CROSS/TESSITORE & ASSOCIATES, P.A.
4763 S. CONWAY ROAD, SUITE F
ORLANDO, FLORIDA 32812
407/851-1484

October 2, 1990

Mr. C. H. Fancy, P.E.
Chief
Bureau of Air Regulation
Florida Department of Environmental Regulation
Twin Towers Office Bldg.
2600 Blair Stone Road
Tallahassee, FL 32399

Subject: Florida Mining and Materials No. 2 Kiln
C/TA # F03.178

Dear Mr. Fancy:

Please find enclosed four (4) copies of the Application to Amend Air Pollution Source Permit (AC 27-173474) for waste fuel utilization for Florida Mining and Materials No. 2 Kiln. Also enclosed is the required permit fee of $200.00.

Please do not hesitate to contract me should you have any questions.

Sincerely,

Joseph L. Tessitore

Joseph L. Tessitore, P.E.
Vice President

Jl
E
c
C

Copies sent to -
Bruce
EPA
NPS
District
Satish
John Glunn
Kathy Liles

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REGISTERED PROFESSIONAL ENGINEERS

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Date 10/02/90

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Company: CROSS-TESSITORE & ASSOCIATES
Department/Floor No.:
Street Address: 4763 S CONWAY RD STE F
City: ORLANDO
State: FL
ZIP Required: 32812

2 To (Recipient's Name) Please Print: C. H. FANCY
Recipient's Phone Number (Very Important): (904) 488 1344
Company: FDER
TWIN TOWERS OFFICE BUILDING
Department/Floor No.:
Exact Street Address (We Cannot Deliver to P.O. Boxes or P.O. Zip® Codes.): 2600 BLAIR STONE ROAD
City: TALLAHASSEE,
State: FL
ZIP Required: 32399-2400

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Declared Value Charge	
Other 1	
Other 2	
Total Charges	

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041

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CROSS/TESSITORE & ASSOCIATES, P.A.
4763 S. CONWAY ROAD, SUITE F
ORLANDO, FLORIDA 32812
407/851-1484

October 2, 1990

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Joseph L. Tessitore

Joseph L. Tessitore, P.E.
Vice President

JLT/kp
Encl: a/s
cc: B. Coleman
C5492.Doc

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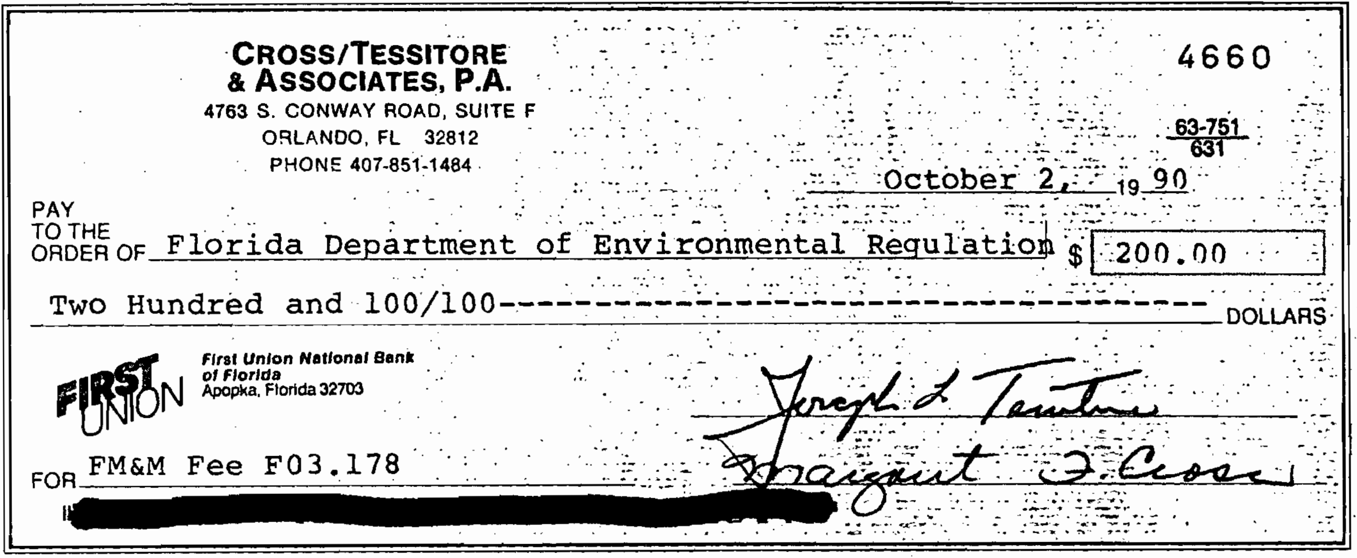

CROSS/TESSITORE
& ASSOCIATES, P.A.
4763 S. CONWAY ROAD, SUITE F
ORLANDO, FL 32812
PHONE 407-851-1484

4660

63-751
631

October 2, 19 90

PAY
TO THE
ORDER OF Florida Department of Environmental Regulation $ 200.00

Two Hundred and 100/100------------------------------------- DOLLARS

FIRST UNION

First Union National Bank
of Florida
Apopka, Florida 32703

Joseph L. Tessitore

Margaret F. Cross

FOR FM&M Fee F03.178

[redacted]

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APPLICATION TO AMEND AIR POLLUTION SOURCE PERMIT FOR WASTE FUEL UTILIZATION

FLORIDA MINING AND MATERIALS NO. 2 KILN

October 2, 1990

CROSS/TESSITORE & ASSOCIATES, P.A.

REGISTERED PROFESSIONAL ENGINEERS

ENVIRONMENTAL ENGINEERS

4763 SOUTH CONWAY ROAD
ORLANDO, FLORIDA 32812

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AC 27-187498
PSD-FL-124

$200pd.
10-3-90
Recpt# 151180

Florida Department of Environmental Regulation
Twin Towers Office Bldg. • 2600 Blair Stone Road • Tallahassee, Florida 32399-2400

DER Form #	
Form Title	
Effective Date	
DER Application No.	
(Filled in by DER)	

APPLICATION TO OPERATE/CONSTRUCT AIR POLLUTION SOURCES

SOURCE TYPE: Portland Cement Plant ☐ New[1] ☒ Existing[1]

APPLICATION TYPE: ☐ Construction ☐ Operation ☒ Modification

COMPANY NAME: Moore McCormack Resources, Inc. d/b/a Florida Mining & Materials COUNTY: Hernando

Identify the specific emission point source(s) addressed in this application (i.e. Lime Kiln No. 4 with Venturi Scrubber; Peaking Unit No. 2, Gas Fired) No. 2 Cement Kiln

SOURCE LOCATION: Street U.S. Highway 98 City NW of Brooksville

UTM: East 17-356 North 3169

Latitude 28 ° 38 ' 34 "N Longitude 82 ° 28 ' 25 "W

APPLICANT NAME AND TITLE: C. M. Coleman Jr., Vice President and General Manager

APPLICANT ADDRESS: P.O. Box 6, Brooksville, Florida 34605-0006

SECTION I: STATEMENTS BY APPLICANT AND ENGINEER

A. APPLICANT

I am the undersigned owner or authorized representative* of Moore McCormack Resources Inc. d/b/a Florida Mining & Materials

I certify that the statements made in this application for a modification permit are true, correct and complete to the best of my knowledge and belief. Further, I agree to maintain and operate the pollution control source and pollution control facilities in such a manner as to comply with the provision of Chapter 403, Florida Statutes, and all the rules and regulations of the department and revisions thereof. I also understand that a permit, if granted by the department, will be non-transferable and I will promptly notify the department upon sale or legal transfer of the permitted establishment.

*Attach letter of authorization

Signed: ____________________

C. M. Coleman Jr., Vice President & General Manager
Name and Title (Please Type)

Date: 9/26/90 Telephone No. 904-796-7241

B. PROFESSIONAL ENGINEER REGISTERED IN FLORIDA (where required by Chapter 471, F.S.)

This is to certify that the engineering features of this pollution control project have been designed/examined by me and found to be in conformity with modern engineering principles applicable to the treatment and disposal of pollutants characterized in the permit application. There is reasonable assurance, in my professional judgment, that

---

[1] See Florida Administrative Code Rule 17-2.100(57) and (104)

DER Form 17-1.202(1)
Effective October 31, 1982

Northwest District
160 Governmental Center
Pensacola, Florida 32501-5794
904-436-8300

Northeast District
3426 Bills Rd.
Jacksonville, Florida 32207
904-798-4200

Central District
3319 Maguire Blvd., Suite 232
Orlando, Florida 32803-3767
407-894-7555

Southwest District
4520 Oak Fair Blvd.
Tampa, Florida 33610-7347
813-623-5561

South District
2269 Bay St.
Fort Myers, Florida 33901-2896
813-332-2667

Southeast District
1900 S Congress Ave., Suite A
West Palm Beach, Florida 33406
407-964-9668

BEST AVAILABLE COPY

the pollution control facilities, when properly maintained and operated, will discharge an effluent that complies with all applicable statutes of the State of Florida and the rules and regulations of the department. It is also agreed that the undersigned will furnish, if authorized by the owner, the applicant a set of instructions for the proper maintenance and operation of the pollution control facilities and, if applicable, pollution sources.

Signed Joseph L. Tessitore

Joseph L. Tessitore, P.E.
Name (Please Type)

Cross/Tessitore & Associates, P.A.
Company Name (Please Type)

4763 S. Conway Rd., Ste. F, Orlando, Florida 32812
Mailing Address (Please Type)

Florida Registration No. 23374 Date: 10/2/91 Telephone No. (407)851-1484

SECTION II: GENERAL PROJECT INFORMATION

A. Describe the nature and extent of the project. Refer to pollution control equipment, and expected improvements in source performance as a result of installation. State whether the project will result in full compliance. Attach additional sheet if necessary.

See Supplemental Information: Section II

. Schedule of project covered in this application (Construction Permit Application Only)

Start of Construction N/A Completion of Construction N/A

. Costs of pollution control system(s): (Note: Show breakdown of estimated costs only for individual components/units of the project serving pollution control purposes. Information on actual costs shall be furnished with the application for operation permit.) The following information represents the initial costs associated with the existin baghouse system. No additional air pollution control equipment will be required for the subject modification.

Baghouse Equipment	$2,825,000.00
Erection	$2,800,000.00
Total	5,625,000.00

D. Indicate any previous DER permits, orders and notices associated with the emission point, including permit issuance and expiration dates.

See Supplemental Information: Section II

8,200 hrs/yr

Requested permitted equipment operating time: hrs/day -- ; days/wk -- ; wks/yr -- ;

if power plant, hrs/yr_____; if seasonal, describe:____________________

If this is a new source or major modification, answer the following questions. (Yes or No)

1. Is this source in a non-attainment area for a particular pollutant? No

   a. If yes, has "offset" been applied? _____

   b. If yes, has "Lowest Achievable Emission Rate" been applied? _____

   c. If yes, list non-attainment pollutants. _____

2. Does best available control technology (BACT) apply to this source? If yes, see Section VI. Yes[1]

3. Does the State "Prevention of Significant Deterioriation" (PSD) requirement apply to this source? If yes, see Sections VI and VII. Yes[2]

4. Do "Standards of Performance for New Stationary Sources" (NSPS) apply to this source? Yes

5. Do "National Emission Standards for Hazardous Air Pollutants" (NESHAP) apply to this source? No

Do "Reasonably Available Control Technology" (RACT) requirements apply to this source? No

   a. If yes, for what pollutants?_____

   b. If yes, in addition to the information required in this form, any information requested in Rule 17-2.650 must be submitted.

Attach all supportive information related to any answer of "Yes". Attach any justification for any answer of "No" that might be considered questionable.

---

[1] BACT has been determined for particulate emissions under the previous Permit AC 27-30450; BACT has been determined for Sulfur Dioxide and Nitrogen Dioxide (NO_x) under the previous Permit AC 27-138850. No BACT review was required for Carbon Monoxide and Volatile Organic Compound emissions.

[2] PSD review for particulate, Sulfur Dioxide and Nitrogen Dioxide (NO_x) was conducted under previous Permits AC 27-30450 and AC 27-138850 (PSD-FL-124).

SECTION III: AIR POLLUTION SOURCES & CONTROL DEVICES (Other than Incinerators)

A. Raw Materials and Chemicals Used in your Process, if applicable:

Description	Contaminants		Utilization Rate - lbs/hr	Relate to Flow Diagram
	Type	% Wt		
Limestone	Particulate	0.02	207,640	
Sand/Clay	Particulate	0.08	20,774	See Supplemental
Fly Ash	Particulate	0.14	26,182	Information: Section II
Staurolite	Particulate	1.40	2,704	
Mill Scale	Particulate	1.40	2,704	

B. Process Rate, if applicable: (See Section V, Item 1)

1. Total Process Input Rate (lbs/hr): 260,000

2. Product Weight (lbs/hr): 159,250

. Airborne Contaminants Emitted: (Information in this table must be submitted for each emission point, use additional sheets as necessary)

Name of Contaminant	Emission[1]		Allowed[2] Emission Rate per Rule 17-2	Allowable[3] Emission lbs/hr	Potential[4] Emission		Relate to Flow Diagram
	Maximum lbs/hr	Actual T/yr			lbs/yr	T/yr	
	See Supplemental		Information:	Section III			

[1] See Section V, Item 2.

[2] Reference applicable emission standards and units (e.g. Rule 17-2.600(5)(b)2. Table II, E. (1) - 0.1 pounds per million BTU heat input)

[3] Calculated from operating rate and applicable standard.

[4] Emission, if source operated without control (See Section V, Item 3).

. Control Devices: (See Section V, Item 4)

Name and Type (Model & Serial No.)	Contaminant	Efficiency	Range of Particles Size Collected (in microns) (If applicable)	Basis for Efficiency (Section V Item 5)
Fuller Reverse	Particulate	99.9	0-60	Testing
Air (Variable Cycle)				
Fabric Filter				

. Fuels

Type (Be Specific)	Consumption*		Maximum Heat Input (MMBTU/hr)
	avg/hr	max./hr	
See Supplemental Information: Section III			

*Units: Natural Gas--MMCF/hr; Fuel Oils--gallons/hr; Coal, wood, refuse, other--lbs/hr.

uel Analysis: See supplemental information: Section II

Percent Sulfur: ____________________ Percent Ash: ____________________

nsity: ____________________ lbs/gal Typical Percent Nitrogen: ____________________

Heat Capacity: ____________________ BTU/lb ____________________ BTU/gal

ther Fuel Contaminants (which may cause air pollution): ____________________

. If applicable, indicate the percent of fuel used for space heating.

nnual Average ____________________ Maximum ____________________

G. Indicate liquid or solid wastes generated and method of disposal.

Solids collected from the fabric filter during normal operation will be returned to the kiln feed and recycled through the system.

Emission Stack Geometry and Flow Characteristics (Provide data for each stack):

Stack Height: 90 ft. Stack Diameter: 14.0 ft.

s Flow Rate: 300,000 ACFM 199,000 DSCFM Gas Exit Temperature: ~ 380 °F.

Water Vapor Content: ~ 10 % Velocity: 24.87 FPS

SECTION IV: INCINERATOR INFORMATION

NOT APPLICABLE

Type of Waste	Type O (Plastics)	Type I (Rubbish)	Type II (Refuse)	Type III (Garbage)	Type IV (Patholog-ical)	Type V (Liq.& Gas By-prod.)	Type VI (Solid By-prod.)
Actual lb/hr Inciner-ated				NOT APPLICABLE			
Uncon-trolled lbs/hr)							

Description of Waste

Total Weight Incinerated (lbs/hr) Design Capacity (lbs/hr)

Approximate Number of Hours of Operation per day day/wk wks/yr.

Manufacturer

te Constructed Model No.

	Volume $(ft)^3$	Heat Release (BTU/hr)	Fuel		Temperature (°F)
			Type	BTU/hr	
rimary Chamber		NOT APPLICABLE			
Secondary Chamber					

ack Height: ft. Stack Diamter: Stack Temp.

Gas Flow Rate: ACFM DSCFM* Velocity: FPS

f 50 or more tons per day design capacity, submit the emissions rate in grains per standard cubic foot dry gas corrected to 50% excess air.

pe of pollution control device: [ ] Cyclone [ ] Wet Scrubber [ ] Afterburner

[ ] Other (specify)

rief description of operating characteristics of control devices:

NOT APPLICABLE

Ultimate disposal of any effluent other than that emitted from the stack (scrubber water, sh, etc.):

NOT APPLICABLE

NOTE: Items 2, 3, 4, 6, 7, 8, and 10 in Section V must be included where applicable.

SECTION V: SUPPLEMENTAL REQUIREMENTS

See Supplemental Information: Section V

ease provide the following supplements where required for this application.

1. Total process input rate and product weight -- show derivation [Rule 17-2.100(127)]

To a construction application, attach basis of emission estimate (e.g., design calculations, design drawings, pertinent manufacturer's test data, etc.) and attach proposed methods (e.g., FR Part 60 Methods 1, 2, 3, 4, 5) to show proof of compliance with applicable standards. To an operation application, attach test results or methods used to show proof of compliance. Information provided when applying for an operation permit from a construction permit shall be indicative of the time at which the test was made.

Attach basis of potential discharge (e.g., emission factor, that is, AP42 test).

4. With construction permit application, include design details for all air pollution control systems (e.g., for baghouse include cloth to air ratio; for scrubber include cross-section sketch, design pressure drop, etc.)

5. With construction permit application, attach derivation of control device(s) efficiency. Include test or design data. Items 2, 3 and 5 should be consistent: actual emissions = potential (1-efficiency).

6. An 8 1/2" x 11" flow diagram which will, without revealing trade secrets, identify the individual operations and/or processes. Indicate where raw materials enter, where solid and liquid waste exit, where gaseous emissions and/or airborne particles are evolved and where finished products are obtained.

7. An 8 1/2" x 11" plot plan showing the location of the establishment, and points of airborne emissions, in relation to the surrounding area, residences and other permanent structures and roadways (Example: Copy of relevant portion of USGS topographic map).

8. An 8 1/2" x 11" plot plan of facility showing the location of manufacturing processes and outlets for airborne emissions. Relate all flows to the flow diagram.

. The appropriate application fee in accordance with Rule 17-4.05. The check should be made payable to the Department of Environmental Regulation.

. With an application for operation permit, attach a Certificate of Completion of Construction indicating that the source was constructed as shown in the construction permit.

SECTION VI: BEST AVAILABLE CONTROL TECHNOLOGY

NOT APPLICABLE

BACT levels have been previously determined in Permit AC 27-138850 and previous Permit AC27-30450

Are standards of performance for new stationary sources pursuant to 40 C.F.R. Part 60 applicable to the source?

[ ] Yes [ ] No

Contaminant	Rate or Concentration

Has EPA declared the best available control technology for this class of sources (If yes, attach copy)

[ ] Yes [ ] No

Contaminant	Rate or Concentration

What emission levels do you propose as best available control technology?

Contaminant	Rate or Concentration

Describe the existing control and treatment technology (if any).

1. Control Device/System:
2. Operating Principles:
3. Efficiency:*
4. Capital Costs:

*Explain method of determining

5. Useful Life:

6. Operating Costs:

7. Energy:

8. Maintenance Cost:

9. Emissions:

Contaminant	Rate or Concentration

NOT APPLICABLE

10. Stack Parameters

a. Height: ft.

b. Diameter: ft.

c. Flow Rate: ACFM

d. Temperature: °F.

e. Velocity: FPS

E. Describe the control and treatment technology available (As many types as applicable, use additional pages if necessary).

1.

a. Control Device:

b. Operating Principles:

c. Efficiency:[1]

d. Capital Cost:

e. Useful Life:

f. Operating Cost:

g. Energy:[2]

h. Maintenance Cost:

i. Availability of construction materials and process chemicals:

j. Applicability to manufacturing processes:

k. Ability to construct with control device, install in available space, and operate within proposed levels:

2.

a. Control Device:

b. Operating Principles:

c. Efficiency:[1]

d. Capital Cost:

e. Useful Life:

f. Operating Cost:

g. Energy:[2]

h. Maintenance Cost:

i. Availability of construction materials and process chemicals:

---

xplain method of determining efficiency.
Energy to be reported in units of electrical power - KWH design rate.

NOT APPLICABLE

j. Applicability to manufacturing processes:

k. Ability to construct with control device, install in available space, and operate within proposed levels:

3.

a. Control Device: b. Operating Principles:

c. Efficiency:[1] d. Capital Cost:

e. Useful Life: f. Operating Cost:

g. Energy:[2] h. Maintenance Cost:

i. Availability of construction materials and process chemicals:

j. Applicability to manufacturing processes:

k. Ability to construct with control device, install in available space, and operate within proposed levels:

4.

a. Control Device: b. Operating Principles:

c. Efficiency:[1] d. Capital Costs:

e. Useful Life: f. Operating Cost:

g. Energy:[2] h. Maintenance Cost:

i. Availability of construction materials and process chemicals:

j. Applicability to manufacturing processes:

k. Ability to construct with control device, install in available space, and operate within proposed levels:

. Describe the control technology selected:

1. Control Device: 2. Efficiency:[1]

3. Capital Cost: 4. Useful Life:

5. Operating Cost: 6. Energy:[2]

7. Maintenance Cost: 8. Manufacturer:

9. Other locations where employed on similar processes:

a. (1) Company:

(2) Mailing Address:

(3) City: (4) State:

---

xplain method of determining efficiency.
nergy to be reported in units of electrical power - KWH design rate.

(5) Environmental Manager:

(6) Telephone No.:

(7) Emissions:[1]

Contaminant	Rate or Concentration

NOT APPLICABLE

(8) Process Rate:[1]

b. (1) Company:

(2) Mailing Address:

(3) City: (4) State:

(5) Environmental Manager:

(6) Telephone No.:

(7) Emissions:[1]

Contaminant	Rate or Concentration

NOT APPLICABLE

(8) Process Rate:[1]

10. Reason for selection and description of systems:

[1] Applicant must provide this information when available. Should this information not be available, applicant must state the reason(s) why.

SECTION VII - PREVENTION OF SIGNIFICANT DETERIORATION

Not Applicable NOT APPLICABLE

Company Monitored Data

1. ____________ no. sites ____________ TSP ____________ ( ) SO^2* ____________ Wind spd/dir

Period of Monitoring ______ / ______ / ______ to ______ / ______ / ______
month day year month day year

Other data recorded ____

Attach all data or statistical summaries to this application.

*Specify bubbler (B) or continuous (C).

NOT APPLICABLE

2. Instrumentation, Field and Laboratory

a. Was instrumentation EPA referenced or its equivalent? ☐ Yes ☐ No

b. Was instrumentation calibrated in accordance with Department procedures?

☐ Yes ☐ No ☐ Unknown

B. Meteorological Data Used for Air Quality Modeling

1. _____ Year(s) of data from ____/____/____ to ____/____/____
month day year month day year

2. Surface data obtained from (location)____________________

3. Upper air (mixing height) data obtained from (location)____________________

4. Stability wind rose (STAR) data obtained from (location)____________________

C. Computer Models Used

1. ____________________ Modified? If yes, attach description.

2. ____________________ Modified? If yes, attach description.

3. ____________________ Modified? If yes, attach description.

4. ____________________ Modified? If yes, attach description.

Attach copies of all final model runs showing input data, receptor locations, and principle output tables.

D. Applicants Maximum Allowable Emission Data

Pollutant	Emission Rate
TSP	____________________ grams/sec
SO^2	____________________ grams/sec

E. Emission Data Used in Modeling

Attach list of emission sources. Emission data required is source name, description of point source (on NEDS point number), UTM coordinates, stack data, allowable emissions, and normal operating time.

F. Attach all other information supportive to the PSD review.

G. Discuss the social and economic impact of the selected technology versus other applicable technologies (i.e., jobs, payroll, production, taxes, energy, etc.). Include assessment of the environmental impact of the sources.

H. Attach scientific, engineering, and technical material, reports, publications, journals, and other competent relevant information describing the theory and application of the requested best available control technology.

SUPPLEMENTAL INFORMATION: SECTION II

1. Project Description
2. Table II-1
   U.S. Kilns Burning Hazardous Waste Fuel
3. Table II-2
   Permitting and Compliance Activities

PROJECT DESCRIPTION

The subject of this Permit Application is the modification of Florida Mining and Materials' No. 2 Kiln (Source E-19). The proposed modification of this source will involve the addition of blended, hazardous waste fuel to supplement the coal currently utilized at the plant. This modification is requested to enable Florida Mining and Materials to reduce fuel costs and remain competitive in today's marketplace.

Estimated emissions relating to the current permit FDER No. AC27-173474 are detailed in the supporting information for Sections III and V of this application. No increase in emissions for currently limited compounds is expected as a result of this source modification. The baghouse currently operated with the No. 2 Kiln will remain as the air pollution control device, thus continuing to provide Best Available Control Technology as previously determined.

The blended fuel may be supplied in liquid or pre-packaged, non-pumpable form. A large number of cement and aggregate kilns throughout the United States are currently utilizing such fuels. Table II-1 provides a summary of these facilities.

The cement kiln system provides an excellent environment for utilization of waste fuels. Initially, thermal destruction of organic compounds is ensured by the available combustion conditions, including temperatures of at least 2800° F and retention times of up to four (4) seconds within the kiln itself. Turbulent gas flow is maintained throughout the kiln which further enhances the environment for thermal destruction. Further in the system, exhaust gases are exposed to a counter current flow of raw materials feed which consists largely of calcium carbonate. Thus conditions are present for effective neutralization of acid gases contained in the exhaust. The counter current flow includes a high concentration of particulate matter as well which provides substantial surface area for condensation of volatile metal species as well as any residual organic compounds. To complete the system, the fabric filter then provides for maximum removal of particulates from the gas stream. Each of these phases combine to make up an efficient industrial process which offers a perfect opportunity for use of waste fuel resources.

Information included in this permit application provides documentation of kiln performance while burning waste fuels at other cement plants across the nation as well as calculations and theoretical analyses characterizing FM&M's No. 2 Kiln. However, after a construction permit is issued a testing program would be conducted to demonstrate system performance and compliance with all applicable regulations.

TABLE II-1

U.S. KILNS BURNING HAZARDOUS WASTE FUEL

Company	Location(s)	Type of Kilns
Ash Grove Cement	*Foreman, AR *Chanute, KS *Louisville, NE	Cement
Continental Cement Co.	Hannibal, MO	Cement
Coplay Cement Co.	Logansport, IN	Cement
Dundee Cement Co.	Clarksville, MO Santee, SC	Cement
Environmental Conservation	Brooks, KY	Lightweight aggregate
Giant Cement Co.	Harleyville, SC	Cement
Gifford-Hill Cement Co.	Midlothian, TX	Cement
Keystone Cement Co.	Bath, PA	Cement
Lafarge Corp.	Demopolis, AL Fredonia, KS Alpena, MI Paulding, OH	Cement
Lone Star Industries Inc.	Greencastle, IN	Cement
Medusa Cement Co.	Wampum, PA	Cement
National Cement Co.	Lebec, CA	Cement
Norlite Corp.	Cohoes, NY	Lightweight aggregate
Oldover Corp. (Solite Corp.)	Green Cove Springs, FL Norwood, NC Avonia, VA	Lightweight aggregate
River Cement Co.	Festus, MO	Cement
Southdown, Inc.	Fairborn, OH Knoxville, TN Kosmosdale, KY	Cement
St. Marys Peerless	Detroit, MI	Cement
Texas Industries	Midlothian, TX	Cement

Note: Kilns marked with an (*) are burning non-pumpable HWF as well as liquids. All others are burning liquids only.

