 6/13

6/5/95

CALL TO BAUMAN (NILM)

NEED TO ANALIZE TRIP DATES
ALSO ASK IF "FORNIKEN" IS GENERIC, IF NOT, HOW TO REFERENCE

CALLED BAUMAN & LEFT MESSAGE THAT WE ARE CANCELLING TRIP (6/5/95)

CALL TO DON WHITNEY

- TOLD HIM WE WOULD RESCHEDULE TRIP
-

CALL to BAUMAN

- FORNIKEN → "SMALL ROLLER KILN" FOR FIXING DECAL
GAS-FIRED, PROBABLY COULD BE USED TO FIRE GREENWARE
→ USED IN THIS CASE PROBLEM

3/29/95

CALL TO DOUG BAUMAN, FLORIDA TILE
(813) 687-7171

- HE HAS TEST REPORTS FOR PM FROM TILE PRESSES, PM FROM SPRAY DRYERS (5 REPORTS), PM FROM ROLLER KILNS, AND HF FROM ROLLER KILNS
- HE WILL CHECK WITH MANAGEMENT ABOUT SENDING THEM TO US (MAY WANT TO KEEP PLANT NAME CONFIDENTIAL)
- INDUSTRY HAS CONCERNS ABOUT METHOD 26A FOR HF, THINKS THAT FTIR MIGHT BE MORE APPROPRIATE, MORE COMPARATIVE TESTING NEEDED
- ROLLER KILN EMISSIONS DIFFER FROM TUNNEL KILN EMISSIONS
  ↳ SINGLE LAYER (BLANKET) OF TILE FED INTO SLOT (3" HIGH x 3-5' LONG) AT END OF KILN, TILE CONVEYED ON ROLLERS THROUGH KILN
- IMPORTANT TO DISTINGUISH BETWEEN CRUSHING/GRINDING OF GREEN CERAMICS & FIRED CERAMICS (& RAW MATERIALS)

<u>CALL TO BAUMAN</u> (813) 284-4089 — 4/4/95

- ASKED FOR PROCESS RATES FOR MARCH 89 TEST @ LAWRENCEBURG, KY
- NLM

CALL BACK FROM BAUMAN

<u>TEMNIKEN KILN</u>

- SMALL ROLLER KILN
- REFIRES TILE AFTER DECALS ARE APPLIED — OR PAINTING OR INK SCREENING
- 35-45 MINUTE RESIDENCE TIME TYPICAL
- MAX RATE
- SHOULD NOT COMBINE WITH OTHER KILN DATA BECAUSE THIS IS FOR REFIRED TILE, DECO APPLICATION
- TYPICAL PROCESSING RATE: 0.18 TONS/HR (360 lb/HR) — 47 MIN RESIDENCE TIME FOR TH
- 47 MINUTE RESIDENCE TIME IN THIS PARTICULAR KILN

<u>OTHER TEST DATA</u>

- CAN SEND REPORTS (90% SURE)

4/24/95

CALL TO BAUMAN, FLORIDA TILE
- CALLED TO SCHEDULE VISIT, NLM

~~DENIS BROSNAN, CLEMSON U.~~

- CONTACT AT KOHLER PLANT SC

BEN HERRING (803) 58? 3401

CALL TO BEN HERRING, KOHLER (PRODUCT ENGINEER), HE SUGGESTED WE CONTACT DON WHITLEY

- DON WHITLEY, PLANT ENGINEER
  - ALSO MANUFACTURE FIBERGLASS TUBS
    I TOLD HIM WE'RE INTERESTED IN CERAMICS ONLY
  - THEY HAVE 3 TYPES OF KILNS
  - NO PROBLEM WITH THE VISIT BUT MUST CHECK WITH CORP HQ
  - THEY MAY HAVE SOME PROCESSES THAT ARE DIFFERENT FROM OTHERS
    RAW MATERIALS ALREADY MIXED IN SLURRY
  - WOULD LIKE LETTER STATING PURPOSE, etc.
  - REGION IV RECENTLY VISITED / INSPECTED PLANT
  - HAVE CONDUCTED TESTS BY THEIR CORP. HQ
    → ON KILNS FOR HF
  - IN GREENVILLE, SC, RMT CONSULTING FIRM HAS DONE STUDIES ON HF
  - HE'LL CALL BACK IN A FEW DAYS

CALL TO DON WHITLEY, KOHLER, SPARTANBURG, SC

- RETURN CALL
- S.A. CAMPBELL & ASSOC. (Sally) (803) 836-2900 Traveller's Rest, SC } HF decay rate expert
- VISITING PLANT
  → NO COPIES OF TEST REPORTS AVAILABLE FROM KOHLER
  HAVE SUBMITTED DATA TO SC DHEC ____ WHICH SAYS
  VISIT IS OK, BUT WANT LETTER & INFORMATION WON'T BE USED FOR ENFORCEMENT ACTION

5/2/95

CALL TO DON WHITLEY, KOHLER

- WON'T LET EPA IN PLANT WITHIN GUARANTEE OF NO ENFORCEMENT ACTION
- MRI CAN VISIT NO PROBLEM
- NO CAMERAS

CALL TO BAUMAN, FLORIDA TILE

- NLM (RE VISIT TO GEORGIA PLANT)

4602-01

CERAMIC CLAY PRODUCTS 9/28/94

SIC

3253 - CERAMIC WALL & FLOOR TILE

3261 - VITREOUS CHINA PLUMBING FIXTURES / FITTINGS ....

3262 - VITREOUS CHINA TABLE AND KITCHEN ARTICLES

3263 - FINE EARTHENWARE (WHITEWARE) TABLE & KITCHEN ARTICLES

3264 - PORCELAIN ELECTRICAL SUPPLIES

3269 - POTTERY PRODUCTS, NEC

- TEST DATA
- REFERENCE BOOKS
- PLANT CONTACTS/VISIT
- ACS CONTACT, OTHER TRADE ASSOC.

CALL TO BROSNAN (803) 656-0603

NILM

CALL TO KY (502) 573-3382

· TERRY SLUCHER (502) 573-3382 ext 432

TECHNICAL SERVICES

· HAS REPORTS FOR FLORIDA TILE (LAWRENCEBURG)

AMERICAN OLEAN TILE (LEWISPORT)

WILL SEND TO US

ASK RON

- AIRS SEARCH
- PORCELAIN GLAZE SPRAYING (SCC IS FOR FABRICATED METAL PRODUCTS)
- STATES TO CONTACT

FRIT

- RON HAS BEEN CALLED BY FRIT PANEL ASKING FOR EXTENSION OF RESPONSE DATE
- HOLD OFF ON FRIT CHANGES UNTIL LATER

SOME RO's IN TX, CA

CERAMICS

- NJ, PA, WI, CA : PES LOOKED THROUGH FILES IF ANY

~~EXIST THEY'RE IN STARS~~

- TRY SC, GA & OHIO DISTRICTS

CALL TO JAKE FRICK, SC (803) 935-6315

· NILM

CALL TO GEORGIA

MIKE FOGEL, (404) 656-7751

CANTON (OH) CITY HEALTH DEPT.

DANIEL SCHILTZ

WILL SEND REPORTS ON METROPOLITAN IND.

SOUTH OF CANTON, MANY PLANTS

ALAN LLOYD, OH EPA

(800) 426-6515 (Ext 6313)

10/5/94

CALL TO FRICK (SCDHEC)

THEY HAVE NO TEST REPORTS ON CERAMIC PLANTS

PHONED BROSNAN (AGAIN), NILM

10/6/94

American Assoc of Ceramic Industries (614) 452-4541 - DOESN'T KNOW ABOUT THEM

* Ceramic Manufacturers Assoc. (614) 452-~~2552~~ 4541 - COULD BE GOOD CONTACT

National Institute of Ceramic Engineers (614) 890-4700 - NOT MUCH HELP

* Tile Council of America (609) 921-7050

→ MAY BE INTERESTED IN ENVIRONMENTAL ASPECTS   Bob Daniels (803) 646-TILE 4021

→ EXEC. DIRECTOR.

- Process Description
- Emission test data
- Plants to visit

CALL TO SIDNEY STEIN - CHAIR OF ACS LEGISLATIVE & REGULATORY COMMITTEE

(610) 272-8000 NLM (HE'LL BE BACK ON 10/11 or 10/14/94

10/13/94

PHONED KY FOR CLARIFICATION OF TEST REPORTS

- THEY WILL CALL BACK AFTER DISCUSSING WITH PERMIT REVIEW SECTION
- TALK TO ANDREA ECTON WROTE PERMIT FOR PLANT, A SHAFIQ AMAWI, TECH. SERV. BRANCH

← I SPOKE WITH AMAWI

TO ASK. STEIN

- KILN DESCRIPTION
- PLANT ACCESS
- JOURNAL NAME
- TEST DATA
- OTHER TRADE ASSOC.

10/13/94

CALL TO KC LIBRARY

- CERAMICS
  AIR POLLUTION, EMISSIONS
- KILNS, DRYER
- FIRING, SINTERING
- GENERAL MFG. PROCESSES

ASK KIM TO DO LIT SEARCH (CERAMIC ABSTRACTS)

CALL TO DANIEL SCHULTZ CANTON HD (216) 489-3385

— ASKED FOR CLARIFICATIONS OF TEST REPORTS
HE'LL CALL BACK WITH ANSWERS

ELECTRIC KILN CERAMICS TT920, R53
KILN BUILDING TT924. C64
KILN & KILN FIRING TP841. F7 1974

10/17/94

— SEND SCHULTZ COPY OF DRAFT
Canton Health Dept, APC Division
420 Market Ave. North
Canton Ohio. 44702

CALL TO BROSNAN — NILM
- HOW TO CLASSIFY BY AP-42 BRICKS
CERAMICS

10/18/94

CALL FROM BROSNAN

CERAMICS

2 TYPES OF PRODUCTS (CLAY)

BRICK - USES ALUMINA SILICA CLAYS MINED ON-SITE

CERAMIC PLANTS USING REFINED CLAYS

CERAMICS
1. STRUCTURAL CLAY PRODUCTS ~~REFRACTORY~~
2. WHITEWARE CERAMIC
3. NONCLAY CERAMIC BASED ON OXIDES (eg. SPARKPLUGS)
4. " " NOT BASED ON OXIDES (INCLUDES ABRASIVES)
↳ PLUS MANY OTHER

SITE VISITS

- HE'LL THINK ABOUT THIS & LET ME KNOW
- TILE PLANTS IN N.C., CATALYTIC
- KOHLER PLANT (SANITARYWARE) IN SPARTANBURG

ALABAMA DEM, DAVID OWSLEY (205) 271-7861

AMERICAN CERAMIC SOCIETY (614) 890-4700

BOB KLEINHANS, Executive Director
TILE COUNCIL OF AMERICA
PO, BOX 326
Princeton NJ 08542

President, ACerS

Robert Hawkins, Hocking Technical, College
14649 State Route 664S, Logan OHIO 43138
(614) 753-3591, ext 2405

Tyson DeLoach, American Olean Tile, Fayette AL
(205) 932-8944
~~David Ousley @ ADEM~~

Tyson
Note to DeLoach, Chief Ceramic Engineer 11/23/94
Add to mailing list
Amer
P.O. 659
Fayette, AL 35555

2/6/95
CALL TO CERAMIC MFG.'S ASSOC. (CerMA)
614-452-4541 ext. 3116 DEBBIE JOHNSTON
- SHE WILL CONTACT BOB HAWKINS, CHAIRMAN

2/17/95
CALL TO CerMA
- LEFT MESSAGE WITH DEBBY JOHNSTON

2/27/95
CALL TO CERMA
BOB HAWKINS (614) 753 3591 ext. 2405
↳ @ HOCKING TECH. COLL.

CALL TO HOCKING NILM, HAWKINS RETURNS 3/15

3/17/95
CALL TO HAWKINS, NILM, HAS NOT YET RETURNED FROM VACATION

REQUESTS TO STATES FOR EMISSION DATA ON CERAMICS MANUFACTURING

Kentucky Dept. of Environmental Protection
Jerry Slucher, (502) 573-3382, Ext. 432
- Provided 2 test reports for Florida Tile, Lawrenceburg.

City of Canton (Ohio) Health Department
Daniel Schiltz, (216) 489-3385
- Provided 5 test reports--3 on ceramics plants, 1 on refractory plant, and 1 on structural clay tile plant.

South Carolina Dept. of Health and Envir. Control
Jake Frick, (803) 935-6315
- Requested reports on Kohler plant in Spartansburg; responded that SC has no ceramics plant test reports on file.

Georgia Air Protection Branch
Mike Fogel, (404) ~~656-7751~~ 363-7141 Left voice mail w/plant names and what were looking for.
- Need to request reports on following:
  - Florida Tile Industries, Shannon, GA (TRIS)
  - Georgia Tile Distributors, Douglasville, GA (TRIS)
  - Lapp Insulator Co., Sandersville, GA (TRIS)
  - Universal Rundel Corp., Monroe, GA (TRIS)
  - Universal Ceramics, Adairsville, GA
  - Dupree Marble Co., Marietta, GA
  - Briggs Co., Atlanta, GA
  - Toto Industries, Atlanta, GA

All small sources. No test data.

Larry Weber (404) 363-7120

Toto will be installing a baghouse on a new process, but won't test until mid-1995.

Alabama Dept. of Environ. Management
David Ousley, (205) 271-7861 (Thank him for the frit info.)
- Need to request reports on following:
  - Tyson Deloach — American Olean Tile, Fayette, AL ✓ (205) 932-8944
  - Monarch Tile Mfg., Florence (TRIS)
  - Riverside Refractories, Pell City, AL

Will check to see if he has these. Has 1 test report for crushing/screening operations @ American Olean

Said that a trade association is developing factors for the industry!

North Ohio Valley Air Authority
? Pat DeLuca, (614) 282-3908 Not in.
- Need to request reports on following:
  - Summitville Tiles, Summitville, OH
  - Sterling China, Wellsville, OH
  - Hall China, East Liverpool, OH

Ohio EPA, Northwest District Office
? Gerald Rich, (419) 352-8461
- Need to request reports on following:
  - Porcelain Products Co., Carey, OH
  - Mansfield Plumbing Products, Perrysville, OH
  - American Standard, Inc., Tiffin, OH
  - Artesian Industries, Ontario, OH

Will check. Faxed a summary sheet of 3 tests done on spray booths @

Ohio EPA, Southeast District Office

? Fred Klingerhafer, (614) 385-8501 Call back after 3:15

- Need to request reports on following:
  Champion Spark Plugs, Cambridge, OH

Hamilton County (Ohio) Dept. of Envir. Services

Harry Schweitering, (513) 651-9437

- Need to request reports on following:
  Electrodyne Co., Batavia, OH

} will check
Mike Fairn Ferrum?
(513) 333-4711
NO DATA AVAILABLE.

Oklahoma Dept. of Envir. Quality

Joyce Sheehy, (405) 271-1683. ext. ~~115~~ 106 Not in.

- Need to request reports on following:
  425-4336 City/county Health Depts. ← Athenian Marble Corp., Oklahoma City, OK
  Frankoma Pottery, Sapulpa, OK
  (918) 744-1000 (Air Q) ← Laufen International Ceramics, Tulsa, OK
  TDK Ferrites Corp., Shawnee, OK → David Schutz

Don Whitney 5220 x117

Debbie Perry x116 Grain Elevators

Chattanooga-Hamilton Country Air Poll. Control Bureau

? Robert Colby, (615) 867-4321 Gravitt Loyd

- Need to request reports on following:
  ← Steward Inc., Chattanooga, TN
  3-M Company, Chattanooga, TN
  ← Coors Electronic Package Co., Chattanooga, TN
  Clowes Ceramic Division, Chattanooga, TN → Norton
  → Address 3711 Calhoun Ave.

3-M is Coors

} will check
Is sending 3 test reports one PM report from Steward, 1 VOC report from Coors, and 1 PM report from Norton. Should be here ≈ Nov 16 or so.

? Tennessee Division of Air Pollution Control

? John Walton, (615) 532-0614

- Need to request reports on following:
  IMAC Corp., Dickson, TN
  American Olean Tile Co., Jackson, TN
  Tilecera, Inc., Clarksville, TN

Document Control Sheet

Project No.: A602-01 (Subtask No.) ____
Document Name: Ceramics External Review letter

CBI: ☐ Yes ☒ No
Originator: B. Shrager Ext. 5224

WP COMMENTS: ID-4231

WP ID No.: 4163, 4164

①

Date to WP: 6/2
Due date/time: 6/5

☐ Flexible
☒ Firm
☐ RUSH

WP PROOF ☐ Yes ☐ No

FORMAT: ☐ EPA ☐ MRI ☐ Note below ☐ Format only

SPACING: ☐ 1 ☐ 1.5 ☐ 2

OUTPUT: ☐ Draft ☐ Final ☐ Rainbow ☐ Copies ____ | ☐ Scan ___ Text ___ Figure ___ Photo ___ Other | ☐ Graphics ___ General use ___ 35 mm slides ___ Transparency ___ Satellite/other

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Route: ____ Instructions/comments: Copy letter #4123 (WP ID No.). Changes as indicated, and prepare variable list.

FJ

②

Date to WP: 6/29
Due date/time: 6/[illegible] 29

☐ Flexible
☒ Firm
☐ RUSH

WP PROOF ☐ Yes ☐ No

FORMAT: ☐ EPA ☐ MRI ☐ Note below ☐ Format only

SPACING: ☐ 1 ☐ 1.5 ☐ 2

OUTPUT: ☐ Draft ☐ Final ☒ Rainbow ☐ Copies ____ | ☐ Scan ___ Text ___ Figure ___ Photo ___ Other | ☐ Graphics ___ General use ___ 35 mm slides ___ Transparency ___ Satellite/other

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Route: ____ Instructions/comments: The ~~attachment~~ enclosures are the AP-42 section and the background report (ATTACHED)

PROOFREADING BY DOC. PROD. ____
___ Revisions only
___ Format only
___ Spellcheck only
___ Format & content
___ Total proof
___ Not proofed

THR

③

Date to WP: ____
Due date/time: ____

☐ Flexible
☐ Firm
☐ RUSH

WP PROOF ☐ Yes ☐ No

FORMAT: ☐ EPA ☐ MRI ☐ Note below ☐ Format only

SPACING: ☐ 1 ☐ 1.5 ☐ 2

OUTPUT: ☐ Draft ☐ Final ☐ Rainbow ☐ Copies ____ | ☐ Scan ___ Text ___ Figure ___ Photo ___ Other | ☐ Graphics ___ General use ___ 35 mm slides ___ Transparency ___ Satellite/other

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Document Control Sheet (continued)

Project No.: ______________ **(Subtask No.)** _____ | **WP ID No.:** ______________________

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④

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Due date/time: ______________

☐ Flexible
☐ Firm
☐ RUSH

WP PROOF ☐ Yes ☐ No

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☐ Flexible
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WP PROOF ☐ Yes ☐ No

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☐ MRI	☐ 1.5	☐ Final	__ Text	__ General use	
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Due date/time: ______________

☐ Flexible
☐ Firm
☐ RUSH

WP PROOF ☐ Yes ☐ No

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☐ MRI	☐ 1.5	☐ Final	__ Text	__ General use	
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DRAFT JUN 29 1995

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

Mr. Robert Kleinhans
Executive Director
Tile Council of America
Post Office Box 326
Princeton, New Jersey 08542

Dear Mr. Kleinhans:

The Emission Factor and Inventory Group of the U. S. Environmental Protection Agency (EPA) is in the process of updating the document *Compilation of Air Pollutant Emission Factors, Volume I: Stationary Point and Area Sources* (known more commonly as AP-42). As part of this process, we are now seeking comments on the draft sections that are to be included in the next update of AP-42.

Enclosed is a copy of the revised draft Section 11.7, Ceramic Products Manufacturing, and the corresponding background report for the section. We would appreciate your organization reviewing the enclosed draft AP-42 section and background report and sending us your comments. In addition, please feel free to distribute copies of these documents to other interested persons. We would appreciate a response to this request by August 16, 1995.

The emission factors presented in AP-42 generally are based upon results from validated tests or other emission evaluations that are similar to EPA reference test methods. As a result, revisions to the emission factors presented in AP-42 must be supported by equivalent documentation. If you disagree with any emission factors presented in the enclosed AP-42 section or have additional supporting documentation, we would appreciate your providing either a copy of the documentation or information on how we can obtain copies of the supporting documentation. We would also appreciate specific comments on the process description and the process flow diagram presented in the enclosed draft AP-42 section.

We look forward to receiving your comments. If you have questions or need additional time to respond, I can be reached by telephone at (919) 541-5407 or by fax at (919) 541-0684.