TABLE II-2

PERMITTING AND COMPLIANCE ACTIVITIES

Activity	Number	Issued	Expired
Construction Permit	AC27-30450	July 25, 1980	December 31, 1983
Operating Permit	AO27-65207	August 16, 1983	August 16, 1988
Consent Order	OGC-86-1471	January 23, 1987	-----
Consent Order	OGC-87-1685	September 1, 1988	-----
Construction Permit	AC27-138850	November 3, 1988	July 20, 1990
Construction Permit	AC27-173474	July 20, 1990	December 31, 1991

SUPPLEMENTAL INFORMATION: SECTION III

1. Table III-1
   Limited Emissions Summary
2. Table III-2
   Fuels Summary
3. Table III-3
   HWF Utilization Options
4. Table III-4
   Additional Fuels Data
5. Table III-5
   Specification for Hazardous Waste Fuels (HWF)

TABLE III-1

LIMITED EMISSIONS SUMMARY

Parameter	Proposed Allowable Emissions		Allowed Emission Rate Per Rule 17-2	Current Allowable Emissions lbs/hr	Potential Emissions		Relate to(1) Flow Diagram
	lbs/hr	T/yr			lbs/hr	T/yr	
Particulate	13.5	55.3	36 lb/hr (17-2.660)	13.5	13.5	55.3	E-19
Sulfur Dioxide	11.5	47.0	N/A(2)	11.5	11.5	47.0	E-19
Nitrogen Dioxide (NO_x)	162.3	665.3	N/A(2)	162.3	162.3	665.3	E-19
Volatile Organic Compounds	7.4	31.2	N/A(2)	7.4	7.4	31.2	E-19
Carbon Monoxide	64.0	262.2	N/A(2)	64.0	64.0	262.2	E-19
Opacity	10 %	--	20% (17-2.660)	10 %	10 %	--	E-19

(1) See Figure V-6.
(2) Allowable emissions for these compounds have been previously established as stated in existing Construction Permit AC 27-173474.

TABLE III-2

FUELS SUMMARY(1)

Type	Consumption (lb/hr)	Maximum Heat Input (Btu/hr)	Maximum Portion of Total Fuel Supply
Current:			
Coal	24,000 lb/hr	3.0×10^8	100 %
Flolite(2)	--	--	--
Proposed:			
Coal	24,000 lb/hr	3.0×10^8	100 %
Flolite(2)	--	--	--
Hazardous Waste Fuel	(3)	0.75×10^8	up to 25 %(3)

(1) The fuels listed in this table will be utilized in various combinations to achieve the total required heat input (3.0×10^8 Btu/hr maximum).

(2) Flolite will mainly be used during start-up of kiln operations and during periods when raw materials feed is stopped and kiln temperature must be maintained, and flolite is normally used only as a substitute for coal. In cases where flolite and coal are used concurrently, the maximum heat input rate will not exceed 3.0×10^8 Btu/hr.

(3) Hazardous waste fuel will be used in both liquid and non-pumpable forms. These two forms will be used in combination to provide up to 25% of the total fuel supply. Table II-3 provides a summary of the three upper boundary cases for combined utilization of liquid and non-pumpable HWF.

TABLE III-3

HWF UTILIZATION OPTIONS

	Consumption (lb/hr)	Consumption (gal/hr)	Heat Input (Btu/hr)	Portion of Total Heat Input (%)
CASE 1 (1)				
Liquid	0	0	0	0%
Non-pumpable	5133	--	0.26×10^8	9%
CASE 2 (2)				
Liquid	4000	500	0.40×10^8	13%
Non-pumpable	2567	--	0.13×10^8	4%
CASE 3 (3)				
Liquid	7503	938	0.75×10^8	25%
Non-pumpable	0	--	0	0%

NOTE: The usage rates for non-pumpable and liquid HWF were calculated by using the fuel specifications listed in Table III-5 and conducting mass balance analyses to achieve compliance with all applicable emission limits and ambient air quality standards. The three cases presented in this table define the range of acceptable fuel usage rates to ensure compliance with these criteria.

(1) Case 1 represents maximized use of non-pumpable HWF with no use of liquid HWF.

(2) Case 2 represents maximized use of both non-pumpable and liquid HWF when used concurrently.

(3) Case 3 represents maximized use of liquid HWF with no use of non-pumpable HWF.

TABLE III-4

ADDITIONAL FUELS DATA

	Heat Capacity		Sulfur Content[2]
Current:			
Coal	12,500	Btu/lb	1.0 %
Flolite[1]	145,000	Btu/gal	1.0 %
Proposed:			
Hazardous Waste Fuel			
Liquid	10,000	Btu/lb (Minimum)	1.0 %
Non-pumpable	5,000	Btu/lb (Minimum)	1.0 %

(1) Flolite will mainly be used during start-up of kiln operations and during periods when raw materials feed is stopped and kiln temperature must be maintained, and flolite is normally used only as a substitute for coal. In cases where flolite and coal are used concurrently, the maximum heat input rate will not exceed 3.0 x 10^8 Btu/hr.

(2) Values shown are approximate.

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TABLE III-5

SPECIFICATION FOR HAZARDOUS WASTE FUELS (HWF)

	Liquid	Non-pumpable
Heat Content, minimum	10,000 Btu per lb	5,000 Btu per lb
Sulfur, maximum	0.83 lb/mmBtu*	0.83 lb/mmBtu*
Halogens	5 percent	5 percent
Inorganic Acids and Bases	Extractable pH between 4.0 and 11.0	Extractable pH between 4.0 and 11.0
Metals, maximum each**		
Cadmium	250 ppm	500 ppm
Chromium	3,000 ppm	6,000 ppm
Lead	4,000 ppm	10,000 ppm
Barium	4,000 ppm	12,000 ppm
Mercury	5 ppm	7.5 ppm
Beryllium	8 ppm	10 ppm
PCB's	Less than 50 ppm	Less than 50 ppm

---

* Consistent with permit requirements for coal, as stated in current permit AC27-173474.

** Special Note: This application also provides specifications for additional metals, which may be contained in the blended HWF, as listed in the "Florida Air Toxics Permitting Strategy - Appendix A" and the EPA "Proposed Regulations for Boilers and Industrial Furnaces Burning Hazardous Waste" (54 FR 43718, October 26, 1989).

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SUPPLEMENTAL INFORMATION: SECTION V

1. Table V-1
   Process Data (Feed, Production, Heat Input Rates)
2. Emissions Calculations
   A. Limited Compounds
   B. Non-Limited Compounds
3. Figure V-1
   FM&M No. 2 Kiln Profile
4. Table V-2
   Thermal Destruction Calculations for Organic Compounds
5. Table V-3
   Summary of Performance Data for Cement Kilns Burning HWF
6. Table V-4
   Evaluation of Metals Emissions
7. Exhibit V-1
   VOST Results for Organics Other than POHC's
8. Table V-5
   PSD Regulated Emissions Summary
9. Figure V-2
   FM&M Kiln No. 2 Process Flow Diagram
10. Figure V-3
    USGS Topographical Map
11. Figure V-4
    FM&M Kilns No. 1 & 2 Plot Plan

TABLE V-1

PROCESS DATA

Kiln Feed Rate	130	T/hr
Clinker Production Rate	159,200	lb/hr
Maximum Heat Input	3.0×10^8	Btu/hr

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EMISSIONS CALCULATIONS

(COMPOUNDS CURRENTLY LIMITED BY PERMIT AC27-173474)

1. PARTICULATE

The proposed allowable emissions rate for particulate is the same as the currently permitted level. In order to determine the efficiency of the air pollution control device, the potential emission loading to the baghouse is calculated based on an emissions factor from the EPA Guidance Document AP-42, Table 8.6-1.

Calculation of Allowable Emissions:

Allowable Emissions = 13.5 lb/hr (Permit AC27-173474)

= 55.3 T/yr (Permit AC27-173474)

Calculation of Potential Emissions:

Potential Emissions = 13.5 lb/hr

= 55.35 T/yr

Calculation of Control Device Removal Efficiency:

Uncontrolled Emissions Factor = 245.0 lb/ton clinker

Production Rate = 79.6 T/hr clinker

Potential Emission Loading to Baghouse = (245 lb/ton) x (79.6 T/hr)

= 19,502.0 lb/hr

Control Device Removal Efficiency = (19,502 lb/hr - 13.5 lb/hr) ÷ (19,502 lb/hr)

= 99.9%

2. SULFUR DIOXIDE

The proposed allowable emissions rate for Sulfur Dioxide is the same as the current permitted level. Sulfur Dioxide is generated in the cement kiln from two sources: 1) The minerals present in the raw process feed, and 2) The combustion of fuel. Uncontrolled emissions factors for Sulfur Dioxide, found in the EPA Guidance Document AP-42, are used in calculating the potential loading to the fabric filter from each source. Control of sulfur dioxide is accomplished by the scrubbing effect of the caustic environment throughout the kiln system and subsequent removal in the fabric filter.

Calculation of Allowable Emissions:

Allowable Emissions = 11.5 lb/hr (Permit AC27-173474)

= 47.0 T/yr (Permit AC27-173474)

Calculation of Potential Emissions:

Potential Emissions = 11.5 lb/hr

= 47.0 T/yr

Calculation of System Removal Efficiency:

Mineral Source:

Sulfur Dioxide Emission Factor = 10.2 lb SO_2/ton clinker (from AP-42)

Clinker Production Rate = 79.6 T/hr

Potential Emissions Loading to the Fabric Filter = (79.6 tons clinker/hr) x (10.2 lb SO_2/ton clinker)

= 811.9 lb/hr

= (811.9 lb/hr x 8,200 hr/yr) ÷ (2,000 lb/ton)

= 3,328.8 T/yr

EMISSIONS CALCULATIONS

(COMPOUNDS CURRENTLY LIMITED BY PERMIT AC27-173474)
(continued)

Calculation of System Removal Efficiency:
(continued)

Fuel Source:

Maximum Fuel Consumption Rate = 300 mmBtu/hr

Maximum Fuel Sulfur Content = 0.83 lb/mmBtu

Conversion Factor = 2 lb SO_2/lb S

Potential Emissions Loading to the Fabric Filter
= (300 mmBtu fuel/hr)
x (0.83 lb sulfur/mmBtu fuel)
x (2 lb SO_2/lb S)
= 498 lb/hr SO_2
= (498 lb/hr x 8,200 hr/yr)
÷ (2,000 lb/ton)
= 2,041 T/yr SO_2

Total:

Estimated Total Potential Emissions Loading to the Fabric Filter
= 498 lb/hr + 811.9 lb/hr
= 1,310 lb/hr SO_2
= 3,329 T/yr + 2,042 T/yr
= 4,371 T/yr SO_2

System Removal Efficiency
= (1,310 lb/hr - 11.5 lb/hr)
÷ (1,310 lb/hr)
= 99.1%

EMISSIONS CALCULATIONS

(COMPOUNDS CURRENTLY LIMITED BY PERMIT AC27-173474)
(continued)

3. NITROGEN DIOXIDE (NO_x)

Nitrogen Dioxide (NO_x) emissions are a function of the kiln combustion process only. It is assumed that no control is provided by the fabric filter. The proposed allowable emissions are the same as the current permitted level.

Allowable Emissions	= 162.3 lb/hr NO_x (Permit AC27-173474)
	= 665.3 T/yr (Permit AC27-173474)
Potential Emissions	= 162.3 lb/hr
	= 665.3 T/yr
Control Device Removal Efficiency	= 0%

EMISSIONS CALCULATIONS

(COMPOUNDS CURRENTLY LIMITED BY PERMIT AC27-173474)
(continued)

4. CARBON MONOXIDE

Carbon Monoxide emissions are a function of the kiln combustion and process reactions only. It is assumed that no control is provided by the fabric filter. The proposed allowable emission rate is the same as the current permitted level.

Allowable Emissions	= 64.0 lb/hr (Permit AC27-173474)
	= 262.2 T/yr (Permit AC27-173474)
Estimated Potential Emissions	= 64.0 lb/hr
	= 262.2 T/yr
Control Device Removal Efficiency	= 0%

EMISSIONS CALCULATIONS

(COMPOUNDS CURRENTLY LIMITED BY PERMIT AC27-173474)
(continued)

5. VOLATILE ORGANIC COMPOUNDS (TOTAL HYDROCARBONS)

Control of volatile organic compounds (hydrocarbons) is achieved through properly maintained combustion conditions within the kiln system. The proposed allowable emissions rate is the same as the current permitted level.

Allowable Emissions	= 7.4 lb/hr (Permit AC27-173474)
	= 31.2 T/yr (Permit AC27-173474)
Potential Emissions	= 7.4 lb/hr
	= 31.2 T/yr
Control Device Removal Efficiency	= 0%

EMISSIONS CALCULATIONS

(ADDITIONAL REGULATED COMPOUNDS)

The preceding section provided emissions calculations for each of the five compounds currently limited by the specific conditions of permit AC27-173474. However, there are additional regulated and non-regulated compounds which are of interest when considering the use of waste fuels.

In addressing these compounds, three general categories of emissions should be considered: (1) Organic compounds, (2) Acid gases, and (3) Metal compounds. The removal or control of each category of emissions requires a different emission control strategy. The control of organic compounds requires "proper" combustion conditions and a high degree of particulate control. The control of acid gases requires a neutralizing scrubber, while the control of metals as particulates and/or fumes requires a high efficiency Venturi scrubber or fabric filter.

The No. 2 kiln system provides for each of these control strategies, therefore achieving an excellent environment for utilizing waste fuels. In addition to addressing each of the three aforementioned categories, the following provides a summary of emissions for each of the PSD regulated emissions not included in the five currently limited compounds.

1. ORGANIC COMPOUNDS

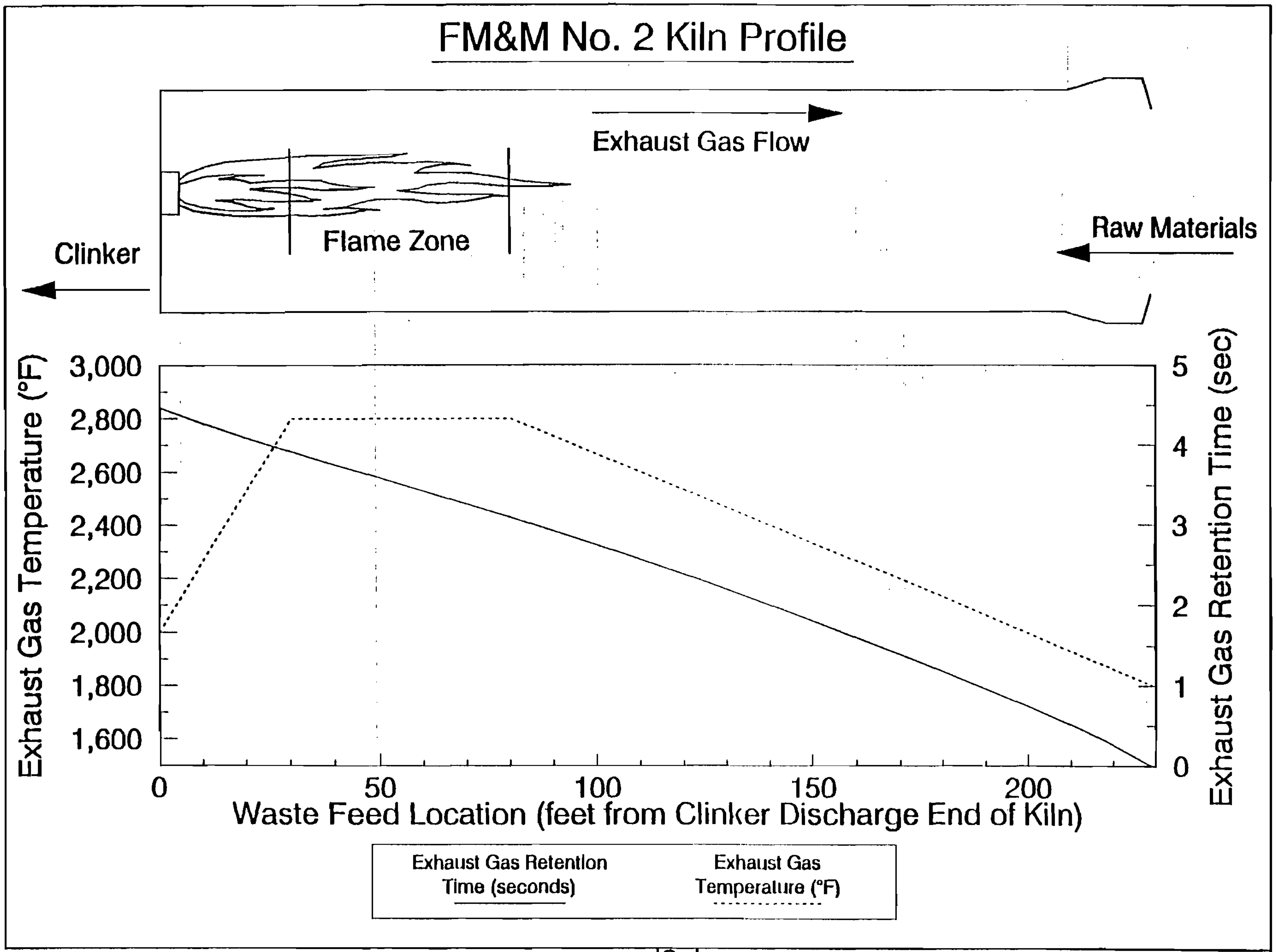
The thermal destruction of organic compounds occurs at temperatures of 2,000°F to 2,200°F with retention times of 1 to 2 seconds. The FM&M No. 2 kiln provides a thermal environment with an average temperature of 2422°F with a retention time of greater than 8 seconds This environment provides a high thermal destruction efficiency and minimizes the existence of organic compounds in the exhaust gases. Figure V-1 provides a temperature and retention time profile for No. 2 Kiln. Non-pumpable fuels will be introduced into the kiln at a point approximately 73 feet downstream from where the raw materials enter the kiln. In this region, the exhaust gas temperature is approximately 2,100°F, and the gas velocity is approximately 40 fps.

After they are injected into the kiln itself, the six gallon containers of non-pumpable fuels will move between 15 and 30 feet from the feed location (along with the kiln raw materials) before volatilization of organics begins, thereby increasing the exhaust gas residence time. At a minimum, exhaust gases generated from the combustion of non-pumpable fuels would be provided approximately 2 seconds residence time within the high temperature kiln environment. This factor, along with the turbulent characteristics of the process, provides optimum conditions for thermal destruction.

Liquid HWF, will be supplied through burners located adjacent to the existing coal burner in the kiln. From this location, exhaust gases are provided the maximum retention time of greater than 4 seconds with an average temperature of 2,422°F. As discussed previously in this application performance of the kiln system while burning each of the waste fuel types will be demonstrated during a trial burn. It is possible, however, to use theoretical methods in order to predict performance of the system given typical combustion conditions. The following analysis provides a calculation of the theoretical destruction efficiency for several organic compounds which are typical constituents of HWF.

The thermal destruction of organic compounds is complicated and may involve a series of decomposition, polymerization, and free radical reactions. Recent studies by the university of Dayton Research Institute and Union Carbide have shown that the most important organic destruction mechanisms are oxidation and thermolytic cracking, pyrolysis. These studies have

FIGURE V-1



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Environmental Engineers Orlando, Florida

resulted in the development of Thermal Destruction Profiles (TDP's) for numerous organic compounds under both oxidation and pyrolysis conditions.

A TDP is a graphical representation of the relationship between the percentage of a compound destroyed and temperature for a specific retention time.

From the TDP, a logarithmic plot of the quantity of a specific compound remaining as a function of temperature and retention time can be developed. The logarithmic plot can then be used to show what destruction efficiency will result from a proposed set of temperature and retention time conditions.

The logarithmic relationship between percent destruction and retention time at a given temperature, is defined by the following equations:

$$\ln (C_A/C_{AO}) = kt_r \qquad \textbf{EQUATION 1}$$

where:

C_A = the concentration of hazardous constituent A at time t_r

C_{AO} = the initial concentration of hazardous constituent A

k = the reaction rate constant

t_r = the time required to reach final concentration of C_A

The effect of temperature on the percent destruction achieved is included in Equation 1 as part of the rate constant k, where the rate constant is expressed by the Arrhenius Equation as follows:

$$k = -Ae^{(-E/RT)} \qquad \textbf{EQUATION 2}$$

where:

A = the Arrhenius pre-exponent frequency factor (S^{-1})

E = energy of activation (kcal/mole)

R = the Universal Gas Constant (1.987 cal/mol-°K)

T = the absolute temperature (°K)

Using Equation 1 and Equation 2 together to solve for C_A/C_{AO} yields the weight fraction remaining of a specific compound as a function of gas retention time within the combustion environment. Table V-2 provides a summary of the assumptions and results for this calculation as performed for benzene, toluene, xylene, carbon tetrachloride, 1,1,1-trichloroethane, and Freon 113. Benzene is ranked third among 320 compounds in order of thermal stability in EPA's Guidance on Setting Permit Conditions And Reporting Trial Burn Results; January, 1989. Results presented in Table V-2 are for gas retention times of 0.5 to 2 seconds. As stated previously, 2 seconds is the minimum retention time which would be provided for combustion of non-pumpable HWF. Fuels introduced at the clinker discharge end of the kiln would be provided a gas retention time in excess of 4 seconds as shown in Figure V-1. Table V-3 provides performance data in terms of destruction removal efficiencies for various cement kilns located across the country which are currently utilizing blended hazardous wastes as a supplemental fuel. Together, the data shown in Tables V-2 and V-3 show that the cement kiln system is highly effective at the destruction of organic compounds.

TABLE V-2

THERMAL DESTRUCTION CALCULATIONS FOR ORGANIC COMPOUNDS*

				Theoretical Thermal Destruction Efficiency at Specified Retention Times (Seconds)			
Compound	A (1/sec)	E (kcal/mole)	K	0.5	1.0	1.5	2.0
Benzene	2.80+08	38	-1814.227	>99.9999%	>99.9999%	>99.9999%	>99.9999%
Toluene	3.37E+16	72.7	-4419302	>99.9999%	>99.9999%	>99.9999%	>99.9999%
Xylene	4.20E+12	77.6	-106.6240	99.99%	99.99%	99.99%	99.99%
Carbon Tetrachloride	1.26E+11	50	-18769.00	>99.9999%	>99.9999%	>99.9999%	>99.9999%
1,1,1-Trichloroethane	1.90E+08	32	-8119.305	>99.9999%	>99.9999%	>99.9999%	>99.9999%
Freon 113	6.62E+14	69	-25101.6	>99.9999%	>99.9999%	>99.9999%	>99.9999%

*Based on: Kiln Mean Temperature = 2422 °F

R=1.987 Cal/mole °K

TABLE V-3

SUMMARY OF PERFORMANCE DATA FOR CEMENT KILNS BURNING HWF

LOCATION	DESTRUCTION REMOVAL EFFICIENCY (%)
Ash Grove Foreman Cement Company[1] Foreman, Arkansas	>99.9999 (*Trichlorobenzene*)
Ash Grove Cement Company[1] Louisville, Nebraska	>99.9999 (*1,1,1-Trichloroethane*)
Lone Star Industries[2] Oglesby, Illinois	>99.999 (*1,1,1-Trichloroethane*)
General Portland[2] Paulding, Ohio	>99.999 (*Freon 113*)
General Portland[2] Los Robles, California	>99.99 (*Methylene Chloride*)

(1) Data from source emissions survey report.

(2) Data from "Permit Writer's Guide to Test Burn Data" EPA/652/6-86/012.

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EMISSIONS CALCULATIONS

(ADDITIONAL REGULATED COMPOUNDS)
(continued)

2. ACID GASES

There is a potential for acid gases to form within the cement kiln, due to the presence of sulfur and chloride as constituents of both fuels and raw materials. Sulfur dioxide emissions are limited by current Permit AC27-173474 and have been previously addressed in this permit application.

Considerable focus has been placed on hydrogen chloride emissions because of the increasing use, throughout the cement industry, of hazardous waste fuels which may include chlorinated solvents. Substantial work has been conducted to properly characterize the emissions of hydrogen chloride emissions from cement kilns. In specific, a paper developed by Dr. Michael von Seebach and Mr. David Gossman entitled "Cement Kilns - Sources of Chlorides Not HCL Emissions" is included in Appendix V-1. The study documented in this paper shows that chlorine reacts within the kiln system to form chloride compounds, primarily sodium, potassium and calcium chlorides. It is extremely unlikely that HCl, which may form during the process, would survive the highly alkaline atmosphere in the kiln system.

3. METAL COMPOUNDS

The FM&M No. 2 kiln system includes a fabric filter control device which provides a particulate removal efficiency of 99.9%, as calculated previously and demonstrated through testing. This level of control minimizes the emissions of condensed particles and dust to comply with the current and proposed allowable emission rate for total particulate of 13.5 lb/hr. The majority of particulate emissions from the kiln system consist of cement dust or calcium carbonate. However, previous testing conducted by FM&M demonstrates that various metals are also emitted as particulate rather than in the gaseous phase, and are therefore controlled as well by the fabric filter. This testing was conducted in order to establish baselines emission rates for various metals resulting from the combustion of coal and process reactions involving raw materials. In addition, total input to the kiln system of each compound was measured in order to determine a system removal efficiency. Applying these results, Table V-4 provides an estimate of future potential emissions for several metals using the maximum concentrations included in the specification for HWF.

4. ADDITIONAL PSD REGULATED POLLUTANTS

In addition to the five currently limited compounds, the Prevention of Significant Deterioration (PSD) regulations define a significant net increase in emissions for ten additional pollutants. These are addressed as follows. Table V-5 provides a summary of emissions for each of the PSD regulated pollutants.

PM_{10}

Because the fabric filter provides an extremely high removal efficiency for total particulate, it can be assumed that controlled emissions are PM_{10}. It has been established previously that no increase in emissions is proposed for particulate. Therefore, no increase is expected for PM_{10}.

TABLE V-4

Evaluation of Metal Emissions

	Antimony	Barium	Lead	Mercury	Silver	Thallium	Arsenic	Cadmium	Chromium	Beryllium
Liquid HWF Concentration (ppm)	100	4000	4000	5	300	50	5	250	3000	8
Non-Pumpable HWF Concentration (ppm)	200	12000	10000	7.5	600	100	7.5	500	6000	10
Maximum HWF Input (ton/yr)	4.20933	252.56000	210.46667	0.16091	12.62800	2.10467	0.15785	10.52333	126.28000	0.23642
Maximum HWF Input (lb/hr)	1.02667	61.60000	51.33333	0.03925	3.08000	0.51333	0.03850	2.56667	30.80000	0.05766
Coal Concentration (ppm)	0.0	136.33333	1.7	0.0	0.0	0.0	5.8233333	0.0	16.533333	1.3333333
Coal Input (ton/yr)	0.0	12.26746	0.15297	0.00000	0.0	0.0	0.52399	0.0	1.48769	0.10810
Coal Input (lb/hr)	0.0	2.99206	0.03731	0.00000	0.0	0.0	0.12780	0.0	0.36285	0.02636
System Removal Efficiency	99.5993%	99.9868%	99.9162%	44.4000%	99.4185%	99.3077%	99.9899%	99.5459%	99.9690%	99.8126%
HWF Emissions (lb/hr)	0.00411	0.00813	0.04302	0.02182	0.01791	0.00355	0.00000	0.01166	0.00955	0.00011
HWF Emissions (lb/yr)	33.73360	66.67584	352.74213	178.93720	146.86364	29.14121	0.03189	95.57291	78.29360	0.88609
Coal Emissions (lb/hr)	0.0	0.00039	0.00003	0.00000	0.0	0.0	0.00001	0.0	0.00011	0.00005
Coal Emissions (lb/yr)	0.0	3.23861	0.25637	0.00000	0.0	0.0	0.10585	0.0	0.92237	0.40515
Estimated Potential Emissions (lb/hr)	0.00411	0.00853	0.04305	0.02182	0.01791	0.00355	0.00002	0.01166	0.00966	0.000157
Estimated Potential Emissions (lb/yr)	33.73360	69.91445	352.99851	178.93720	146.86364	29.14121	0.13773	95.57291	79.21597	1.29124
Estimated Potential Emissions (ton/yr)	0.01687	0.03496	0.17650	0.08947	0.07343	0.01457	0.00007	0.04779	0.03961	0.0006456

TABLE V-5

PSD REGULATED EMISSIONS SUMMARY

Compound	Current Actual Emissions (lb/hr)	Current Actual Emissions (T/yr)	Proposed Potential Emissions (lb/hr)	Proposed Potential Emissions (T/yr)	Net Emissions Increase (T/yr)	Significant* Emissions Increase (T/yr)
Carbon Monoxide	41.1	162.3	64.0	262.2	99.9	100
Nitrogen Dioxide (NO_x)	158.4	625.4	162.3	665.3	39.9	40
Sulfur Dioxide	1.8	7.1	11.5	47.0	39.9	40
Ozone (VOC)	5.4	21.3	7.4	31.2	9.9	40
Particulate	7.7	30.4	13.5	55.3	24.9	25
Lead	0.00003	0.00014	0.04305	0.17650	0.17636	0.6
Mercury	0.0	0.0	0.02182	0.08947	0.08947	0.1
Beryllium	0.00006	0.0002459	0.000157	0.0006456	0.0003997	0.0004

* From Table 500-2 DER 17-2.500 (2)(e)2

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TOTAL REDUCED SULFUR (including H_2S)

Total reduced sulfur emissions should not increase significantly due to the high kiln temperatures as well as the positive oxygen atmosphere.

REDUCED SULFUR COMPOUNDS (including H_2S)

Total reduced sulfur emissions should not increase significantly due to the high kiln temperatures as well as the positive oxygen atmosphere.

SULFURIC ACID MIST

Due to the high process temperatures and the alkalinity of the kiln feed, a significant level of sulfuric acid mist should not exist. The kiln feed acts as a dry scrubber in the preheater which neutralizes acidic compounds by formation of sulfate salts, i.e. solids, the emission of which is controlled by the baghouse.

FLUORIDES

The highly reactive alkaline atmosphere in the kiln system, specifically the highly reactive CaO, ensures that all F^- will form CaF_2. The emissions of these solids are controlled by the baghouse, consequently no change in emission of fluorides is expected when burning HWF.

VINYL CHLORIDE

The thermal destruction conditions existing in the kiln due to high temperatures, positive oxygen, and kiln residence time result in 99.99 % + destruction efficiency (DRE) of organic compounds. No significant increase in vinyl chloride emissions is expected. Also, vinyl chloride is not expected to be a constituent of HWF.

ASBESTOS

Asbestos is not expected to be constituent of HWF.

BENZENE

Benzene emissions will not be increased as a result of burning the supplemental fuels. Benzene is a minor component of the waste fuels and has a range of 0 - 1.00% by weight with average values of 0.05%. Benzene will be thermally destroyed in the consumption of fuel during cement manufacture. The calcination of cement requires the raw materials be heated to temperatures of 2700°F. In testing conducted on cement kilns by the U.S. EPA in 1983, it was confirmed that benzene emissions decreased from baseline due to hazardous waste fuel utilization. Table 8.7 of this report is provided in Exhibit V-1.

RADIONUCLIDES/RADON

Radionuclide emissions will not be increased as a result of burning hazardous waste derived fuels. Fuel blending facilities exclude radioactive waste materials from site blending operations. In addition radiation screening will be accomplished at FM&M for all incoming supplemental fuel loads.

TABLE 8-7. VOST RESULTS FOR ORGANICS OTHER THAN POHC's

Run #	Tetrachloroethylene (ng)	Tetrachloroethylene (mg/s)	Benzene (ng)	Benzene (mg/s)	Chloroform (ng)	Chloroform (mg/s)
Runs #1-#4*						
1-5[a]	510	1.0	28,400	55.7	44	0.086
2-2[a]	412	0.78	15,600	29.6	79	0.15
3-3[a]	496	0.91	13,300	24.4	35	0.064
4-2[a]	350	0.59	21,000	35.5	ND	ND
Runs #5-#7						
5-3	1,340	2.5	24,200	45.2	18	0.034
6-2	1,450	2.6	18,500	33.2	492	0.88
7-2	ND	ND	14,800	24.5	ND	ND
8-3	ND	ND	8,000	14.7	ND	ND
Run #9* **						
9-5	ND	ND	388,000	671	1,286	2.2
1-Blank[b]	ND	--	55	--	ND	--
5-Blank[b]	ND	--	64	--	42	--

[a] Baseline (coal only) tests. Other days are with waste fuel.
[b] Field blanks.

*Coal Baseline - Range = 13,300 to 28,400 Mean = 19,575 ng Benzene
**Coal and HWF - Range = 8,000 to 24,200 Mean = 16,375 ng Benzene
***Discounted - Coal rate was increased twice. Kiln exit oxygen dropped from 2.3 to 1 percent with THC at 32 ppm vs a 16 ppm daily average.

Extracted From: Evaluation of Waste Combustion in a Wet Process Kiln at General Portland, Inc., Paulding, OH - Robert B. Mournighan, February, 1985.

CFC's AND HALON

These types of compounds are minor components of fuel and can have a range of < 0.02 - 6.7%. These compounds will also be thermally destroyed in the cement kiln. The above referenced EPA test report showed no difference between the Freon - 113 compounds from baseline to burning with supplemental HWF. All values were below detection.

FIGURE V-2

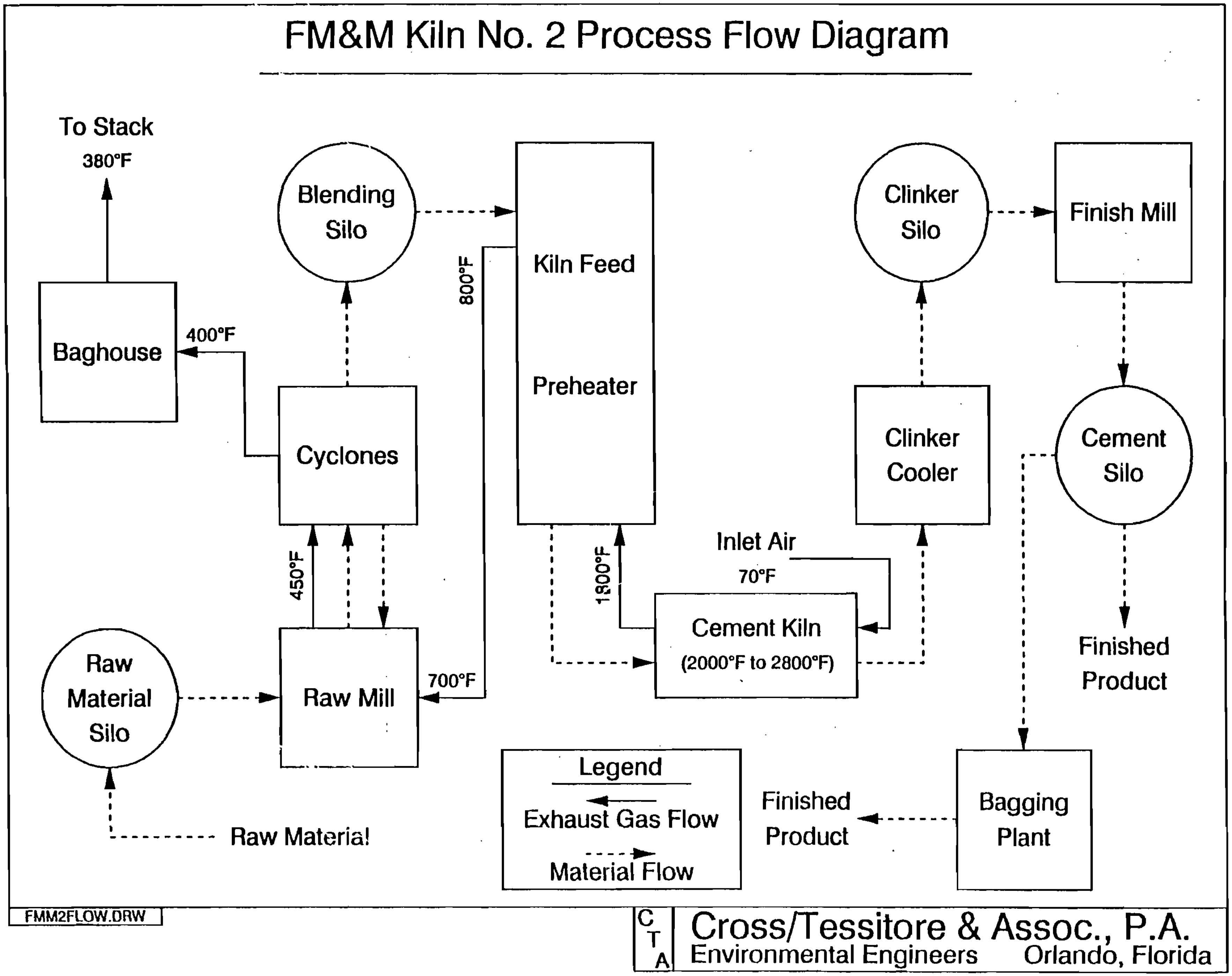
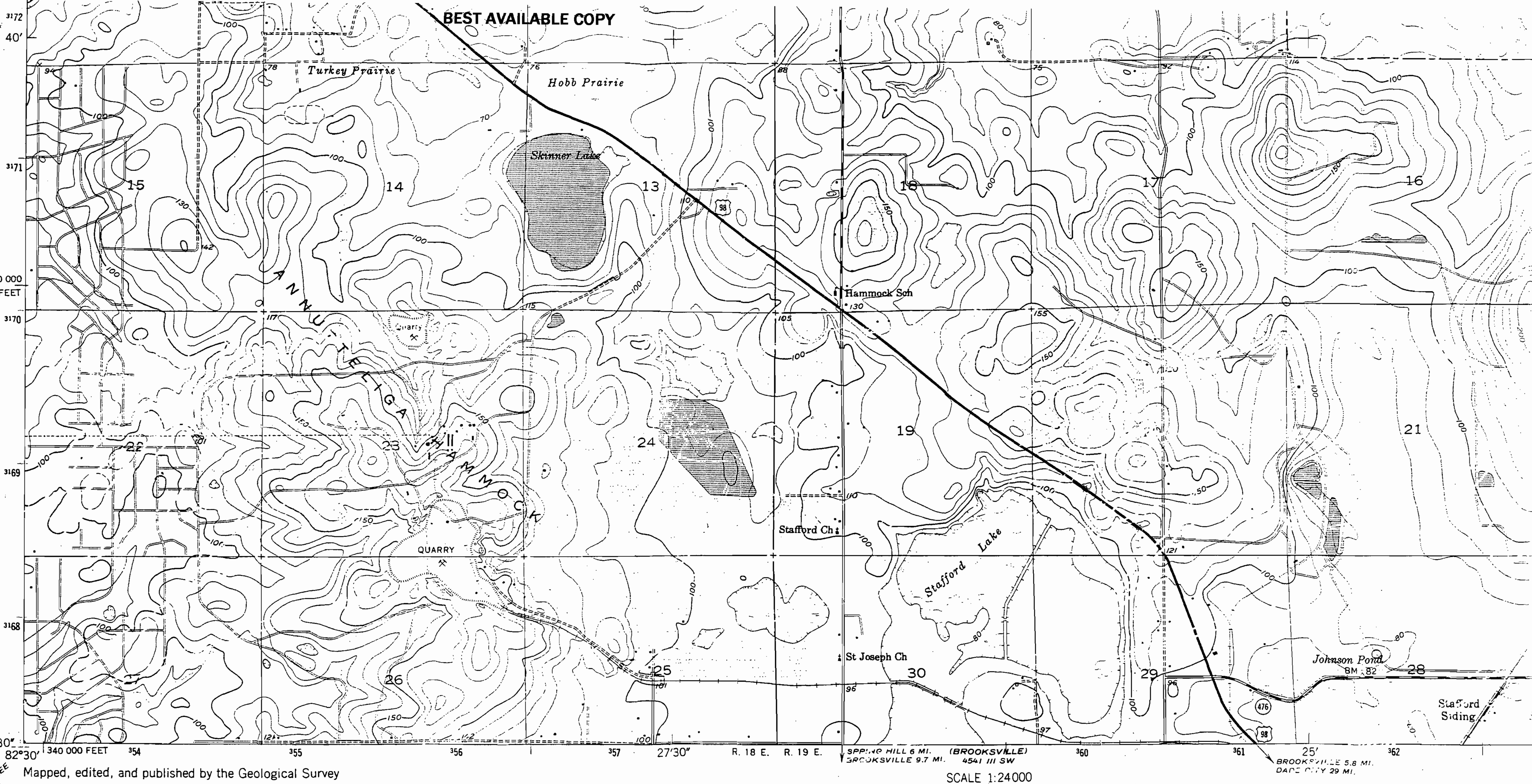

FM&M Kiln No. 2 Process Flow Diagram
To Stack
380°F
Baghouse
400°F
Blending Silo
Cyclones
450°F
Raw Material Silo
Raw Material
Raw Mill
700°F
800°F
Kiln Feed
Preheater
1900°F
Inlet Air
70°F
Cement Kiln
(2000°F to 2800°F)
Clinker Silo
Clinker Cooler
Finish Mill
Cement Silo
Finished Product
Bagging Plant
Finished Product
Legend
Exhaust Gas Flow
Material Flow
FMM2FLOW.DRW
CTA
Cross/Tessitore & Assoc., P.A.
Environmental Engineers
Orlando, Florida

FIGURE V.3
USGS TOPOGRAPHICAL MAP



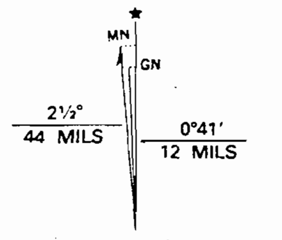
Mapped, edited, and published by the Geological Survey

Control by USGS and USC&GS

Topography from aerial photographs by Kelsh plotter
Aerial photographs taken 1951. Field check 1954

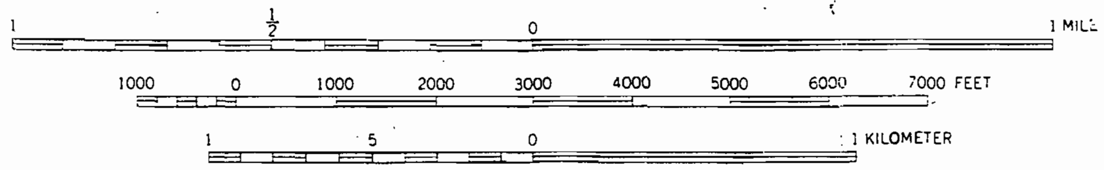
Polyconic projection. 1927 North American datum
10,000-foot grid based on Florida coordinate system, west zone
1000-meter Universal Transverse Mercator grid ticks, zone 17. shown in blue

To place on the predicted North American Datum 1983, move the projection lines 27 meters south and 16 meters west as shown by dashed corner ticks
There may be private inholdings within the boundaries of the National or State reservations shown on this map



UTM GRID AND 1988 MAGNETIC NORTH
DECLINATION AT CENTER OF SHEET

SCALE 1:24000



CONTOUR INTERVAL 10 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

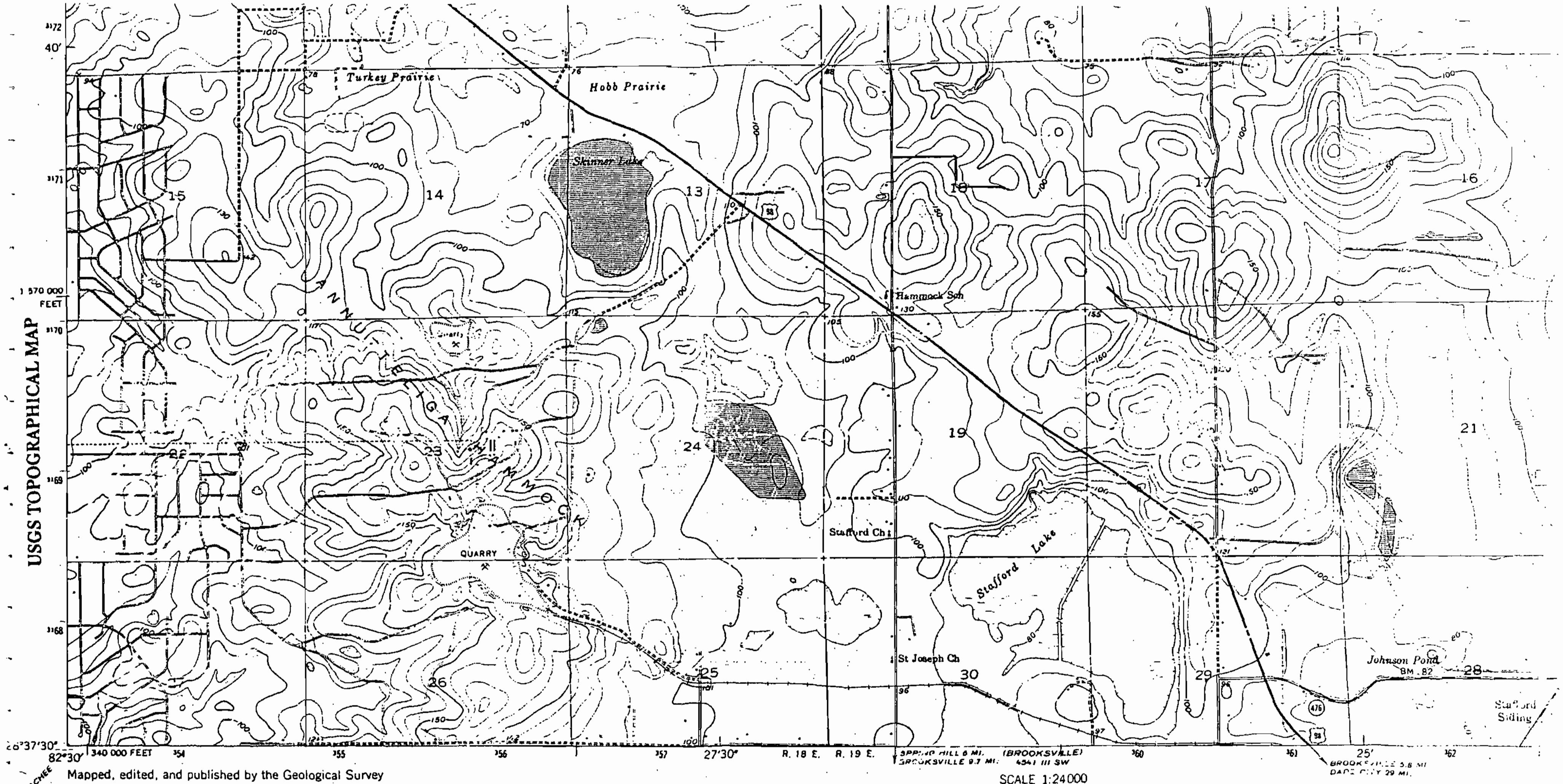
THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U. S. GEOLOGICAL SURVEY
DENVER, COLORADO 80225, OR RESTON, VIRGINIA 22092
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

QUADRANGLE LOCATION

Revisions shown in purple compiled from aerial photographs other sources. This information not field checked. Map ed

BEST AVAILABLE COPY

USGS TOPOGRAPHICAL MAP



Mapped, edited, and published by the Geological Survey

Control by USGS and USC&GS

Topography from aerial photographs by Kelsh plotter
Aerial photographs taken 1951. Field check 1954

Polyconic projection. 1927 North American datum
10,000-foot grid based on Florida coordinate system, west zone
1000-meter Universal Transverse Mercator grid ticks, zone 17, shown in blue

To place on the predicted North American Datum 1983, move the projection lines 27 meters south and 16 meters west as shown by dashed corner ticks
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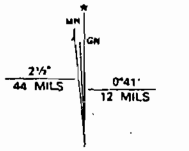
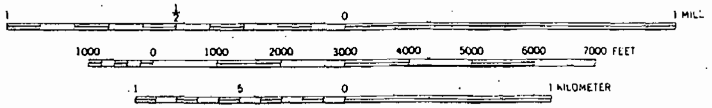


UTM GRID AND 1988 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

SCALE 1:24000



CONTOUR INTERVAL 10 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

QUADRANGLE LOCATION

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U. S. GEOLOGICAL SURVEY
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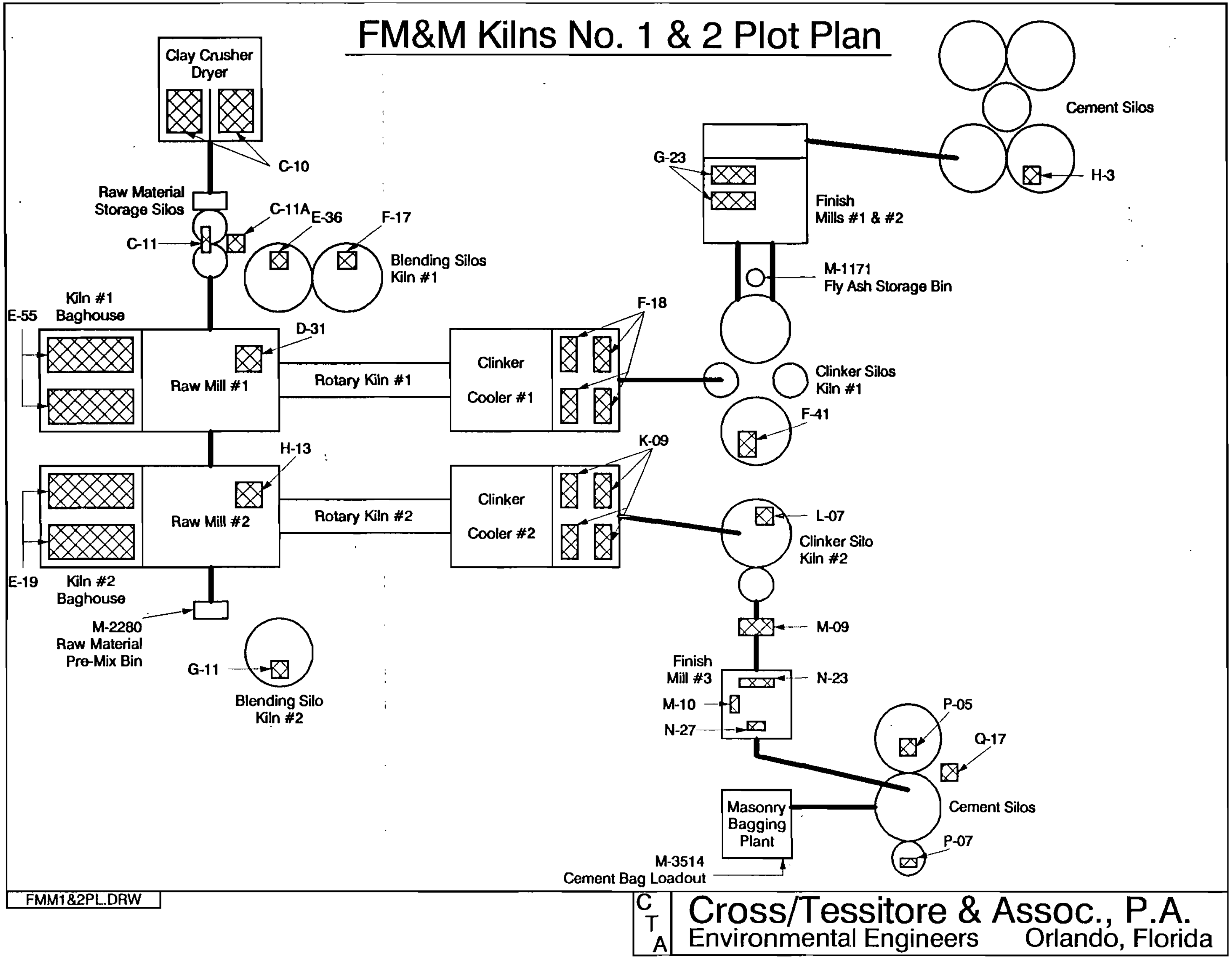
Revisions shown in purple compiled from aerial photo, other sources. This information not field checked

FIGURE V-4


FM&M Kilns No. 1 & 2 Plot Plan
Clay Crusher Dryer
C-10
Raw Material Storage Silos
C-11A
C-11
E-36
F-17
Blending Silos Kiln #1
Kiln #1 Baghouse
E-55
D-31
Raw Mill #1
Rotary Kiln #1
Clinker Cooler #1
F-18
H-13
Raw Mill #2
Rotary Kiln #2
Clinker Cooler #2
K-09
E-19
Kiln #2 Baghouse
M-2280 Raw Material Pre-Mix Bin
G-11
Blending Silo Kiln #2
Cement Silos
H-3
G-23
Finish Mills #1 & #2
M-1171 Fly Ash Storage Bin
Clinker Silos Kiln #1
F-41
L-07
Clinker Silo Kiln #2
M-09
Finish Mill #3
N-23
M-10
N-27
P-05
Q-17
Cement Silos
Masonry Bagging Plant
P-07
M-3514 Cement Bag Loadout
FMM1&2PL.DRW
CTA
Cross/Tessitore & Assoc., P.A.
Environmental Engineers
Orlando, Florida

SUPPLEMENTAL INFORMATION: SECTION VI

1. Previous BACT Submittal - SO_2
2. Previous BACT Submittal - NO_x

BACT ANALYSIS FOR SO_2

A summary of SO_2 emission factors and the associated emission control systems for Portland Cement Plants are included in Tables VI-1 and VI-2 for permitted Florida and Nationwide Facilities showing SO_2 emission rates ranging from 0.144 lbs SO_2 per ton of clinker to 12.1 lbs SO_2 per ton of clinker. The FM&M allowable emission rate of 0.144 lbs per ton of clinker is the lowest for existing and proposed Portland Cement Plants in Florida and the United States. In fact, the resulting emission factor and the SO_2 removal efficiency are substantially better than those achieved with liquid scrubbers. Currently a liquid alkali slurry scrubber has an achieved emission rate of 1.3 to 2.5 lbs per ton of clinker.

The low SO_2 emission rates achieved by No. 2 Kiln at FM&M are a result of; 1) The use of low sulfur coal, 2) The development of a unique material flow process which maximizes the exposure of SO_2 in the gas stream to the limestone feed material, and 3) Efficient management of the kiln process.

The details of the material flow process are presented in Attachment V, Item V-6. In general, this figure shows that the SO_2 laden combustion gases pass through the kiln, the kiln feed pre-heater, the raw mill, cyclones, and the fabric filter before entering the exhaust stack. In each of the above components, the exhaust gases are thoroughly mixed with the alkaline feed material or limestone, thereby providing a significant scrubbing of the exhaust gases with the limestone feed. Retention times seen by exhaust gases throughout the kiln system are extensive. Table VI-3 provides a summary of exhaust gas retention times in each component of the system. The removal of SO_2 in the above processes occurs due to the chemical reaction between limestone, ($CaCO_3$) and SO_2 to form $CaSO_4$. It is enhanced by; 1) The high temperatures in the process, 2) The long retention time between the gas flow and the limestone, and 3) The large amount of turbulence in the counter-current flow process.

The above process is substantially more efficient and less costly than a liquid alkaline scrubbing system. However, the option of using a liquid scrubber, was evaluated and the design and cost requirements are presented in Tables VI-4 and VI-5, respectively. This data shows that reducing the SO_2 emissions from 20 lbs per hour to 3 lbs per hour requires a three stage spray tower using Na_2SO_3 and lime. This system would require a capital cost of \$29.4 x 10^6, and an annual operating cost of \$5.263 x 10^6. This additional cost is extremely excessive since air quality modeling for emission rates of 20 lbs per hour shows SO_2 ground level impacts below the significance levels and no predicted environmental impacts.