Sincerely,

Ronald E. Myers
Emission Factor and Inventory Group
Emissions, Monitoring, and
Analysis Division

2 Enclosures

IDENTICAL LETTER SENT TO THE FOLLOWING ADDRESSEES:

Mr. Robert Hawkins
President,- Ceramic Manufacturers' Association
Hocking Technical College
14649 State Route 6645
Logan, Ohio 43138

Dr. Sidney J. Stein
President
Electro-Science Laboratories, Inc.
416 East Church Road
King of Prussia, Pennsylvania 19406

Mr. W. Paul Holbrook
Executive Director
American Ceramic Society
735 Ceramic Place
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Mr. Douglas Bauman
Corporate Environmental Engineer
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Lakeland, Florida 33802

Mr. Daniel Schiltz
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420 Market Avenue, North
Canton, Ohio 44702

Mr. Tyson DeLoach
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American Olean Tile
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Fayette, Alabama 35555

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Columbus, Ohio 43266-0149

Mr. James D. Boyd
Executive Officer
California Air Resources Board
2020 L Street
Sacramento, California 95814

Mr. S. William Becker
Executive Director
State & Territory Air Pollution Program Administrators
444 North Capitol Street, NW, Suite 307
Washington, D.C. 20001-1514

Canton City Health Department

Division of Air Pollution Control
420 Market Avenue N. • Canton, Ohio 44702-1544
(216) 489-3385 • Fax: (216) 489-3335

Robert E. Pattison, M.P.A.
Health Commissioner
Bruce E. Blankenship
Administrator

August 21, 1995

Mr. Ronald E. Myers
Emission Factor and Inventory Group
USEPA
Office of Air Quality Planning and Standards
Research Triangle Park, N.C. 27711

RE: AP-42 Section 11.7

Dear Mr. Myers:

This letter is a response to your request for comments on the Draft AP-42 Section 11.7

Comment # 1
Reference Table #11.7-3 & Table #11.7-2

Gas-Fired Kiln Tunnel 4.1 LB SO_2 / Ton
Gas-Fired Roller Kiln 0.078 LB SO_2 / Ton

These two emission factors are very misleading. An unsuspecting individual could easily interpret these factors as representative of *all* similar kilns, when in fact these factors are based on only a few stack tests. Much more important than the type of kiln is the sulfur content of the raw materials and the type of product being produced.

A better alternative would be an emission factor similar to the one used for an oil fired boiler. I would use 31.2 (S) as a factor with the S representing the % of sulfur in the raw materials. The calculations to explain this factor are these:

If all of the sulfur was converted to SO2, then 1 pound of S and 1 pound O2 in the raw materials would result in the emission of 2 pounds of S02 based on this chemical formula: $S^{(32)} + O_2^{(32)} = SO_2^{(64)}$

Based on numerous stack tests done at Metropolitan Industries, this agency believes that only around 78% of the sulfur in the raw materials is converted to S02 in the kilns at Metropolitan. Therefore 1 pound of sulfur in the raw materials would cause 1.56 pounds of S02 to be emitted. 1lb X .78 X 2 = 1.56 lb

If a raw material has 1% sulfur content, then 1 ton of this material would have 20 lbs. of sulfur in it.

20 Lbs Sulfur/ton of raw material X 1.56 Lb S02/ Lb Sulfur = 31.2 Lb S02/ton Raw Material

Emission factor should be 31.2(S) where S is the sulfur content in per cent of the raw materials.

The metric equivalent of Table 11.7-3 is Table 11.7-2 and it obviously also should be revised.

Comment # 2
Reference 11.7-3 Emissions and Controls.

"Emissions of S0x are primarily a function of the sulfur content of the fuel used to fire the calciners; the sulfur content of the raw materials used to manufacture ceramics generally is negligible." This sentence does not correlate well with Table 11.7-3 which shows considerable $S0_2$ Emissions from a Gas Fired Tunnel Kiln. The sulfur content of raw materials appears to be dependent on what quality of ceramics are being produced. If a company can get away with using cheaper high sulfur clay and still produce a satisfactory product they will. U.S. Ceramic Tile, here in Stark County, has to go out of state to get the low sulfur clay they use, because of the type of ceramics they make while Metropolitan Industries can use local clay to make wall tile. Stark Ceramics makes a structural clay ceramic brick so they also can use high sulfur local clay. I have enclosed brochures of the products these three companies make. I think that a better explanation can be developed to show that the sulfur content of ceramic clay products and raw materials can vary considerably based on the product being produced.

Comment # 3
Reference Section 11.3 Bricks and Related Clay Products

This Agency recently received the reformatted 1/95 version of this section, it was written in 10/86 and has not been revised since. This section is closely related to Section 11.7 in that the products produced are similar. In Tables 11.3-1 and 11.3-2 the $S0_2$ Emissions Factors for Gas Fired Tunnel Kilns is negligible. My experience with Brick Mfg. is that they can tolerate a large amount of sulfur in their raw materials. The brick kilns I have seen emit a large amount of $S0_2$. Will this factor be revised?

Additional Comments
Metropolitan Industries submitted some comments on this draft report which I have enclosed.

In summary, I hope that you will take the time to consider my recommendations. I am sure that you will also receive a lot of comments from the clay products industry. Here in Stark County we have three manufactures of clay products whom each have S0x Emissions above 200 Tons year and with considerable fluoride emissions. This agency had no idea that these companies were emitting that amount of pollutants until extensive stack testing was done. Using the old version of AP-42 an agency would have no inkling that these kilns would be emitting this much pollution. In fact when the State of Ohio SIP for S02 was done the emissions from kilns were not considered. Title V and FESOP applications often use AP-42 Emission factors to determine potential to emit. Unless we can develop better factors there will be much inaccurate data being submitted with potentially serious consequences.

If you have any questions, please contact this Agency.

Sincerely,

Daniel J. Schiltz

Daniel J. Schiltz
Permit Processing Technician

Enclosure

g:\shared\apc\letters\schiltz\0821rm.ca

EMISSION FACTOR DOCUMENTATION FOR AP-42 SECTION 11.7 CERAMIC PRODUCTS MANUFACTURING DRAFT REPORT.

The following data shows reasons for disagreement with the draft report.

1). Groupings by tunnel kiln as compared to roller hearth kiln are incorrect. Actual emissions are a function of materials used, not type of kiln. The report shows data from three specific tunnel kiln tests, where the materials used have higher sulfur and fluoride content than materials normally used in roller hearth kilns.

2). Fluoride content in raw materials varies from 0.01-0.2%. This is a bigger factor in the emission quantity than the type of kiln.

3). The second best choice for groupings would be by product as defined by American Society for Testing and Materials (ASTM) for example Quarry, Paver, Wall, Mosaic tile or by any other ceramic product category, this grouping takes into account similar materials used for manufacture.

4). The specific tunnel kilns used in the report are producing products that require very low absorption, and therefore cannot use lime as an additive. The lime ties up the fluorine as CaF_2 and emissions will be lower. The roller hearth kilns producing wall tile can use lime as an additive because the resulting absorption of the product is much higher in the 12-15% range. The specific tunnel kiln products in the report require 2% absorption and lime cannot be used as it makes the body more porous.

5). While scrubbing may be effective in using limestone to reduce HF emission by forming CaF_2, it should be noted that sulfur compounds also result in the residue. These volumes of sulfur compounds must be disposed of at costs beyond reasonable operating costs.

6). There are two methods quoted for measuring total fluorides method 13A and 13B, of these two the former is used for 0 to 1.4 Ig F/ml and the latter 0.02 to 2000 Ig F/mg stating that small measurements require extra care. The points being first one of consistency and secondly the roller hearth kiln with quoted low emissions used method 13B whereas the tunnel kilns used 13A.

Report compiled 8/9/95 by: Roy Gorton and Phil McGuinness.

11.3 Bricks And Related Clay Products

11.3.1 Process Description

The manufacture of brick and related products such as clay pipe, pottery, and some types of refractory brick involves the mining, grinding, screening, and blending of the raw materials, and the forming, cutting or shaping, drying or curing, and firing of the final product.

Surface clays and shales are mined in open pits. Most fine clays are found underground. After mining, the material is crushed to remove stones and is stirred before it passes onto screens for segregation by particle size.

To start the forming process, clay is mixed with water, usually in a pug mill. The 3 principal processes for forming bricks are stiff mud, sort mud, and dry press. In the stiff mud process, sufficient water is added to give the clay plasticity, and bricks are formed by forcing the clay through a die. Wire is used in separating bricks. All structural tile and most brick are formed by this process. The soft mud process is usually used with clay too wet for the stiff mud process. The clay is mixed with water to a moisture content of 20 to 30 percent, and the bricks are formed in molds. In the dry press process, clay is mixed with a small amount of water and formed in steel molds by applying pressure of 3.43 to 10.28 megapascals (500 to 1500 pounds per square inch). A typical brick manufacturing process is shown in Figure 11.3-1.

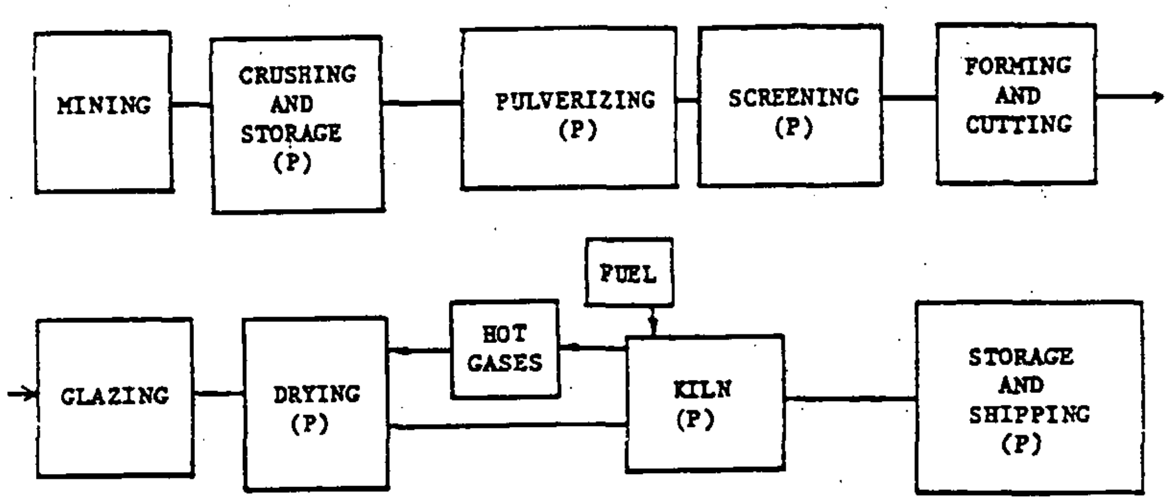


Figure 11.3-1. Basic flow diagram of brick manufacturing process.
(P = a major source of particulate emissions.)

Wet clay units that have been formed are almost completely dried before firing, usually with waste heat from kilns. Many types of kilns are used for firing brick, but the most common are the downdraft periodic kiln and the tunnel kiln. The periodic kiln is a permanent brick structure with a number of fireholes where fuel enters the furnace. Hot gases from the fuel are drawn up over the bricks, down through them by underground flues, and out of the oven to the chimney. Although lower heat recovery makes this type less efficient than the tunnel kiln, the uniform temperature distribution leads to a good quality product. In most tunnel kilns, cars carrying about 1200 bricks travel on rails through the kiln at the rate of one 1.83-meter (6-foot) car per hour. The fire zone is located near the middle of the kiln and is stationary.

In all kilns, firing takes place in 6 steps: evaporation of free water, dehydration, oxidation, vitrification, flashing, and cooling. Normally, gas or residual oil is used for heating, but coal may be used. Total heating time varies with the type of product; for example, 22.9-centimeter (9-inch) refractory bricks usually require 50 to 100 hours of firing. Maximum temperatures of about 1090°C (2000°F) are used in firing common brick.

11.3.2 Emissions And Controls[1,3]

Particulate matter is the primary emission in the manufacture of bricks. The main source of dust is the materials handling procedure, which includes drying, grinding, screening, and storing the raw material. Combustion products are emitted from the fuel consumed in the dryer and the kiln. Fluorides, largely in gaseous form, are also emitted from brick manufacturing operations. Sulfur dioxide may be emitted from the bricks when temperatures reach or exceed 1370°C (2500°F), but no data on such emissions are available.[4]

A variety of control systems may be used to reduce both particulate and gaseous emissions. Almost any type of particulate control system will reduce emissions from the material handling process, but good plant design and hooding are also required to keep emissions to an acceptable level.

The emissions of fluorides can be reduced by operating the kiln at temperatures below 1090°C (2000°F) and by choosing clays with low fluoride content. Satisfactory control can be achieved by scrubbing kiln gases with water, since wet cyclonic scrubbers can remove fluorides with an efficiency of 95 percent or higher.

Tables 11.3-1 and 11.3-2 present emission factors for brick manufacturing without controls. Table 11.3-3 presents data on particle size distribution and emission factors for uncontrolled sawdust-fired brick kilns. Table 11.3-4 presents data on particle size distribution and emission factors for uncontrolled coal-fired tunnel brick kilns. Table 11.3-5 presents data on particle size distribution and emission factors for uncontrolled screening and grinding of raw materials for brick and related clay products. Figure 11.3-2, Figure 11.3-3, and Figure 11.3-4 present a particle size distribution for Tables 11.3-3, 11.3-4, and 11.3-5 expressed as the cumulative weight percent of particles less than a specified aerodynamic diameter (cut point), in micrometers (μm).

Table 11.3-1 (Metric Units). EMISSION FACTORS FOR BRICK MANUFACTURING WITHOUT CONTROLS[a]

EMISSION FACTOR RATING: C

Process	Particulates	Sulfur Oxides	Carbon Monoxide	Volatile Organic Compounds		Nitrogen Oxides	Fluorides[b]
				Nonmethane	Methane		
Raw material handling[c]							
Drying	35	ND	ND	ND	ND	ND	ND
Grinding	38	ND	ND	ND	ND	ND	ND
Storage	17	ND	ND	ND	ND	ND	ND
Brick dryer[d]							
Coal/gas fired	0.006A	0.55S	ND	ND	ND	0.33	ND
Curing and firing[e]							
Tunnel kiln							
Gas fired	0.012	Neg	0.03	0.0015	0.003	0.09	0.5
Oil fired	0.29	1.98S	0.06	0.0035	0.013	0.525	0.5
Coal fired	0.34A	3.65S	0.71	0.005	0.003	0.73	0.5
Coal/gas fired	0.16A	0.31S	ND	ND	ND	0.81	ND
Sawdust fired	0.12	ND	ND	ND	ND	ND	ND
Periodic kiln							
Gas fired	0.033	Neg	0.075	0.005	0.01	0.25	0.5
Oil fired	0.44	2.93S	0.095	0.005	0.02	0.81	0.5
Coal fired	9.42	6.06S	1.19	0.01	0.005	1.18	0.5

[a] Expressed as units per unit weight of brick produced, kilograms per megagram (kg/Mg). One brick weighs about 2.95 kg. ND = no data. A = % ash in coal. S = % sulfur in fuel. Neg = negligible.

[b] References 3,6-10.

[c] Based on data from Section 11.7, "Ceramic Clay Manufacturing" in this publication. Because of process variation, some steps may be omitted. Storage losses apply only to that quantity of material stored.

[d] Reference 12.

[e] References 1,5,12-16.

Table 11.3-2 (English Units). EMISSION FACTORS FOR BRICK MANUFACTURING WITHOUT CONTROLS[a]

EMISSION FACTOR RATING: C

Process	Particulates	Sulfur Oxides	Carbon Monoxide	Volatile Organic Compounds		Nitrogen Oxides	Fluorides[b]
				Nonmethane	Methane		
Raw material handling[c]							
Drying	70	ND	ND	ND	ND	ND	ND
Grinding	76	ND	ND	ND	ND	ND	ND
Storage	34	ND	ND	ND	ND	ND	ND
Brick dryer[d]							
Coal/gas fired	0.012A	1.10S	ND	ND	ND	0.66	ND
Curing and firing[e]							
Tunnel kiln		?					
Gas fired	0.023	Neg	0.06	0.003	0.006	0.18	1.0
Oil fired	0.59	3.95S	0.12	0.007	0.025	1.05	1.0
Coal fired	0.67A	7.31S	1.43	0.01	0.006	1.45	1.0
Coal/gas fired	0.31A	0.62S	ND	ND	ND	1.61	ND
Sawdust fired	0.24	ND	ND	ND	ND	ND	ND
Periodic kiln							
Gas fired	0.065	Neg	0.15	0.01	0.02	0.50	1.0
Oil fired	0.88	5.86S	0.19	0.01	0.04	1.62	1.0
Coal fired	18.84	12.13S	2.39	0.02	0.015	2.35	1.0

[a] Expressed as units per unit weight of brick produced, pounds per ton (lb/ton). One brick weighs about 6.5 pounds. ND = no data. A = % ash in coal. S = % sulfur in fuel. Neg = negligible.

[b] References 3,6-10.

[c] Based on data from Section 11.7, "Ceramic Clay Manufacturing" in this publication. Because of process variation, some steps may be omitted. Storage losses apply only to that quantity of material stored.

[d] Reference 12.

[e] References 1,5,12-16.

Table 11.3-3 (Metric Units). PARTICLE SIZE DISTRIBUTION AND EMISSION FACTORS FOR UNCONTROLLED SAWDUST-FIRED BRICK KILNS[a]

EMISSION FACTOR RATING: E

Aerodynamic Particle Diameter (μm)	Cumulative Weight % ≤ Stated Size	Emission Factor[b] (kg/Mg)
2.5	36.5	0.044
6.0	63.0	0.076
10.0	82.5	0.099
	Total particulate emission factor	0.12[c]

[a] Reference 13.

[b] Expressed as cumulative weight of particulate ≤ corresponding particle size/unit weight of brick produced.

[c] Total mass emission factor from Table 11.3-1.

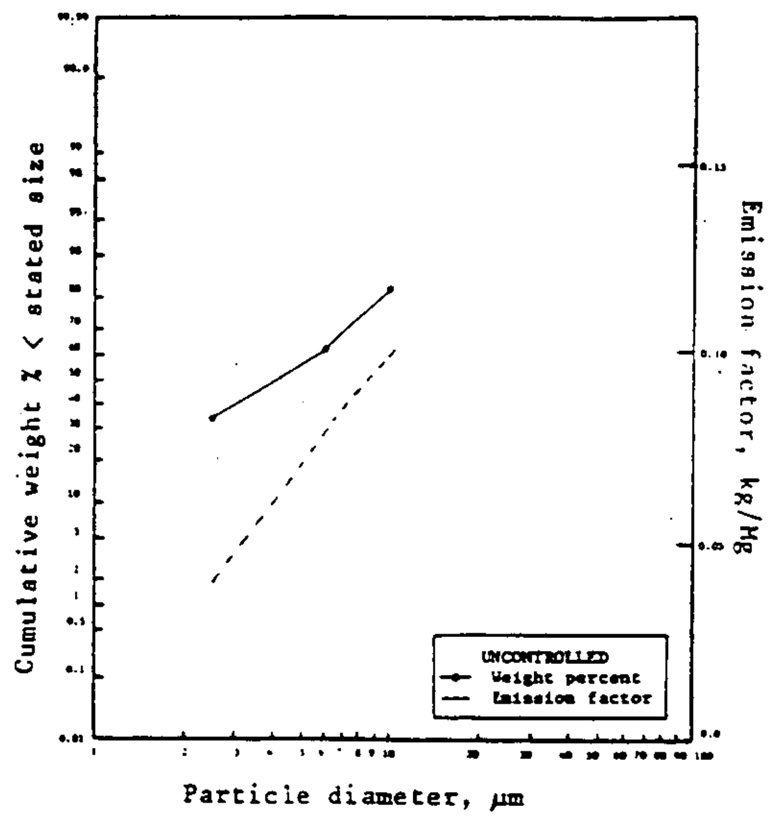


Figure 11.3-2. Cumulative weight percent of particles less than stated particle diameters for uncontrolled sawdust-fired brick kilns.

Table 11.3-4 (Metric Units). PARTICLE SIZE DISTRIBUTION AND EMISSION FACTORS FOR UNCONTROLLED COAL-FIRED TUNNEL BRICK KILNS[a]

EMISSION FACTOR RATING: E

Aerodynamic Particle Diameter (μm)	Cumulative Weight % ≤ Stated Size	Emission Factor[b] (kg/Mg)
2.5	24.7	0.08A
6.0	50.4	0.17A
10.0	71.0	0.24A
	Total particulate emission factor	0.34A[c]

[a] References 12,17.
[b] Expressed as cumulative weight of particulate ≤ corresponding particle size/unit weight of brick produced. A = % ash in coal. (Use 10% if ash content is not known.)
[c] Total mass emission factor from Table 11.3-1.