In summary, it can be concluded that the existing SO_2 control system provides maximum SO_2 removal at minimum operating cost, and results in the lowest SO_2 emission rates for Portland Cement Plants in the United States.

TABLE VI-1
CEMENT KILN SO_2 EMISSIONS AND CONTROL TECHNOLOGY SUMMARY
(Nationwide Facilities)

Facility	Plant Throughput (ton/hr Clinker)	Permit Limit (lb/hr)	Emission Factor (lb/ton Clinker)	Pollution Control System	Permit Date
California Portland Cement Plant Mojave, CA	79	616	7.8	Baghouse Alkali Dust	01/10/79
Kaiser Cement & Gypsum Corporation (2 kilns) Dermante, CA	145	481	3.3	Baghouse Alkali Dust	12/26/78
Lonestar Industries, Inc. Georgetown, TX	79	960	12.1	Baghouse Alkali Dust	02/19/80
Creole Corporation Imperial County, CA	67	78.3	1.17	Baghouse Alkali Dust	05/20/80
Monolith Portland Cement Company Monolith, CA	67	300	4.4	Baghouse Alkali Dust	12/21/81
Southeastern Portland Cement Company Odessa, TX					
Kiln #1	71	208	1.9	None	11/05/81
Kiln #2	62	86	1.4	Liquid Scrubber	
Kiln #3	104	134	1.3	Partial Liquid Scrubber	
Lonestar Industries, Inc. Concrete, WA	100		2.75	Baghouse Alkali Dust	01/25/82

TABLE VI-1
CEMENT KILN SO_2 EMISSIONS AND CONTROL TECHNOLOGY SUMMARY
(Nationwide Facilities)
(Continued)

Facility	Plant Throughput (ton/hr Clinker)	Permit Limit (lb/hr)	Emission Factor (lb/ton Clinker)	Pollution Control System	Permit Date
Las Vegas Portland Cement Jean, NV	148	260 (2 hr avg.) 150 (30 day avg.)	1.76 1.0	Low Sulfur Coal and Alkali Dust	02/01/82
Lonestar Industries California	100	250	2.5	Alkaline Slurry Injection System	07/29/87

TABLE VI-2
CEMENT KILN SO_2 EMISSIONS AND CONTROL TECHNOLOGY SUMMARY
(Florida Facilities)

Facility	Plant Throughput (ton/hr Clinker)	Permit Limit (lb/hr)	Emission Factor (lb/ton Clinker)	Pollution Control System	Permit Date
Lonestar Florida Hialeah, FL		None	5.0	Doubled Chamber ESP	12/84
Kiln #1	25				
Kiln #2	25				
Kiln #3	87.5				
Florida Crushed Stone Brooksville, FL	75	74	0.98	Baghouse	03/84
Florida Mining & Materials Brooksville, FL	79.6	11.5	0.144	Baghouse	7/90

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TABLE VI-3

EXHAUST GAS RETENTION TIME SUMMARY

Location	Gas Flow (ACFM)	Area (ft^2)	Velocity (ft/sec)	Length (ft)	Time (sec)
Cement Kiln		(See Figure V-1)			4.5
Preheater	183,198	452	6.75	180	26.7
Raw Mill	359,437	143	41.89	80	1.91
TOTAL					33.11

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TABLE VI-4

SO_2 WET SCRUBBER DESIGN PARAMETERS

SO_2 Removal Efficiency: 85%

System: Dual Alkali/Three Stage Tower

Operating Parameters:

12 ft/sec Superficial Gas Velocity

Pressure Drop = 10" H_2O

Liquid to Gas Ratio = 80 gal/100 ACF

Make-up Rate = 186 gpm

SO_2 WET SCRUBBER OPERATING DATA

Operating Hours = 8,000 hrs/yr

Chemicals = 266 tons/yr

Waste Sludge = 612 tons/yr

Water Consumption = 89.3×10^6 gal/yr

Electricity = 5.928×10^6 KW-hr/yr

Labor and Supervision = 24,000 hrs/yr

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TABLE VI-5

SO_2 WET SCRUBBER SYSTEM COST

CAPITAL COSTS*	$29,400,000
OPERATING COST ($/YR)	
DIRECT COST	
Chemicals	$ 8,160
Waste Disposal	61,200
Operating Labor & Supervision	432,000
Electricity	177,840
Water	8,930
Maintenance, Labor & Materials	882,030
	$ 1,570,160
INDIRECT COST	
Capital Charges	$ 3,528,120
Overhead	123,750
Administration	43,200
	$ 3,695,070
TOTAL	$ 5,623,730 /year

* Total installed cost for reactor, scrubber, sludge filtration, controls, instrumentation, fans, and auxiliary systems.

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BACT ANALYSIS FOR NO_x

A summary of NO_x emission factors and the associated pollution control systems for Portland Cement Plants are included in Tables VI-6 and VI-7 for permitted Florida and Nationwide Facilities. This data shows that the NO_x emission factors range from 2.04 lbs of NO_x per ton of clinker to 7.98 lbs of NO_x per ton of clinker. The FM&M allowable emission rate of 2.04 lbs per ton of clinker is the lowest emission rate for Florida and United States Portland Cement Plants.

NO_x emissions at the FM&M facility are due largely to the use of ammonia contaminated fly ash produced by the Tampa Electric Company. Currently, the only viable alternative to using the ammonia contaminated fly ash in cement production is land disposal. A breakdown of land disposal cost for the ammonia contaminated fly ash is presented in Table VI-8. This data shows that the cost for packaging, neutralization, solidification, transportation, and disposal ranges from \$165 to \$210 per drum and a total cost of \$54 x 10^6 per year.

This cost can be considered excessive since the use of this ash in cement manufacturing provides a safe and efficient disposal method without significant air quality impacts.

Currently, FM&M has a "take or pay" contract with Tampa Electric for all the fly ash produced by TECO. (See Exhibit VI-1 letter from FM&M, dated May 20, 1988.) The estimated cost for revoking this contract would be \$9.0 million with an additional \$9.0 million possible due to breach of contract.

Additionally, the closest available ash supply is the new St. John's River Power Plant at Blount Island in Duval County. Assuming the fly ash could be obtained free, the cost of transportation would be \$14 per ton. This compares with an existing transportation cost of \$4.50 per ton. This would result in an annual cost increase of \$1,016,500.00 for 106,000 tons of ash per year. Furthermore, this annual cost to FM&M can be projected to approximately \$40.0 million over the life of Kiln No. 2. The alternative to eliminating fly ash from the material feed in order to reduce NO_x emissions is to provide a control system. To evaluate this option, C/TA has conducted a cost analysis for the addition of an NO_x catalytic reduction system to the existing Kiln No. 2 baghouse. The NO_x reduction system would consist of a Mitsubishi Low Temperature Catalyst which would reduce the NO_x emissions from 300 lbs per hour to 190 lbs per hour. The capital cost for this system would be approximately \$9.0 million with an annual operating cost of approximately \$1.0 million. Included in Table VI-8 is a summary of the cost analysis conducted.

TABLE VI-6
CEMENT KILN NO_x EMISSIONS AND CONTROL TECHNOLOGY SUMMARY
(Nationwide Facilities)

Facility	Plant Throughput (ton/hr Clinker)	Permit Limit (lb/hr)	Emission Factor (lb/ton Clinker)	Pollution Control System	Permit Date
California Cement Mojave, CA Precalciner	79	No Limit	None	Reduced Fuel Usage Low Furnace Temperature	01/10/79
Monolith Portland Cement Company Monolith, CA	67	260	3.88	Coal Fired Wet Process	12/21/81
Creole Corporation Plaster City, CA Kiln	67	213	3.17	Reduced Temperature in Precalcining Furnace High Fuel Efficiency	05/20/80
Lonestar Industries California	100	250	2.50	O_2 Control on Combustion Air	07/29/86
Kaiser Cement & Gypsum Corporation Permenente, CA	145	1,158	7.98	Reduced Fuel Usage and Low Temperature	12/26/78
Las Vegas Portland Cement Jean, NV	71	281	3.95	Baghouse	02/01/82
Lonestar Industries, Inc. Georgetown, TX	79	360	4.50	Reclaimer Process Design	02/17/80
Lonestar Industries, Inc. Concrete, WA	100	300	3.00	Process Design	01/25/82

TABLE VI-7
CEMENT KILN NO_x EMISSIONS AND CONTROL TECHNOLOGY SUMMARY
(Florida Facilities)

Facility	Plant Throughput (ton/hr Clinker)	Permit Limit (lb/hr)	Emission Factor (lb/ton Clinker)	Pollution Control System	Permit Date
Lonestar Cement Hialeah, FL					
Kiln #1	25			ESP	12/85
Kiln #2	25				
Kiln #3	87.5	582*	4.23		
Florida Mining & Materials Brooksville, FL	79.6	162.3	2.04	Baghouse	7/90
Florida Crushed Stone Brooksville, FL	75.0	359.6	4.8	Design	03/27/84

* Not a permit limit, but stated as "an emission estimate".

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TABLE VI-8

ANNUAL COST FOR LAND DISPOSAL OF AMMONIA FLY ASH

Production: 106,000 tons/yr

Density: 1 Dump truck (21 yd^3) = 25 tons

Cost Per Drum: \$165-\$210/drum

(55 gal)
-Packaging
-Transportation
-Solidification
-Neutralization

-Disposal

(106,000 tons/yr) (21 yd^3/25 tons) = 89,040 yd^3/yr

(55 gal/drum) (ft^3/7.45 gal) (yd^3/27 ft^3) = 0.27 yd^3/drum

(89,040 yd^3/yr) (drum/0.277 yd^3) = 329,778 drum/yr

@ %165/drum:

(165) (329,778) = \$54,413,370.00/year

@ \$210/drum:

(210) (329,778) = \$69,253,380.00/year

EXHIBIT VI-1

FLORIDA MINING & MATERIALS CORP.

P.O. BOX 6
BROOKSVILLE, FLORIDA 34298-0006
TELEPHONE: (904) 796-7241

C. M. COLEMAN, JR.
VICE PRESIDENT
CONSTRUCTION MATERIALS

May 20, 1988

Mr. Joe Tessitore
CROSS/TESSITORE & ASSOCIATES, P.A.
4763 S. Conway Road
Box 12, Suite F
Orlando, FL 32812

Dear Joe:

I have given considerable thought to the question of not using the fly ash from Big Bend #4 (with ammonia). To discontinue its use at the Brooksville Cement Plant would pose unrealistic economic problems for Florida Mining.

First, we have a take or pay contract with Tampa Electric for all the fly ash they produce. The contract has at least eleven years remaining. If TECO agreed not to sue Florida Mining for breach of contract (highly unlikely) I estimate a minimum cost to Florida Mining, in 1988 dollars, of $9.0 million. A breach of contract suit could add an additional $9.0 million to our tab.

Florida Mining's cement plant must use fly ash as its source of iron and aluminum. There are no naturally occurring deposits of iron and aluminum in Florida. The next closest, available source of fly ash in the quantity required, is the new St. Johns River Power Park at Blount Island, Duval County. The cost to transport the material to Brooksville is three times the transport cost from Tampa ($14.00/ton versus $4.50/ton). This would impose an additional freight burden of $1,016,500 a year ($14.00 - 4.50 x 107,000 tons/year). Since the cement plant has a life expectancy at least forty more years, the total cost to Florida Mining (in additional freight) would be over $40.0 million in today's dollars. I have no idea what the fly ash would cost at the Blount Island facility, but

EXHIBIT VI-1
(Cont.)

Mr. Joe Tessitore
May 20, 1988
Page Two

anything above our current TECO cost would add to our economic woes.

For your information, the total fly ash production at Crystal River is contracted for, and therefore, not even considered as a potential source for our cement plant.

Certainly, in view of this serious financial burden, the DER can justify an increase in the No_x limits at the Brooksville plant and allow us to continue using the Big Bend #4 fly ash.

Very truly yours,

C. M. Coleman, Jr.

CMC,Jr:gm

cc: Hank Andre
Ralph Shepard

AIR QUALITY IMPACT ANALYSIS

1. Table VII-1
   Comparison of Class I and Class II Air Quality Impact
2. Figure VII-1
   FM&M ISCST Modeling Receptor Grid Class II Area
3. Figure VII-2
   Chassahowitzka National Wildlife Refuge
4. Figure VII-3
   FM&M ISCST Modeling Class I Area
5. Table VII-2
   Evaluation of No-Threat Levels - Organic Compounds
6. Table VII-3
   Evaluation of No-Threat Levels - Metal Compounds

In order to evaluate air quality impact, a dispersion modeling analysis was conducted according to the following protocol.

1) Highest and Second Highest Groundlevel Concentrations were calculated for the following averaging times: 1-hour, 3-hour 8-hour and 24-hour.

2) Annual Concentrations were obtained from ISCST's N-day Average Concentration.

3) Receptor Grid: Rectangular coordinate system, receptors spaced every 100 meters, and grid extends far enough beyond property boundary to determine off-site maximums.

4) Discrete Receptors: Rectangular coordinate system with receptors placed every 500 meters along the eastern edge of the Chassahowitzka Wilderness Area to determine Class I Area maximum concentrations.

5) Terrain is assumed to be flat (no terrain elevations input).

6) Meteorological Data: 5 years of hourly preprocessed data from Tampa (NWS 12842), 1985 through 1989.

7) Rural Dispersion Mode.

8) Regulatory Default Option was used:
   * Final plume rise used at all down wind receptors;
   * Stack-tip downwash effects included;
   * Buoyancy-induced dispersion effects are parameterized;
   * Default wind profile coefficients are used;
   * Default wind profile coefficients are used;
   * Default vertical potential temperature gradients are used;
   * Default vertical potential temperature gradients are used;
   * Calm processing routine used to handle concentrations during calm periods;
   * Revised building wake effects procedure is selected, either Huber-Snyder or Schulman-Scire depending on stack height and building dimensions;
   * No decay assigned to SO_2 in the rural dispersion mode.

9) Source Data:

   * Emission Rate = 1.0 gram/sec for each source to determine dispersion coefficients;
   * Stack Height = 90 ft;
   * Stack Diameter = 14 ft;
   * Stack Gas Exit Flow Rate = 300,000 ACFM @ 386°F.

10) Wind Direction Specific Building Dimensions for downwash and building wake effects calculations were calculated using the model BREEZE WAKE by Trinity Consultants, Inc. BREEZE WAKE produces the direction-specific, building wake effect calculations required by ISCST.

11) No gravitational settling was considered for particulate emissions.

Results of the dispersion analysis were used to compare with the National Ambient Air Quality Standards for Class I and Class II areas. This comparison is provided in Table VII-1. The Class II area receptor grid is shown in Figure VII-1. The Class I area considered is shown in Figures VII-2 and VII-3. In addition, the results were used to address the Air Quality Impact Guidelines set forth in FDER's "The Florida Air Toxics Permitting Strategy. The "no-threat levels" identified in Appendix A of these guidelines are compared in Table VII-2 with the estimated maximum ambient concentrations of various organic compounds. The compounds listed have been identified through laboratory analysis as typical volatile and semi-volatile organic constituents, for which "no-threat levels" are specified, of the blended HWF which will be used at the FM&M facility. The typical concentrations for each compound are also provided in Table VII-2. For calculation purposes, it was assumed that each compound represented 50% of the blended HWF. It is unlikely that the actual concentrations would approach this level, however, the calculations therefore represent a worst case scenario. A thermal destruction efficiency (DRE) of 99.99% was applied to conservatively estimate emissions of the listed compounds. Dispersion coefficients calculated through computer modeling were then used to determine the maximum ambient concentrations for each compound.

Table VII-3 provides a similar comparison of metal compounds with the specified "no-threat levels". Emissions rates for each of these compounds are calculated in Section V of this application.

TABLE VII-1

COMPARISON OF CLASS I AND CLASS II AREA AIR QUALITY IMPACT

PARAMETER	MAXIMUM AMBIENT* CONCENTRATION ($\mu g/M^3$) Class II Area	MAXIMUM AMBIENT* CONCENTRATION ($\mu g/M^3$) Class I Area	NATIONAL AMBIENT AIR QUALITY STANDARD ($\mu g/M^3$)
Particulate			
24-hour	4.6	0.6	150
Annual	0.6	0.05	50
Sulfur Dioxide			
3-hour	15.6	2.5	1300
24-hour	3.9	0.5	260
Annual	0.5	0.04	60
Nitrogen Dioxide (NO_X)			
Annual	6.8	0.6	100
Carbon Monoxide			
1-hour	132.3	25.1	40,000
8-hour	51.3	9.8	10,000
Lead			
24-hour	0.02	0.002	1.5**

* As determined based on 2nd highest dispersion coefficients and proposed allowable emissions for each compounds.

** Standard specified as maximum quarterly arithmetic mean.

FMM2HWF.Doc

FIGURE VII-1

FM&M ISCST Modeling Receptor Grid

Class II Area

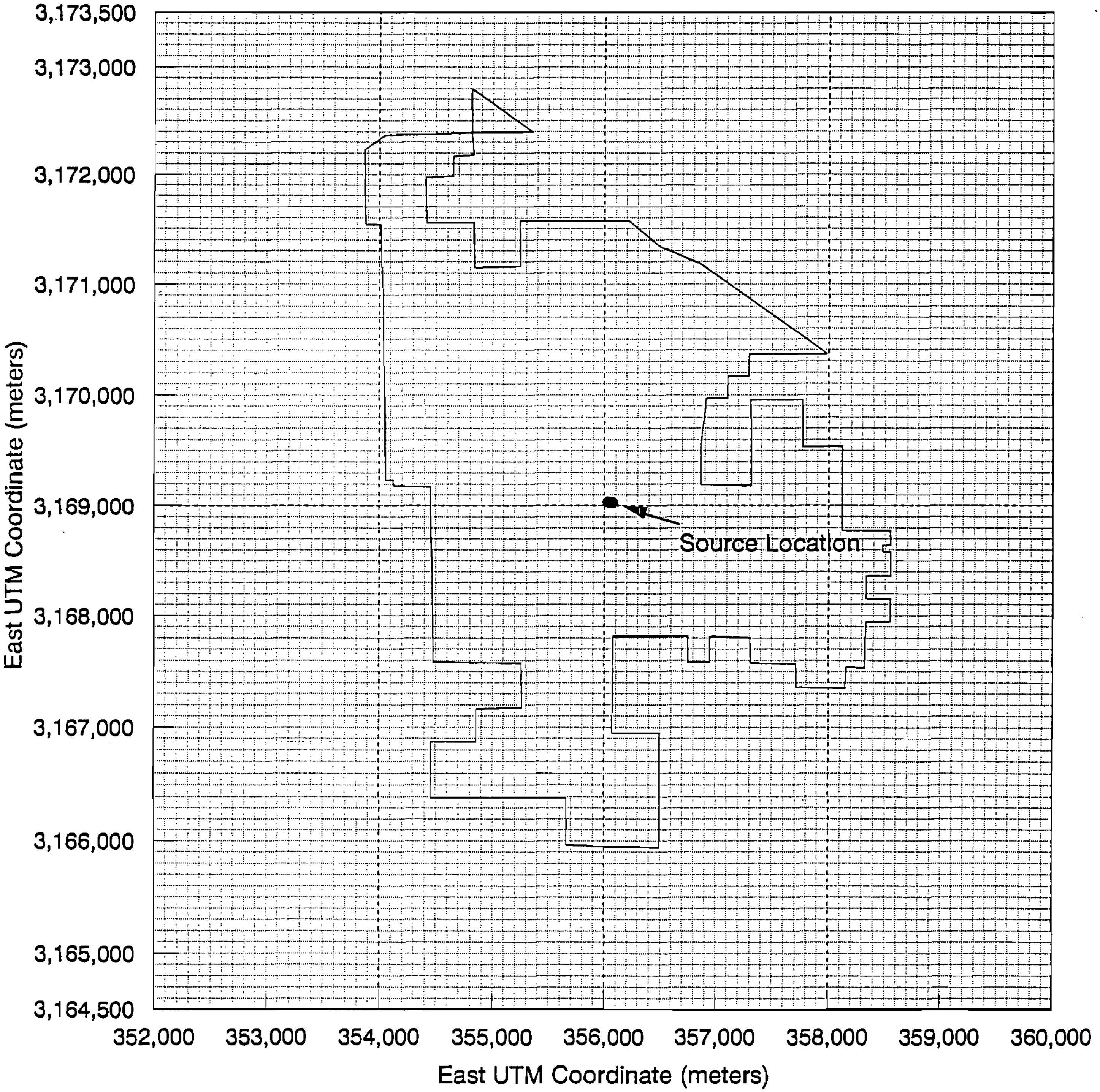

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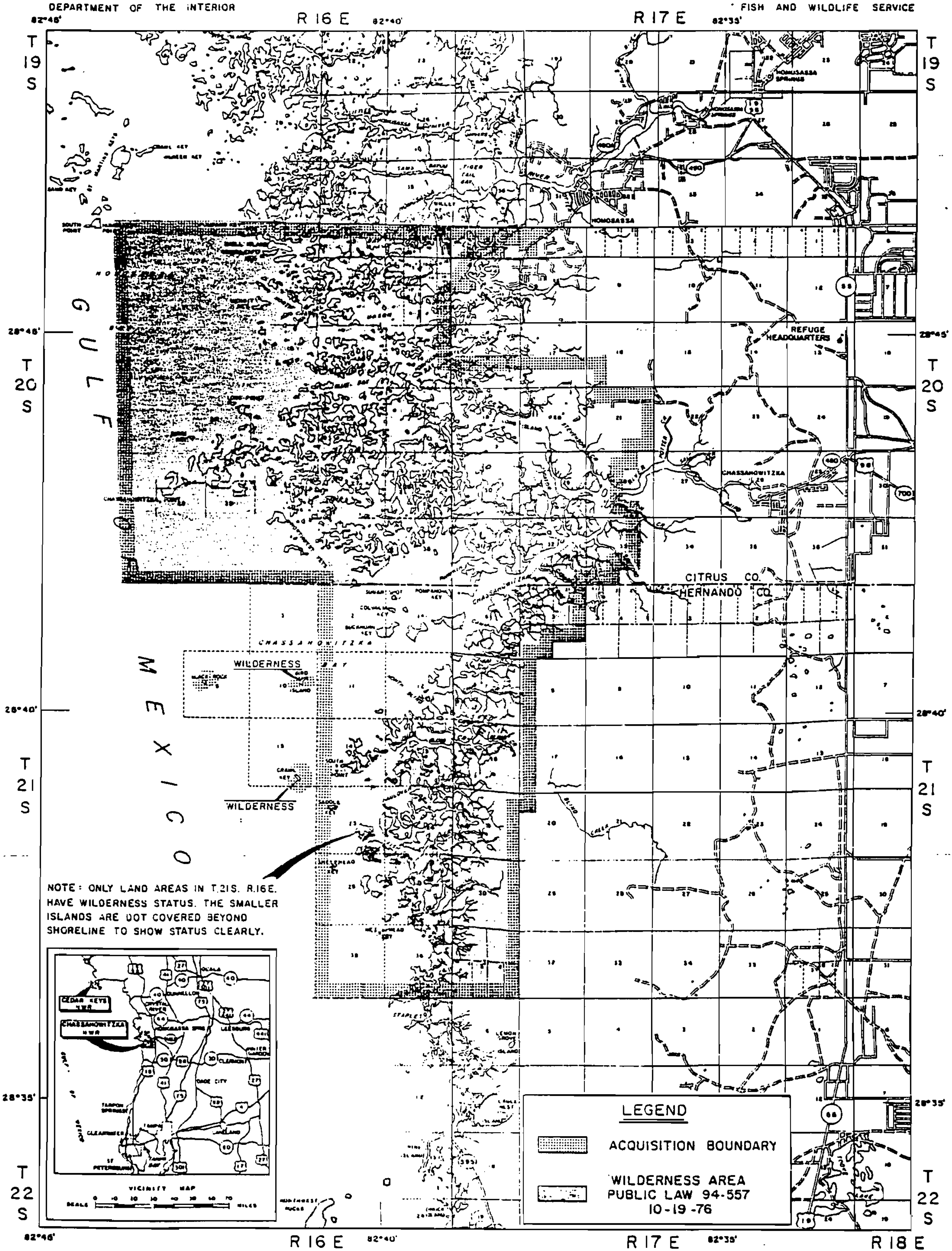
FIGURE VII-2

CHASSAHOWITZKA NATIONAL WILDLIFE REFUGE

CITRUS AND HERNANDO COUNTIES, FLORIDA

UNITED STATES
DEPARTMENT OF THE INTERIOR

UNITED STATES
FISH AND WILDLIFE SERVICE



NOTE: ONLY LAND AREAS IN T.21S. R.16E. HAVE WILDERNESS STATUS. THE SMALLER ISLANDS ARE DOT COVERED BEYOND SHORELINE TO SHOW STATUS CLEARLY.

LEGEND

▨ ACQUISITION BOUNDARY

▨ WILDERNESS AREA PUBLIC LAW 94-557 10-19-76

COMPILED IN THE DIVISION OF REALTY FROM SURVEYS BY GLO, U.S.G.S. AND AERIAL PHOTOGRAPHY

ATLANTA, GEORGIA JUNE, 1974
REVISED: 5/79

TALLAHASSEE MERIDIAN

Scale 0 2640 5280 7920 10560 15840 21120 FEET
0 1/2 1 1/2 1 4 MILES

MEAN DECLINATION 1974

4R FLA 363 404

FIGURE VII-3

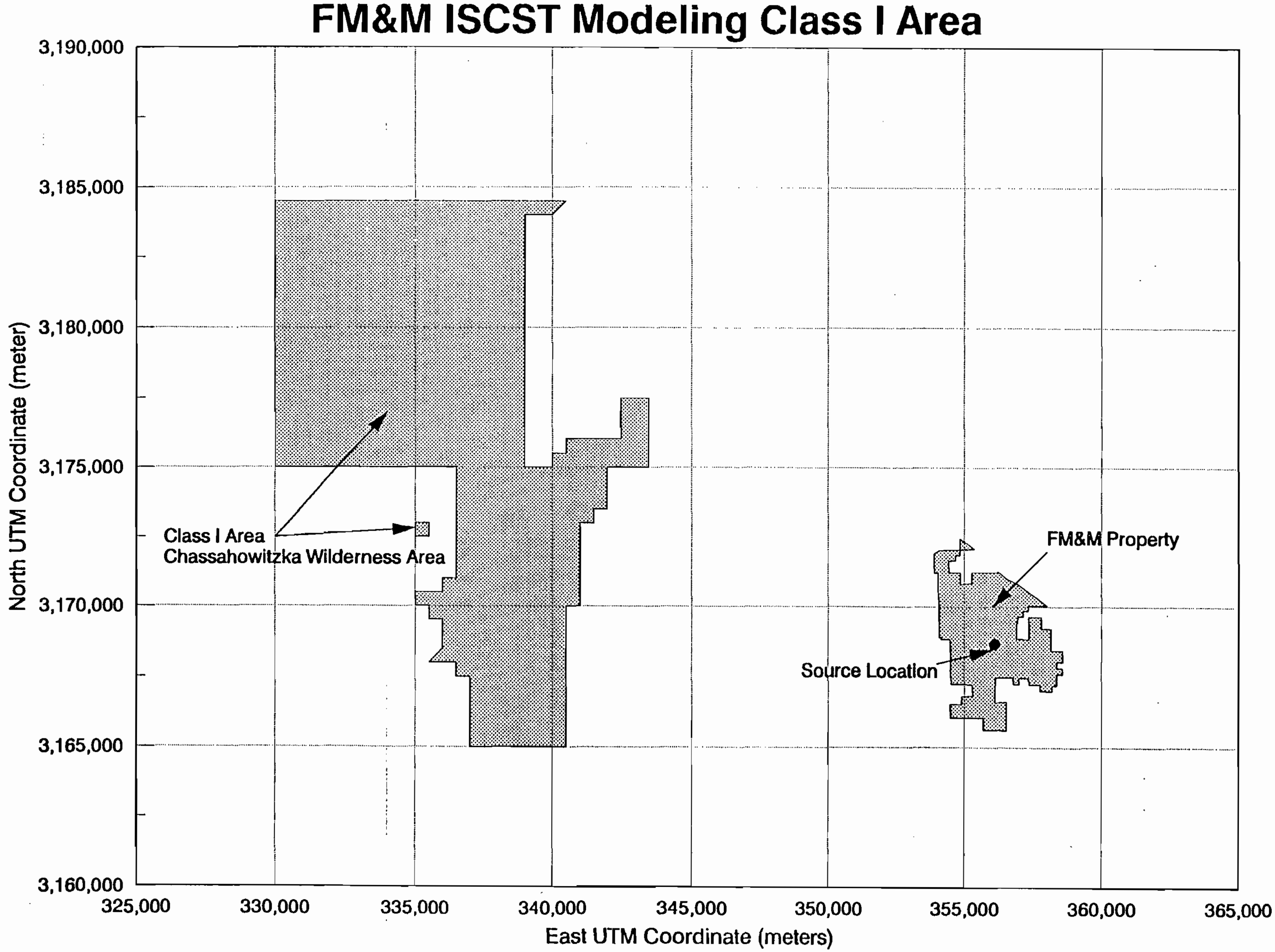

FM&M ISCST Modeling Class I Area
3,190,000
3,185,000
3,180,000
3,175,000
3,170,000
3,165,000
3,160,000
North UTM Coordinate (meter)
325,000
330,000
335,000
340,000
345,000
350,000
355,000
360,000
365,000
East UTM Coordinate (meters)
Class I Area
Chassahowitzka Wilderness Area
FM&M Property
Source Location

TABLE VII-2

Evaluation of No-Threat Levels - Organic Compounds

Compound	HWF Concentration (ppm)		Assumed[1] Emission Rate (lb/hr)	Maximum Groundlevel Concentration (μg/cu.m.)			No-Threat Level[2] (μg/cu.m.)		
	Typical	Assumed		8-hour	24-hour	Annual	8-hour	24-hour	Annual
Acrolein	100	500000	0.3751531	0.3615992	0.1500680	0.0156458	2.5	0.6	N/D
Acrylonitrile	100	500000	0.3751531	0.3615992	0.1500680	0.0156458	45	11	0.015
Benzene	34.7	500000	0.3751531	0.3615992	0.1500680	0.0156458	30	7.1	0.12
Bromoform	10	500000	0.3751531	0.3615992	0.1500680	0.0156458	50	12	N/D
Carbon Tetrachloride	10	500000	0.3751531	0.3615992	0.1500680	0.0156458	126	30	0.07
Chlorobenzene	185	500000	0.3751531	0.3615992	0.1500680	0.0156458	460	110	N/D
Chloroethane	10	500000	0.3751531	0.3615992	0.1500680	0.0156458	52000	12381	N/D
Chloroform	47.1	500000	0.3751531	0.3615992	0.1500680	0.0156458	98	23	0.04
1,2-Dichlorobenzene	55.2	500000	0.3751531	0.3615992	0.1500680	0.0156458	N/D	N/D	10
1,4-Dichlorobenzene	10	500000	0.3751531	0.3615992	0.1500680	0.0156458	4020	1071	10
Dichlorobromonethane	10	500000	0.3751531	0.3615992	0.1500680	0.0156458	N/D	N/D	N/D
Dichlorodifluoromethane	10	500000	0.3751531	0.3615992	0.1500680	0.0156458	94000	73571	200

---

(1) Destruction Removal Efficiency = 99.99%

(2) As specified in the "Florida Air Toxics Permitting Strategy - Appendix A".
N/D = Not Defined for this averaging time in the "Florida Air Toxics Permitting Strategy - Appendix A"

TABLE VII-2 (continued)

Evaluation of No-Threat Levels - Organic Compounds

	HWF Concentration (ppm)		Assumed(1) Emission Rate	Maximum Groundlevel Concentration (µg/cu.m.)			No-Threat Level(2) (µg/cu.m.)		
Compound	Typical	Assumed	(lb/hr)	8-hour	24-hour	Annual	8-hour	24-hour	Annual
1,1-Dichloroethane	10	500000	0.3751531	0.3615992	0.1500680	0.0156458	4000	952	0.04
1,2-Dichloroethane	10.2	500000	0.3751531	0.3615992	0.1500680	0.0156458	40	9.5	0.04
1,1-Dichloroethylene	10	500000	0.3751531	0.3615992	0.1500680	0.0156458	40	9.5	0.02
1,2-Dichloroethylene	10	500000	0.3751531	0.3615992	0.1500680	0.0156458	7400	1881	N/D
1,2-Dichloropropane	10	500000	0.3751531	0.3615992	0.1500680	0.0156458	3500	833	N/D
1,3-Dichloropropylene(3)	10	95	0.0000712	0.0000687	0.0000285	0.0000029	50	12	0.000003
Ethylbenzene	3560	500000	0.3751531	0.3615992	0.1500680	0.0156458	4350	1036	N/D
Methyl Bromide	10	500000	0.3751531	0.3615992	0.1500680	0.0156458	200	48	N/D
Methyl Chloride	10	500000	0.3751531	0.3615992	0.1500680	0.0156458	1050	250	N/D
Methylene Chloride	171	500000	0.3751531	0.3615992	0.1500680	0.0156458	1750	417	3

---

(1) Destruction Removal Efficiency = 99.99%

(2) As specified in the "Florida Air Toxics Permitting Strategy - Appendix A".
N/D = Not Defined for this averaging time in the "Florida Air Toxics Permitting Strategy - Appendix A"

(3) 1,3-Dichloropropylene will be controlled through prequalification review
at the processing location to ensure that it is not inappropiately blended into the fuel.

TABLE VII-2 (continued)

Evaluation of No-Threat Levels - Organic Compounds

	HWF Concentration (ppm)		Assumed(1) Emission Rate	Maximum Groundlevel Concentration (μg/cu.m.)			No-Threat Level(2) (μg/cu.m.)		
Compound	Typical	Assumed	(lb/hr)	8-hour	24-hour	Annual	8-hour	24-hour	Annual
1,1,2,2-Tetrachloroethane	10	500000	0.3751531	0.3615992	0.1500680	0.0156458	70	17	0.02
Tetrachloroethylene	225	500000	0.3751531	0.3615992	0.1500680	0.0156458	3350	798	N/D
Toluene	9500	500000	0.3751531	0.3615992	0.1500680	0.0156458	2000	N/D	N/D
1,1,1-Trichloroethane	512	500000	0.3751531	0.3615992	0.1500680	0.0156458	N/D	N/D	0.02
1,1,2-Trichloroethane	10	500000	0.3751531	0.3615992	0.1500680	0.0156458	450	107	N/D
Trichloroethylene	50.9	500000	0.3751531	0.3615992	0.1500680	0.0156458	2700	643	0.77
Trichlorofluoromethane	10	500000	0.3751531	0.3615992	0.1500680	0.0156458	N/D	N/D	300
Vinyl Chloride	10	500000	0.3751531	0.3615992	0.1500680	0.0156458	100	24	0.14

---

(1) Destruction Removal Efficiency = 99.99%

(2) As specified in the "Florida Air Toxics Permitting Strategy - Appendix A".
N/D = Not Defined for this averaging time in the "Florida Air Toxics Permitting Strategy - Appendix A"

TABLE VII-3

Evaluation of No-Threat Levels - Metal Compounds

	Fuel Concentration (ppm)			Emission(1) Rate (lb/hr)	Maximum Groundlevel Concentration (µg/cu.m.)			No-Threat Level(2) (µg/cu.m.)		
Compound	Liquid HWF	Non-Pumpable HWF	Coal		8-hour	24-hour	Annual	8-hour	24-hour	Annual
Antimony	100	200	0.0	0.00411	0.0039652	0.0016456	0.0001715	5.0	1.2	N/D
Barium	4000	12000	136.3333	0.00853	0.0082181	0.0034106	0.0003555	5.0	1.2	N/D
Lead	4000	10000	1.7	0.04305	0.0414933	0.0172202	0.0017953	1.5	0.36	0.09
Mercury	5	7.5	0.0	0.02182	0.0210332	0.0087290	0.0009100	0.1	0.024	N/D
Silver	300	600	0.0	0.01791	0.0172631	0.0071644	0.0007469	N/D	N/D	3.0
Thallium	50	100	0.0	0.00355	0.0034254	0.0014215	0.0001482	N/D	N/D	0.3
Arsenic	5	7.5	5.8233	0.00002	0.0000161	0.0000067	0.0000007	2.0	0.5	0.0002
Cadmium	250	500	0.0	0.01166	0.0112341	0.0046623	0.0004860	0.5	0.12	0.0006
Chromium	3000	6000	16.5333	0.00966	0.0093114	0.0038643	0.0004028	0.5	0.12	N/D
Beryllium	8	10	1.3333	0.000157	0.0001517	0.0000629	0.0000065	0.02	0.005	0.0004

---

(1) As determined in Section V of the application.

(2) As specified in the "Florida Air Toxics Permitting Strategy - Appendix A".
N/D = Not Defined for this averaging time in the "Florida Air Toxics Permitting Strategy - Appendix A"

APPENDIX V-1

CEMENT KILNS
SOURCES OF CHLORIDES NOT HCl EMISSIONS

Dr. Michael von Seebach
Senior Vice President, Southdown, Inc., Houston, Texas
David Gossman
President, Gossman Consulting, Inc., Hampshire, Illinois

Cement kilns have all the ingredients required for complete scrubbing of acid gasses. These ingredients are a broad range of gas temperatures from 220° to 3,000°F; gas retention times of approximately 30 seconds, high levels of turbulence, high concentrations of alkaline solids, including sodium and potassium oxides; and, in high concentrations, freshly created CaO. Despite this environment, HCl emissions are reportedly measured from cement kilns when EPA Method 26, as presently proposed, is used.

This paper describes how the analyses of the impinger solutions can be taken a step further. This is performed by testing the impinger train not only for chloride but also for a variety of cation concentrations. Specifically, the cations ammonium, sodium, potassium, and calcium were analyzed. The results clearly demonstrate the Method 26, as presently proposed, provides faulty results. The data proves conclusively that the chloride measured with Method 26 when applied to cement kilns originates from ammonium chloride and other chloride salts, and does not originate from HCl. This was further confirmed by analyzing the condensate at the transition between the hot and cold connectors between the heated filter box (250°F) and the ice-cold impinger bath. The analysis of the condensate clearly revealed that NH_4Cl had condensated at temperatures below 220°F.

This validates previous proposals that HCl emissions from cement kilns are impossible. The results further indicate that EPA Method 26 as presently proposed is not applicable for cement kilns. As amendment, the impinger solutions should not only be analyzed for chloride but additionally using ion chromatography, for NH_4^+, Fe^{2+}, Fe^{3+}, Al^{3+}, Ba^{2+}, Ca^{2+}, K^+, Mg^{2+} and Na^+. The presence of any of these cations would indicate the penetration of the filter by volatile or pseudo-particulate solids.

Introduction and Background

Southdown, Inc. is the parent company of Southwestern Portland Cement Company which owns and operates eight active cement plants within the continental U.S. Southdown is a U.S. owned company and most of its 11 kilns are already covered by New Source Performance Standards. Southdown, Inc. and Southwestern Portland Cement Company's primary business is the manufacturing of high quality Portland Cements. Some of Southwestern's cement kilns are currently utilizing hazardous liquid and solid waste in the beneficial reuse of these wastes through recycling, utilizing the waste as fuels to replace, partially, fossil fuels in cement kilns.

The very high acid scrubbing capabilities of cement and lime kilns (not aggregate kilns) is a well known phenomenon[1]. The ability of these kilns to scrub acid gases is based on the high turbulence and residence times of the gases loaded with highly alkaline, fine and reactive solids. These reactive solids include freshly decarbonized lime (CaO), in the process of formation. This provides for the complete reaction of any acid gases which might form in the combustion zone with the highly alkaline material tumbling the entire length of the kiln and in the suspension preheater (for the energy efficient type of system). Even the particulate emissions are highly alkaline, and maintain the alkalinity over an extended period. This clearly indicates that any chloride emissions are in the form of salts, not HCl.

Despite these facts, literature references[2,3,4,5,6,7] and EPA supported stack tests continue to report HCl emissions from cement kilns. This strongly suggests the conclusion that some interfering species penetrates the sampling train filter producing erroneous "HCl" results. Indeed section 1.3 of proposed Method 26 states "Volatile materials which produce chloride ions upon dissolution during sampling are obvious interferences."[8]

Southdown completed stack tests at three cement plants where EPA proposed methodology for "HCl" testing was employed. To clear up this discrepancy in addition to testing the impinger trains used in these tests for chloride, a variety of cation concentrations were also determined.

Test Procedures and Results

Stack tests were performed by the suggested Method 26 by means of a gas pump. The particulate and gas samples were drawn out of the stack through an insulated probe. Gas velocity into the probe was controlled by the usual Pitoty tube arrangement. From the insulated tube through the stack wall, the gas sample carrying the particulates was brought into a heated area. In this heated area the filter arrangement holding back the major particulates was located. From there the gas sample was pumped through the impingers. Also the evaluation of the results of the stack tests were performed in accordance with the proposed Method 26.

The stack test results are shown in detail in Table I. The second column of this table shows the chloride content of the front and back impinger solutions. These data demonstrate that in all impinger solutions, with very few exceptions, Cl^--anions were found. In addition to the anion analysis, cations were also measured in the impinger solutions. Specifically, the cations NH_4^+ Na^+ and K^+ were determined and found in considerable quantities. Specifically, ammonium was found in large quantities. It was found that of 27 impingers tested all but three showed more than enough ammonium to account for all of the chloride as ammonium chloride. These data are shown in detail in Table I. In addition to the ammonium chloride found, there is enough potassium and/or sodium to account for the remaining chloride in two of those three cases in which insufficient ammonium was present to account for all chloride.

These results are graphically demonstrated in Figures 1 - 3. These figures show the measured chloride as a percent of cation carrying capacity for all measured plants in Florida, Kentucky and in Colorado. All figures show clearly that there are generally far more cations in the impinger solutions available than could be satisfied with chloride. Consequently the results clearly demonstrate that there must be chlorides and/or other pseudo particulate alkaline salts that penetrate through the filter and end up in the impingers.

In Table I, columns 2, 3, and 4 primarily suggest that ammonium chloride has penetrated through the filter into the impinger solution. Therefore a linear regression analysis of the data given in Table I columns 2 - 3 was performed. The results of this statistical correlation of Cl^- and NH_4^+ in the impingers is shown in Figure 4. This figure shows the chloride concentration in the impinger plotted versus the ammonium concentration. Only the front impinger was used for this correlation. The graph shows that there is a statistically significant correlation between the ammonium concentrations and the chloride concentrations in the front impinger. Unfortunately, there were an inadequate number of data points available from the back impingers to draw a statistically significant conclusion.. However, the statistical analysis of the chloride and ammonium concentration in the front impinger clearly shows that the chloride primarily results from ammonium chloride penetrating through the filter.

This finding is supported by separate tests[9] performed at Southdown's plant at Victorville, California. During stack testing in this plant a white condensate was found in the glass tube connector between the front half filter and the back half impingers in a Method 5 sampling train modified for HCl determination. Using aqueous dissolution followed by specific iron electrode analysis nearly stoichiometric amounts of ammonium and chloride ions were found. This result further confirms the nature of chloride emissions as ammonium chloride from cement kilns.

Conclusion

Since considerable amounts of cations, primarily ammonium, are found in the impinger solutions Method 26 as presently suggested cannot be used for measuring HCl emissions from cement kilns. In fact, the data presented in this paper clearly show that chloride is present as ammonium chloride or other chloride salts in the particulate emission of cement kilns.

The data further show the value of routinely monitoring cation concentrations when performing stack tests from alkaline sources using Method 26.

Recommendation of Modification to Method 26

If HCl testing using proposed Method 26 is absolutely necessary even in the face of data clearly demonstrating the unlikelihood of HCl emissions, the use of the following minor modifications is recommended:

1. Eliminate the third and fourth (caustic) impingers. This portion of the system is designed to capture Cl_2 which is not an emission issue for cement kilns.

2. In addition to testing the impinger solution for chloride anions, test the solution using ion chromatography for the following cations: NH_4^+, Fe^{2+}, Fe^{3+}, Al^{3+}, Ca^{2+}, Ba^{2+}, K^+, Mg^{2+}, and Na^+. The presence of any of these cations would indicate the likely penetration of the filter by

volatile of fine particulate salts. The concentrations of these cations can be used to correct the Cl⁻ concentration by the appropriate stochiometric quantities.

3. Since this is an invalidated methodology for cement kilns, blank runs using the same sampling train and a high purity mix of CO_2 and nitrogen should be performed. Values above the detection limits for both Cl⁻ and the cations should be used as a blank correction of the measured value.

4. Three runs of two hours duration should be performed as well as three runs of similar durations and flow rates for the blank determinations. Results should be averaged and the determination should include a minimum and maximum value for the 95% confidence range. This determination should consider both sampling and analytical errors.

The results of any such testing should be considered tentative until the EPA validates the method for use on cement kilns.

REFERENCES

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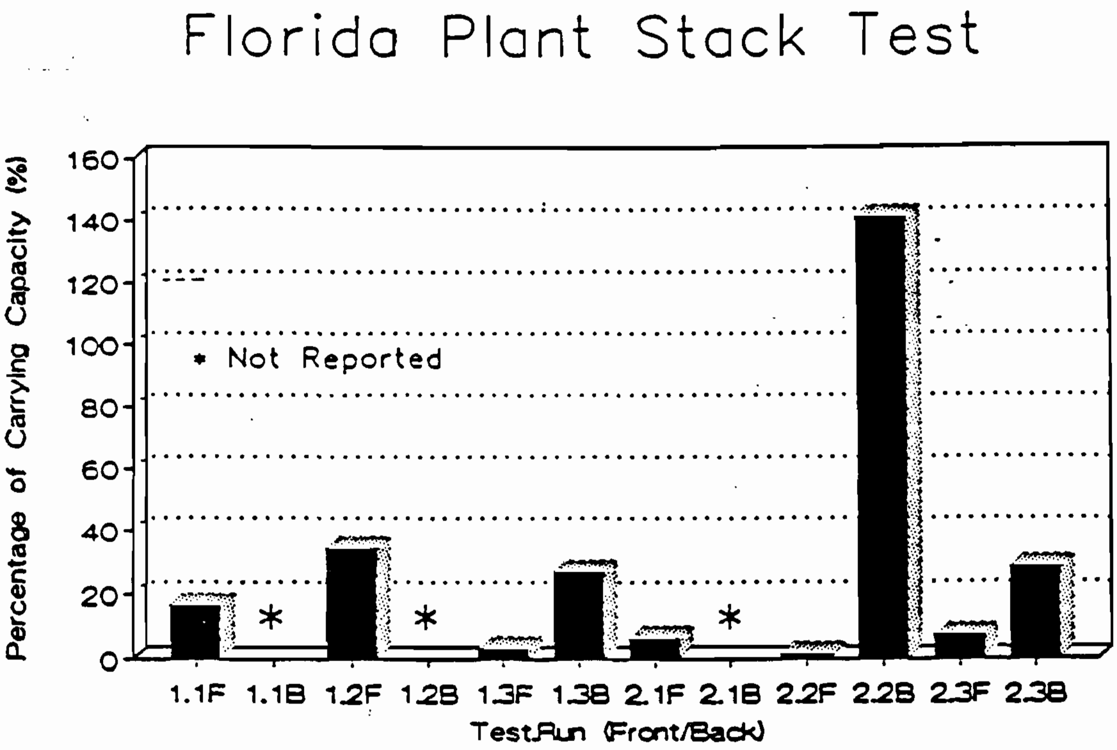
Table I

Southdown Cement Kilns Chloride Emission Data

Test.Run Front/ Back Impinger	Cl- (ug/sample)	NH4+ (ug/sample)	NH4+ chloride carrying capacity (ug/sample)	Na+ (ug/sample)	Na+ chloride carrying capacity (ug/sample)	K+ (ug/sample)	K+ chloride carrying capacity (ug/sample)	Total cation chloride carrying capacity (ug/sample)	Measure chloride % of cati carryin capacit
Florida Plant									
1.1F	1560	4720	9290	0	0	9.40	8.52	9300	16.8%
1.1B	31.7	NR	0	NR	0	NR	0	0	ERR
1.2F	1850	2710	5340	0	0	0	0	5340	34.6%
1.2B	37.5	NR	0	NR	0	NR	0	0	ERR
1.3F	378	5400	10600	8.60	13.3	103	93.4	10700	3.5%
1.3B	52.1	81.3	160	14.7	22.7	9.80	8.89	192	27.2%
2.1F	159	1170	2310	36.6	56.4	18.3	16.6	2380	6.7%
2.1B	21.4	NR	0	NR	0	NR	0	0	ERR
2.2F	285	8520	16800	24.2	37.3	8.05	7.30	16800	1.7%
2.2B	154	23.0	45.3	36.8	56.7	7.35	6.66	109	141.7%
2.3F	2640	17000	33400	791	1220	73.7	66.8	34700	7.6%
2.3B	30.7	54.4	107	0	0	0	0	107	28.7%
Kentucky Plant									
1.1F	1280	7650	15100	21.0	32.4	0	0	15100	8.5%
1.1B	17.5	99.0	195	49.0	75.5	0	0	270	6.5%
1.2F	1780	7640	15000	20.0	30.8	0	0	15100	11.8%
1.2B	16.5	76.0	150	50.0	77.1	0	0	227	7.3%
1.3F	2170	8820	17400	17.0	26.2	0	0	17400	12.5%
1.3B	14.6	106	209	56.0	86.3	0	0	295	4.9%
Colorado Plant									
1.1F	254	115	226	97.0	150	ND	0	376	67.6%
1.1B	198	31.0	61.1	329	507	260	236	804	24.6%
1.2F	405	229	451	ND	0	ND	0	451	89.8%
1.2B	21.4	15.0	29.5	50.0	77.1	ND	0	107	20.1%
1.3F	448	954	1880	29.0	44.7	ND	0	1920	23.3%
1.3B	ND	34.0	67.0	116	179	ND	0	246	0.0%
1.4F	245	1600	3160	37.0	57.0	ND	0	3220	7.6%
1.4B	19.5	23.0	45.3	24.0	37.0	ND	0	82.3	23.7%
1.5F	214	410	807	37.0	57.0	34.0	30.8	895	23.9%
1.5B	ND	43.0	84.7	42.0	64.7	ND	0	149	0.0%
1.6F	272	1230	2420	27.0	41.6	ND	0	2460	11.1%
1.6B	ND	34.0	67.0	31.0	47.8	ND	0	115	0.0%

NR - Not Reported
ND - Not Detected

Figure 1



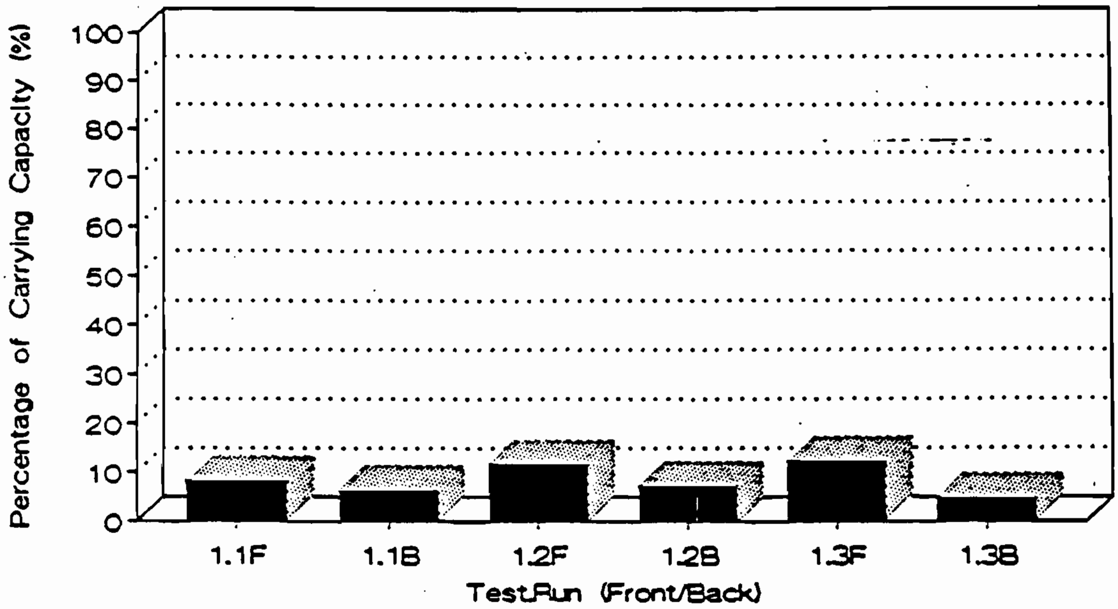
MEASURED CHLORIDE AS % OF CATION CARRYING CAPACITY

Gossman Consulting, Inc.

Southdown, Inc.

Figure 2

Kentucky Plant Stack Test

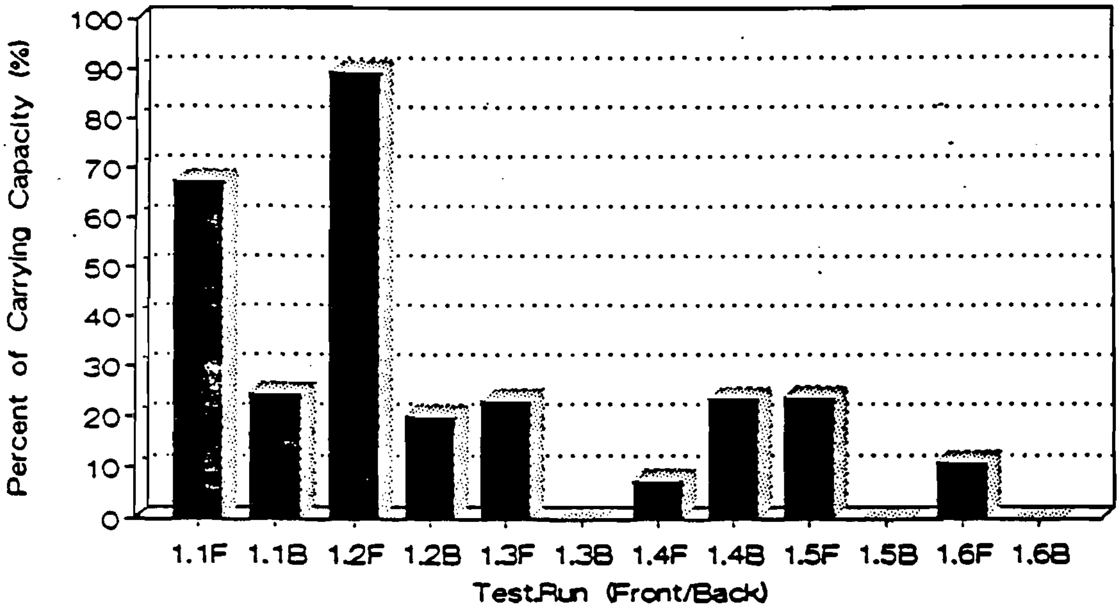


MEASURED CHLORIDE AS % OF CATION CARRYING CAPACITY

Gossman Consulting, Inc. Southdown, Inc.

Figure 3

Colorado Plant Stack Test



MEASURED CHLORIDE AS % OF CATION CARRYING CAPACITY

Gossman Consulting, Inc.