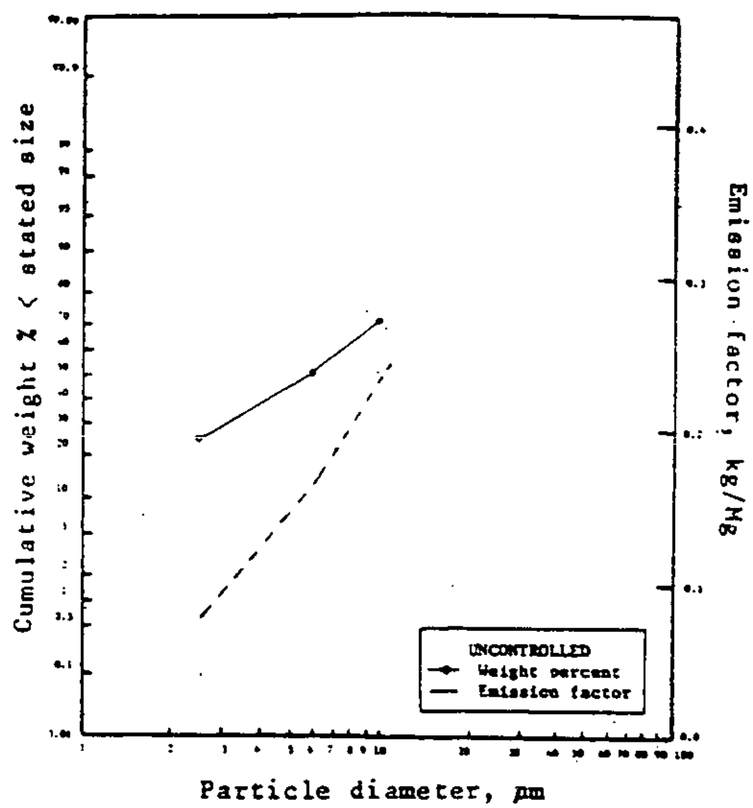


Figure 11.3-3. Cumulative weight percent of particles less than stated particle diameters for uncontrolled coal-fired tunnel brick kilns.

Table 11.3-5 (Metric Units). PARTICLE SIZE DISTRIBUTION AND EMISSION FACTORS FOR UNCONTROLLED SCREENING AND GRINDING OF RAW MATERIALS FOR BRICK AND RELATED CLAY PRODUCTS[a]

EMISSION FACTOR RATING: E

Aerodynamic Particle Diameter (μm)	Cumulative Weight % ≤ Stated Size	Emission Factor[b] (kg/Mg)
2.5	0.2	0.08
6.0	0.4	0.15
10.0	7.0	2.66
	Total particulate emission factor	38[c]

[a] References 11,18.

[b] Expressed as cumulative weight of particulate ≤ corresponding particle size/unit weight of raw material processed.

[c] Total mass emission factor from Table 11.3-1.

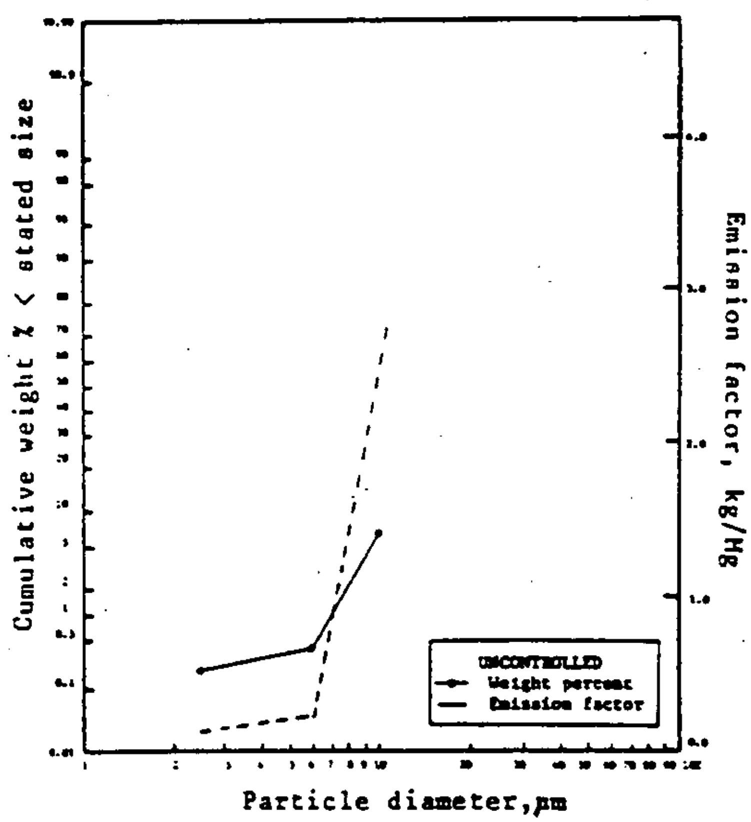


Figure 11.3-4. Cumulative weight percent of particles less than stated particle diameters for uncontrolled screening and grinding of raw materials for brick and related clay products.

1. *Air Pollutant Emission Factors*, APTD-0923, U. S. Environmental Protection Agency, Research Triangle Park, NC, April 1970.

2. "Technical Notes on Brick and Tile Construction", Pamphlet No. 9, Structural Clay Products Institute, Washington, DC, September 1961.

3. Unpublished control techniques for fluoride emissions, U. S. Department Of Health And Welfare, Washington, DC, May 1970.

4. M. H. Allen, "Report On Air Pollution, Air Quality Act Of 1967 And Methods Of Controlling The Emission Of Particulate And Sulfur Oxide Air Pollutants", Structural Clay Products Institute, Washington, DC, September 1969.

5. F. H. Norton, *Refractories*, 3rd Ed, McGraw-Hill, New York, 1949.

6. K. T. Semrau, "Emissions Of Fluorides From Industrial Processes: A Review", *Journal Of The Air Pollution Control Association*, *7*(2):92-108, August 1957.

7. *Kirk-Othmer Encyclopedia Of Chemical Technology*, Vol. 5, 2nd Edition, John Wiley and Sons, New York, 1964.

8. K. F. Wentzel, "Fluoride Emissions In The Vicinity Of Brickworks", *Staub*, *25*(3):45-50, March 1965.

9. "Control Of Metallurgical And Mineral Dusts and Fumes In Los Angeles County", Information Circular No. 7627, Bureau Of Mines, U. S. Department Of Interior, Washington, DC, April 1952.

10. Notes on oral communication between Resources Research, Inc., Reston, VA, and New Jersey Air Pollution Control Agency, Trenton, NJ, July 20, 1969.

11. H. J. Taback, *Fine Particle Emissions From Stationary And Miscellaneous Sources In The South Coast Air Basin*, PB 293 923/AS, National Technical Information Service, Springfield, VA, February 1979.

12. *Building Brick And Structural Clay Industry — Lee Brick And Tile Co., Sanford, NC*, EMB 80-BRK-1, U. S. Environmental Protection Agency, Research Triangle Park, NC, April 1980.

13. *Building Brick And Structural Clay Wood Fired Brick Kiln — Emission Test Report - Chatham Brick And Tile Company, Gulf, North Carolina*, EMB-80-BRK-5, U. S. Environmental Protection Agency, Research Triangle Park, NC, October 1980.

14. R. N. Doster and D. J. Grove, *Stationary Source Sampling Report: Lee Brick And Tile Co., Sanford, NC, Compliance Testing*, Entropy Environmentalists, Inc., Research Triangle Park, NC, February 1978.

15. R. N. Doster and D. J. Grove, *Stationary Source Sampling Report: Lee Brick And Tile Co., Sanford, NC, Compliance Testing*, Entropy Environmentalists, Inc., Research Triangle Park, NC, June 1978.

16. F. J. Phoenix and D. J. Grove, *Stationary Source Sampling Report - Chatham Brick And Tile Co., Sanford, NC, Particulate Emissions Compliance Testing*, Entropy Environmentalists, Inc., Research Triangle Park, NC, July 1979.

17. Fine Particle Emissions Information System, Series Report No. 354, Office Of Air Quality Planning And Standards, U. S. Environmental Protection Agency, Research Triangle Park, NC, June 1983.

Information for Form 3150

#7 FAST FIRE ROLLER HEARTH KILN

Item 1.

Describe the product or service to be produced by the applicant along with a description of the proposed source/facility.

The U. S. Ceramic Tile Company (USCT) is a leading manufacturer of decorative ceramic wall tile. Complete tile manufacturing is performed at this facility including blending of base clay materials, pressing of blended materials to the proper shapes and sizes, glazing the tile shapes, firing the tiles in gas fired kilns, packaging, and shipping the finished product to distributors.

USCT intends to build another Fast Fire production line to be known as #7 Fast Fire. This production line will be a duplicate of #6 Fast Fire Production Line and will be located 30 feet South of #6. This PTI application is for the proposed new #7 Fast Fire Gas Fired Roller Hearth Kiln used to fire unglazed ceramic wall tiles. The kiln will be a duplicate of other kilns (#2, #3, #4, #5, and #6 Fast Fire Roller Hearth Kilns) used at this facility.

A roller hearth kiln uses one inch diameter ceramic rollers to convey tile through the preheater, kiln-proper, and cooling sections. The kiln-proper is 58 feet long and firing time in the kiln is 11½ minutes. The absence of refractory setters, which act as insulating chambers, make possible the rapid firing cycle and much more uniform firing never attainable in conventional processes using refractories. The much more uniform firing treatment reduces variations in all attributes affected by firing, particularly size and shade variations in the tile. The rapid firing not only improves service, but also improves the tile quality because of much quicker feedback of information.

Equally important to the high product quality of the kiln is the kilns fuel efficiency. Traditional tunnel kilns use up to 50% more natural gas to fire tile at a slower rate. A roller hearth kiln uses less fuel to fire higher quality tile with less scrap.

This kiln uses 63 gas burners controlled by a modern, state of the art, solid state temperature control system which automatically and continuously records and controls fuel consumption and temperature inside the kiln. Peak firing temperature is 2300° Fahrenheit. Attached to the entrance end of the kiln is the preheater. Heat is drawn through the kiln and into the preheater by a fan. The fan exhausts the heat and emissions from the kiln.

Introduction & Index

United States Ceramic Tile Company is proud to introduce our 1986 product catalog detailing the finest glazed and unglazed ceramic tile products available today, *in a variety of shapes, sizes, textures, and colors* for use in commercial and residential installations, indoors and out.

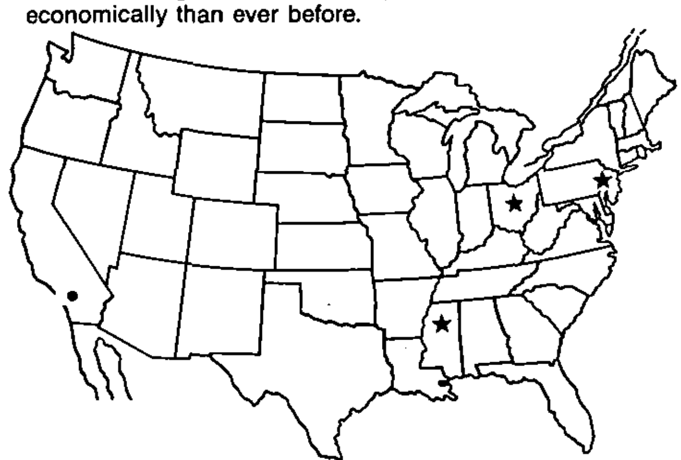
From one of the first glazed 2" x 2" ceramic mosaics available from an American manufacturer to a 9" x 9" glazed monocottura floor tile; from the finest unglazed 1" x 1" ceramic mosaics to 8" x 8" unglazed pavers, United States Ceramic Tile Company can provide you with quality tile for your every need.

Symbol Index

- Wall Tile
- Wall and Floor Tile for residential bathrooms
- III Glazed Vitreous Floor (or Wall) Tile for moderate use areas such as normal residential and light commercial applications (hotel guest rooms, offices, etc.)
- HD Unglazed Vitreous/or Impervious Floor (or Wall) Tile for heavy duty traffic applications such as airports, subways, shopping malls and other applicable areas.
- Anti-Skid Floor Tile for wet areas subject to heavy duty traffic such as commercial kitchens, food and beverage processing areas, and swimming pool decks.

Manufacturing and Re-distribution Centers

Our company has one of the largest networks of ceramic tile manufacturing plants to serve you in North America, with plants in Morrisville, PA; Houston, MS and two plants in East Sparta, Ohio. We have also started our Re-Distribution Centers at each geographical manufacturing location, and at our newly established warehouse facility in Anaheim, California, in order to serve you with our entire range of fine ceramic products faster, and more economically than ever before.



★ *Manufacturing and Re-Distribution Centers*
• Re-Distribution Center

Page Index

Cover:
Park City Mall, Lancaster, PA with 25,000 sq. ft. of unglazed *Porcelain Pavers in special colors and special patterns.*

United States Ceramic Tile Company

10233 Sandyville SE • E Sparta, OH 44626 • 216/866-5531 Telex 983437

Architectural Specifications

Quality of Tile
All glazed and unglazed ceramic tile as supplied by United States Ceramic Tile Company, per approved samples, or equivalent, only as approved by the Architect.

Grade and Certificate
All tile is standard grade and cartons grade-sealed in accordance with minimum grade specifications published by ANSI 137.1-1980 standard specifications for ceramic tile. In addition to grade seal, specifier will be furnished with master grade certificate stating grade, kind of tile, identification marks for tile packages, name and location of job signed by the manufacturer and the tile contractor. Cartons to be delivered to site with seals unbroken.

Colors, Patterns, Samples
Colors and patterns of tile shall be as selected by the Architect. Architect will furnish Contractor with schedule showing location of tile colors and patterns selected. Sample panels of each type of tile shall be submitted as requested by Architect.

Extra Stock
An additional 2% of each tile color and size should be ordered for owner's use.

Installation Conditions
Surface to be tiled should be clean and free of loose dirt or foreign matter. Temperature should be 50ºF or more during installation and for seven days thereafter. Proper lighting and ventilation should also be assured.

Product Specification
All sizes referred to in the following sections are nominal. All white body wall tile have contact spacer lugs to provide uniform spacing.

Ceramic Floor and Wall Tile
(A) Interior glazed wall tile—bright glaze, matte glaze: tile shall be furnished in face sizes of 4¼" x 4¼" with cushioned edges and a colored (matte)—(bright)—finish.

Mounting: tile will be factory-mounted using Better-Bond® water-resistant back mounting. Tiles shall have face size of 4¼" x 4¼".

(B) Interior glazed textured wall or floor tile—United States Ceramic Tile Company Prestige: tile shall feature a textured glaze surface furnished in face sizes (4¼" x 4¼") (6" x 6") with cushioned edges.

(C) Interior glazed wall tile—United States Ceramic Tile Company Windrift or Windrift Reflections: tile shall feature an undulated surface in a matte or bright finish in face size 4¼" x 4¼" with cushioned edges.

(D) Interior glazed wall tile—United States Ceramic Tile Company Saxony: tile shall feature a high gloss tone on tone finish in face sizes (4¼" x 4¼")—(6" x 6").

(E) Interior glazed wall tile—United States Ceramic Tile Company Maze: tile shall feature a glazed, dappled surface furnished in face size (4¼" x 4¼")—(6" x 6") with cushioned edges.

(F) Interior glazed wall tile—United States Ceramic Tile Company Mayflower Collection: tile shall feature a glazed, dappled surface with distinct designed decos with and without corner designs and face size (4¼" x 4¼")—(6" x 6") with cushioned edges.

(G) Interior glazed floor and wall tile—United States Ceramic Tile Company Regency: tile shall be red body, semi-vitreous glazed tile in nominal (8" x 8" x ⅜").

(H) Interior glazed floor & wall tile—United States Ceramic Tile Company Sandstone and Sandstone America: tile shall be semi-vitreous glazed tile in nominal (9" x 9" x ⅜" and 9" Octagon respectively).

(I) Interior glazed floor & wall tile—United States Ceramic Tile Company Rustic II, Park Avenue: tile shall be red body, semi-vitreous, tone-on-tone glaze finish in nominal (8" x 8" x ⅜").

(J) Interior glazed floor and wall and exterior wall tile—United States Ceramic Tile Company Tiffany Matte Glazed Mosaics: tile shall be matte glazed, dust-pressed, semi-vitreous with cushioned edges in nominal face size (2" x 2" x ¼").

(K) Interior or exterior unglazed floor and wall tile—United States Ceramic Tile Company Natural Clay Mosaics: tile shall be unglazed, dust-pressed, textured "Orsan® Natural Clay" furnished in face sizes—(1" x 1" x ¼")—(2" x 2" x ¼") with cushioned edges. Mounting shall be (Q) Quickset® back mounting or (R) Regular paper-face mounting.

(L) Interior or exterior unglazed floor and wall tile—United States Ceramic Tile Company Porcelain Mosaics: tile shall be unglazed, dust-pressed "Dresden® Porcelain" furnished in face sizes—(1" x 1" x ¼")—(2" x 2" x ¼") with cushioned edges. Mounting shall be (Q) Quickset® back mounting or (R) Regular paper-face mounting.

(M) Interior or exterior unglazed floor and wall tile—natural clay, Orsan Paver: tile shall be unglazed, dust-pressed, textured "Orsan Paver" furnished in face sized—(4" x 4"x ⅜")—(2" x 4" x ⅜")—(2" x 2" x ⅜") with cushioned edges. Tile shall be loose or face mounted.

(N) Interior or exterior unglazed floor and wall tile—United States Ceramic Tile Company Porcelain Pavers: tile shall be unglazed, dust-pressed, solid color "Porcelain Pavers" furnished in face size (4" x 4" x ⅜") with cushion edges. Tile shall be loose or (R) Regular face mounted.

(O) Interior or exterior unglazed floor and wall tile—United States Ceramic Tile Company ½"quary-Pavers: tile shall be frostproof (vitreous less than 3% absorption) natural clay body (flashed or unflashed) furnished in face size (6" x 6" x ½") with cushioned edges.

(P) Interior or exterior unglazed floor and wall tile—United States Ceramic Tile Company Rio Grande: tile shall be frostproof (vitreous, less than 3% water absorption) natural clay body furnished in nominal face size (8" x 8").

(Q) Interior or exterior unglazed skid inhibiting unglazed floor tile—United States Ceramic Tile Company Abrasive ½" quary-Paver: tile shall be unglazed, dust-pressed, frostproof ½" quary-Paver with abrasive content added (Abrasive ½" quary-Paver) in size (6" x 6" x ½").

(R) Tile trim shapes: provide all required shapes, such as cove, bullnose, angles, etc. Unless otherwise noted on the drawings, all internal corners shall be square and all external corners bullnosed.

Installation of Tile
United States Ceramic Tile Company recommends that all tile shall be installed according to the following specifications:

Installation Specifications
- **A108.1-1976**—Glazed Wall tile, Ceramic Mosaic Tile, Quarry Tile and Paver Tile Installed with Portland Cement Mortar
- **A108.4-1976**—Ceramic Tile Installed with Water-Resistant Organic Adhesives
- **A108.5-1976**—Ceramic Tile Installed with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar
- **A108.6-1976**—Ceramic Tile Installed with Chemical-Resistant, Water Cleanable Tile-Setting and Grouting Epoxy
- **A108.7-1967 (R1976)**—Electrically Conductive Ceramic Tile Installed with Conductive Dry-Set Portland Cement Mortar

Material Specifications
- **A118.1-1976**—Dry-Set Portland Cement Mortar
- **A118.2-1967 (R1976)**—Conductive Dry-Set Portland Cement Mortar
- **A118.3-1976**—Chemical-Resistant, Water-Cleanable Tile-Setting and Grouting Epoxy
- **A118.4-1973 (R1976)**—Latex-Portland Cement Mortar
- **A136.1-1967 (R1972)**—Organic Adhesives for Installation of Ceramic Tile
- **ANSI 137.1-1980**—Ceramic Tile

Compliance
All standard grade ceramic tile as supplied by United States Ceramic Tile Company located in East Sparta, Ohio, and Houston, Mississippi, meets or exceeds the standard grade requirements of ANSI A137.1-1980 specification.

Color, Size & Grouting Information
Slight variations in color and size are a natural characteristic of all genuine ceramic tile. Since contrasting grout may stain or discolor ceramic tile, United States Ceramic Tile Company recommends the use of a grout which color is similar to that of the tile. When colored grouts are used, care must be taken to properly protect the tile.