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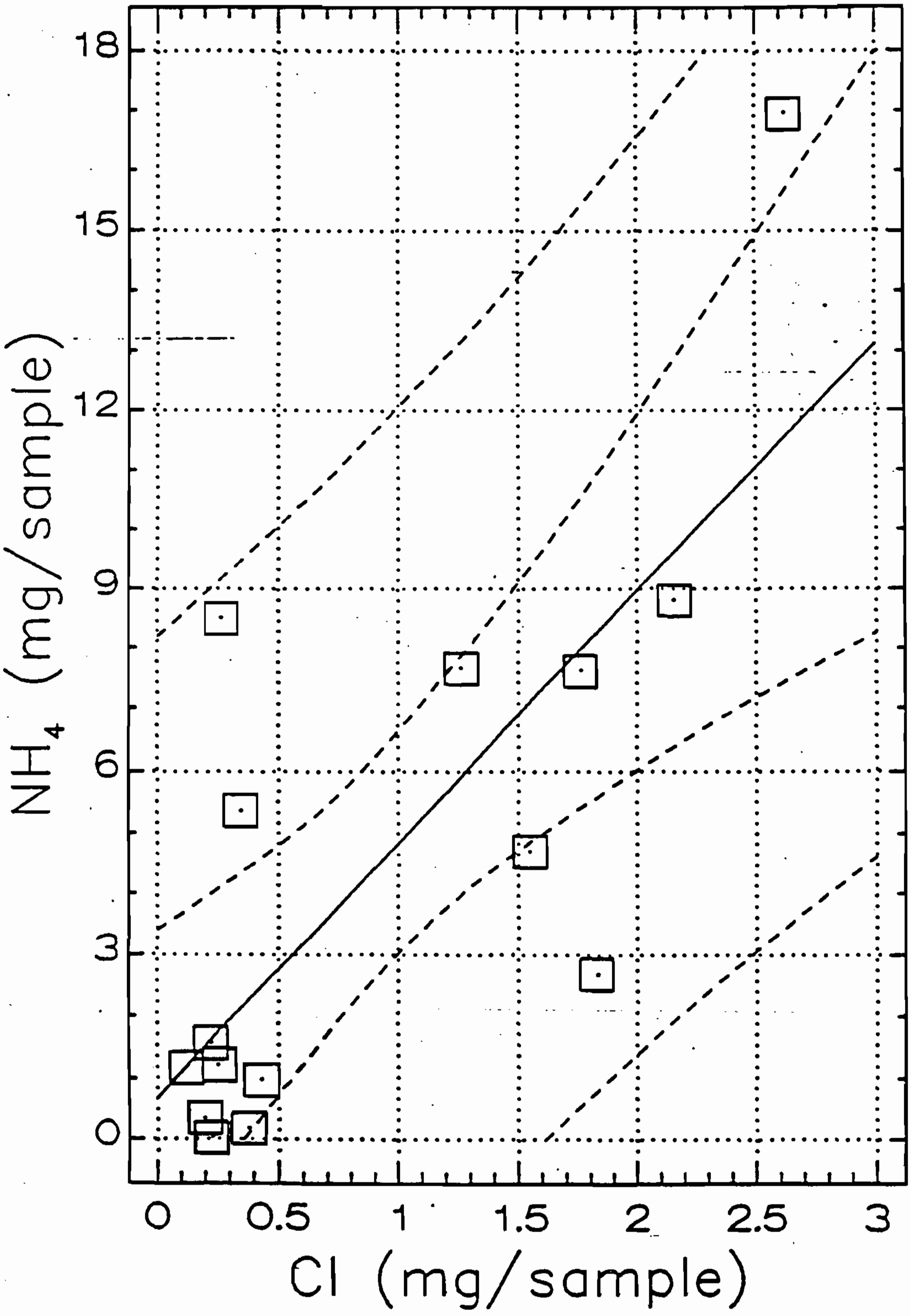
Statistical Correlation of Cl and NH_4 in Impingers



Board of County Commissioners

Hernando County

20 North Main Street, Room 460
Brooksville, FL 34601
(904)-754-4000
(904)-754-4002

November 1, 1990

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Mr. Clare Fancy, Bureau Chief
Department of Environmental Regulation
Bureau of Air Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Dear Mr. Fancy:

Mr. Segundo Fernandez of Oertel, Hoffman, Fernandez & Cole, P.A. is acting as the County's representative for air sources in Hernando County as related to Florida Mining and Materials and Florida Crushed Stone. Mr. Fernandez' firm will review all permitting documents to ensure that the County's interests are protected. Please forward all correspondence relating to these facilities to the attention of Mr. Segundo Fernandez, P.A. at the following address:

Oertel, Hoffman, Fernandez, and Cole, P.A.
2700 Blair Stone Road
Post Office Box 6507
Tallahassee, FL 32314-6507

Mr. Bruce Mitchell of your staff indicated that DER is required to copy the County but is not required to copy the County's legal representative. The County is requesting that you forward the County's official notification to Mr. Fernandez.

If you should need any additional information, please contact me.

Sincerely,

Hernando County Board of
County Commissioners

Henry D. Ledbetter

Henry D. Ledbetter
Chairman

KPL/mre

cc: Richard Garrity, DER (Tampa Office)
Charles B. Hetrick, County Administrator
R. Bruce Snow, County Attorney
Segundo Fernandez, P.A., OHF&C
Larry Jennings, Planning Department Manager
B. Mitchell
J. Reynolds
OHF/B4

than 1,700-tons of steel film cassettes; 600-tons of polyethylene film containers and lids; and 330-tons of polystyrene film cartridges, housings and cores from paper.

DENMARK'S KK HAZWASTE-ENERGY PLANT HAS REPORTED 32 ACCIDENTS SINCE '77

Kommunekemi (KK), Denmark's central treatment plant for the disposal of hazardous waste, has reported 32 major accidents from 1977 through the first half of 1990 and 79 occupational accidents from 1983 through 1989, according to Lars P.D. Rasmussen, Kommunekemi sales and logistics manager.

Rasmussen, who was speaking at the Fourth International Symposium on Operating European Hazardous Waste Management Facilities held earlier this month in Denmark, noted that the facility supplies host community Nyborg with about 60% of its district heating and about 14% of its electricity.

Twelve of the major accidents at KK, or 38%, were caused because of faulty information from the waste producer, Rasmussen continued. In addition, seven, or 21%, were caused by KK employees; four, or 13%, were caused by technical problems: and nine, or 28%, were caused by unknown/unforeseen events, he said.

Fires and explosions are the most frequent accidents and most involve drums, he said. Of the 32 major accidents, 11 involved drums—six explosions, four fires and one gas accident. Eleven involved tanks—five leaks, three gas accidents, two explosions and one fire. Six pits caught on fire. Three slag baths exploded. And there was one flue gas explosion, Rasmussen said.

Commenting on the number of occupational accidents, Rasmussen said it is likely he "only got half of the number I should have" because workers are nervous about reporting accidents. He emphasized that no worker ever suffered "permanent damage."

The drum emptying station is the most dangerous part of the facility and the receiving area is also dangerous, he told symposium attendees. While the percentage of employees varies from year to year, from 1987-1989 the percentage of employees reporting occupational accidents was under 10%. In 1989, for example, out of 200 employees, 17 reported occupational accidents—9%.

Kommunekemi was founded in 1971 by all Danish municipalities to dispose of their hazwaste. The plant consists of a lab, receiving facilities, treatment plants for waste oil and inorganic waste, a wastewater treatment plan, power plants, three rotary kiln incinerators for solid, sludge and liquid organic wastes, a system for heat delivery to a district heating installation, workshops and a landfill.

According to Arne Kristensen, a KK official who presented a paper about the three incinerators during the symposium, total incinerator capacity is 135,000 metric tons/year. Each incinerator has a rotary kiln, a secondary combustion chamber, a waste heat boiler and a gas cleaning system.

The first plant, which started operation in 1975, has a dry scrubber and a single electrostatic precipitator, he said. The second plant, which started in 1982, is equipped with a semi-dry scrubber and two electrostatic precipitators in parallel. And the third incinerator, which started up in 1989, is equipped with a semi-dry scrubber and a bag-house filter.

Hazwaste, destroyed in the incinerators include waste oil, sludges, spent solvent, pharmaceutical wastes, and pesticides.

"We have now been operating rotary kiln incinerator systems for more than 15 years, and we can conclude that there is no major corrosion problem, though there is significant wear on chains and bearings in the slag conveyors," he said.

6 Nov 90

Note to Rick W. RGN
+ Steve S. —

Notice the article on page 8 about Denmark's KK plant. This is the plant technology that will be used at the Fla. Hlt Processing plant in Polk Co. Obtain all info possible so we can check the permit app. for those problems.
DHS

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY - REGION IV
AIR, PESTICIDES & TOXICS MANAGEMENT DIVISION
345 Courtland Street, N. E.
Atlanta, Georgia 30365
Fax Number:FTS 257-5207 or 404/347-5207

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If the following pages are received poorly, please call G. WORLEY at FTS 257-_____ or 404/347-2904.

SPECIAL INSTRUCTIONS FOR RECEIVER:

(1) MATERIAL WHICH INDICATES "AFTERBURNER" SHOULD BE REQUIRED ON ROTARY KILN BURNING HAZ. WASTE

(2) August 7, 1980 FR cites which explain EPA'S POSITION ON "SIGNIFICANCE" LEVELS.

An Overview of

Hazardous/Toxic Waste Incineration

C. C. Lee, George L. Huffman, and Donald A. Oberacker
U. S. Environmental Protection Agency
Cincinnati, Ohio

Effective hazardous/toxic waste disposal and safe dumpsite cleanup are two of EPA's major missions in the 1980s. Incineration has been recognized as a very efficient process to destroy the hazardous wastes generated by industry or by the dumpsite remediations. This paper provides an incineration summary ranging from discussion of broad regulatory and permitting requirements through more detailed descriptions of typical incineration processes and monitoring techniques.

It is estimated that over 264 million metric tons of organic hazardous/toxic wastes is generated annually in the United States, posing a serious threat to human health and the environment if improperly managed.[1] The federal government responded to the critical hazardous waste problem with the enactment of the Resource Conservation and Recovery Act (RCRA) in 1976 (Public Law 94-580), the Toxic Substance Control Act (TSCA) in 1976 (Public Law 94–469), and the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) in 1980 (Public Law 96–510) to assure the reliable management of hazardous/toxic waste disposal operations and dumpsite cleanup. The enactment of these laws has intensified research into the thermal destruction of organic chemical waste and this research has accumulated a large amount of useful information.

Incineration (or "thermal destruction") has been well recognized as one of the best demonstrated and available technologies for waste destruction. Incineration is an engineered process, with waste destruction being the ultimate goal. Its function is to use either direct or indirect heat to break chemical structures of organic compounds, thus reducing the volume and toxicity of the remaining residuals.

From an engineering viewpoint, the basic objective of the incineration process is to efficiently combust the material to an ash that is acceptable for land disposal while assuring that the exhaust gas products can likewise be dispersed without harm to the environment. Secondary objectives are to carry out the process with minimum energy usage and minimum system maintenance costs.

This paper provides an overview of hazardous/toxic waste incineration. It is intended for those who are not involved in actual incineration management or operations, to enable them to easily understand the status of and the prospects for incineration. It describes current regulatory requirements and provides an overview of hazardous waste incineration. Data on the performance of and emission levels associated with incinerators are not provided in this paper because they have been made available in other recent EPA publications.[2–5]

The Regulatory Basis for Incineration

RCRA and TSCA are two key pieces of legislation enabling EPA to regulate wastes generated from either industrial processes or from CERCLA's dumpsite cleanup activities. In general, RCRA covers all hazardous wastes except for PCB (which is considered a toxic substance and is regulated under TSCA).

RCRA Requirements

In 1980, EPA published a comprehensive list of hazardous wastes.[6–8] The next year (1981), under RCRA, EPA promulgated the standards for operating hazardous waste incinerators.[9] The key requirements of the standards are:

- An incinerator must achieve a destruction and removal efficiency (DRE) of 99.99 percent for each principal organic hazardous constituent (POHC) designated for each waste feed. Initially, EPA suggested the use of compound incinerability and concentration for selecting POHCs. It further suggested that heat of combustion (ΔH_c) be used as the measure of compound incinerability in its guidance manual to permit writers.[10]
- DRE for an incinerator/air pollution control system is defined by the following formula:

$$\mathrm{DRE} = \frac{W_{in} - W_{out}}{W_{in}} \times 100$$

where DRE = destruction and removal efficiency, percent
W_{in} = mass feed rate of POHC to the incinerator
W_{out} = mass emission rate of POHC to the atmosphe[illegible] measured in the [illegible]rior to dis[illegible]

- An incine[illegible] [illegible]zardous waste co[illegible]re than 0.5 percent chlor[illegible] must remove 99 percent of the hydrogen chloride from the exhaust gas.

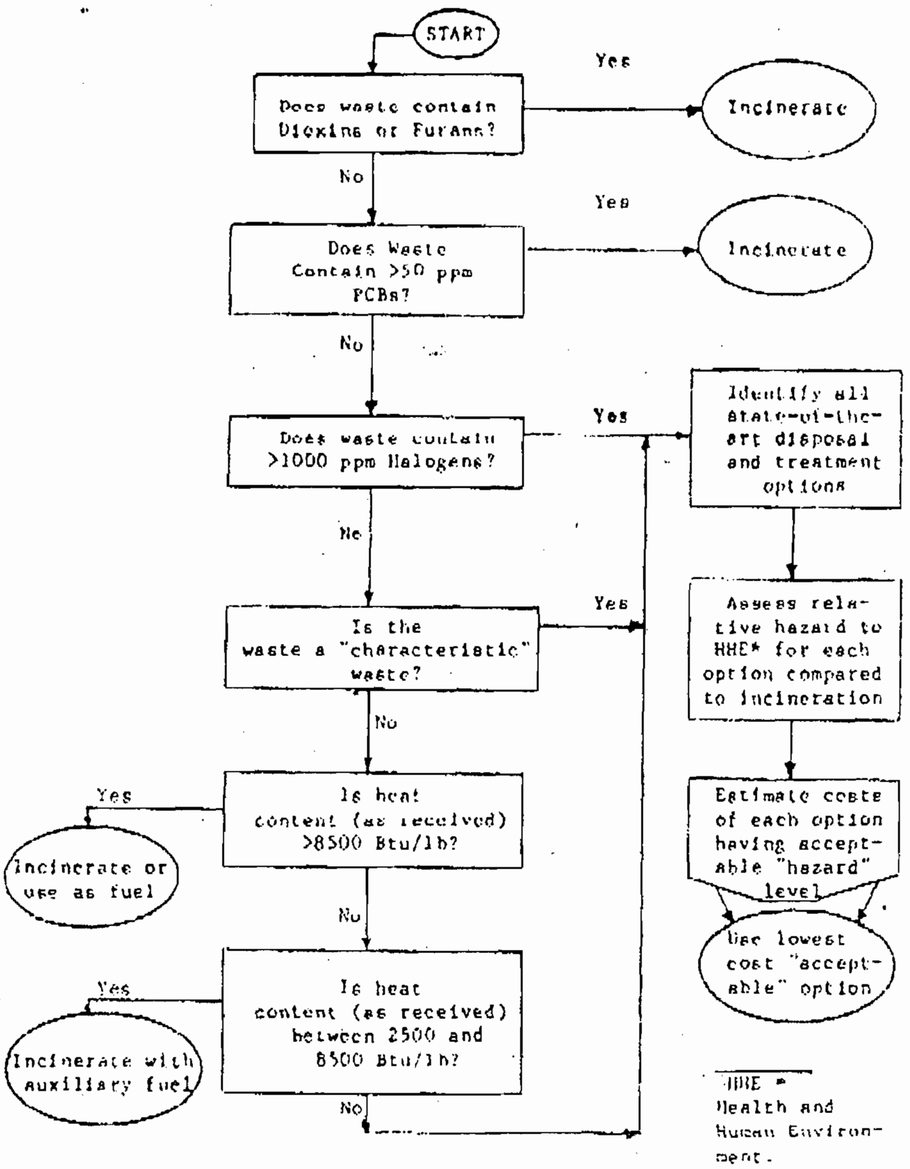

Figure 1. Conceptual strategy for determining waste burnability.

- An incinerator burning hazardous waste must not emit particulate matter exceeding 180 mg/dscm corrected to 7 percent O_2 in the stack gas.

A trial burn (or data equivalent to a trial burn) is generally required to demonstrate the ability of a hazardous waste incinerator to comply with the above performance standards.

TSCA Requirements

In 1979, under TSCA, EPA promulgated the standards for operating PCB (polychlorinated biphenyl) incinerators. The general requirements of the standards are:[11]

- Liquid PCBs—maintenance of the introduced liquids for a 2-second dwell time at 1200°C (± 100°C) and 3 percent excess oxygen in the stack gas; or
- Maintenance of the introduced liquids for 1.5- second dwell time at 1600°C (± 100°C) and 2 percent excess oxygen in the stack gas.
- Combustion efficiency shall be at least 99.9 percent computed as follows:

Combustion efficiency

$$= [C_{CO_2}/(C_{CO_2} + C_{CO})] \times 100$$

where C_{CO_2} = concentration of carbon dioxide
C_{CO} = concentration of carbon monoxide

- Nonliquid PCBs—the mass of emissions from the incinerator shall be no greater than 0.001g PCB/kg of the PCB introduced into the incinerator. (This is equivalent to 99.9999 percent DRE.)
- Similar to the RCRA requirements, a trial burn is generally required to demonstrate that the incinerator meets the above standards.

Wastes Suitable for Incineration

Background information about the hazardous waste to be burned is generally available. Such information may have been generated under RCRA's Section 3001 (Identification and Listing of Hazardous Waste), Section 3002 (Standards Applicable to Generators of Hazardous Waste), or Section 3003 (Standards Applicable to Transporters of Hazardous Waste) of the RCRA regulations. Additional information usually can be obtained from studies of the process(es) generating the waste(s). This background information is helpful in evaluating waste for incineration.

Factors to be considered in evaluating waste for incineration are:

- Dioxin/furan and PCB content
- Moisture content
- Potential pollutants expected in incinerator effluents
- Inert (ash) content
- Heating value and auxiliary fuel requirements
- Potential health and environmental effects of the effluents
- Physical form
- Corrosiveness
- Known carcinogenic content

A conceptual strategy for determining the wastes which are candidates for thermal destruction is shown schematically in Figure 1.[12] In general, the heat content of the waste burned must maintain adequate ignition and incineration temperatures or a supplemental fuel must be provided.

The Incineration Concept

Conventional speculation suggests that about 99 percent of wastes are destroyed in the flame zone of an incinerator, and that about 1 percent is destroyed in the post-flame zone. From a chemical point of view, incineration is an intensive oxidation process. Incineration or combustion basically refers to the rapid oxidation of organic substances. When oxidation is rapid, the temperature of the material rises rapidly due to the inability of transferring heat to the surroundings as rapidly as it is produced by the oxidation reaction. As a result, the material emits visible radiation which is referred to as a "flame." A simplication of the overall

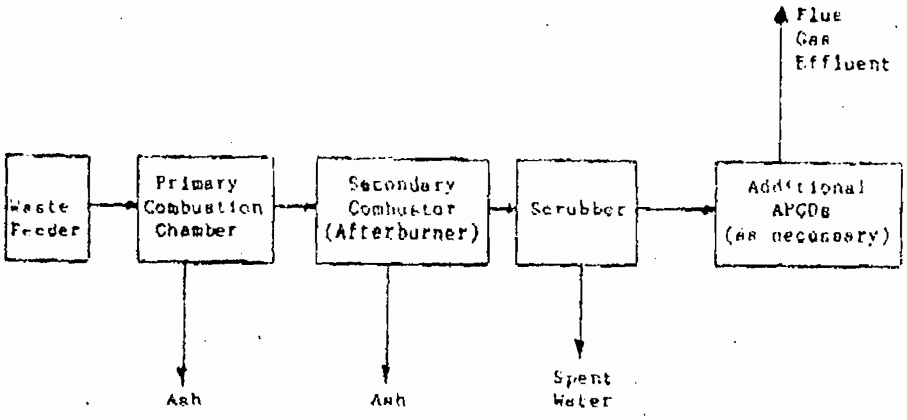

Figure 2. Key components of a typical incineration system.

chemical process that takes place during incineration is as follows:

Reactants		*Products*	
$C + O_2$	$\rightarrow$	CO_2	(1)
$H_2 + \frac{1}{2}O_2$	$\rightarrow$	H_2O	(2)

In actuality, these reactions (and the three that follow) seldom go to 100 percent completion. Consequently, numerous products of incomplete combustion (PICs) can, and oftentimes do, form—generally, however, in the ppm range.

There are three major components in a combustion system: fuel, oxidant, and diluents. A fuel containing energy-rich bonds such as carbon-carbon, carbon-hydrogen, and hydrogen-hydrogen bonds is a common source of chemical potential energy. During combustion, such fuels are oxidized and their chemical potential is transformed into thermal energy. The second distinct component of a combustion system is the oxidant. The oxidant reacts with the fuel during combustion to release the chemical potential energy stored in the fuel as thermal energy. Most commonly, the oxidant is molecular oxygen, a constituent of combustion air. The third component is the diluent. A diluent in this discussion is a substance that does not participate chemically in the combustion reaction either as a fuel substance or as an oxidant. It is physically present and often does influence the combustion process. For example, nitrogen is a diluent which has heat capacity and, while it does not make a positive contribution to the total energy released, it acts as a thermal sink and limits the temperature rise achieved by combustion. One unit of oxygen has 3.76 units of nitrogen in combustion air. Therefore, for example, propane (C_3H_8) combustion at 100 percent of theoretical air can be expressed as follows:

For 100 percent theoretical air

$$C_3H_8 + 5(O_2 + 3.76N_2) \rightarrow 3CO_2 + 4H_2O + 18.8N_2 \quad (3)$$

There are three types of combustion, theoretical (stoichiometric), lean, and rich combustion, depending on the quantities of oxidant available in the system. Theoretical combustion refers to the system in which the quantity of oxidant present is just sufficient to completely oxidize the fuel. Lean combustion refers to the system which contains excess oxidant, and the converse case where there is insufficient oxidant for complete oxidation of the available fuel is referred to as rich combustion.

Equation 3 above shows "theoretical combustion." Equation 4 below shows lean combustion and Equation 5 depicts rich combustion.

For 80 percent of theoretical air (rich combustion)

$$C_3H_8 + 5 \times 0.8(O_2 + 3.76N_2) \rightarrow 2CO + CO_2 4H_2O + 4H_2O + 15.04N_2 \quad (4)$$

For 150 percent of theoretical air (lean combustion)

$$C_3H_8 + 5 \times 1.5(O_2 + 3.76N_2) \rightarrow 3CO_2 + 4H_2O + 2.5O_2 + 28.2N_2 \quad (5)$$

Combustion is a very complicated process. It involves complex interaction of heat and mass transfer, and chemical kinetics in a two-phase system. It is so complicated that many consider it as an art rather than a science. Applying already-complicated combustion theories to hazardous waste incineration makes the problem even tougher. The ultimate goal of hazardous waste incineration is to convert the hazardous materials into harmless combustion products (such as CO_2 and H_2O) which can be rejected directly to the atmosphere or removed by air pollution control devices when the combustion products are not totally harmless in themselves.

Description of Major Incineration Processes

In general, the key components and their configuration in a "typical" incinerator system are shown in Figure 2.

Waste Feeders

The type of waste feeder employed depends entirely on the characteristics of the wastes to be incinerated. The factors that need to be considered in selecting a proper waste feeder include:

- Waste physical form: solid, liquid, gas or mixture
- Solids: size, form, and quantity
- Liquids: viscosity as a function of temperature, and specific gravity
- Sludges (slurries): density, viscosity and percent solids
- Gases: density
- Special characteristics: toxicity, corrosiveness, and other unusual features.
- Disposal rate: peak, average, and

Table 1. Estimation of available incinerator capacity by incinerator design.

Incinerator design	Number of units	Average design capacity (MM Btu/h)	Utilization (percent)	Available capacity (MM Btu/h)	Percent with air pollution control equipment
Rotary kiln	42	58.7	77	570	80
Liquid injection	85	30.1	55	1640	42
Fume	25	29.5	94	40	40
Hearth	32	22.6	62	270	38
Other	14	23.8	—	110	—
Total or average values	208	37.6[a]	67[b]	2530	50

[a] 181 incinerators reporting.
[b] 90 incinerators reporting.

Table II. Applicability of available incineration processes to the burning of waste (by waste type).

Waste type	Rotary kiln	Liquid injection	Fluidized bed[a]	Fixed hearth (controlled air)
Solids:				
Granular, homogeneous	X		X	X
Irregular, bulky (pellets, etc.)	X			X[b]
High melting point (tars, etc.)	X	X[c]	X	X
Organic compounds with fusible ash constituents	X			X
Unprepared, large, bulky material	X			
Gases:				
Organic vapor-laden	X[d]	X[d]	X[d]	X[d]
Liquids:				
High organic-strength aqueous wastes often toxic	X[e]	X	X	
Organic liquids	X[e]	X	X	
Solids/liquids:				
Waste contains halogenated aromatic compounds	X	X[f]		
Aqueous organic sludge	X[g]		X	

[a] Suitable for pyrolysis operation.
[b] Handles large material on a limited basis.
[c] If material can be melted and pumped.
[d] If properly fed into the incinerator.
[e] If equipped with auxiliary liquid injection nozzles.
[f] If liquid.
[g] Provided waste does not become sticky upon drying.

minimum at the present and future requirement levels.

For example, liquid feeder systems consist of waste filtration, waste/fuel blending and feed preheating (optional) while solid feeders are designed to feed waste pneumatically, mechanically or by gravity to the incinerator.

Primary and Secondary Combustors

The primary combustor is an important part of an incinerator system. The incinerator system is usually named after the primary combustor such as "a rotary kiln incinerator" or "a liquid injection incinerator." Secondary combustors (afterburners) are simple combustion chambers (incinerators) designed to improve destruction efficiencies. As a first step to an air pollution control process, the afterburner acts to continue the combustion process and greatly decrease pollutants in the flue gas. This in turn creates less pollutant loading on downstream emission control devices which then require less servicing and maintenance, and produce less residue as a result. In general, primary combustors can be grouped into two categories: conventional incinerators and innovative thermal destructors. Only conventional incinerators will be discussed here.

In 1985, EPA conducted a survey relative to the types and population of conventional incinerators in the United States. The survey showed that three types of conventional incineration processes dominate the incineration field. They are the liquid injection, rotary kiln, and hearth processes. A summary of their features, along with those of some others, is given in Table I.[13] Table II compares the applicability of these technologies with a variety of waste types.[14]

Liquid Injection Incinerators (LIIs). Liquid injection incinerators, as the name implies, are applicable almost exclusively to pumpable liquid waste. These incinerators are usually simple, refractory-lined cylinders (either horizontally or vertically aligned) equipped with one or more waste burners. Liquid wastes are injected through the burner(s), atomized to fine droplets, and burned in suspension. Burners as well as separate waste injection nozzles may be oriented for axial, radial, or tangential firing. Improved utilization of combustion space and higher heat release rates, however, can be achieved with the utilization of swirl or vortex burners or designs involving tangential entry. A typical horizontally-fired incinerator is shown in Figure 3.[15]

Vertically-aligned liquid injection incinerators are preferred when wastes are high in inorganic salts and ash content while horizontal units may be used with low ash waste. The typical capacity of liquid injection incinerators is roughly 10 × 10^6 Btu/h (2.5 × 10^6 kcal/h). Units, however, range as high as 70 to 100 × 10^6 Btu/h (17.6 to 25.2 × 10^6 kcal/h.[14]

Advantages of LIIs

- No secondary combustion chamber is needed if the primary combustor has enough residence time—2 seconds as a general rule of thumb.
- Capable of incinerating a wide range of liquid hazardous waste.
- No continuous ash removal system is required other than for downstream air pollution control systems.
- Capable of a fairly high turndown ratio.
- Virtually no moving parts.
- Low maintenance costs.

Disadvantages of LIIs

- Only wastes which can be atomized through a burner nozzle can be incinerated.
- Burners susceptible to pluggage (burners are designed to accept a certain particle size; therefore, particle size is a critical parameter for successful operation).
- Burner may or may not be able to accept a material which dries and cakes as it passes through the nozzles.

Rotary Kiln Incinerators (RKIs). Rotary kiln incinerators are more versatile incinerators in the sense that they are applicable to the destruction of solid wastes, slurries, and containerized waste as well as liquids. The rotary kiln is a cylindrical refractory-lined shell that is mounted on a slight incline. Rotation of the kiln provides for movement of waste through the kiln as well as for enhancement of waste mixing.

To ensure complete waste combustion, rotary kiln incinerator designs normally include a secondary combustor (an afterburner). The primary function of the kiln is to convert solid waste to gases, which occurs through a series of volatilization, destructive distillation, and partial combustion reactions. However, a secondary combustor is almost always required to complete the gas-phase combustion reactions. The secondary combustor is connected directly to the discharge end of the kiln. Both the kiln and the secondary combustor are usually equipped with an auxiliary fuel firing system to bring the units up to the desired operating

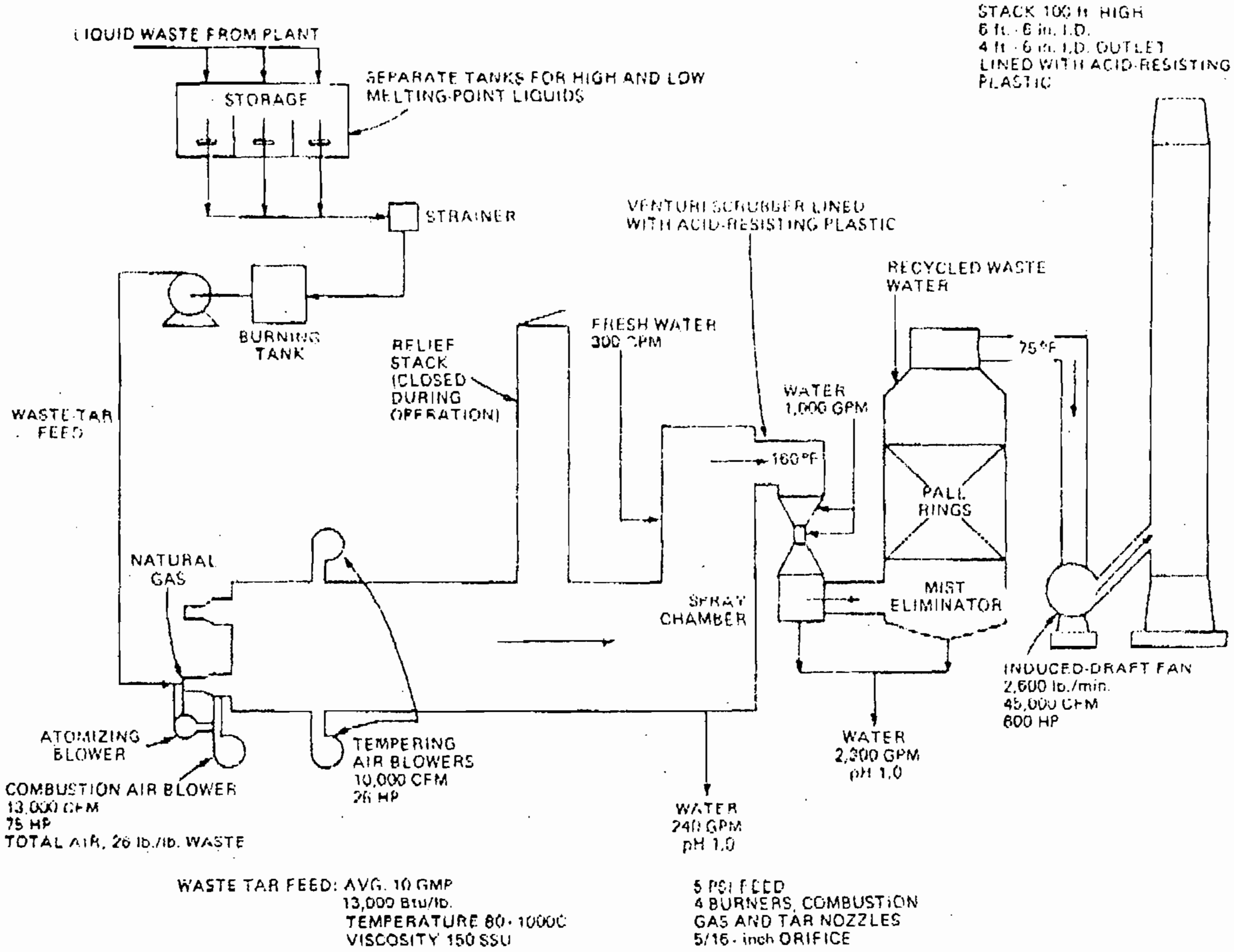

Figure 3. Example of a horizontally-fired liquid injection incinerator.

temperatures. Rotary kilns burning hazardous wastes are designed with a typical capacity of 25 × 10^6 Btu/h (6.3 × 10^6 kcal/h). A typical rotary kiln incinerator is shown in Figure 4.[15]

Advantages of RKIs[15]

- Can maintain a higher retention or residence time and incinerate a wide variety of liquid and solid hazardous wastes.
- Feed capability for drums and bulk containers.
- Continuous ash removal which does not interfere with the waste oxidation.
- The retention or residence time of the nonvolatile component can be controlled by adjusting the rotational speed.
- Rotary kilns can be operated at temperatures perhaps as high as 2,550°F (1,400°C), making them well suited for the destruction of toxic compounds that are difficult to thermally degrade.

Disadvantages of RKIs[16]

- High capital cost for installation, because of the need for the secondary combustor.
- Spherical or cylindrical items may roll through kiln before complete combustion.
- High particulate loadings.
- Problems in maintaining seals at either end of the kiln are a significant operating difficulty.
- Drying of aqueous sludge wastes or melting of some solid wastes can result in clinker or ring formation on refractory walls.

Hearth Incinerators (HIs). Hearth incinerators, also called controlled air, starved air, or pyrolytic incinerators, are the third major technology in use for hazardous waste incineration today. Hearth incineration is basically a two-stage combustion process. A cutaway view of a typical unit is shown in Figure 5.[14] Waste is ram-fed into the first stage, or primary chamber, and burned at roughly 50–80 percent of stoichiometric air requirements. This starved air condition causes most of the volatile fraction to be destroyed pyrolytically, with the required endothermic heat provided by the oxidation of the fixed carbon fraction. The resultant smoke and pyrolytic products, consisting primarily of volatile hydrocarbons and carbon monoxide, along with products of combustion, pass to the second stage, or secondary chamber. Here, additional air is injected to complete the combustion, which can occur either spontaneously or through the addition of supplementary fuels. It is this two-stage process that generally allows low stack emissions. The primary chamber combustion reactions and turbulent velocities are maintained at such low levels by the starved air conditions that particulate entrainment and carryover is minimized. With the addition of secondary air, total excess air for controlled air incinerators is in the

100 to 200 percent range.

Secondary chambers of controlled air incinerators are generally designed to provide gas residence times from 0.5 to 1.0 seconds (0.7 seconds typically) and combustion temperatures ranging from 760°C (1400°F) to 982°C (1800°F), typically 871°C (1600°F). Longer residence times (up to 2.0 seconds) and temperatures up to 1204°C (2200°F) may be required, however, for systems burning many types of hazardous wastes.[14]

Advantages of HIs[15]

- Are well suited for sludge disposal.
- Large quantities of waste-bound water can be evaporated.
- Can utilize many types of fuels including coal dust, waste oils and solvents.
- For multizone configuration hearths, fuel efficiency is high and improves with the number of hearths used. Fuel burners can be added to any of the hearths to maintain a desired temperature profile.

Disadvantages of HIs[15]

- Need a secondary combustor, thus increasing installation, maintenance and operating costs.
- Solid wastes generally have to be pretreated prior to successful incineration.
- Not well suited for wastes containing fusible ash, wastes which require extremely high temperature for destruction of irregular bulky solids.

Air Pollution Control

Although incineration can destroy hazardous or toxic wastes, it also produces undesirable air pollutants which require that treatment procedures be adopted to ensure clean discharges of combustion gases to the atmosphere. The undesirable pollutants may include:

- Hydrogen chloride (HCl); other halogens
- Particulates
- Nitrogen oxides (NO_x)
- Sulfur oxides (SO_x)
- Products of incomplete combustion (PICs)
- Trace metals and their complexes

HCl and particulates are regulated under RCRA. Currently, there are no regulations on the emissions of PICs and trace metal (*per se*) from the operation of incinerators.

To control these undesirable pollutants, an incineration system generally requires one or more air pollution control devices (APCDs).[15] Currently, the most common APCDs used in the United States include:

APCD	*Primary control function*
Venturi scrubbers	Particulate
Packed bed scrubbers	HCl
Plate tower scrubbers	HCl
Baghouses	Particulate
Electrostatic precipitators	Particulate

The sequence of the APCD installations is likely to be as follows: Combustion gas → Quenching → Scrubber → Baghouse or ESP → Discharge.

Quenching System

The purpose of the quenching system is to reduce combustion gas temperature from about 1000°C to 100°C, a temperature which is acceptable for scrubbing operations. This lowered temperature also minimizes gas volume flow rates for downstream processing. During the quenching process, heat can be recovered if this is a desirable option.

Scrubbers

Venturi scrubbers involve the injection of a scrubbing liquid (usually water or a water/caustic solution to neutralize HCl acid gas) into the exhaust gas stream as it passes through a throat at a velocity of approximately 30 to 130 m/s. The accelerating gas creates a pressure drop [illegible] the throat and atomizes the injected liquid into fine droplets which allow [illegible] large surface area for mass transfer. [illegible] this intimate gas/liquid contact [illegible] permits removal of the gaseous contaminants.

Contaminants are removed in packed bed scrubbers by a gas absorption process that also depends on intimate gas/liquid contact. These scrubbers are vessels filled with randomly-oriented packing material such as

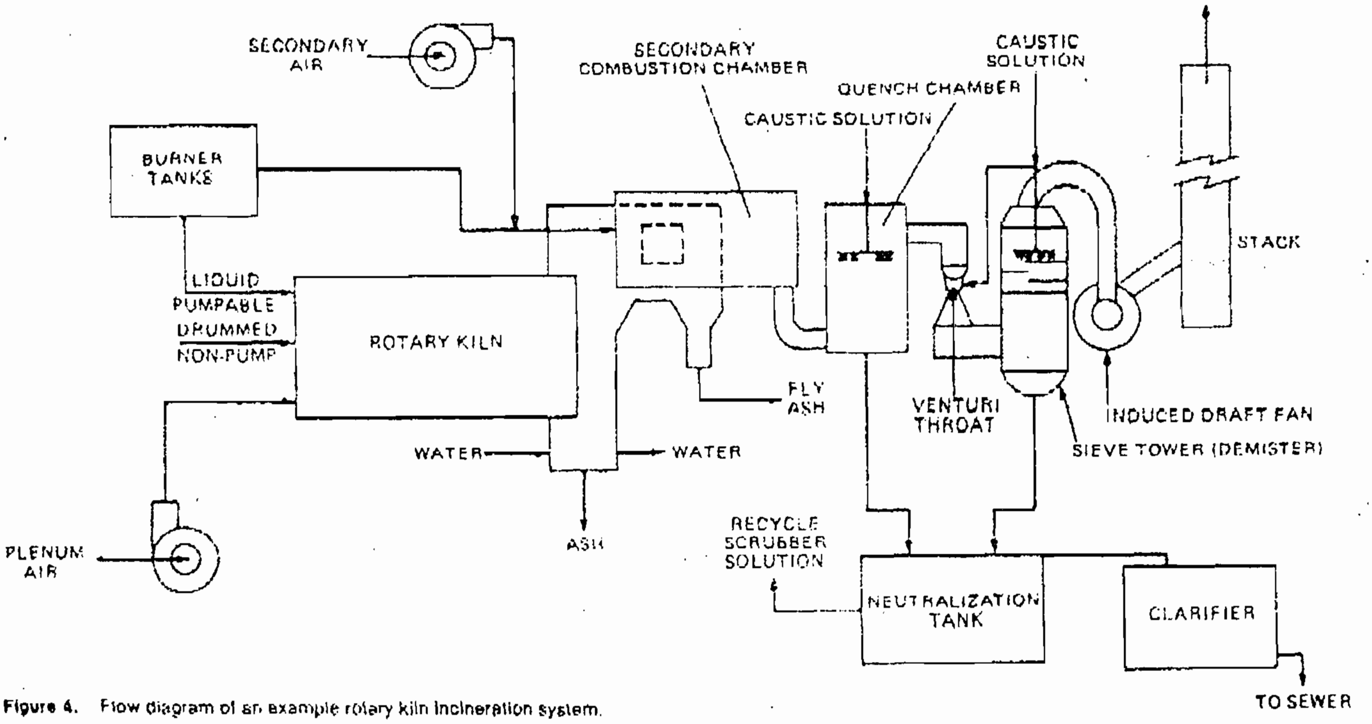

Figure 4. Flow diagram of an example rotary kiln incineration system.

Table III. Continuous monitoring parameters and methodologies

Parameter	Method of detection
CO	Nondispersive infrared
O_2	Paramagnetic analyzer
CO_2	Nondispersive infrared
NO_x	Chemiluminescence
Total hydrocarbons	Flame ionization detection
Temperature	Thermocouple

saddles or rings. The scrubbing liquid is fed to the top of the vessel, with the gas flowing in either countercurrent, concurrent, or crossflow modes (countercurrent being the most common). As the liquid flows through the bed of packing, it wets the packing material and thus provides interfacial surface area for mass transfer with the gas phase.

Like packed bed scrubbers, plate scrubbers also rely on gas absorption into liquids for the removal of contaminants. The basic design is a vertical cylindrical column with a number of plates or trays inside. The scrubbing liquid is introduced at the top plate and flows successively across each plate as it moves downward to the liquid outlet at the tower bottom. Gas comes in at the bottom of the tower and passes upward through openings in each plate before exiting the tower at the top. Gas absorption is promoted by the breaking up of the gas phase into small bubbles which pass through the volume of liquid on each plate.[14]

Electrostatic Precipitators

Electrostatic precipitation is a process by which particles suspended in a gas are electrically charged and separated from the gas stream. In this process, negatively charged gas ions are formed between emitting and collecting electrodes by applying a sufficiently high voltage to the emitting electrodes to produce a corona discharge. Suspended particulate matter is charged as a result of bombardment by the gaseous ions and migrates toward the rounded collecting plates due to electrostatic forces. Particle charge is neutralized at the collecting electrode where subsequent removal is affected by periodically rapping or rinsing the electrode.[15]

Table IV. Permit requirements for a recent New Jersey project.

Title of permit	Permit reference
	Federal permits.
Resource Conservation and Recovery Act, (RCRA)	40 CFR Parts 261, 262, 264 and 265 and 270 Treatment Storage Disposal of Hazardous Wastes
Clean Air Act	40 CFR 52.21, Prevention of Significant Air Quality Deterioration Regulation (PSD regulation)
Toxic Substances Control Act (TSCA)	40 CFR 761.40, Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions
National Environmental Policy Act (NEPA)	40 CFR Part 6, Agency Implementation of National Environmental Policy Act
National Pollutant Discharge Elimination System (NPDES)	National Pollutant Discharge Elimination System under the Clean Water Act, 33 U.S.C. 1251, Discharge of Pollutants into the Waters of the United States
	State permits.
Incinerator Permit Application for Air Pollution Control	New Jersey Department of Environmental Protection Administrative Code, Title 7, Chapter 27, Subchapter 8, Permits and Certificates
Discharge Elimination Systems Permits (NJ-PDES)	New Jersey Pollutant Discharge Elimination System 58:10 Al, et. seq.
Hazardous Waste Facility Registration Requirement Report (EIS)	Covered under New Jersey Hazardous Waste Management Regulations, 7026-1, et. seq.
Division of Hazard Management Permit (DPCC, DCR permit)	Covered under Rules Concerning Discharges of Petroleum and Other Hazardous Substances (N.J.A.C. 7.1 e-1 et. seq.; Subchapter 3 Discharge Cleanup Operations)

Baghouses

A baghouse filter contains a permeable material through which a gas laden with particles is passed. The mechanisms of a baghouse filter for removing particles from a gas stream are: 1) filtration through the fibers; 2) interception: collision between the particles and the fibers of the filter media; 3) impingement: a sudden change in direction of the particle; 4) gravitational settling; 5) electrostatic attraction: for the collection of small particles; and 6) diffusion: for the collection of particles in the submicron range. All baghouse filters operate in basically the same way: Dirty gas is introduced to the unit where it is filtered by cloth tubes or bags. The filtering action usually removes greater than 99 percent of the entrained particles entering the unit.[16]

Monitoring Requirements

The objective of monitoring is to ensure the proper performance of incinerator operation. The state of the art is such that some parameters (such as O_2, CO_2, CO, total hydrocarbon, NO_x, temperature, etc.) can be measured on a continuous basis using automatic instruments, while some trace contaminants [such as PCB, dioxin (PCDD) and furan (PCDF)] can only be measured manually.

Continuous Emission Monitoring[17]

Instruments currently available to continuously and automatically measure their corresponding parameters are summarized in Table III. The monitoring system normally comprises a gas conditioning system for removing particulates and condensate, sensors for measuring the various parameters listed above, and a data acquisition system as shown in Figure 6.

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HCl Sampling[15]

The sampling procedure developed for the determination of hydrogen chloride emissions from stationary sources is shown in Figure 7. A heated glass-lined probe is used with the temperature maintained at 300°F or at stack temperature, whichever is greater. A Pyrex wool plug is inserted in the inlet end of the probe. The impinger train, which should be immersed in an ice bath during the samping, consists of four midget impingers connected by glass U-tubes and clamps. Impinger Nos. 1 and 2 contain 15 mL of the absorbing solution (0.1N NaOH). Impinger No. 3 contains 15 mL of 3 percent H_2O_2 solution, which will remove SO_2 from the sample stream. Impinger No. 4 is a dry impinger which functions to remove moisture from the sample stream. A sampling rate of 2.0 liters per minute is typically recommended with a total sample volume of 60–300 liters (dry) per sample, depending on the expected concentrations of HCl to be measured. Samples are analyzed for chloride ion by titration with a standard solution of mercuric nitrate $[Hg(No_3)_2]$.

Volatiles: Volatile Organic Sampling Train (VOST)[16]

The VOST is typically used to quantify concentrations of VOCs. VOC refers to those organic compounds with boiling points less than 150°C. The method utilizes Tenax and Tenax/charcoal cartridges to absorb the VOCs each of which is preceded by a condensing module.

The train consists of a glass-lined probe with a glass-wool plug to remove particulate, followed by an assembly of condensers and organic resin traps as illustrated in Figure 8. The first condenser cools the gas stream and condenses the water vapor present. The flue gas and condensed moisture then pass through a cartridge containing 1.5 grams of Tenax resin (60–80 mesh). The condensate is collected in the first impinger with is continually purged by a gas stream. The second condenser and trap containing Tenax/charcoal serves as a backup for low-volume breakthrough compounds. Following the second Tenax trap is a silica gel drying tube for residual moisture removal.

Semivolatiles: Modified Method 5 (MM5)[16]

Modified Method 5 sampling trains are used for the collection of particu-

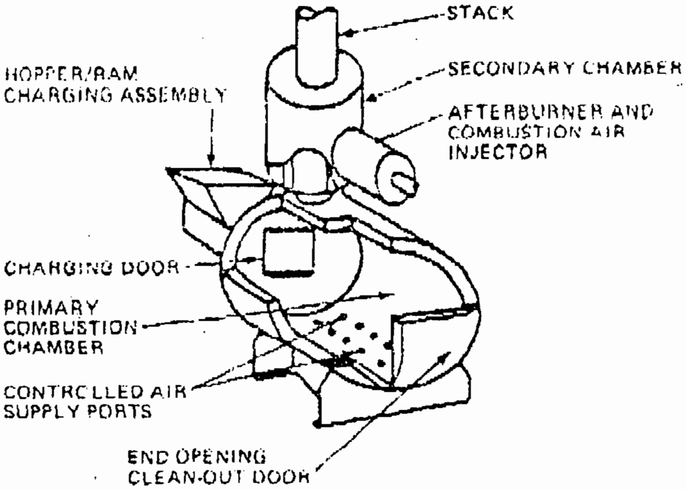

Figure 5. Cutaway view of a controlled air incinerator.

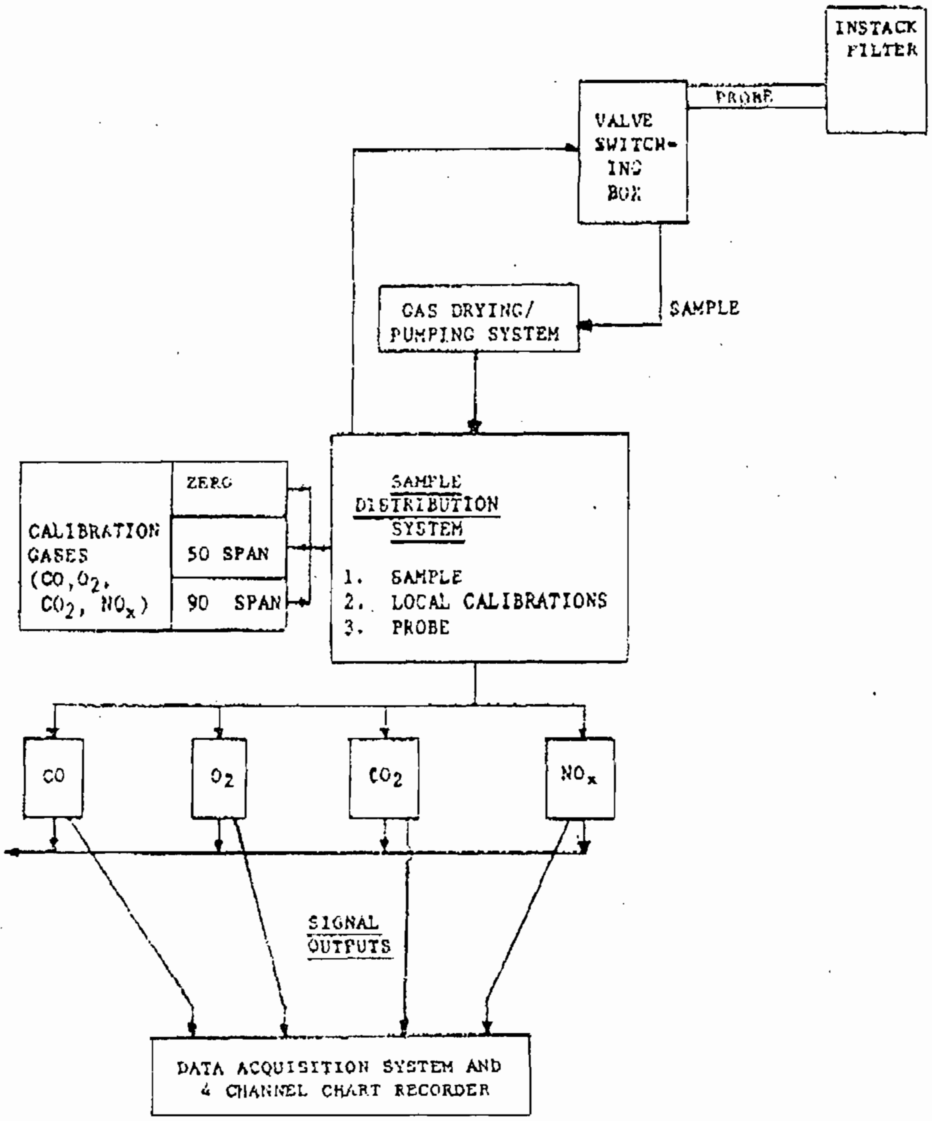

Figure 6. Continuous monitor sampling schematic.

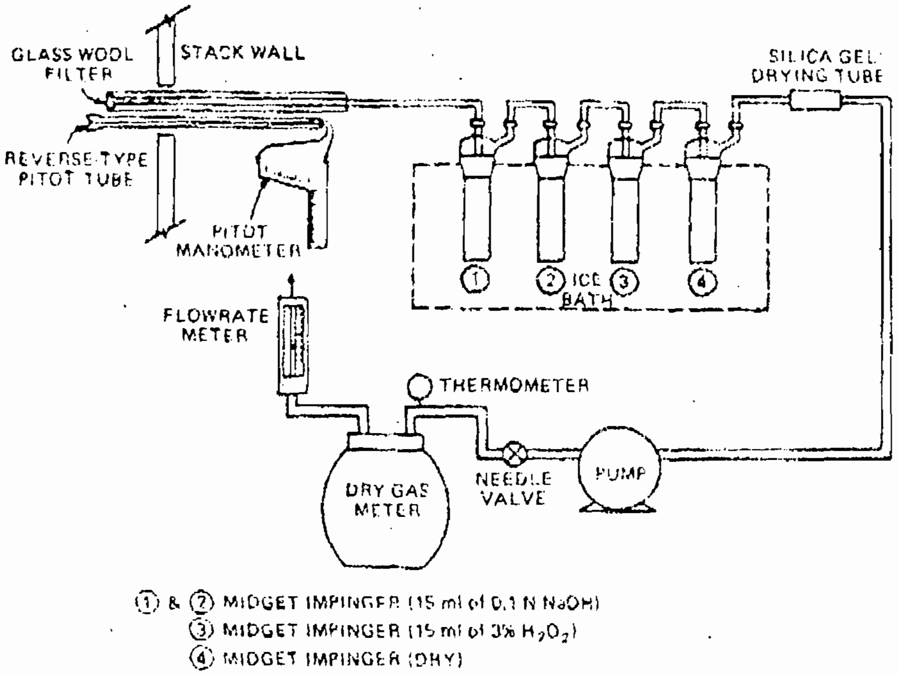

Figure 7. Schematic diagram of hydrogen chloride sampling train.

lates, semivolatiles, polychlorinated biphenyls, and polychlorinated dibenzo-p-dioxins/polychlorinated dibenzofurans (PCDD/PCDF). A schematic of the MM5 sampling train is shown in Figure 9.

The sample train consists of a glass-lined heat-traced probe with a stainless steel button-hook nozzle and attached thermocouple and pitot tube. After the probe, the gas passes through a heated glass fiber filter. Downstream of the heated filter, the sample gas passes through a water-cooled module, then through a sorbent module containing approximately 25 g of XAD-2 resin. The XAD module, which is kept at a temperature below 20°C, is followed by a series of four impingers. The first impinger, acting as a condensate reservoir connected to the outlet of the XAD module, is modified with a short stem so that the sample gas does not bubble through the collected condensate. The first and third impingers are empty, the second contains 100 mL of deionized water, and the fourth contains a known weight of silica gel. All connections within the train are glass or Teflon, no sealant greases are used. The impingers are followed by a pump, dry gas meter, and a calibrated orifice meter.

The gas samples taken by VOST or MM5 are then analyzed by GC or GC/MS for the organic compounds of interest, depending on the desired specificity. Using the resulting data, the destruction and removal efficiencies can then be calculated.