METRO®TILE




250
Galaxy Ironspot (Heavily Flashed)

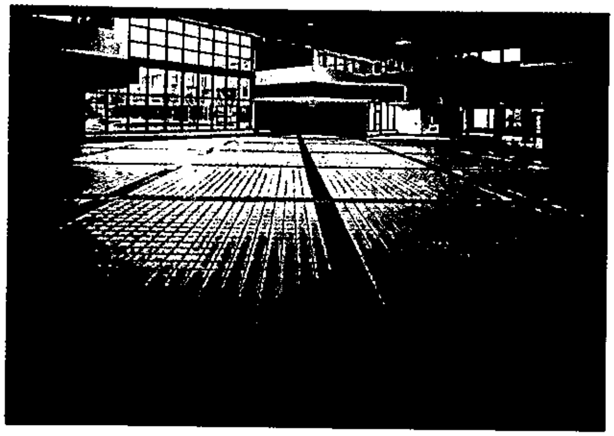
101
Oyster Bay

105
Buckskin

107
Boulevard

310
Mayflower Red

507
Puritan Gray



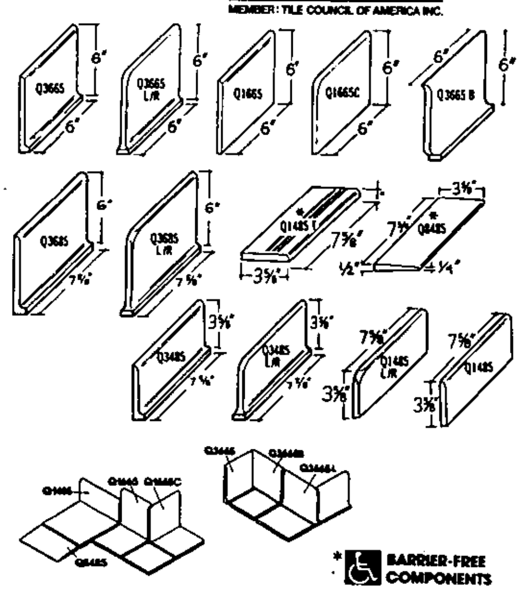
General Motors Great Lakes Technology Center, Flint, MI Architects: Grainger/Park-Architects Engineers, Inc & General Motors Division, Argonaut, A.P.C. Tile Contractor: J. C. Cokley Inc. Distributor: Genesee Ceramic Tile Distributors, Inc. METRO®TILE #101 Oyster Bay, #507 Puritan Gray, IRONROCK® #605 Plaza Gray.

U.S. Post Office, Jackson Branch, Jackson, MS Tile Contractor: Major Associates Distributor: B.J.'s Ceramic Tile Distributing Co. METRO®TILE #101 Oyster Bay, special order green.

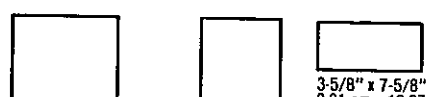
Contemporary, colorful, economical. **METRO®TILE** *is* versatility.

METRO®TILE colors and sizes are designed to be compatible with each other for a virtually unlimited palette of pattern combinations.

MADE IN USA
MEMBER: TILE COUNCIL OF AMERICA INC.



* BARRIER-FREE COMPONENTS



7-5/8" x 7-5/8" x 1/2"
19.37 cm x 19.37 cm x 1.27 cm

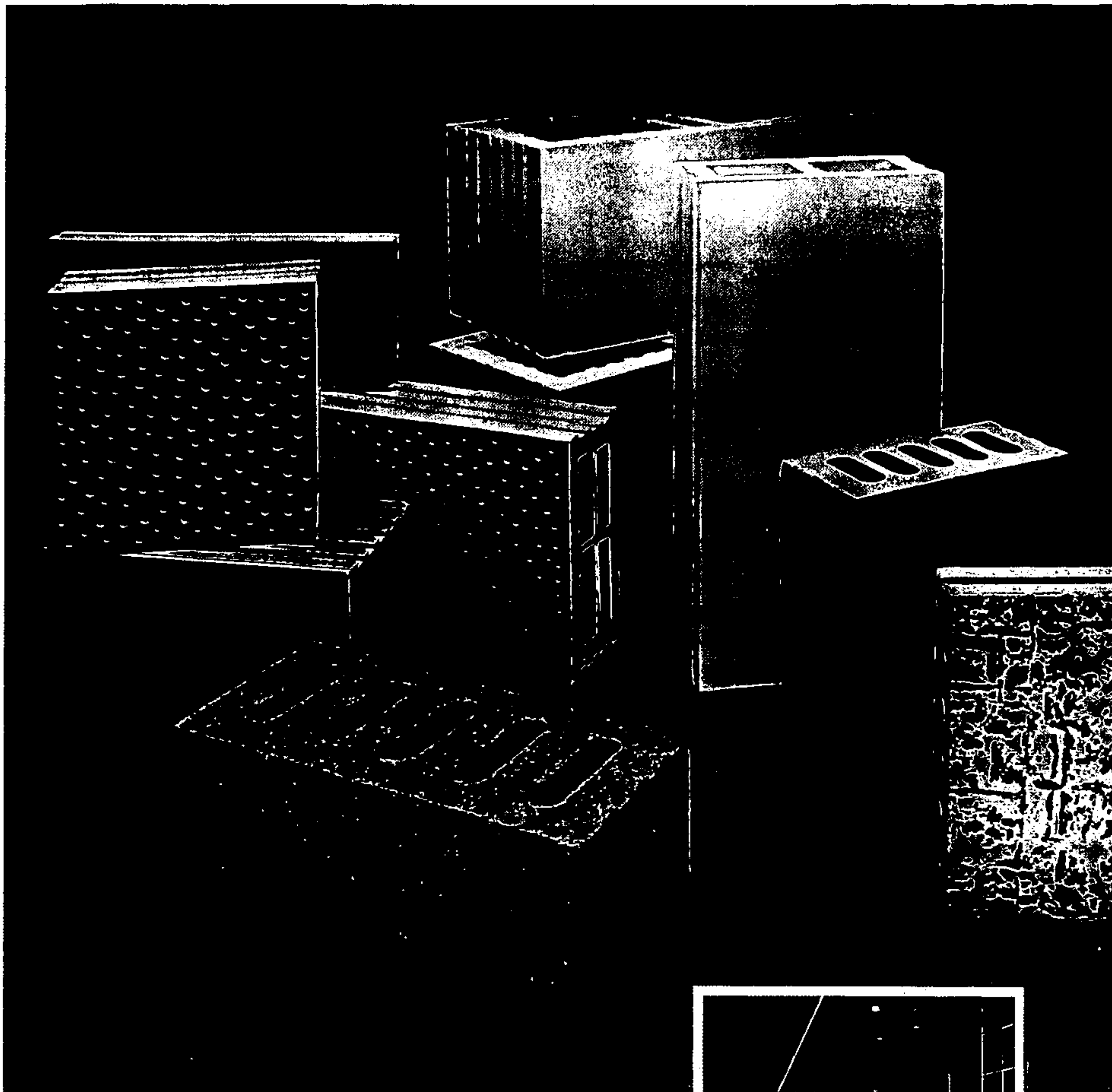
6" x 6" x 1/2"
15.24 cm x 15.24 cm x 1.27 cm

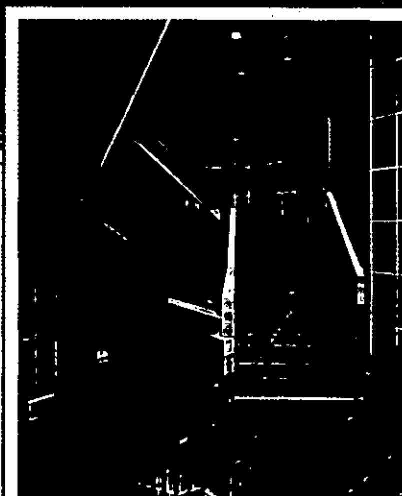
3-5/8" x 7-5/8" x 1/2"
9.21 cm x 19.37 cm x 1.27 cm

IRONROCK® and METRO®TILE are available in three sizes, based on the use of a 3/8" grout joint: 7-5/8" x 7-5/8" x 1/2," 6" x 6" x 1/2" and 3-5/8" x 7-5/8" x 1/2."

Note: All colors shown are as accurate as printed representations can be. Final selections should be made from actual, current tile samples.

Subtle shade variations are inherent in all kiln-fired products. Variations increase with flashed colors.





Create visual drama, end maintenance problems with structural clay products for interiors and exteriors from Stark

stark

CANTON CITY HEALTH DEPARTMENT
DIVISION OF AIR POLLUTION CONTROL
420 MARKET AVENUE NORTH
CANTON, OHIO 44702

FAX: (216) 489-3335

TELEFAX TRANSMITTAL

DATE: 8-21-95

FOR THE ATTENTION OF: RON MYERS

FIRM: USEPA EMISSION FACTORS

FAX NUMBER: 9-1-919-541-0684

RE: CLAY PRODUCTS

This transmission consists of 4 pages including this page.

Please notify us if you do not receive all the pages at (216) 489-3385.

FROM: DAN SCHILTZ

HARD COPY IN MAIL.

Rick / Bryan

It appears that Dan Schiltz has some emission tests for F and maybe for SO_2 that we can use for the ceramic Clay Products section. The tests may have merit. His comments re SO_2 more. Could you contact him

Ron

BOARD OF HEALTH CANTON, OHIO

Canton City Health Department

Division of Air Pollution Control
420 Market Avenue N. • Canton, Ohio 44702-1544
(216) 489-3385 • Fax: (216) 489-3335

Robert E. Pattison, M.P.A.
Health Commissioner

Bruce E. Blankenship
Administrator

August 21, 1995

Mr. Ronald E. Myers
Emission Factor and Inventory Group
USEPA
Office of Air Quality Planning and Standards
Research Triangle Park, N.C. 27711

RE: AP-42 Section 11.7

Dear Mr. Myers:

This letter is a response to your request for comments on the Draft AP-42 Section 11.7

<u>Comment # 1</u>
Reference Table #11.7-3 & Table #11.7-2

Gas-Fired Kiln Tunnel 4.1 LB SO_2 / Ton
Gas-Fired Roller Kiln 0.078 LB SO_2 / Ton

These two emission factors are very misleading. An unsuspecting individual could easily interpret these factors as representative of *all* similar kilns, when in fact these factors are based on only a few stack tests. Much more important than the type of kiln is the sulfur content of the raw materials and the type of product being produced.

A better alternative would be an emission factor similar to the one used for an oil fired boiler. I would use 31.2 (S) as a factor with the S representing the % of sulfur in the raw materials. The calculations to explain this factor are these:

If all of the sulfur was converted to SO2, then 1 pound of S and 1 pound O2 in the raw materials would result in the emission of 2 pounds of S02 based on this chemical formula: $S^{(32)} + O_2^{(32)} = SO_2^{(64)}$

Based on numerous stack tests done at Metropolitan Industries, this agency believes that only around 78% of the sulfur in the raw materials is converted to S02 in the kilns at Metropolitan. Therefore 1 pound of sulfur in the raw materials would cause 1.56 pounds of S02 to be emitted. 1lb X .78 X 2 = 1.56 lb

If a raw material has 1% sulfur content, then 1 ton of this material would have 20 lbs. of sulfur in it.

20 Lbs Sulfur/ton of raw material X 1.56 Lb S02/ Lb Sulfur = 31.2 Lb S02/ton Raw Material

Emission factor should be 31.2(S) where S is the sulfur content in per cent of the raw materials.

The metric equivalent of Table 11.7-3 is Table 11.7-2 and it obviously also should be revised.

Mr. Ronald E. Myers
Page 2
August 21, 1995

Comment # 2
Reference 11.7-3 Emissions and Controls.

"Emissions of S0x are primarily a function of the sulfur content of the fuel used to fire the calciners; the sulfur content of the raw materials used to manufacture ceramics generally is negligible." This sentence does not correlate well with Table 11.7-3 which shows considerable SO_2 Emissions from a Gas Fired Tunnel Kiln. The sulfur content of raw materials appears to be dependent on what quality of ceramics are being produced. If a company can get away with using cheaper high sulfur clay and still produce a satisfactory product they will. U.S. Ceramic Tile, here in Stark County, has to go out of state to get the low sulfur clay they use, because of the type of ceramics they make while Metropolitan Industries can use local clay to make wall tile. Stark Ceramics makes a structural clay ceramic brick so they also can use high sulfur local clay. I have enclosed brochures of the products these three companies make. I think that a better explanation can be developed to show that the sulfur content of ceramic clay products and raw materials can vary considerably based on the product being produced.

Comment # 3
Reference Section 11.3 Bricks and Related Clay Products

This Agency recently received the reformatted 1/95 version of this section, it was written in 10/86 and has not been revised since. This section is closely related to Section 11.7 in that the products produced are similar. In Tables 11.3-1 and 11.3-2 the SO_2 Emissions Factors for Gas Fired Tunnel Kilns is negligible. My experience with Brick Mfg. is that they can tolerate a large amount of sulfur in their raw materials. The brick kilns I have seen emit a large amount of SO_2. Will this factor be revised?

Additional Comments
Metropolitan Industries submitted some comments on this draft report which I have enclosed.

In summary, I hope that you will take the time to consider my recommendations. I am sure that you will also receive a lot of comments from the clay products industry. Here in Stark County we have three manufactures of clay products whom each have S0x Emissions above 200 Tons year and with considerable fluoride emissions. This agency had no idea that these companies were emitting that amount of pollutants until extensive stack testing was done. Using the old version of AP-42 an agency would have no inkling that these kilns would be emitting this much pollution. In fact when the State of Ohio SIP for S02 was done the emissions from kilns were not considered. Title V and FESOP applications often use AP-42 Emission factors to determine potential to emit. Unless we can develop better factors there will be much inaccurate data being submitted with potentially serious consequences.

If you have any questions, please contact this Agency.

Sincerely,

Daniel J. Schiltz

Daniel J. Schiltz
Permit Processing Technician

Enclosure

g:\shared\apc\letters\schiltz\0821rm.ca

EMISSION FACTOR DOCUMENTATION FOR AP-42 SECTION 11.7
CERAMIC PRODUCTS MANUFACTURING DRAFT REPORT.

The following data shows reasons for disagreement with the draft report.

1). Groupings by tunnel kiln as compared to roller hearth kiln are incorrect. Actual emissions are a function of materials used, not type of kiln. The report shows data from three specific tunnel kiln tests, where the materials used have higher sulfur and fluoride content than materials normally used in roller hearth kilns.

2). Fluoride content in raw materials varies from 0.01-0.2%. This is a bigger factor in the emission quantity than the type of kiln.

3). The second best choice for groupings would be by product as defined by American Society for Testing and Materials (ASTM) for example Quarry, Paver, Wall, Mosaic tile or by any other ceramic product category, this grouping takes into account similar materials used for manufacture.

4). The specific tunnel kilns used in the report are producing products that require very low absorption, and therefore cannot use lime as an additive. The lime ties up the fluorine as CaF_2 and emissions will be lower. The roller hearth kilns producing wall tile can use lime as an additive because the resulting absorption of the product is much higher in the 12-15% range. The specific tunnel kiln products in the report require 2% absorption and lime cannot be used as it makes the body more porous.

5). While scrubbing may be effective in using limestone to reduce HF emission by forming CaF_2, it should be noted that sulfur compounds also result in the residue. These volumes of sulfur compounds must be disposed of at costs beyond reasonable operating costs.

6). There are two methods quoted for measuring total fluorides method 13A and 13B, of these two the former is used for 0 to 1.4 Ig F/ml and the latter 0.02 to 2000 Ig F/mg stating that small measurements require extra care. The points being first one of consistency and secondly the roller hearth kiln with quoted low emissions used method 13B whereas the tunnel kilns used 13A.

Report compiled 8/9/95 by: Roy Gorton and Phil McGuinness.

REQUESTS TO STATES FOR EMISSION DATA ON CERAMICS MANUFACTURING

Kentucky Dept. of Environmental Protection
Jerry Slucher, (502) 573-3382, Ext. 432
- Provided 2 test reports for Florida Tile, Lawrenceburg.

City of Canton (Ohio) Health Department
Daniel Schiltz, (216) 489-3385
- Provided 5 test reports--3 on ceramics plants, 1 on refractory plant, and 1 on structural clay tile plant.

South Carolina Dept. of Health and Envir. Control
Jake Frick, (803) 935-6315
- Requested reports on Kohler plant in Spartansburg; responded that SC has no ceramics plant test reports on file.

Georgia Air Protection Branch
Mike Fogel, (404) 656-7751
- Need to request reports on following:
  Florida Tile Industries, Shannon, GA (TRIS)
  Georgia Tile Distributors, Douglasville, GA (TRIS)
  Lapp Insulator Co., Sandersville, GA (TRIS)
  Universal Rundel Corp., Monroe, GA (TRIS)
  Universal Ceramics, Adairsville, GA
  Dupree Marble Co., Marietta, GA
  Briggs Co., Atlanta, GA
  Toto Industries, Atlanta, GA

Alabama Dept. of Environ. Management
David Ousley, (205) 271-7861 (Thank him for the frit info.)
- Need to request reports on following:
  American Olean Tile, Fayette, AL
  Monarch Tile Mfg., Florence (TRIS)
  Riverside Refractories, Pell City, AL

North Ohio Valley Air Authority
Pat DeLuca, (614) 282-3908
- Need to request reports on following:
  Summitville Tiles, Summitville, OH
  Sterling China, Wellsville, OH
  Hall China, East Liverpool, OH

Ohio EPA, Northwest District Office
Gerald Rich, (419) 352-8461
- Need to request reports on following:
  Porcelain Products Co., Carey, OH
  Mansfield Plumbing Products, Perrysville, OH
  American Standard, Inc., Tiffin, OH
  Artesian Industries, Ontario, OH

Ohio EPA, Southeast District Office

Fred Klingerhafer, (614) 385-8501

- Need to request reports on following:
  Champion Spark Plugs, Cambridge, OH

Hamilton County (Ohio) Dept. of Envir. Services

Harry Schweitering, (513) 651-9437

- Need to request reports on following:
  Electrodyne Co., Batavia, OH

Oklahoma Dept. of Envir. Quality

Joyce Sheehy, (405) 271-1683. ext. 115

- Need to request reports on following:
  Athenian Marble Corp., Oklahoma City, OK
  Frankoma Pottery, Sakulpa, OK
  Laufen International Ceramics, Tulsa, OK
  TDK Ferrites Corp., Shawnee, OK

Chattanooga-Hamilton Countrey Air Poll. Control Bureau

Robert Colby, (615) 867-4321

- Need to request reports on following:
  Steward Inc., Chattanooga, TN
  3-M Company, Chattanooga, TN
  Coors Electronic Package Co., Chattanooga, TN
  Clowes Ceramic Division, Chattanooga, TN

Tennessee Division of Air Pollution Control

John Walton, (615) 532-0614

- Need to request reports on following:
  IMAC Corp., Dickson, TN
  American Olean Tile Co., Jackson, TN
  Tilecera, Inc., Clarksville, TN

FAX TRANSMISSION

TO: Ron Myers, EIB

FROM: Rick Marinshaw, MRI

DATE: October 24, 1994

RECEIVING FAX NUMBER: 541-0684

SENDING FAX NUMBER: 919-677-0065

THIS FAX CONSISTS OF 7 PAGES (INCLUDING THIS PAGE)

Here is a draft of the letter to the ceramics industry trade associations requesting help with the revised AP-42 section. Let me know of any changes so that we can prepare the rainbow package.

Dear

The Emission Inventory Branch of the U. S. Environmental Protection Agency (EPA) is in the process of updating the document *Compilation of Air Pollutant Emission Factors, Volume I: Stationary Point and Area Sources* (known more commonly as AP-42). As part of this process, we are now seeking additional emission data and updated process descriptions for sections that are being revised.

Enclosed is a copy of the existing Section 8.7, Ceramic Clay Manufacturing. As you can see from the enclosed copy, the current AP-42 section is very brief and does not address ceramic products. Furthermore, the emission factors presented in the section are based on references that date back to the 1960's and probably are not representative of current practices. For these reasons, we are planning a complete rewrite of this section for the next supplement to AP-42. The revised section will focus on the manufacture of ceramic products; clay processing is now addressed in a separate AP-42 section.

Also enclosed is a list of the emission test reports currently on file. As you can see, we have a total of six test reports upon which to base the emission factors for the industry. In order for the emission factors to be representative of the ceramics manufacturing industry, we would like to obtain copies of as many additional test reports as possible. If you are aware of additional emission data that we could use to develop emission factors for ceramics manufacturing, we would appreciate your assistance in obtaining copies of the data. Please note that the emission factors presented in AP-42 generally are based upon results from validated tests or other emission evaluations that are similar to EPA reference test methods.

In order to develop a better understanding of the processes and emission sources that characterize the industry, we also are interested in visiting a few ceramics manufacturing facilities. Your assistance in identifying representative facilities in this geographic region (North Carolina, South Carolina, Virginia) that would be willing to give us a tour of their manufacturing operation would be greatly appreciated.

We would appreciate a response to this request by December 16, 1994. If you have any questions or need additional information regarding this effort, I can be reached by telephone at (919) 541-5407 or by fax at (919) 541-0684. I look forward to hearing from you soon.

Sincerely,

Ronald E. Myers
Emission Factors and Methodologies Section
Emission Inventory Branch

2 Enclosures

Mailing List for Ceramics Manufacturing

Robert Kleinhans
Executive Director
Tile Council of America
Post Office Box 326
Princeton, New Jersey 08542
(609) 921-7050

Robert Hawkins
President, Ceramic Manufacturers' Association
Hocking Technical College
14649 State Route 6645
Logan, Ohio 43138
(614) 753-3591, ext. 2405

Dr. Sidney J. Stein
President
Electro-Science Laboratories, Inc.
416 East Church Road
King of Prussia, PA 19406
(610) 272-6759

W. Paul Holbrook
Executive Director
American Ceramic Society
735 Ceramic Place
Westerville, Ohio 43081-6136
(614) 890-4700

Document Control Sheet

Project No.: 4602-01 (Subtask No.) 02
Document Name: Ceramic Industry Letter

CBI: ☐ Yes ☒ No
Originator: Marinshaw Ext. 5359

WP COMMENTS:

WP ID No.: 3502-LTR / 3503-Var

①

Date to WP: 10/25
Due date/time: 10/25
☐ Flexible ☑ Firm ☐ RUSH
WP PROOF ☐ Yes ☐ No

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②

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Due date/time: 10/26
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WP PROOF ☐ Yes ☐ No

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W2

③

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Due date/time:
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WP PROOF ☐ Yes ☐ No

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Document Control Sheet (continued)

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☐ RUSH

WP PROOF ☐ Yes ☐ No

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☐ MRI	☐ 1.5	☐ Final	___ Text	___ General use	
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Instructions/comments: ______________________________

OCT 26 1994 DRAFT

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

Mr. Robert Kleinhans
Executive Director
Tile Council of America
Post Office Box 326
Princeton, New Jersey 08542

Dear Mr. Kleinhans:

The Emission Inventory Branch of the U. S. Environmental Protection Agency (EPA) is in the process of updating the document *Compilation of Air Pollutant Emission Factors, Volume I: Stationary Point and Area Sources* (known more commonly as AP-42). As part of this process, we are now seeking additional emission data and updated process descriptions for sections that are being revised.

Enclosed is a copy of the existing Section 8.7, Ceramic Clay Manufacturing. As you can see from the enclosed copy, the current AP-42 section is very brief and does not address ceramic products. Furthermore, the emission factors presented in the section are based on references that date back to the 1960's and probably are not representative of current practices. For these reasons, we are planning a complete rewrite of this section for the next supplement to AP-42. The revised section will focus on the manufacture of ceramic products; clay processing is now addressed in a separate AP-42 section.

Also enclosed is a list of the emission test reports currently on file. As you can see, we have a total of six test reports upon which to base the emission factors for the industry. In order for the emission factors to be representative of the ceramics manufacturing industry, we would like to obtain copies of as many additional test reports as possible. If you are aware of additional emission data that we could use to develop emission factors for ceramics manufacturing, we would appreciate your assistance in obtaining copies of the data. Please note that the emission factors presented in AP-42 generally are based upon results from validated tests or other emission evaluations that are similar to EPA reference test methods.

In order to develop a better understanding of the processes and emission sources that characterize the industry, we also are interested in visiting a few ceramics manufacturing facilities. We would greatly appreciate your assistance in identifying representative facilities in this geographic region (North Carolina, South Carolina, Virginia) that would be willing to give us a tour of their manufacturing operation would be greatly appreciated.

We would appreciate a response to this request by December 16, 1994. If you have any questions or need additional information regarding this effort, I can be reached by telephone at (919) 541-5407 or by fax at (919) 541-0684. I look forward to hearing from you soon.

Sincerely,

Ronald E. Myers
Emission Factors and Methodologies Section
Emission Inventory Branch

2 Enclosures

8.7 CERAMIC CLAY MANUFACTURING

8.7.1 Process Description[1]

The manufacture of ceramic clay involves the conditioning of the basic ores by several methods. These include the separation and concentration of the minerals by screening, floating, wet and dry grinding, and blending of the desired ore varieties. The basic raw materials in ceramic clay manufacture are kaolinite ($Al_2O_3 \cdot 2SiO_2 \cdot 2H_2O$) and montmorillonite [(Mg, Ca) $O \cdot Al_2O_3 \cdot 5SiO_2 \cdot nH_2O$] clays. These clays are refined by separation and bleaching, blended, kiln-dried, and formed into such items as whiteware, heavy clay products (brick, etc.), various stoneware, and other products such as diatomaceous earth, which is used as a filter aid.

8.7.2 Emissions and Controls[1]

Emissions consist primarily of particulates, but some fluorides and acid gases are also emitted in the drying process. The high temperatures of the firing kilns are also conducive to the fixation of atmospheric nitrogen and the subsequent release of NO, but no published information has been found for gaseous emissions. Particulates are also emitted from the grinding process and from storage of the ground product.

Factors affecting emissions include the amount of material processed, the type of grinding (wet or dry), the temperature of the drying kilns, the gas velocities and flow direction in the kilns, and the amount of fluorine in the ores.

Common control techniques include settling chambers, cyclones, wet scrubbers, electrostatic precipitators, and bag filters. The most effective control is provided by cyclones for the coarser material, followed by wet scrubbers, bag filters, or electrostatic precipitators for dry dust. Emission factors for ceramic clay manufacturing are presented in Table 8.7-1.

Table 8.7-1. PARTICULATE EMISSION FACTORS FOR CERAMIC CLAY MANUFACTURING[a]
EMISSION FACTOR RATING: A

Type of process	Uncontrolled		Cyclone[b]		Multiple-unit cyclone and scrubber[c]	
	lb/ton	kg/MT	lb/ton	kg/MT	lb/ton	kg/MT
Drying[d]	70	35	18	9	7	3.5
Grinding[e]	76	38	19	9.5	–	–
Storage[d]	34	17	8	4	–	–

[a]Emission factors expressed as units per unit weight of input to process.
[b]Approximate collection efficiency: 75 percent.
[c]Approximate collection efficiency: 90 percent.
[d]References 2 through 5.
[e]Reference 3.

References for Section 8.7-1

1. Air Pollutant Emission Factors. Final Report. Resources Research, Inc. Reston, Va. Prepared for National Air Pollution Control Administration, Durham, N.C., under Contract Number CPA-22-69-119. April 1970.

2. Allen, G. L. et al. Control of Metallurgical and Mineral Dusts and Fumes in Los Angeles County. Department of Interior, Bureau of Mines. Washington, D.C. Information Circular Number 7627. April 1952.

3. Private Communication between Resources Research, Incorporated, Reston, Virginia, and the State of New Jersey Air Pollution Control Program, Trenton, New Jersey. July 20, 1969.

4. Henn, J. J. et al. Methods for Producing Alumina from Clay: An Evaluation of Two Lime Sinter Processes. Department of Interior, Bureau of Mines. Washington, D.C. Report of Investigations Number 7299. September 1969.

5. Peters, F. A. et al. Methods for Producing Alumina from Clay: An Evaluation of the Lime-Soda Sinter Process. Department of Interior, Bureau of Mines. Washington, D.C. Report of Investigation Number 6927. 1967.

Enclosure 2

EMISSION TEST REPORTS ON FILE FOR CERAMICS MANUFACTURING

Plant	Location	Test dates	Source	Product	Pollutants (a)
Florida Tile Corp.	Lawrenceburg, KY	March 7-8, 1989	Kiln	ceramic tile	PM, fluoride
Florida Tile Corp.	Lawrenceburg, KY	April 19, 1989	Kiln	ceramic tile	PM, fluoride
Stark Ceramics, Inc.	East Canton, OH	Sept. 16, 1993	Kiln	glazed structural clay tile	PM, fluoride, SO2
Metro Ceramics, Inc.	Canton, OH	November 17-18, 1993	Kiln	unglazed ceramic tile	PM, HF, NOx
Metro Ceramics, Inc.	Canton, OH	March 30, April 14, 1994	Kiln	unglazed ceramic tile	PM, fluoride, SO2
US Ceramic Tile Company	East Sparta, OH	August 11, 1993	Kiln	ceramic wall tile	PM, HF, SO2, NOx

(a) PM = particulate matter, HF = hydrogen fluoride, SO2 = sulfur dioxide, and NOx = nitrogen oxides.

IDENTICAL LETTER SENT TO THE FOLLOWING ADDRESSEES:

Mr. Robert Hawkins
President, Ceramic Manufacturers' Association
Hocking Technical College
14649 State Route 6645
Logan, Ohio 43138

Dr. Sidney J. Stein
President
Electro-Science Laboratories, Inc.
416 East Church Road
King of Prussia, PA 19406

Mr. W. Paul Holbrook
Executive Director
American Ceramic Society
735 Ceramic Place
Westerville, Ohio 43081-6136

FAX TRANSMISSION COVER SHEET

Commonwealth of Kentucky
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION FOR AIR QUALITY
803 Schenkel Lane
Frankfort, KY 40601

TO: Mr. Rick Marinsehw

FAX # (919) 677-0065 Office# (919) 677-0249 ext. 5359

FROM: Shafiq Amawi

Office # (502) 573-3382 Fax # (502) 573-3787

DATE: 10/13/94 PAGES SENT (including this page): 10

COMMENTS:

Natural Resources and Environmental Protection Cabinet
Kentucky Department for Environmental Protection
Division for Air Quality

PERMIT

FLORIDA TILE - DIVISION OF SIKES CORPORATION
1247 Alton Road
Lawrenceburg, Kentcky 40342

RE: Addition of Decorative Tile Manufacturing Process

Pursuant to your application which was determined to be complete by this office on September 8, 1988, the Natural Resources and Environmental Protection Cabinet issues this permit for the construction of the equipment specified herein in accordance with the plans, specifications, and other information submitted with your application. This permit has been issued under the provisions of KRS Chapter 224.033 and regulations promulgated pursuant thereto and is subject to all conditions and operating limitations contained herein. Issuance of this permit does not relieve the permittee from the responsibility of obtaining any other permits, licenses, or approvals required by this Cabinet and/or other state, federal, and local agencies.

POINT OF EMISSION	AFFECTED FACILITY	CONDITIONS
RAW MATERIAL STORAGE		
53 (-)	Clay Storage: Silo & Conveyor	1. The processing rate of material shall not exceed 7,650 lbs/hour and 26,239.5 tons/year. 2. Particulate emissions shall not exceed 0.13 lb/hour and 0.45 ton/year as measured by EPA Reference Method 5, 40 CFR 60, Appendix A. 3. The opacity of visible emissions shall not equal or exceed 20% as measured by EPA Reference Method 9, 40 CFR 60, Appendix A. 4. Refer to General Condition 11.

No deviation from the plans and specifications submitted with your application or the conditions specified herein is permitted, unless authorized in writing by the Division for Air Quality. Violations of the terms and conditions contained herein shall be grounds for the Department to seek revocation of this permit. All rights of inspection by the representatives of the Division for Air Quality are reserved. Responsibility for satisfactory conformance with all Air Quality Regulations must be borne by the permittee.

PERMIT NUMBER: C-88-198
FILE NUMBER: 102-0060-0008
REGION: Bluegrass
COUNTY: Anderson
SIC CODE: 3253

Issued this 5th day of December 1988

William C. Eddins, Director

Arthur L. Williams, Acting Commissioner

DEP7001 (10-88)

PERMIT NUMBER: C-88-198

PERMIT - Continued

POINT OF EMISSION	AFFECTED FACILITY	CONDITIONS
54 (-)	Talc Storage: Silo & Conveyor	1. The processing rate of material shall not exceed 10,350 lbs/hour and 35,500.5 tons/year. 2. Particulate emissions shall not exceed 0.13 lb/hour and 0.45 ton/year as measured by EPA Reference Method 5, 40 CFR 60, Appendix A. 3. The opacity of visible emissions shall not equal or exceed 20% as measured by EPA Reference Method 9, 40 CFR 60, Appendix A. 4. Refer to General Condition 11.
55 (-)	Vansil Storage: Silo & Conveyor	1. The processing rate of material shall not exceed 1,800 lbs/hour and 6,174.0 tons/year. 2. Particulate emissions shall not exceed 0.13 lb/hour and 0.45 ton/year as measured by EPA Reference Method 5, 40 CFR 60, Appendix A. 3. The opacity of visible emissions shall not equal or exceed 20% as measured by EPA Reference Method 9, 40 CFR 60, Appendix A. 4. Refer to General Condition 11.
BODY PREPARATION		
56 (-)	Eirich Mixer with Elevators & Conveyors	1. The processing rate of material shall not exceed 19,800 lbs/hour and 67,914.0 tons/year. 2. Particulate emissions shall not exceed 4.96 lbs/hour and 17.00 tons/year as measured by EPA Reference Method 5, 40 CFR 60, Appendix A. 3. The opacity of visible emissions shall not equal or exceed 20% as measured by EPA Reference Method 9, 40 CFR 60, Appendix A. 4. Refer to General Condition 11.

PERMIT NUMBER: C-88-198

PERMIT - Continued

POINT OF EMISSION	AFFECTED FACILITY	CONDITIONS
57 (-)	Rework System with Elevators & Conveyors	1. The processing rate of material shall not exceed 1,052 lbs/hour and 4,332.0 tons/year. 2. Particulate emissions shall not exceed 0.41 lb/hour and 1.42 tons/year as measured by EPA Reference Method 5, 40 CFR 60, Appendix A. 3. The opacity of visible emissions shall not equal or exceed 20% as measured by EPA Reference Method 9, 40 CFR 60, Appendix A. 4. Refer to General Condition 11.
58 (-)	Wet Storage Bin with Elevators & Conveyors	1. The processing rate of material shall not exceed 19,800 lbs/hour and 67,914.0 tons/year. 2. Particulate emissions shall not exceed 5.25 lbs/hour and 18.00 tons/year as measured by EPA Reference Method 5, 40 CFR 60, Appendix A. 3. The opacity of visible emissions shall not equal or exceed 20% as measured by EPA Reference Method 9, 40 CFR 60, Appendix A. 4. Refer to General Condition 11.
59 (-)	Pneumatic Press Feeder	1. The processing rate of material shall not exceed 19,800 lbs/hour and 67,914.0 tons/year. 2. Particulate emissions shall not exceed 5.25 lbs/hour and 18.00 tons/year as measured by EPA Reference Method 5, 40 CFR 60, Appendix A. 3. The opacity of visible emissions shal lnot equal or exceed 20% as measured by EPA Reference Method 9, 40 CFR 60, Appendix A. 4. Refer to General Condition 11.
60 (-)	Six Tile Presses	1. The total processing rate of material for six presses shall not exceed 19,800 lbs/hour and 67,914.0 tons/year.

PERMIT NUMBER:

C-88-198 PERMIT - Continued

POINT OF EMISSION	AFFECTED FACILITY	CONDITOINS
60 (-)	Six Tile Presses (continued)	2. Particulate emissions shall not exceed 1.11 lbs/hour and 3.80 tons/year per press as measured by EPA Reference Method 5, 40 CFR 60, Appendix A. 3. The opacity of visible emissions shall not equal or exceed 20% as measured by EPA Reference Method 9, 40 CFR 60, Appendix A. 4. Refer to General Condition 11.
GLAZE PREPARATION		
26 (-)	Batching Station	1. The processing rate of material shall not exceed 2,074 lbs/hour and 6,097.0 tons/year. 2. Particualte emissions shall not exceed 0.83 lb/hour and 2.44 tons/year as measured by EPA Reference Method 5, 40 CFR 60, Appendix A. 3. The opacity of visible emissions shall not equal or exceed 20% as measured by EPA Reference Method 9, 40 CFR 60, Appendix A. 4. Refer to General Condition 11.
Bag Baler/Press (Relocation)		
Glaze Storage (Relocation)		
27 (6B, 6C, 6D, & 6E)	Four Ball Mills	1. The total processing rate of materials for all ball mills shall not exceed 2,074 lbs/hour and 6,097 tons/year. 2. Particulate emissions shall not exceed 0.17 lb/hour and 0.50 ton/year per ball mill as measured by EPA Reference Method 5, 40 CFR 60, Appendix A. 3. The opacity of visible emissions shall not equal or exceed 20% as measured by EPA Reference Method 9, 40 CFR 60, Appendix A. 4. Refer to General Condition 11.

PERMIT NUMBER: C-88-198

PERMIT - Continued

POINT OF EMISSION	AFFECTED FACILITY	CONDITIONS
GLAZE SPRAYING-LINE 4		
61 (A)	Glaze Spray Booth A	1. The application rate of mixed glaze shall not exceed 6.7 gals/hour and 40,200 gals/year. 2. Particulate emissions shall not exceed 0.12 lb/hour and 0.354 ton/year as measured by EPA Reference Method 5, 40 CFR 60, Appendix A. 3. The opacity of visible emissions shall not equal or exceed 20% as measured by EPA Reference Method 9, 40 CFR 60, Appendix A.
62 (B)	Glaze Spray Booth B	1. The application rate of mixed glaze shall not exceed 16.7 gals/hour and 100,200 gals/year. 2. Particulate emissions shall not exceed 0.12 lb/hour and 0.354 ton/year as measured by EPA Reference Method 5, 40 CFR 60, Appendix A. 3. The opacity of visible emissions shall not equal or exceed 20% as measured by EPA Reference Method 9, 40 CFR 60, Appendix A.
63 (C)	Glaze Spray Booth C	1. The application rate of mixed glaze shall not exceed 6.7 gals/hour and 40,200 gals/year. 2. Particulate emissions shall not exceed 0.12 lb/hour and 0.354 ton/year as measured by EPA Reference Method 5, 40 CFR 60, Appendix A. 3. The opacity of visible emissions shall not equal or exceed 20% as measured by EPA Reference Method 9, 40 CFR 60, Appendix A.
64 (D)	Glaze Spray Booth D	1. The application rate of mixed glaze shall not exceed 16.7 gals/hour and 100,200 gals/year.

PERMIT NUMBER: C-88-198

PERMIT - Continued

POINT OF EMISSION	AFFECTED FACILITY	CONDITIONS
64 (D)	Glaze Spray Booth D (continued)	2. Particulate emissions shall not exceed 0.12 lb/hour and 0.354 ton/year as measured by EPA Reference Method 5, 40 CFR 60, Appendix A. 3. The opacity of visible emissions shall not equal or exceed 20% as measured by EPA Reference Method 9, 40 CFR 60, Appendix A.
65 (E)	Glaze Spray Booth E	1. The application rate of mixed glaze shall not exceed 6.7 gals/hour and 40,200 gals/year. 2. Particulate emissions shall not exceed 0.12 lb/hour and 0.354 ton/year as measured by EPA Reference Method 5, 40 CFR 60, Appendix A. 3. The opacity of visible emissions shall not equal or exceed 20% as measured by EPA Reference Method 9, 40 CFR 60, Appendix A.
SERIGRAPHICS		
- (-)	Decal Application	
66 (-)	Pad Printing	Refer to General Condition 11.
67 (-)	Screen Printing	Refer to General Condition 11.
68 (-)	Glaze Spraying	1. The application rate of decorative glaze shall not exceed 6.7 gals/hour and 438 gals/year. 2. Particulate emissions shall not exceed 0.52 lb/hour and 0.017 ton/year as measured by EPA Reference Method 5, 40 CFR 60, Appendix A. 3. The opacity of visible emissions shall not equal or exceed 20% as measured by EPA Reference Method 9, 40 CFR 60, Appendix A.

PERMIT NUMBER: C-88-198

PERMIT - Continued

POINT OF EMISSION	AFFECTED FACILITY	CONDITIONS
69 (-)	Forniker Kiln	1. The processing rate of tiles shall not exceed 497.3 lbs/hour and 200.0 tons/year. 2. Particulate emissions shall not exceed 0.52 lb/hour and 0.21 ton/year as measured by EPA Reference Method 5, 40 CFR 60, Appendix A. 3. The opacity of visible emissions shall not equal or exceed 20% as measured by EPA Reference Method 9, 40 CFR 60, Appendix A.
KILNS		
39 (-)	Kiln #6	1. The processing rate of tiles shall not exceed 4,435 lbs/hour and 18,254 tons/year. 2. Particulate emissions shall not exceed 3.40 lbs/hour and 14.00 tons/year as measured by EPA Reference Method 5, 40 CFR 60, Appendix A. 3. The opacity of visible emissions shall not equal or exceed 20% as measured by EPA Reference Method 9, 40 CFR 60, Appendix A. 4. Refer to General Condition 11. 5. Refer to General Conditions 3(a) and 12.

GENERAL CONDITIONS:

1. The owner and/or operator of the affected facilities specified on this permit shall furnish to the Division for Air Quality the following:
   a) Written notification, postmarked within 15 days, of the date construction commenced. (See Condition 2)
   b) Written notification of the actual date of start-up and the date of achieving the maximum production rate of each of the affected facilities listed on this permit. This notification must be postmarked within 15 days after each of the above mentioned events. (See Condition 3)
   c) Within 15 days after demonstration of compliance, an application for a permit to operate. (See Condition 3)

PERMIT NUMBER: C-88-198

PERMIT - Continued

GENERAL CONDITIONS: (Continued)

2. Unless construction is commenced on or before eighteen months from the date of this permit or if construction is commenced and then stopped for any consecutive period of six months or more, then this construction permit shall be null and void.

3. a) This construction permit shall allow time for the initial start-up, operation and performance testing of the affected facilities listed herein. However, within 60 days after achieving the maximum production rate at which the affected facilities will be operated, but not later than 180 days after initial start-up of such facilities, the owner or operator shall conduct performance tests on the #6 kiln stack and the Forniker kiln and furnish the Division a written report of the results of such performance tests.
   b) Unless notification and justification to the contrary are received by this Division, the date of achieving the maximum production rate at which the affected facilities will be operated shall be deemed to be 30 days after initial start-up.
   c) At least 30 days prior to the date of the required performance test(s), the permittee shall complete and return a Compliance Test Protocol (Form DEP6027). The Protocol form shall be utilized by the Division to determine if a pretest meeting is required. The Division shall be notified of the actual test date at least 10 days prior to the tests.

4. Operation of an affected facility is considered to have commenced at any time air pollutants are generated and emitted to the atmosphere by that affected facility.

5. All air pollution control equipment and all air pollution control measures proposed by the application in response to which this permit is issued shall be in place and operational at any time an affected facility is operated.

6. Those affected facilities specified herein whose continued compliance has been demonstrated to the Division's satisfaction are hereby authorized by this permit to operate for 90 calendar days following such compliance demonstration or for such additional period as may be authorized by 401 KAR 50:035, Section 1(2)(c). Authorization for operation provided by 401 KAR 50:035, Section 1(2)(c), shall expire thirty (30) days after the date notification is made to the source by the Department that an operating permit fee balance is due or immediately upon notification to the source by the Department that the source operating permit is denied.

7. Those affected facilities specified herein for which compliance has not been demonstrated during the time period specified by General Condition 3 shall not be operated unless authorized in writing by the Director.

8. The permittee shall maintain and make available for inspection by this Division all production records necessary to assure that the allowable annual production rates will not be exceeded.

9. In no way does this permit relieve the permittee from compliance with all applicable emission and air quality standards.

PERMIT NUMBER: C-88-198

PERMIT - Continued

GENERAL CONDITIONS: (Continued)

10. An operating permit cannot be issued for the affected facilities listed on this permit unless the remainder of the source's affected facilities are either in compliance, shut down, or on an approved compliance schedule.

11. The permittee shall not allow the emission of potentially hazardous matter or toxic substances in such quantities or duration as may be harmful to the health and welfare of humans, animals, and plants.

12. The performance tests required by General Condition 3(a) for the kilns stack and the Forniker kiln stack shall consist of the determination of particulate by EPA Reference Method 5, 40 CFR 60, Appendix A, and gaseous fluoride emissions in accordance with Kentucy Method 130.

CONTACT REPORT--MRI Project No. 4602-01

From: Richard Marinshaw, Environmental Engineering Department

Date of Contact: October 17, 1994

Contacted by: Telephone

Company/Agency: Canton City Health Department
420 Market Avenue North
Canton, Ohio 44702

Telephone Number: (216) 489-3385

Person(s) Contacted/Title(s)

Daniel Schiltz, Air Pollution Control Engineering Technician

CONTACT SUMMARY:

Mr. Schiltz was contacted for additional information on the emission test reports provided by the Canton City Health Department for revising the AP-42 section on ceramics manufacturing.

Mr. Schiltz provided the following information:

Stark Ceramics--September 16, 1993 Emission Test

The kiln production rate for this test was 5,482 lb/hr.

Metropolitan Ceramics--November 17-18, 1993 Emission Test

The kiln test was a gas-fired kiln producing unglazed ceramic tile. The SO_2 results should be considered invalid due to equipment problems during the test.

Newcastle Refractories--April 29, 1994 Emission Test

The kiln production rate for the test was 2,400 lb/hr. The facility manufactures refractory bricks.

QUILL® QUICK REPLY LETTER 7-45332

QUILL CORPORATION GENERAL OFFICES, LINCOLNSHIRE, IL 60069-3621 LINCOLNSHIRE, IL ○ ONTARIO, CA ○ TORONTO, CANADA MADE IN U.S.A.

CERAMIC MANUFACTURERS ASSOCIATION

1100-H BRANDYWINE BOULEVARD PHONE: 614-452-4541

P. O. BOX 2188 ZANESVILLE, OH 43702-2188 FAX: 614-452-2552

TO RONALD MYERS

SUBJECT 12/27/94

MESSAGE

DATE

Ron

Enclosed is a copy of our letter to a group of our member companys in the South east section of the country. We will advise you on the response to this letter

SIGNED

REPLY

DATE

Sorry for the delay, I had to wait to present this to our Board of Directors

SIGNED [signature]

INSTRUCTIONS TO RECEIVER:
1 WRITE REPLY 2 DETACH STUB KEEP WHITE COPY RETURN PINK COPY TO SENDER

Serving
Ceramic
Glass
Cement
Manufacturers
& Suppliers

CerMA
Ceramic Manufacturers
Association

December 20, 1994

Dear Industry Colleague:

The "Office of Air Quality Plannning and Standards" of the E.P.A. at Triangle Park, North Carolina, has asked our organization for help in updating the AP-42 for ceramic product manufacturing. In discussion with Mr. Ronald Myers of the E.P.A. office, the agency is planning on broading the current "8.7 Ceramic Clay Manufacturing of the AP-42" to a section on ceramic products. The clay processing section (structural clay products) will be in a separate section.

Mr. Myers is interested in obtaining recent emission test information that companies have obtained through their own inititive or from agency (state, etc.) request that will help to form a very realistic data base for future standards. Currently, the emission test reports on file are from six tests taken at four ceramic tile, ceramic wall tile, and glazed and unglazed structural tile.

The agency would like to get test information from chinaware plants, refractory plants, technical ceramic plants, sanitaryware plants, and pottery plants. They are particularly interested in the Southeast section of the country so that plant visits would work into travel constraints.

The Ceramic Manufacturers Association can be a positive source for information if some of our member companies would be willing to work with the EPA on this program. Mr. Douglas Bauman, the Environmental Engineer at Florida Tile Company, has offered to be a resource for the coordination of information that may be forthcoming from member companies "that have emission data to offer". Can you help us?

If you have any questions or can offer assistance, call Debby Johnston at CerMA Headquarters, 614-452-4541 ext. 3116.

Sincerely yours,

Robert J. Hawkins
Chair

1100-H Brandywine Boulevard, P.O. Box 2188, Zanesville, OH 43702-2188 USA
TEL: (614) 452-4541 • FAX: (614) 452-2552

MRI FAX

MIDWEST RESEARCH INSTITUTE
425 Volker Boulevard, Kansas City, Missouri 64110-2299

Telephone (816) 753-7600
FAX (816) 753-8420

Date 10/20/94

To Rick Marushaw, NCD

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MRI Verification: (816) 753-7600 Ext. 1361

MESSAGE:

As requested

07103229/7
DIALOG(R)File 335:Ceramic Abstracts

07103229 DOCUMENT TYPE: Abstract
Ceramic tile industry and air pollution--control experiences in a ceramic district.
AUTHOR: Palmonari, C.; Timellini, G.
JOURNAL: South Afr. Ceram. Soc.--Ann. Symp. Proc., 22pp. 71-80
CODEN: SACER@
PUBLICATION YEAR: 1990 JOURNAL ANNOUNCEMENT: 923
LANGUAGE: ENGL
ABSTRACT: // The Ceramic District of Sassuolo (Italy) with approximately 250 ceramic tile factories caused considerable pollution problems since the 1970's. Authors reviewed Italian pollution control regulations for the ceramic floor and wall tile industry and the results obtained since these regulations were put into effect 10 yr ago. (meeting proceedings)

06908708/7
DIALOG(R)File 335:Ceramic Abstracts

06908708 DOCUMENT TYPE: Abstract
Keeping pollution under control is identifying the problem.
AUTHOR: Lemkey, Peter
JOURNAL: Process Eng. (London), 69[8]35
CODEN: PSEGAP
PUBLICATION YEAR: 1988 JOURNAL ANNOUNCEMENT: 905
LANGUAGE: ENGL
ABSTRACT: A laser densimeter rapidly assesses airborne contaminants.

06808536/7
DIALOG(R)File 335:Ceramic Abstracts

06808536 DOCUMENT TYPE: Abstract
Air pollution from the ceramic industry--control experiences in the Italian ceramic tile industry.
AUTHOR: Palmonari, Carlo; Timellini, Giorgio
JOURNAL: Am. Ceram. Soc. Bull., 68[8]1464-9
CODEN: ACSBA7
PUBLICATION YEAR: 1989 JOURNAL ANNOUNCEMENT: 895
LANGUAGE: ENGL
ABSTRACT: Pollution control systems have reduced the negative impact on the environment of the Italian ceramic floor- and wall-tile industry, particularly the quality of air in the Ceramic District of Sassudo where some 250 plants are located. A network of 12 stations equipped with continuous analyzers and recorders determine the concentration of pollutants.

07009055/7
DIALOG(R)File 335:Ceramic Abstracts

07009055 DOCUMENT TYPE: Abstract
Use of small truck-type continuous fast firing kilns for ceramics.
AUTHOR: Hulme, M. M.; Wight, T. D. B.; Wight, Harold B.
JOURNAL: Mater. Sci. Forum, 34-36pp. 1041-6
CODEN: MATSC@
PUBLICATION YEAR: 1988 JOURNAL ANNOUNCEMENT: 915
LANGUAGE: ENGL
ABSTRACT: // Small tunnel kilns with a low load height and low thermal mass cars are automated and have the capability of being turned off on weekends and at night. It can almost eliminate work in progress as products can be made, dried, glazed, and fired within one shift. Factory space requirements can be reduced. (meeting proceedings)

07001417/7
DIALOG(R)File 335:Ceramic Abstracts

07001417 DOCUMENT TYPE: Abstract
Bringing existing kilns to state-of-the-art technology.
AUTHOR: Harmon, Cameron G., Jr.
JOURNAL: Ceram. Eng. Sci. Proc., 11[11-12]1891-6
CODEN: CESPDK
PUBLICATION YEAR: 1990 JOURNAL ANNOUNCEMENT: 911
LANGUAGE: ENGL
ABSTRACT: To design a kiln, the approach depends on how much is known about how kilns actually work. The basic problems faced in kiln design are such things as burner types, distance between burners, burner pattern, air flow, load arrangement, wall structure, and temp. uniformity.

06502477/7
DIALOG(R)File 335:Ceramic Abstracts

06502477 DOCUMENT TYPE: Abstract
New design concepts for energy-efficient kilns and furnaces in the production of whitewares.
AUTHOR: Greaves, J. R.
JOURNAL: Ceram. Eng. Sci. Proc., 6[11-12]1440-4
CODEN: CESPDK
PUBLICATION YEAR: 1985 JOURNAL ANNOUNCEMENT: 862
LANGUAGE: ENGL
ABSTRACT: Comparison of new designs with older tunnel-type kilns emphasizes fiber linings, repair, and relining problems encountered, projected savings, production advantages and disadvantages, and use on low-mass kiln cars.

07106451/7
DIALOG(R)File 335:Ceramic Abstracts

07106451 DOCUMENT TYPE: Abstract
Review of advanced ceramic materials.
AUTHOR: Niesz, Dale E.
JOURNAL: Int. Ceram. J., (No. 46)pp. 19-22
CODEN: ICEJEJ
PUBLICATION YEAR: 1990 JOURNAL ANNOUNCEMENT: 925
LANGUAGE: ENGL
ABSTRACT: Title describes article content.

06600912/7
DIALOG(R)File 335:Ceramic Abstracts

06600912 DOCUMENT TYPE: Abstract
Development of ceramics for electronics[--review].
AUTHOR: Cantagrel, Michel
JOURNAL: Am. Ceram. Soc. Bull., 65[9]1248-9
CODEN: ACSBA7
PUBLICATION YEAR: 1986 JOURNAL ANNOUNCEMENT: 871
LANGUAGE: ENGL
ABSTRACT: Discussion covers capacitors, soft ferrites, thermistors (both PTCR and NTCR) and ZnO varistors, and compares the European and US markets.

06910074/7
DIALOG(R)File 335:Ceramic Abstracts

06910074 DOCUMENT TYPE: Abstract
Fine grinding--a review.
AUTHOR: Russel, Alison
JOURNAL: Ind. Miner. (London), [No. 259]pp. 57-70
CODEN: IMINBG
PUBLICATION YEAR: 1989 JOURNAL ANNOUNCEMENT: 905
LANGUAGE: ENGL
ABSTRACT: Title describes article content.

06306873/7
DIALOG(R)File 335:Ceramic Abstracts

06306873 DOCUMENT TYPE: Abstract
Industrial mineral processing: II, Screening and classification [equipment review].
AUTHOR: Buckley, Simon
JOURNAL: Ind. Miner. (London), [No. 190]pp. 45-55
CODEN: IMINBG
PUBLICATION YEAR: 1983 JOURNAL ANNOUNCEMENT: 845
LANGUAGE: ENGL

06306872/7
DIALOG(R)File 335:Ceramic Abstracts

06306872 DOCUMENT TYPE: Abstract
Industrial mineral processing: I, Crushing and grinding [review].
AUTHOR: Buckley, Simon
JOURNAL: Ind. Miner. (London), [No. 189]pp. 27-50
CODEN: IMINBG
PUBLICATION YEAR: 1983 JOURNAL ANNOUNCEMENT: 845
LANGUAGE: ENGL

06608016/7
DIALOG(R)File 335:Ceramic Abstracts

06608016 DOCUMENT TYPE: Abstract
Developments in ultrasonic machining of ceramics[--review].
AUTHOR: Cordemans, E. D.; Hannecart, B. O.; Gallemaers, J. P.
JOURNAL: Proc.-Int. Symp. Mach. Adv. Cer. Mater. Comp., 1pp. 131-7
CODEN: PISMC@
PUBLICATION YEAR: 1987 JOURNAL ANNOUNCEMENT: 875
LANGUAGE: ENGL
ABSTRACT: //

SIC	Title
Cement and Structural Clay Products	
3251	Brick and Structural Clay Tile
3253	Ceramic Wall and Floor Tile
3259	Structural Clay Products, not elsewhere classified
Pottery and Related Products	
3261	Vitreous Plumbing Fixtures
3262	Vitreous China Table and Kitchenware
3263	Semivitreous Table and Kitchenware
3264	Porcelain Electrical Supplies
3269	Pottery Products, not elsewhere classified

OhioEPA
REPRESENTATIVE SERVING STARK COUNTY

AIR POLLUTION CONTROL DIVISION
CITY HALL
CANTON, OHIO 44702

DATE 10-6-94

TO:

1. RICK MARINSHAW
2. M. R. I.
3. 401 HARRISON OAKS BLVD, SUITE 350
4. CARY, N.C. 27513
5.

- ☐ APPROVAL
- ☐ COMMENT
- ☐ NECESSARY ACTION
- ☐ INVESTIGATE
- ☐ NOTE AND RETURN
- ☐ NOTE AND FILE
- ☐ PREPARE REPLY
- ☐ SIGNATURE
- ☐ SEE ME
- ☒ AS REQUESTED
- ☐ FOR YOUR INFORMATION
- ☐ PER CONVERSATION

REMARKS: IF YOU NEED ANYMORE INFORMATION PLEASE CALL.

FROM DANIEL SCHILTZ

PHONE (216) 489-3385

FAX TRANSMISSION

TO: Ron Myers, EIB

FROM: Rick Marinshaw, MRI

DATE: October 12, 1994

RECEIVING FAX NUMBER: 541-0684

SENDING FAX NUMBER: 919-677-0065

THIS FAX CONSISTS OF 2 PAGES (INCLUDING THIS PAGE)

Here is the criteria set for generating a list of all domestic ceramic manufacturers from the AIRS data base.

Let me know if you have any questions about this.

CRITERIA SETS FOR WOOD PRODUCTS AP-42 REPORTS TO BE GENERATED FROM AIRS DATABASE

Format type: Q1
Title: CERAMIC MANUFACTURERS

Selection criteria
REGN GE 00
SIC1 CE 3253
SIC1 CE 3261
SIC1 CE 3262
SIC1 CE 3263
SIC1 CE 3264
SIC1 CE 3269

Output elements
PNME 40.0 PLANT/NAME/
STRT 30.0 STREET/ADDRESS/
CYNM 20.0 CITY/NAME/
CTNM 15.0 COUNTY/NAME/
STAB 2.0 ST/
SIC1 4.0 SIC/CODE/

Sorting elements
STAB A
SIC1 A

POSSIBLE TECHNICAL REFERENCES

Modern Ceramic Engineering by M. Dekker TP807.R53 1992

Ceramic Fabrication Processes by W.D. Kingery (ed) TP807.K56

Making True Porcelain Dinnerware by R.E. Gould TP822.G6

Ceramics, H. Hannah NK4695.T33 H36 1986

Fundamentals of Ceramic Engineering, P Vincenzini TP807.C457 1990

CHECK ALL THESE CALL #'s

TL698.F58 vol.3

RC965.C43 H43 1991

TS695.9.C46

TA455.C43 F59

TP786.I584

BOARD OF HEALTH CANTON, OHIO

Canton City Health Department

Division of Air Pollution Control
420 Market Avenue N. • Canton, Ohio 44702-1544
(216) 489-3385 • Fax: (216) 489-3335

Robert E. Pattison, M.P.A.
Health Commissioner

Bruce E. Blankenship
Administrator

June 21, 1994

Mr. Ron Myers
U.S. EPA
Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina 27711

Re: Emission Factors for Brick & Clay Products Manufacturing

Dear Mr. Myers:

This letter is intended to provide data on sulfur dioxide emissions from brick and other clay products kilns.

This agency has required a ceramic tile manufacturer to do several stack tests to determine SO_2 emission rates from his kilns.

A test was run in April of 1994 on three kilns vented to a common stack. Some of the data from this test were:

Dry tons process weight rate	=	200 tons/day
Maximum kiln temperature	=	2174°F
Average SO_2 rate	=	39.56 lbs/hour
Raw material sulfur content	=	0.164%

In AP42 8.3.2, it states that sulfur dioxide may be emitted from the bricks when temperatures reach or exceed 2500°F. The kilns at this facility do not exceed 2500°F and yet a large amount of sulfur dioxide is emitted.

This facility tried to determine an emission factor relating the amount of sulfur in the raw materials to the amount of SO_2 emissions. They took numerous samples of the raw materials and compared that to SO_2 emissions. The results of their work is attached. They have decided that about 22% of the sulfur is retained in the final product while 78% is converted to SO_2 and is emitted. The kilns were fired with natural gas.

If you need any additional information, please contact me at (216) 489-3058.

Sincerely,

Daniel J. Schiltz

Daniel J. Schiltz
APC Engineering Technician

Enclosures

DS0621RM.TL

Emission factor calculation

192.51	\232.03	*100	82.9677 % SO2 emitted from product	17 % S retained in product
calc SO2 from Envis.	calc SO2 from tile samples	%		

Analysis for Emission Factor using tiles					
Test #1 TK1 Clay	0.212 %S	Test #1 TK1 FIRED	0.128 %S	47.16981	% S retained in tile
Test #2 TK1 Clay	0.152 %S	Test #2 TK1 FIRED	0.038 %S	25	% S retained in tile
Test #1 TK2 Clay	0.144 %S	Test #1 TK2 FIRED	0.024 %S	16.66667	% S retained in tile
Test #3 TK2 Clay	0.164 %S	Test #3 TK2 FIRED	0.026 %S	15.85366	% S retained in tile
			Average	26.17253	% S retained in tile

3 decimal place.

CALC.				
0.128	\0.212	*100	60.3774	% S retained in tile during firing
%S in Fired Tile	%S in Unfired Tile			

3 decimal place.

USING THE TWO APPROACHES TO A EMISSION FACTOR (% sulfur retained in the product)

FOR CALCULATIONS OF SO2 EMITTED FROM A KNOWN % SULFUR CONTENT IN METROPOLITAN

RAW MATERIAL COMPOSITE SAMPLES

THE AVERAGE FROM THE TWO CALCULATED NUMBERS IS 17 plus 26.173 \2

21.5865 % Sulfur retained in product

FACTOR CHOSEN FOR ALL CALCULATIONS 0.78
% SULFUR EMITTED FROMMETROPOLITAN RAW MATERIALS

RETEST FOR SO2

8.3.2 Emissions And Controls[1,3]

Particulate matter is the primary emission in the manufacture of bricks. The main source of dust is the materials handling procedure, which includes drying, grinding, screening and storing the raw material. Combustion products are emitted from the fuel consumed in the dryer and the kiln. Fluorides, largely in gaseous form, are also emitted from brick manufacturing operations. Sulfur dioxide may be emitted from the bricks when temperatures reach or exceed 1370°C (2500°F), but no data on such emissions are available.[4]

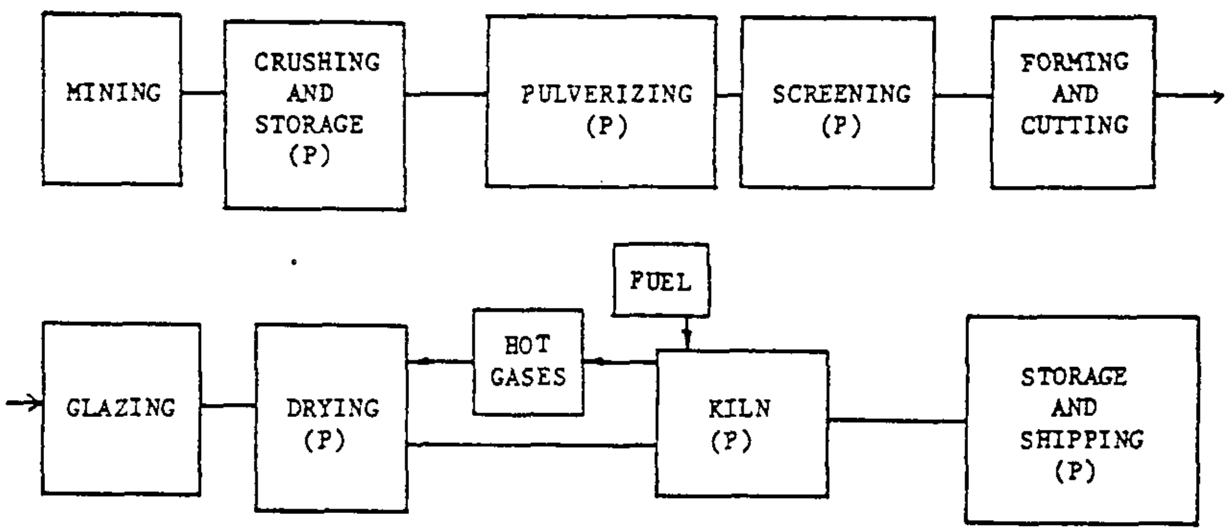

Figure 8.3-1. Basic flow diagram of brick manufacturing process. (P = a major source of particulate emissions)

A variety of control systems may be used to reduce both particulate and gaseous emissions. Almost any type of particulate control system will reduce emissions from the material handling process, but good plant design and hooding are also required to keep emissions to an acceptable level.

The emissions of fluorides can be reduced by operating the kiln at temperatures below 1090°C (2000°F) and by choosing clays with low fluoride content. Satisfactory control can be achieved by scrubbing kiln gases with water, since wet cyclonic scrubbers can remove fluorides with an efficiency of 95 percent or higher.

Table 8.3-1 presents emission factors for brick manufacturing without controls. Table 8.3-2 presents data on particle size distribution and emission factors for uncontrolled sawdust fired brick kilns. Table 8.3-3 presents data on particle size distribution and emission factors for uncontrolled coal fired tunnel brick kilns.

8.7 CERAMIC CLAY MANUFACTURING

8.7.1 Process Description[1]

The manufacture of ceramic clay involves the conditioning of the basic ores by several methods. These include the separation and concentration of the minerals by screening, floating, wet and dry grinding, and blending of the desired ore varieties. The basic raw materials in ceramic clay manufacture are kaolinite ($Al_2O_3 \cdot 2SiO_2 \cdot 2H_2O$) and montmorillonite [$(Mg, Ca) O \cdot Al_2O_3 \cdot 5SiO_2 \cdot nH_2O$] clays. These clays are refined by separation and bleaching, blended, kiln-dried, and formed into such items as whiteware, heavy clay products (brick, etc.), various stoneware, and other products such as diatomaceous earth, which is used as a filter aid.

8.7.2 Emissions and Controls[1]

Emissions consist primarily of particulates, but some fluorides and acid gases are also emitted in the drying process. The high temperatures of the firing kilns are also conducive to the fixation of atmospheric nitrogen and the subsequent release of NO, but no published information has been found for gaseous emissions. Particulates are also emitted from the grinding process and from storage of the ground product.

Factors affecting emissions include the amount of material processed, the type of grinding (wet or dry), the temperature of the drying kilns, the gas velocities and flow direction in the kilns, and the amount of fluorine in the ores.

Common control techniques include settling chambers, cyclones, wet scrubbers, electrostatic precipitators, and bag filters. The most effective control is provided by cyclones for the coarser material, followed by wet scrubbers, bag filters, or electrostatic precipitators for dry dust. Emission factors for ceramic clay manufacturing are presented in Table 8.7-1.

Table 8.7-1. PARTICULATE EMISSION FACTORS FOR CERAMIC CLAY MANUFACTURING[a]
EMISSION FACTOR RATING: A

Type of process	Uncontrolled		Cyclone[b]		Multiple-unit cyclone and scrubber[c]	
	lb/ton	kg/MT	lb/ton	kg/MT	lb/ton	kg/MT
Drying[d]	70	35	18	9	7	3.5
Grinding[e]	76	38	19	9.5	-	-
Storage[d]	34	17	8	4	-	-

[a] Emission factors expressed as units per unit weight of input to process.
[b] Approximate collection efficiency: 75 percent.
[c] Approximate collection efficiency: 90 percent.
[d] References 2 through 5.
[e] Reference 3.

9/28/94

NUMBER OF FACILITIES BY STATE

Fst	FIPS	Count of Facn
OH	39	23
PA	42	18
NY	36	17
TX	48	14
WI	55	11
CA	6	10
KY	21	8
OK	40	8
TN	47	8
CO	8	7
GA	13	7
NJ	34	6
NE	31	5
NC	37	5
SC	45	5
IN	18	3
MS	28	3
FL	12	2
IL	17	2
MA	25	2
WV	54	2
AL	1	1

SCC	Process Name	PART Lbs/Unit	PM10 Lbs/Unit	SOx Lbs/Unit	NOx Lbs/Unit	VOC Lbs/Unit	CO Lbs/Unit	LEAD Lbs/Unit	UNITS	NOTES
Cement Manufacturing: Wet Process - 3241										
3-05-007-07	- Raw Material Unloading	0.2 (c)	0.1	0.0	0.0	0.0	0.0	---	Tons of Material Unloaded	
3-05-007-08	- Raw Material Piles	4.0 (c)	1.4	0.0	0.0	0.0	0.0	---	Tons In Pile	
3-05-007-09	- Primary Crushing	0.5 (c)	0.26	0.0	0.0	0.0	0.0	---	Tons Processed	
3-05-007-10	- Secondary Crushing	1.5 (c)	1.13	0.0	0.0	0.0	0.0	---	Tons Processed	
3-05-007-11	- Screening	---	---	0.0	0.0	0.0	0.0	---	Tons Processed	
3-05-007-12	- Raw Material Transfer	0.3 (c)	0.15	0.0	0.0	0.0	0.0	---	Tons Handled	
3-05-007-14	- Clinker Cooler	---	0.8	0.0	0.0	0.0	0.0	---	Tons Cement Produced	
3-05-007-15	- Clinker Piles	---	---	0.0	0.0	0.0	0.0	---	Tons Cement Produced	
3-05-007-16	- Clinker Transfer	---	---	0.0	0.0	0.0	0.0	---	Tons Cement Produced	
3-05-007-17	- Clinker Grinding	32.0	27.0	0.0	0.0	0.0	0.0	0.02	Tons Cement Produced	
3-05-007-18	- Cement Silos	---	---	0.0	0.0	0.0	0.0	---	Tons Cement Produced	
3-05-007-19	- Cement Load Out	0.24 (c)	0.2	0.0	0.0	0.0	0.0	---	Tons Cement Produced	
3-05-007-99	- Other Not Classified	XXX	XXX	XXX	XXX	XXX	XXX	XXX	Tons Cement Produced	
Ceramic Clay Manufacture - 3261										
3-05-008-01	- Drying	70.0	35.7	2.4	1.6	0.004	---	---	Tons Input to Process	
3-05-008-02	- Grinding	76.0	64.6	7.4	2.3	0.0	---	---	Tons Input to Process	
Ceramic Clay Mfg. - 3261										
3-05-008-03	- Storage	34.0	29.0	---	0.0	0.0	---	---	Tons Input to Process	
3-05-008-99	- Other Not Classified	XXX	XXX	XXX	XXX	XXX	XXX	XXX	Tons Produced	
Clay & Fly Ash Sintering - 3295										
3-05-009-01	- Fly Ash Sintering	110.0	68.0	---	---	1.4	---	---	Tons Finished Product	
3-05-009-02	- Clay/Coke Sintering	40.0	20.4	---	---	1.4	---	---	Tons Finished Product	
3-05-009-03	- Natural Clay/ Shale Sintering	12.0	6.12	---	---	1.4	---	---	Tons Finished Product	
3-05-009-04	- Raw Clay/ Shale Crushing/ Screening	0.5 (c)	0.25	0.0	0.0	0.0	0.0	---	Tons Raw Material	
3-05-009-05	- Raw Clay/ Shale Transfer/ Conveying	0.8 (c)	0.4	0.0	0.0	0.0	0.0	---	Tons Raw Material	
3-05-009-06	- Raw Clay/Shale Storage Piles	---	---	0.0	0.0	0.0	0.0	---	Tons Raw Material	

AIRS 1990

7 Ceramic Clay Manuf.

EFs

ØIRS P.119

8.7 CERAMIC CLAY MANUFACTURING

8.7.1 Process Description[1] (7-2)

The manufacture of ceramic clay involves the conditioning of the basic ores by several methods. These include the separation and concentration of the minerals by screening, floating, wet and dry grinding, and blending of the desired ore varieties. The basic raw materials in ceramic clay manufacture are kaolinite ($Al_2O_3 \cdot 2SiO_2 \cdot 2H_2O$) and montmorillonite [$(Mg, Ca) O \cdot Al_2O_3 \cdot 5SiO_2 \cdot nH_2O$] clays. These clays are refined by separation and bleaching, blended, kiln-dried, and formed into such items as whiteware, heavy clay products (brick, etc.), various stoneware, and other products such as diatomaceous earth, which is used as a filter aid.

8.7.2 Emissions and Controls[1] (7-4)

Ref 1(7-4) Emissions consist primarily of particulates, but some fluorides and acid gases are also emitted in the drying process. The high temperatures of the firing kilns are also conducive to the fixation of atmospheric nitrogen and the subsequent release of NO, but no published information has been found for gaseous emissions. Particulates are also emitted from the grinding process and from storage of the ground product.

Ref 1(7-4) Factors affecting emissions include the amount of material processed, the type of grinding (wet or dry), the temperature of the drying kilns, the gas velocities and flow direction in the kilns, and the amount of fluorine in the ores.

Common control techniques include settling chambers, cyclones, wet scrubbers, electrostatic precipitators, and bag filters. The most effective control is provided by cyclones for the coarser material, followed by wet scrubbers, bag filters, or electrostatic precipitators for dry dust. Emission factors for ceramic clay manufacturing are presented in Table 8.7-1.

Table 8.7-1. PARTICULATE EMISSION FACTORS FOR CERAMIC CLAY MANUFACTURING[a]
EMISSION FACTOR RATING: A

Type of process	Uncontrolled		Cyclone[b]		Multiple-unit cyclone and scrubber[c]	
	lb/ton	kg/MT	lb/ton	kg/MT	lb/ton	kg/MT
Drying[d]	70	35	18	9	7	3.5
Grinding[e]	76	38	19	9.5	–	–
Storage[d]	34	17	8	4	–	–

Ref 1(7-5)

[a] Emission factors expressed as units per unit weight of input to process.
[b] Approximate collection efficiency: 75 percent.
[c] Approximate collection efficiency: 90 percent.
[d] References 2 through 5.
[e] Reference 3.

References for Section 8.7-1

1. ~~Air Pollutant Emission Factors. Final Report. Resources Research, Inc. Reston, Va. Prepared for National~~ Air Pollution Control Administration, Durham, N.C., under Contract Number CPA-22-69-119. April 1970.

2. Allen, G. L. et al. Control of Metallurgical and Mineral Dusts and Fumes in Los Angeles County. Department of Interior, Bureau of Mines. Washington, D.C. Information Circular Number 7627. April 1952.

missing 3. Private Communication between Resources Research, Incorporated, Reston, Virginia, and the State of New Jersey Air Pollution Control Program, Trenton, New Jersey. July 20, 1969.

4. Henn, J. J. et al. Methods for Producing Alumina from Clay: An Evaluation of Two Lime Sinter Processes. Department of Interior, Bureau of Mines. Washington, D.C. Report of Investigations Number 7299. September 1969.

5. Peters, F. A. et al. Methods for Producing Alumina from Clay: An Evaluation of the Lime-Soda Sinter Process. Department of Interior, Bureau of Mines. Washington, D.C. Report of Investigation Number 6927. 1967.

I don't know how the data in Ref 2, 4 & 5 were put together to determine the emission factors

AIRS 1990 7? Ceramic Elec. Parts NO EF

SCC	Process Name	PART Lbs/Unit	PM10 Lbs/Unit	SOx Lbs/Unit	NOx Lbs/Unit	VOC Lbs/Unit	CO Lbs/Unit	LEAD Lbs/Unit	UNITS	NOTES
Magnesium Carbonate - 1459										
3-05-024-99	- Other Not Classified	XXX	XXX	XXX	XXX	XXX	XXX	XXX	Tons Processed	
Sand/Gravel - 1442, 1446										
3-05-025-02	- Aggregate Storage	0.33	0.12	0.0	0.0	0.0	0.0	---	Tons Product	
3-05-025-03	- Material Transfer and Conveying	0.029	0.0064	0.0	0.0	0.0	0.0	---	Tons Product	
3-05-025-04	- Hauling	52.0	---	0.0	0.0	0.0	0.0	---	Vehicle-Miles	
3-05-025-05	- Pile Forming: Stacker	0.13	0.06	0.0	0.0	0.0	0.0	---	Tons Product	
3-05-025-06	- Bulk Loading	0.02	0.0024	0.0	0.0	0.0	0.0	---	Tons Product	
3-05-025-07	- Storage Piles	3796.0	1367.0	0.0	0.0	0.0	0.0	---	Acres of Storage Area	
3-05-025-08	- Dryer	---	---	0.002	1.6	0.004	---	---	Tons Product	
3-05-025-09	- Cooler	---	---	0.0	0.0	0.0	---	---	Tons Product	
3-05-025-10	- Crushing	---	---	0.0	0.0	0.0	---	---	Tons Product	
3-05-025-11	- Screening	---	0.12	0.0	0.0	0.0	---	---	Tons Product	
Diatomacous Earth - 1499, 3295										
3-05-026-01	- Handling	---	---	0.0	0.0	0.0	0.0	---	Tons Product	
3-05-026-99	- Other Not Classified	XXX	XXX	XXX	XXX	XXX	XXX	XXX	Tons Processed	
Ceramic Electric Parts - 3264										
3-05-030-99	- Other Not Classified	XXX	XXX	XXX	XXX	XXX	XXX	XXX	Tons Processed	
Asbestos Mining - 1499										
3-05-031-01	- Surface Blasting	---	---	0.0	0.0	0.0	0.0	---	Tons of Ore	
3-05-031-02	- Surface Drilling	---	---	0.0	0.0	0.0	0.0	---	Tons of Ore	
3-05-031-03	- Cobbing	---	---	0.0	0.0	0.0	0.0	---	Tons of Ore	
3-05-031-04	- Loading	---	---	0.0	0.0	0.0	0.0	---	Tons of Ore	
3-05-031-05	- Convey/Haul Asbestos	---	---	0.0	0.0	0.0	0.0	---	Tons of Ore	
3-05-031-06	- Convey/Haul Waste	---	---	0.0	0.0	0.0	0.0	---	Tons of Ore	
3-05-031-07	- Unloading	---	---	0.0	0.0	0.0	0.0	---	Tons of Ore	
3-05-031-08	- Overburden Stripping	---	---	0.0	0.0	0.0	0.0	---	Tons Removed	
3-05-031-09	- Ventilation of Process Operations	---	---	0.0	0.0	0.0	0.0	---	Tons of Ore	
3-05-031-10	- Stockpiling	---	---	0.0	0.0	0.0	0.0	---	Tons of Ore	

Chattanooga – Hamilton County
Air Pollution Control Bureau
3511 Rossville Boulevard • Chattanooga, Tennessee 37407-2495
(615) 867-4321 Telefax (615) 867-4348

November 16, 1994

Mr. Bryan Shrager
Midwest Research Institute
401 Harrison Oaks Blvd.
Suite 350
Cary, NC 27513

Dear Mr. Shrager:

Please find enclosed, copies of the information which you requested recently. The information enclosed consists of the most recent inspection reports and stack test results for three local ceramics manufacturing facilities. These facilities are Coors Electronic Package Company, Norton Company, and Steward Inc.

I hope this information assists you in your present work associated with improvements to EPA's AP-42 Document. If you have any questions or require any additional information, please contact me.

Very truly yours,

B. Loyd Gravitt

B. Loyd Gravitt
Air Toxics Coordinator

ADEM

ALABAMA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

James W. Warr, Director

Jim Folsom
Governor

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(205) 353-1713
FAX 340-9359

2204 Perimeter Road
Mobile, AL
36615-1131
(205) 450-3400
FAX 479-2593

November 14, 1994

Mr. Brian Schraeger
MRI
Suite 350
401 Harrison Oaks Blvd
Cary, NC 27513-2412

Dear Mr. Schraeger:

Enclosed is the information that you requested concerning American Olean Tile located in Fayette, Alabama.

If you have any questions or require further assistance, please call me at (205)271-7861.

Sincerely,

David Ousley
Engineering Services Branch
Air Division

ADO/ado

enclosure:

MRITESTS.DOC

WPID N. 3200

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

DRAFT

AUG - 4 1994

Mr. Nelson Cooney
Brick Institute of America
11490 Commerce Park Drive
Suite 300
Reston, Virginia 22091-1525

Dear Mr. Cooney:

It was a pleasure meeting with you and the other members of the Brick Institute of America on July 26. In the meeting I described how the Emission Inventory Branch of the U. S. Environmental Protection Agency (EPA) is in the process of updating the document *Compilation of Air Pollutant Emission Factors, Volume I: Stationary Point and Area Sources* (known more commonly as AP-42). As we discussed in the meeting, we have almost finished the testing phase of our effort to update the AP-42 section for Brick Manufacturing. As part of this process, we are now seeking additional emission data and updated process descriptions for sections that are being revised.

Chapter 11 of AP-42 addresses the mineral products industry and is one of the chapters being updated. Enclosed is a copy of the existing Section 11.3, Brick and Related Clay Products. We would appreciate it if you or one of your associates would review the enclosed AP-42 section and would send us your comments. In addition, please feel free to distribute the enclosed documents among other interested persons in the brick industry. We would appreciate a response to this request by September 22, 1994.

As you can see from the AP-42 section, the current emission factors are based on data from only five emission test reports. Enclosed is a list of the test reports currently cited in AP-42 and additional test reports that have been obtained for use in developing emission factors. If you are aware of additional emission data that we could use to develop emission factors for brick manufacturing, we would appreciate your assistance in obtaining copies of the data. In particular, if any emission data for screening and grinding operations are available, we have relatively little data on these processes. Please note that the emission factors presented in AP-42 generally are based upon results from validated tests or other emission evaluations that are similar to EPA reference test methods. We also would appreciate specific comments on the general process description presented in the enclosed AP-42 section, information on variations in brick manufacturing operations, and identification of specific air pollution emission points associated with brick manufacturing. General information on the brick industry, including the location of plants and annual production rates also would be helpful.

In our meeting we also discussed our use of information that would be considered by one or more of your member companies as Confidential Business Information (CBI). As I stated in the meeting we are sensitive to the needs of businesses to keep some information confidential. Therefore as I agreed, I am enclosing for your information our CBI procedures and the procedures we require our contractors to follow when handling CBI. Should your members wish to provide emission test data that contains CBI, I would ask that you have them identify the specific information in the test report that is considered CBI.

We appreciate your cooperation and look forward to receiving your comments. If you have any questions or need additional time to respond to this report, I can be reached by telephone at (919) 541-5407 or by fax at (919) 541-0684.

Sincerely,

Ronald E. Myers
Emission Factors and Methodologies Section
Emission Inventory Branch

3 Enclosures

8.3 BRICKS AND RELATED CLAY PRODUCTS

8.3.1 Process Description

The manufacture of brick and related products such as clay pipe, pottery and some types of refractory brick involves the mining, grinding, screening and blending of the raw materials, and the forming, cutting or shaping, drying or curing, and firing of the final product.

Surface clays and shales are mined in open pits. Most fine clays are found underground. After mining, the material is crushed to remove stones and is stirred before it passes onto screens for segregation by particle size.

To start the forming process, clay is mixed with water, usually in a pug mill. The three principal processes for forming brick are stiff mud, soft mud and dry press. In the stiff mud process, sufficient water is added to give the clay plasticity, and bricks are formed by forcing the clay through a die. Wire is used in separating bricks. All structural tile and most brick are formed by this process. The soft mud process is usually used with clay too wet for the stiff mud process. The clay is mixed with water to a moisture content of 20 to 30 percent, and the bricks are formed in molds. In the dry press process, clay is mixed with a small amount of water and formed in steel molds by applying pressure of 3.43 to 10.28 megapascals (500 to 1500 pounds per square inch). A typical brick manufacturing process is shown in Figure 8.3-1.

Wet clay units that have been formed are almost completely dried before firing, usually with waste heat from kilns. Many types of kilns are used for firing brick, but the most common are the downdraft periodic kiln and the tunnel kiln. The periodic kiln is a permanent brick structure with a number of fireholes where fuel enters the furnace. Hot gases from the fuel are drawn up over the bricks, down through them by underground flues, and out of the oven to the chimney. Although lower heat recovery makes this type less efficient than the tunnel kiln, the uniform temperature distribution leads to a good quality product. In most tunnel kilns, cars carrying about 1200 bricks travel on rails through the kiln at the rate of one 1.83 meter (6 foot) car per hour. The fire zone is located near the middle of the kiln and is stationary.

In all kilns, firing takes place in six steps: evaporation of free water, dehydration, oxidation, vitrification, flashing, and cooling. Normally, gas or residual oil is used for heating, but coal may be used. Total heating time varies with the type of product, for example, 22.9 centimeter (9 inch) refractory bricks usually require 50 to 100 hours of firing. Maximum temperatures of about 1090°C (2000°F) are used in firing common brick.

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8.3.2 Emissions And Controls[1,3]

Particulate matter is the primary emission in the manufacture of bricks. The main source of dust is the materials handling procedure, which includes drying, grinding, screening and storing the raw material. Combustion products are emitted from the fuel consumed in the dryer and the kiln. Fluorides, largely in gaseous form, are also emitted from brick manufacturing operations. Sulfur dioxide may be emitted from the bricks when temperatures reach or exceed 1370°C (2500°F), but no data on such emissions are available.[4]

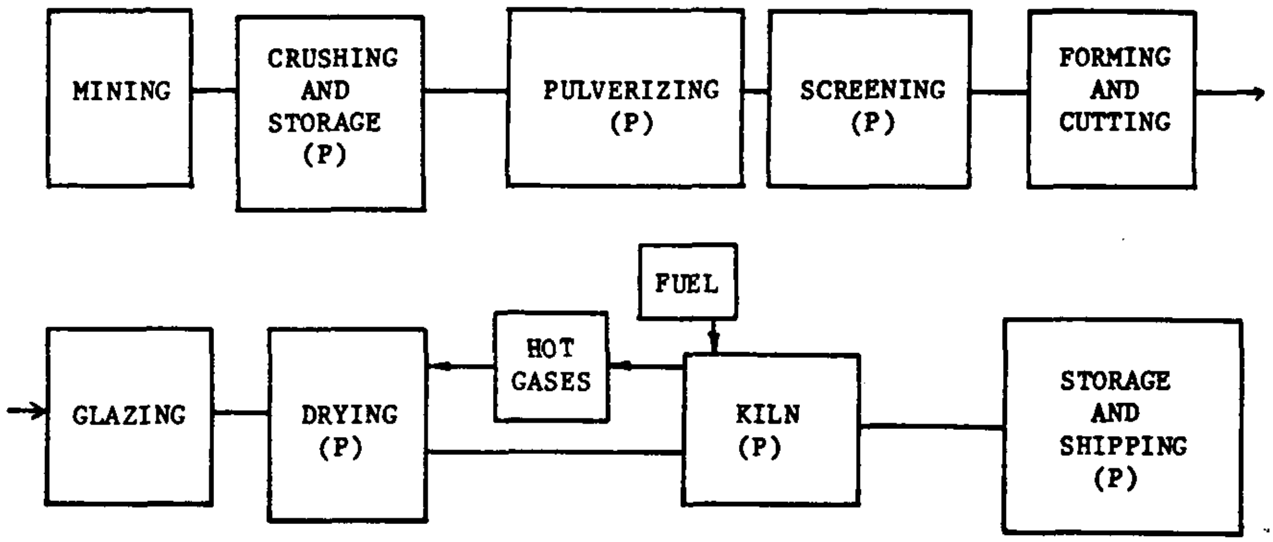

Figure 8.3-1. Basic flow diagram of brick manufacturing process. (P = a major source of particulate emissions)

A variety of control systems may be used to reduce both particulate and gaseous emissions. Almost any type of particulate control system will reduce emissions from the material handling process, but good plant design and hooding are also required to keep emissions to an acceptable level.

The emissions of fluorides can be reduced by operating the kiln at temperatures below 1090°C (2000°F) and by choosing clays with low fluoride content. Satisfactory control can be achieved by scrubbing kiln gases with water, since wet cyclonic scrubbers can remove fluorides with an efficiency of 95 percent or higher.

Table 8.3-1 presents emission factors for brick manufacturing without controls. Table 8.3-2 presents data on particle size distribution and emission factors for uncontrolled sawdust fired brick kilns. Table 8.3-3 presents data on particle size distribution and emission factors for uncontrolled coal fired tunnel brick kilns.

TABLE 8.3-2. PARTICLE SIZE DISTRIBUTION AND EMISSION FACTORS FOR UNCONTROLLED SAWDUST FIRED BRICK KILNS[a]

EMISSION FACTOR RATING: E

Aerodynamic particle diameter (μm)	Cumulative weight % ≤ stated size	Emission factor[b] (kg/Mg)
2.5	36.5	0.044
6.0	63.0	0.076
10.0	82.5	0.099
	Total particulate emission factor	0.12[c]

[a]Reference 13.
[b]Expressed as cumulative weight of particulate ≤ corresponding particle size/unit weight of brick produced.
[c]Total mass emission factor from Table 8.3-1.

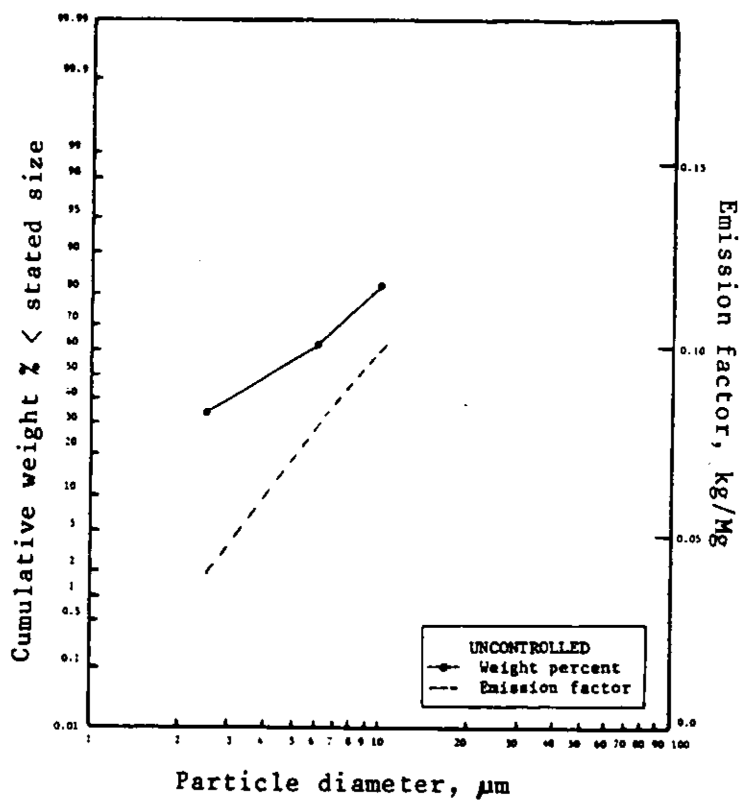

Figure 8.3-2. Cumulative weight percent of particles less than stated particle diameters for uncontrolled sawdust fired brick kilns.

TABLE 8.3-1. EMISSION FACTORS FOR BRICK MANUFACTURING WITHOUT CONTROLS[a]

EMISSION FACTOR RATING: C

	Particulates		Sulfur oxides		Carbon monoxide		Volatile Organic Compounds: Nonmethane		Volatile Organic Compounds: Methane		Nitrogen oxides		Fluorides[b]	
Process	kg/Mg	lb/ton	kg/Mg	lb/ton	kg/Mg	lb/ton	kg/Mg	lb/ton	kg/Mg	lb/ton	kg/Mg	lb/ton	kg/Mg	lb/ton
Raw material handling[c]														
Drying	35	70	-	-	-	-	-	-	-	-	-	-	-	-
Grinding	38	76	-	-	-	-	-	-	-	-	-	-	-	-
Storage	17	34	-	-	-	-	-	-	-	-	-	-	-	-
Brick dryer[d]														
Coal/gas fired	0.006A	0.012A	0.55S	1.10S	-	-	-	-	-	-	0.33	0.66	-	-
Curing and firing[e]														
Tunnel kiln														
Gas fired	0.012	0.023	Neg	Neg	0.03	0.06	0.0015	0.003	0.003	0.006	0.09	0.18	0.5	1.0
Oil fired	0.29	0.59	1.98S	3.95S	0.06	0.12	0.0035	0.007	0.013	0.025	0.525	1.05	0.5	1.0
Coal fired	0.34A	0.67A	3.65S	7.31S	0.71	1.43	0.005	0.01	0.003	0.006	0.73	1.45	0.5	1.0
Coal/gas fired	0.16A	0.31A	0.31S	0.62S	-	-	-	-	-	-	0.81	1.61	-	-
Sawdust fired	0.12	0.24	-	-	-	-	-	-	-	-	-	-	-	-
Periodic kiln														
Gas fired	0.033	0.065	Neg	Neg	0.075	0.15	0.005	0.01	0.01	0.02	0.25	0.50	0.5	1.0
Oil fired	0.44	0.88	2.93S	5.86S	0.095	0.19	0.005	0.01	0.02	0.04	0.81	1.62	0.5	1.0
Coal fired	9.42	18.84	6.06S	12.13S	1.19	2.39	0.01	0.02	0.005	0.01	1.18	2.35	0.5	1.0

[a]Expressed as units per unit weight of brick produced. One brick weighs about 2.95 kg (6.5 pounds). Dash = No data. A = % ash in coal. S = % sulfur in fuel. Neg = negligible.

[b]References 3, 6-10.

[c]Based on data from Section 8.7 on Ceramic Clay Manufacturing in this publication. Because of process variation some steps may be omitted. Storage losses apply only to that quantity of material stored.

[d]Reference 12.

[e]References 1, 5, 12-16.

TABLE 8.3-4. PARTICLE SIZE DISTRIBUTION AND EMISSION FACTORS FOR UNCONTROLLED SCREENING AND GRINDING OF RAW MATERIALS FOR BRICKS AND RELATED CLAY PRODUCTS[a]

EMISSION FACTOR RATING: E

Aerodynamic particle diameter (μm)	Cumulative weight % ≤ stated size	Emission factor[b] (kg/Mg)
2.5	0.2	0.08
6.0	0.4	0.15
10.0	7.0	2.66
	Total particulate emission factor 38[c]	

[a]References 11, 18.
[b]Expressed as cumulative weight of particulate ≤ corresponding particle size/unit weight of raw material processed.
[c]Total mass emission factor from Table 8.3-1.

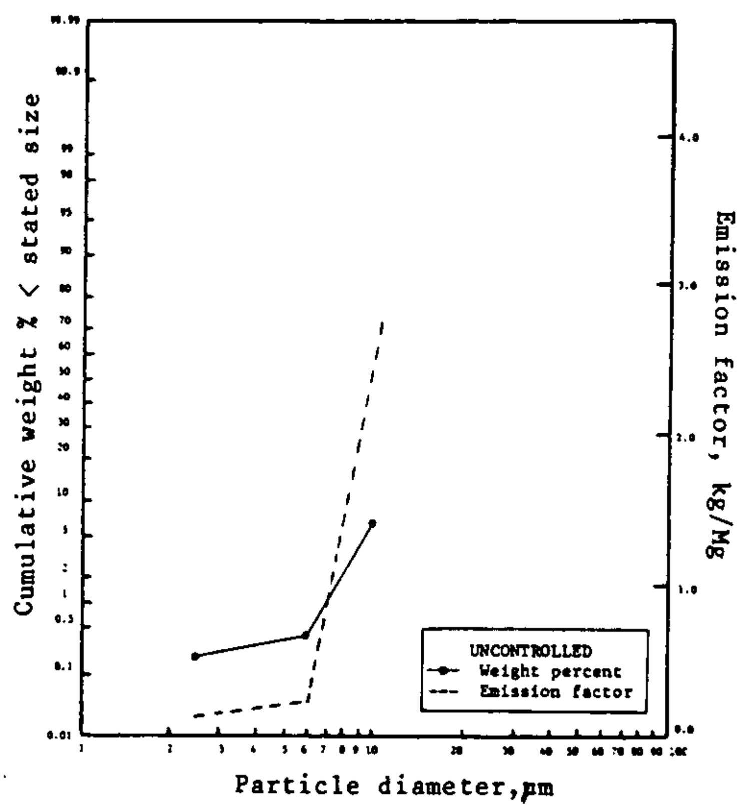

Figure 8.3-4. Cumulative weight percent of particles less than stated particle diameters for uncontrolled screening and grinding of raw materials for bricks and related clay products.

TABLE 8.3-3. PARTICLE SIZE DISTRIBUTION AND EMISSION FACTORS FOR UNCONTROLLED COAL FIRED TUNNEL BRICK KILNS[a]

EMISSION FACTOR RATING: E

Aerodynamic particle diameter (μm)	Cumulative weight % ≤ stated size	Emission factor[b] (kg/Mg)
2.5	24.7	0.08A
6.0	50.4	0.17A
10.0	71.0	0.24A
	Total particulate emission factor	0.34A[c]

[a]References 12, 17.
[b]Expressed as cumulative weight of particulate ≤ corresponding particle size/unit weight of brick produced. A = % ash in coal. (Use 10% if ash content is not known).
[c]Total mass emission factor from Table 8.3-1.

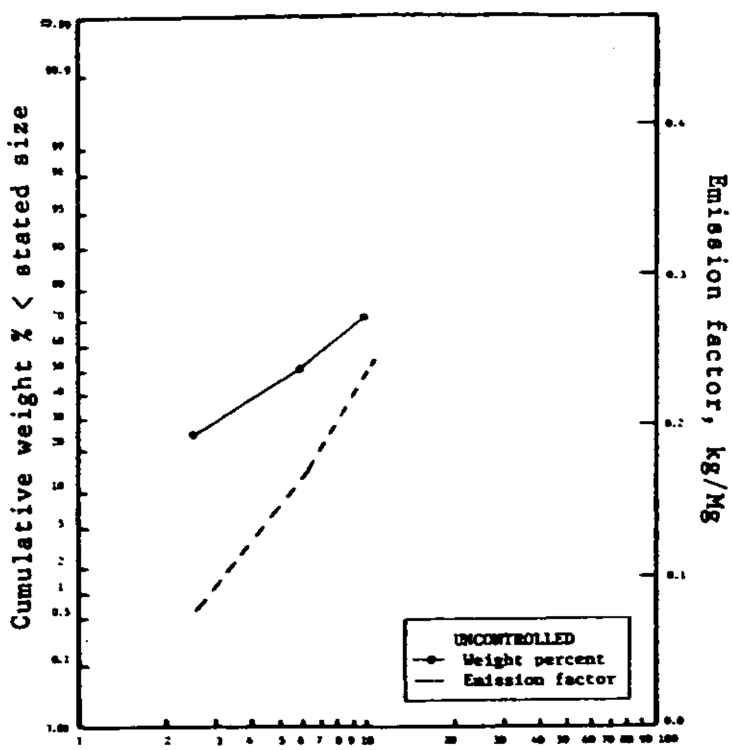

Figure 8.3-3. Cumulative weight percent of particles less than stated particle diameters for uncontrolled coal fired tunnel brick kilns

References for Section 8.3

1. Air Pollutant Emission Factors, APTD-0923, U. S. Environmental Protection Agency, Research Triangle Park, NC, April 1970.

2. "Technical Notes on Brick and Tile Construction", Pamphlet No. 9, Structural Clay Products Institute, Washington, DC, September 1961.

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10. Notes on oral communication between Resources Research, Inc., Reston, VA and New Jersey Air Pollution Control Agency, Trenton, NJ, July 20, 1969.

11. H. J. Taback, Fine Particle Emissions from Stationary and Miscellaneous Sources in the South Coast Air Basin, PB 293 923/AS, National Technical Information Service, Springfield, VA, February 1979.

12. Building Brick and Structural Clay Industry - Lee Brick and Tile Co., Sanford, NC, EMB 80-BRK-1, U. S. Environmental Protection Agency, Research Triangle Park, NC, April 1980.

13. Building Brick and Structural Clay Wood Fired Brick Kiln - Emission Test Report - Chatham Brick and Tile Company, Gulf, North Carolina, EMB-80-BRK-5, U. S. Environmental Protection Agency, Research Triangle Park, NC, October 1980.

14. R. N. Doster and D. J. Grove, Stationary Source Sampling Report: Lee Brick and Tile Co., Sanford, NC, Compliance Testing, Entropy Environmentalists, Inc., Research Triangle Park, NC, February 1978.

15. R. N. Doster and D. J. Grove, Stationary Source Sampling Report: Lee Brick and Tile Co., Sanford, NC, Compliance Testing, Entropy Environmentalists, Inc., Research Triangle Park, NC, June 1978.

16. F. J. Phoenix and D. J. Grove, Stationary Source Sampling Report - Chatham Brick and Tile Co., Sanford, NC, Particulate Emissions Compliance Testing, Entropy Environmentalists, Inc., Research Triangle Park, NC, July 1979.

17. Fine Particle Emissions Information System, Series Report No. 354, Office Of Air Quality Planning And Standards, U. S. Environmental Protection Agency, Research Triangle Park, NC, June 1983.

Enclosure 2

TEST REPORTS AVAILABLE FOR USE IN DEVELOPING EMISSION FACTORS

Plant	Location and date	Fuel	Pollutants
Lee Brick and Tile Co.	Sanford, NC Apr. 1980	Coal	Kiln--PM, SO_2, NO_X, Particle size
Chatham Brick and Tile Co.	Gulf, NC Oct. 1980	Sawdust	Kiln--CO_2, Particle size
Lee Brick and Tile Co.	Sanford, NC Feb. 1978	Coal	Kiln--PM
Lee Brick and Tile Co.	Sanford, NC June 1978	Coal	Kiln--PM
Chatham Brick and Tile Co.	Sanford, NC July 1979	?	Kiln--PM
General Shale	Atlanta, Ga Mar. 9, 1993	Coal	Kiln--SO_2, NO_X, CO, THC, CO_2 Dryer--SO_2, NO_X, CO, THC, CO_2
General Shale	Glascow, Va Oct. 16, 1990	Coal	Kiln--Filt. PM, CO_2
General Shale	Kingsport, TN Oct. 11, 1983	Coal	Kiln--Filt. PM, CO_2
General Shale	Johnson City Feb. 7-9, 1984	Coal	Kiln--Filt. PM, CO_2, Particle sizing
General Shale	Kingsport, TN July 21, 1982	Coal	Kiln--Filt. PM, CO_2 Coal crusher--Filt. PM
General Shale	Knoxville, TN Apr. 22, 1986	Coal	Kiln--Filt. PM, CO_2
General Shale	Marion, VA Oct. 17-19,1990	Coal and supplemental gas	2 Kilns--Filt. PM, CO_2
General Shale	Mooresville, IN Dec. 2, 1986	Coal	Kiln/dryer--SO_2
Belden Brick	Sugarcreek, OH Mar. 3, 1992	Natural gas	Kiln--Filt. PM, SO_2, NO_X, CO_2
Belden Brick	Sugarcreek, OH July 21, 1989	Natural gas	Kiln--Filt. PM, SO_2, NO_X, CO_2
Acme Brick	Sealy, TX	Natural gas	Kiln--Filt. PM, HF, SO_2 Dryer--SO_2
Pine Hall Brick--EPA test	Madison, NC Oct.-Nov., 1992	Sawdust	Grinding room--Filt. PM, PM-10 Sawdust dryer--Filt. PM, Cond. PM, PM-10, SO_2, NO_X, CO, THC, methane, ethane, CO_2, HF/HCL, volatiles, semi-volatiles, metals Kiln--Filt. PM, Cond. PM, PM-10, SO_2, NO_X, CO, THC, methane, ethane, CO_2, HF/HCL, volatiles, semi-volatiles, metals
General Shale--EPA test	Johnson City, TN July 26-31,1993	Coal and supplemental gas	Grinding room--Filt. PM, PM-10 Brick dryer--THC Kiln--Filt. PM, Cond. PM, PM-10, SO_2, NO_X, CO, THC, methane, ethane, CO_2, HF/HCL, volatiles, semi-volatiles, metals
Belden Brick--EPA test	Sugarcreek, OH Nov. 8-12, 1993	Natural gas	Grinding room--Filt. PM, PM-10 Brick dryer--THC, methane, ethane Kiln--Filt. PM, Cond. PM, PM-10, SO_2, NO_X, CO, THC, CO_2, HF/HCL, volatiles, semi-volatiles, metals