Permitting

Permitting is one of the very important steps in managing an incinerator facility. It can take a minimum of 18 months to obtain the RCRA permit. In addition to the RCRA permit, other permits may need to be obtained as well. The list shown in Table IV is an example of the permit requirements for a recent project within the State of New Jersey.[19]

Conclusion

Incineration is thus far the best demonstrated available technology for waste destruction. Unfortunately, it is not a perfect technology. It may emit unwanted products of incomplete combustion or trace metals. The PICs could conceivably be equally or more hazardous than the original compounds in the waste fed to the unit. However, the amounts of the PICs in the exhaust are generally at least two orders of magnitude less than the original compounds in the feed. Both PIC and trace metal emissions are very complicated problems. A considerable amount of research needs to be done in order to ensure that they can be adequately controlled.

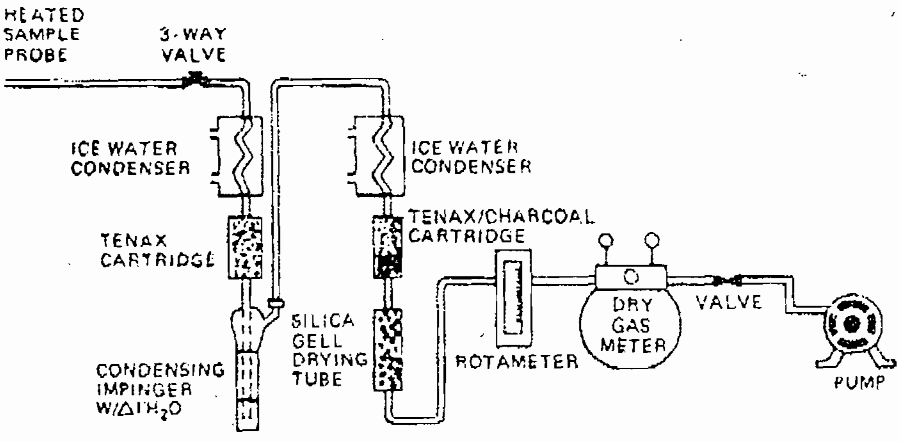

Figure 8. Volatile organic sampling train schematic.

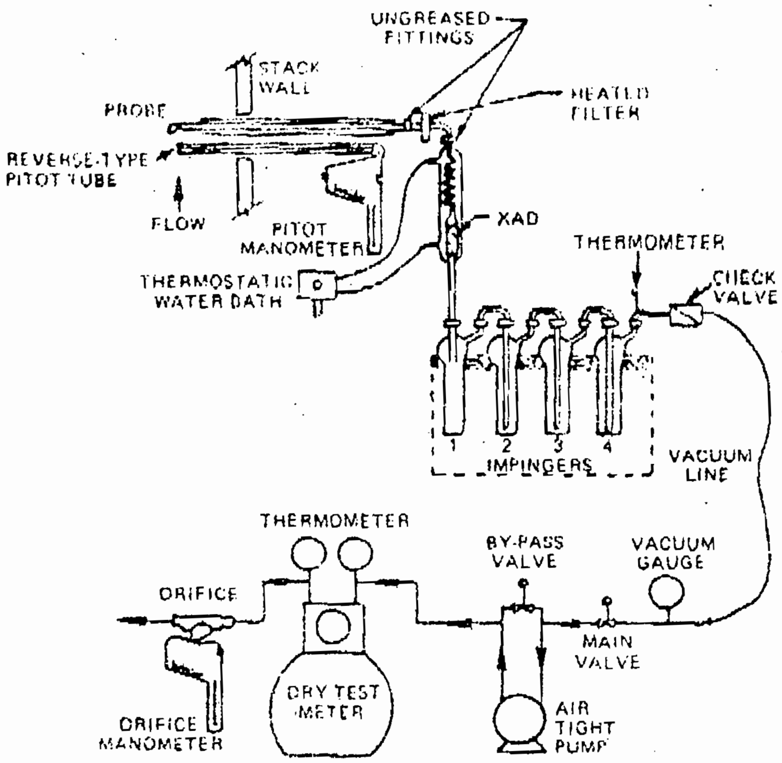

Figure 9. Modified Method 5 train.

Notice. This paper has been reviewed by the Hazardous Waste Engineering Research Laboratory, U.S. Environmental Protection Agency, Cincinnati, Ohio and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of EPA, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

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The authors are with the U.S. Environmental Protection Agency, Office of Research and Development, Office of Environmental Engineering and Technology, Hazardous Waste Engineering Research Laboratory, Alternative Technologies Division, Thermal Destruction Branch, Cincinnati, OH 45268. This paper was submitted for peer review May 7, 1986; the revised manuscript was received June 23, 1986.

HAZARDOUS WASTE NEWS

Hazardous Waste Communications Network

The City of St. Paul, Minnesota has implemented a system which will help it to more effectively handle a hazardous waste accident or chemical spill should it occur in the city. Working with NewVector Communications, Inc., the cellular mobile phone company, city emergency management officials have created a communications network which enables them to identify the scope of a hazardous waste accident and provides action steps for solving or containing the problem.

In a chemical fire or emergency involving hazardous waste this system allows the city to determine the nature of the chemicals involved, the level of danger, how to best control the situation, and whether or not an area should be evacuated—all in a matter of seconds. The elements that make the system operational are the VectorOne cellular phone, a specially designed modem, computer terminal and keyboard, installed in emergency vehicles or in brief cases that can be transported to the scene of an accident.

The phone systems provide a link to "Hazard Line," a national hazardous materials data base located in Washington D.C. Because the system operates by way of cellular and mobile telephone, all information can be transmitted on-site. If the chemical is unknown, the caller can input characteristic traits: color, smell, texture, etc., and the computer will print out possible chemicals matching that description.

Previously the city used reference books and expert sources to determine the nature of hazardous wastes and chemicals, according to Russ Polansky, director of emergency services for the city. "No one resource could help us. Although we had hundreds of texts, no one reference was all inclusive and we weren't always finding texts to be 100 percent consistent," said Polansky.

The data base also provides information on how the chemical can best be controlled until help arrives, types of equipment that should be used to fight it in the case of a fire, or clear it up in the case of a spill, types of garments to be worn by emergency personnel, types of foams or sprays to use or not to use. As conditions change these can continue to be fed into the computer for up-to-the-minute information.

Infrared System Tested for Effectiveness on PCBs

The Shirco infrared thermal treatment technology was field tested for its effectiveness on PCB-contaminated soil at two Superfund sites during May 13–20, 1986. The transportable pilot system, manufactured by Shirco Infrared Systems in Dallas, Texas, consists of a primary furnace through which solid and semisolid wastes are conveyed on a wire mesh belt. The heat source is supplied by electric glow bars in lieu of gaseous fuels. Residence time and furnace temperatures can be manually or automatically controlled, resulting in a consistently even ash quality. A secondary chamber, heated by either electric or gaseous fuels, follows the primary furnace and provides temperatures in excess of 2200°F. The system is designed to comply fully with all RCRA and TSCA requirements. The transportable pilot is housed in a 45-foot van and is easily relocated for on-site trials.

EPA issued an R&D permit from the Washington headquarters Chemical Regulation Branch of the Office of Toxic Substances. The R&D permit authorized incineration of PCB-contaminated soil at a Superfund site in southeastern Florida. The lead responsible party was evaluating the feasibility of on-site incineration as an alternative to disposal of the waste in an off-site landfill.

The test included incineration of approximately 2,000 pounds of soil containing from 50 to 5,000 ppm of PCBs. The waste feed rate, due to greater efficiency than originally anticipated, was increased from 50 lb/h to 125 lb/h. Preliminary results indicate that the treated soils were below detection limits of 1 ppm. The R&D permit required that all wastes generated by the pilot unit be characterized. This included stack emissions (gases and particulates), bottom ash, scrubber water, and other particulates from air pollution control equipment. Also required was analysis of all wastes for PCBs, PCDDs and PCDFs including the congeners 2,3,7,8-tetrachlorodibenzodioxin and dibenzofuran, total TCDD and TCDF. Stack emissions were monitored for oxygen, carbon monoxide, carbon dioxide, nitrogen oxides, hydrochloric acid, total chlorinated organic content, and total particulate.

The second on-site trial was conducted on May 21–22, 1986 at Peak Oil, a Superfund site near Brandon, Florida. The testing was done at the request of the Region IV EPA. Peak Oil is ranked high on the National Priority List and has received a great deal of local attention. The site contains PCBs, halogenated organics and trace metals.

The Peak Oil trial was supervised by the EPA, the Florida Department of Environmental Regulation and local air pollution control agencies. EPA's Edison, New Jersey air emissions staff was responsible for the test design, sampling and analytical requirements—much like what EPA proposes to do under its Site Innovative Technology Evaluation (SITE) program. Test parameters were virtually identical to the on-site trial performed the week earlier.

Test results from both on-site trials will be available by June 30, 1986. For further information contact Mr. Fred Stroud at (404) 347-3931 or Scott Berdine at (214) 630-7511.

Products and Services For Hazardous Waste Processing

In what company officials describe as "the most extensive and important product introduction in the history of any of its operating subsidiaries," Crown Andersen Inc. today unveiled a product line for cleanup, storage, and thermal or chemical destruction of hazardous, toxic, radioactive, and chemical waste materials. These products were developed jointly by Crown Andersen's subsidiary companies, Andersen 2000 Inc. and Crown Rotational Molded Products, Inc.

Crown Andersen Inc. will furnish all of the required engineering and technical services to obtain required permits, design and furnish the waste handling and loading machinery, furnish standard or specially designed containers of advanced plastics or corrosion resistant metals for shipping and storage (including appropriate DOT exemptions) and design, manufacture, and install complete plants with all component parts to chemically or thermally destroy these wastes within regulatory requirements of federal, state, and local agencies. According to Brady and Hendricks, these products and services are offered on a turnkey basis to waste generators or to contract facilities which will accept wastes from small generators which cannot afford on-site waste processing.

The Andersen subsidiary is building a toxic and hazardous waste incineration system for a large chemical company, and has recently started up its new automated heat exchanger manufacturing facility where du Pont Teflon® is applied to heat exchange surfaces to allow operation in dirty and corrosive gas streams which are found extensively in waste processing plants. Andersen has also filed recent patent applications on its newly developed pollution control and heat recovery systems for toxic waste incinerators. The Crown subsidiary has developed nonmetallic containers for low level radioactive materials. New Crown products announced include resealable, DOT exempt hazardous waste containers, and a complete line of corrosion resistant tanks up to 6200 gallons in capacity for storage and transport of toxic and hazardous materials.

Crown Andersen Inc. believes its major customers for the new line will be the industrial chemical and petrochemical producers, pharmaceutical companies, petroleum refineries, and radioactive materials processing facilities in North America. The same products will be offered in Europe through Crown Andersen's Dutch subsidiary, Montair Andersen bv in Sevenum, Holland. For further information contact Jack D. Brady, Crown Andersen Inc., 306 Dividend Dr., Peachtree City, GA 30269.

Contractor Selected For Remediation Activities At DOE's Fernald Plant

Roy F. Weston, Inc. (WESTON) has been selected by Westinghouse Materials Company of Ohio to conduct site characterization studies and develop recommendations for the disposal of wastes stored at the U.S. Department of Energy facility in Fernald, Ohio.

During the project, WESTON will sample soils, surface water and groundwater in the vicinity of the waste storage area, then will analyze the samples for chemical and radiological elements.

The Feed Materials Production Center produces uranium metal for defense programs. Initial site work is scheduled to begin in July, with the final recommendations due in 18 months.

Call For Papers Issued For ASTM Hazardous Waste Symposium

Papers are needed for the 4th International Hazardous Waste Symposium on Environmental Aspects of Stabilization/Solidification of Hazardous and Radioactive Wastes, scheduled for May 3-6, 1987 in Atlanta, Georgia. The symposium co-sponsors are ASTM Committee D-34 on Waste Disposal, Environment Canada, and the Oak Ridge National Laboratory. Cooperating organizations include the U.S. Environmental Protection Agency, Alberta Environmental Centre, and the Imperial College of Science and Technology.

The objective of the symposium is to present a state-of-the-art review of the suitability of stabilization/solidification as a solution for the long-term safe disposal of industrial hazardous and low-level radioactive wastes in the accessible environment (i.e., excluding geological repositories). It should provide a unique forum for scientists from around the world working with the two types of wastes to share their experiences.

Papers are solicited on the following topics:

- Overview of stabilization/solidification
- Process technology
- Evaluation of performance
- Mechanisms of containment and leaching
- Leachability in field environment

A poster session will include shorter presentations and stimulate discussion among participants. Posters can address any of the symposium topics or present the technical aspects of a commercially available process. Abstracts submitted for both the formal and the poster sessions will be reviewed based on their technical content. Topical state-of-the-art reviews will also be considered. English is the official language of the symposium.

Prospective authors are requested to submit a 500 word abstract and an ASTM Paper Submittal Form no later than September 15, 1986 to Symposium Cochairman Pierre Côté, Environment Canada, Wastewater Technology Centre, P.O. Box 5050, Burlington, Ontario L7R 4A6, 416/336-4605. Paper Submittal Forms are available from Theresa Smoot, ASTM Publications Division, 1916 Race Street, Philadelphia, PA 19103, 215/299-5414.

A Special Technical Publication (STP) on the symposium proceedings is anticipated by ASTM. Manuscript deadline has been set for April 1, 1987. ASTM will print and distribute accepted abstracts at the symposium with the approval of the chairman.

John Zink Co. Offers Hazardous Waste Services

John Zink Company of Tulsa, Oklahoma, has formed a wholly-owned subsidiary offering full scope clean-up services at sites contaminated with hazardous industrial waste. The role of the new company, named John Zink Ser-

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vices, Inc., is to apply John Zink's capabilities in the thermal destruction of chemical wastes to the reclamation of landfills and lagoons which have been accumulating such materials over the years. The new organization will provide all related project management, environmental control, construction, operation, and safety services for remediation of these sites. John Zink Company, a member company of Allegheny International has over 1,500 incinerators in place worldwide.

EPA To Hold Hazardous Waste Workshops

EPA will hold a series of workshops this fall on Hazardous Waste Combustion Sampling and Analysis. The workshops will be held in Philadelphia, September 23-24; Dallas, October 7-8; and Chicago, October 28-29. Intended audiences are permit writers, inspectors and operators. Topics will include regulatory requirements, sampling methods, testing methods, sampling issues, quality assurance/quality control, and field observations and procedures. No registration fee. Sponsored by EPA's Office of Research and Development. For registration and more information call Kathleen Kelly, JACA Corp., (215) 643-5466

EPA also will hold a separate but related series of workshops on permitting hazardous waste incinerators, October–December 1986; contact JACA Corp. for details.

International Hazardous Waste Management Conference In Denmark

The Third International Symposium on Operating European Hazardous Waste Management Facilities which takes place in Odense, Denmark, on September 16–19, 1986, and which is sponsored by Chemcontrol in conjunction with the ISWA Working Group on Hazardous Waste, the University of Kentucky, and Louisiana State University, is attracting considerable attention from the United States. The symposium will highlight:

- Collection and transfer stations
- Transportation systems
- Rotary kiln incinerators
- Waste oil treatment and recovery
- Secure landfills
- Public perception
- Risks of operating hazardous waste treatment facilities
- Flue gas cleaning and emissions
- Regulations
- Control
- Operation

Further information can be obtained from Chemcontrol A/S, 534 Pioneer Building, Seattle, WA 98104; (206) 682-1188.

California To Sponsor Symposia On Land Disposal Alternatives

The State of California has announced it will sponsor a series of symposia on alternatives to hazardous waste land disposal, October 20–24, 1986. They are: "Solvent Waste Reduction Alternatives" symposia, October 20 and 21 in Santa Clara, October 23 and 24 in Los Angeles, sponsored by the California Department of Health Services, Toxic Substances Control Division to inform industries of regulations, technology, and management of solvent wastes; for information call ICF Consulting Associates at (213) 485-4568. Also, a "Hazardous Waste Alternative Technology" exhibition and demonstration will be held on October 22 in Los Angeles, sponsored by California Chamber of Commerce; for information call (916) 638-3715.

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November 2, 1990

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HAND DELIVERY

Mr. Bruce Mitchell
Bureau of Air Regulation
Florida Department of Environmental Regulation
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Re: Florida Mining and Materials
No. 2 Kiln; AC 27-187489;
[Application to Amend AC 27-173474]

Dear Mr. Mitchell:

As communicated earlier from this office and from Hernando County Planning Department in a letter dated November 1, 1990 (copy attached), we offer the following comments on Florida Mining and Material Company's (FMM) request for burning hazardous waste fuel in their No. 2 Kiln.

1. The application cites a number of cement kilns that have been authorized in the country to burn hazardous fuel. Only the Ash Grove Cement kilns are indicated as burning non-pumpable and pumpable hazardous waste fuels. Information on the contents of non-pumpable fuel used at the Ash Grove Cement kilns together with their stack tested emissions should be provided for comparison with FMM's proposal. Performance data contained in Table V-3 need to be explained in terms of kiln input and emission rates of heavy metals and organic constituents as well as emissions of any products of incomplete combustion.

2. The sources of hazardous waste fuels for the FMM facility and their blended characteristics should be provided particularly for the non-pumpable fuel. An explanation of how the sulfur content and heat values were arrived at should be provided. (Table III-4).

3. Additional information on the specification limits of hazardous waste fuel (Table III-5) is needed. This information

should describe the steps that will be taken to assure the specification limits are strictly adhered to.

4. It is not clear whether FMM's proposal includes a neutralizing scrubber for the control of acid gases (See page 31).

5. A correlation between actual versus theoretical thermal destruction profiles (TDP's) should be submitted. In the absence of such a correlation, the TDP's contained in Table V-2 are of little or no value in estimating the efficiency of the kiln performance.

6. Details should be provided on how the system removal efficiencies (Table V-4) were derived. The text on page 36 indicates that they were based on baseline testing at the FMM kiln. How were the efficiencies for antimony, cadmium, mercury, silver and thallium calculated?

7. The FMM proposal would increase the emissions of regulated pollutants to levels very close to significant emission quantities (see Table V-5).

Pollutant	Net Emissions Increase (T/Y)	Significant Emissions Increase (T/Y)
CO	99.9	100
NO_x	39.9	40
SO_2	39.9	40
Particulate	24.9	25
Mercury	0.08947	0.
Beryllium	0.0003997	0.0004

Considering that these emission estimates would most likely exceed the significant quantity limitation and considering the variations in hazardous fuel characteristics, PSD analysis should be required. Secondly, these estimates apparently were based on

8200 hours of operation per year except for VOCs, which is based on 8432 hours.

To summarize, the application is incomplete. Additionally, the application references that 99.99 and 99.9999% DREs would be achieved in the No. 2 Kiln. It should be noted that DREs are usually determined through trial burns on a site specific and fuel mix specific basis. To our knowledge, FMM has not conducted any trial burns and therefore the project should not be approved.

Finally, I would like to note that Hernando County has adopted an ordinance (Ordinance 90-8) which prohibits the burning of hazardous waste as an industrial fuel in Hernando County. This ordinance, a copy of which is attached, was filed with the Secretary of State on May 17, 1990.

On behalf of Hernando County, I appreciate the opportunity to provide these comments. If you have any questions, please call me or Dr. J. P. Subramani of our office.

Sincerely,

FOR HERNANDO COUNTY, BOARD OF
COUNTY COMMISSIONERS

Segundo Fernandez
Segundo J. Fernandez

SJF:nhg

Enclosures

cc: Mr. Clair Fancy (w/enclosures)
Mr. Bruce Snow, County Attorney (w/enclosures)
Mr. Lawrence Jennings, Planning Director (w/enclosures)
Ms. Kathy Liles, Planning Department (w/enclosures)

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On behalf of Hernando County, I appreciate the opportunity to provide these comments. If you have any questions, please call me or Dr. J. P. Subramani of our office.

Sincerely,

FOR HERNANDO COUNTY, BOARD OF
COUNTY COMMISSIONERS

Segundo Fernandez

Segundo J. Fernandez

SJF:nhg

Enclosures

cc: Mr. Clair Fancy (w/enclosures)
Mr. Bruce Snow, County Attorney (w/enclosures)
Mr. Lawrence Jennings, Planning Director (w/enclosures)
Ms. Kathy Liles, Planning Department (w/enclosures)
B. Thomas, SW Dist,
J. Harper, EPA
C. Shaver, NPS
B. Andrews

mitchell.ltr\segundo:nhg

Board of County Commissioners

Hernando County

PLANNING DEPARTMENT

Government Center / Administration Building
20 North Main Street, Room 262
Brooksville, Florida 34601-2807

Manager's Office - (904) 754-4051
Planning - (904) 754-4057
Fax - (904) 754-4420

November 1, 1990

RECEIVED
NOV 6 1990
DER - BAQM

Mr. Bruce Mitchell
Department of Enviromental Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Dear Mr. Mitchell:

Pursuant to your request for comments from Hernando County regarding Florida Mining & Materials' application to burn hazardous waste as fuel, Mr. Segundo Fernandez, Attorney with the law firm of Oertel, Hoffman, Fernandez & Cole, P.A. represents Hernando County on this issue. Any comments appropriate at this time will be forthcoming from Mr. Fernandez regarding this specific request. Additionally, as Mr. Fernandez represents Hernando County on this issue, all correspondence should be directed to his attention.

If you should need any additional information, please contact me.

Sincerely,

Lawrence Jennings

Lawrence Jennings, Manager
Planning Department

mre

cc: Charles B. Hetrick, County Administrator
Robert Bruce Snow, Esq., County Attorney
Segundo Fernandez, Esq., Attorney

FILED
90 MAY 17 PM 2:42
TALLAHASSEE, FLORIDA

ORDINANCE 90-8

AN ORDINANCE RELATING TO THE EMISSION OF AIR TOXICS AND ASSOCIATED HAZARDOUS WASTE FACILITIES; PROVIDING FOR A MORATORIUM UPON CERTAIN CONDITIONS; ESTABLISHING AN EFFECTIVE DATE

BE IT ORDAINED BY THE BOARD OF COUNTY COMMISSIONERS OF HERNANDO COUNTY, FLORIDA:

Section I. Title

This Ordinance shall be known and cited as the "Hernando County Air Toxics and Hazardous Waste Fuel Burning Facility Moratorium".

Section II. Authority

This Ordinance is adopted pursuant to the general laws of Florida, and the provisions hereof and all sections contained herein shall be construed as having been adopted in the interests of the public's health, safety and general welfare of the people of Hernando County, Florida.

Section III. Legislative Findings and Intent

The Board of County Commissioners of Hernando County, Florida, finds and declares that the Floridan Aquifer constitutes a natural resource of the highest magnitude and importance to the residents of Hernando County, Florida.

The Board of County Commissioners of Hernando County finds and declares that the air quality currently enjoyed by the residents of Hernando County is threatened by the prospect of the emission of air toxics, particularly arising from the use of hazardous waste as fuel in industrial facilities.

The Board further finds and declares that both the United States Congress and the United States Environmental Protection Agency are presently considering measures which would create controls on the burning of hazardous wastes in industrial boilers, including cement kilns, but because those measures may not become effective until after application for such a facility to be located in Hernando County is filed, it is essential that a moratorium be immediately placed upon the burning of hazardous waste fuel in the County, and also upon the issuance of permits by Hernando County to construct or operate such a facility, prior to the effective date of these federal measures. Currently, the emission of air toxics from the burning of hazardous wastes in industrial boilers is unregulated, and the impacts of such unregulated burning may significantly affect air quality, water quality, and the health of the citizens of Hernando County. The Board recognizes that allowing such burning or the construction or operation of such a facility prior to the effective date of these measures would defeat the purpose of such measures.

Section IV. Moratorium

Subsequent to the effective date of this Ordinance the burning of hazardous waste as an industrial fuel in Hernando County is prohibited, except as provided below, until such time as the United States Congress and/or the United States Environmental Protection Agency adopt standards regulating such burning and requiring appropriate controls and limits to the emissions necessarily resulting from such burning. Further, permits for the construction and operation of hazardous waste facilities ancillary to the burning of hazardous waste as an industrial fuel proposed to be located in Hernando County will not be issued subsequent to the effective date of this moratorium, nor will the burning of hazardous waste as an industrial fuel be allowed, except in the following circumstances:

(a) The applicant has obtained all necessary State of Florida DER permits for the construction and/or operation of such facility; and including hazardous waste and air pollution permits; and

(b) The DER air permit establishes that the burning of hazardous waste as an industrial fuel will result in no (zero) emissions of air toxics; or

(c) The DER air permit establishes that the burning of hazardous waste as an industrial fuel will meet all requirements contained in proposed regulations of the United States Environmental Protection Agency found at 52 Fed. Reg. 16982 et seq., 54 Fed. Reg. 43718, et seq., and 55 Fed. Reg. 17862 et seq.; and

(d) The Administrator of the United States Environmental Protection Agency has promulgated emission and ambient standards for all toxic air pollutants proposed to be emitted and the DER air permit establishes that the facility will comply with such standards.

The standards specified in subsection (c), above, may be revised to reflect changes in the proposed regulations which are proposed and noticed by the United States Environmental Protection Agency.

Section V. Definitions

The following words as used in this Ordinance shall have the following meanings:

A. "Hazardous Waste" shall mean hazardous waste as identified and defined at Section 403.703(23), Florida Statutes, and at Florida Administrative Code Rule 17-703.030.

B. "Air Toxics" shall mean hazardous air pollutants which present, or may present, through inhalation or other routes of exposure, a threat of adverse human health effects (including, but not limited to, substances which are known to be, or may reasonably be anticipated to be, carcinogenic, mutagenic, teratogenic, neurotoxic, which cause reproductive disfunction or which are acutely or chronically toxic) or adverse environmental effects whether through ambient concentrations, bioaccumulation, deposition or otherwise. Air toxics shall include those substances listed in Title III of the amendments to the Clean Air Act enacted by the United States Senate on April 3, 1990.

Section VI. Severability

It is the declared intent of the Board that, if any section, subsection, sentence, clause, phrase, or provision of this ordinance is held invalid or unconstitutional by a court of competent jurisdiction, such invalidity or unconstitutionality shall not be so construed so as to render invalid or unconstitutional the remaining provisions of this ordinance.

Section VII. <u>Effective Date</u>

This ordinance shall become effective upon receipt of official acknowledgement from the Secretary of State that this ordinance has been filed with that office.

BOARD OF COUNTY COMMISSIONERS
HERNANDO COUNTY, FLORIDA

Clerk: Cindy S Kotkis, Deputy BY: Henry D Ledbetter
Karen Nicolai Henry D. Ledbetter, Chairman

(SEAL)

OERTEL, HOFFMAN, FERNANDEZ & COLE, P. A.

ATTORNEYS AT LAW

SUZANNE BROWNLESS
M. CHRISTOPHER BRYANT
R. L. CALEEN, JR.
C. ANTHONY CLEVELAND
TERRY COLE
ROBERT C. DOWNIE, II
MARTHA J. EDENFIELD
SEGUNDO J. FERNANDEZ
KENNETH F. HOFFMAN
KENNETH G. OERTEL
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PATRICIA A. RENOVITCH
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TALLAHASSEE, FLORIDA 32314-6507

TELEPHONE (904) 877-0099
FACSIMILE (904) 877-0981

JOHN H. MILLICAN
ENVIRONMENTAL CONSULTANT
(NOT A MEMBER OF THE FLORIDA BAR)

J. P. SUBRAMANI, PH. D., P. E.
ENVIRONMENTAL CONSULTANT
(NOT A MEMBER OF THE FLORIDA BAR)

November 1, 1990

HAND DELIVERY

Clair H. Fancy, P.E.
Chief, Bureau of Air Regulation
Florida Department of Environmental
  Regulation
2600 Blair Stone Road
Tallahassee, FL 32399-2400

RECEIVED
NOV 1 1990
DER - BAQM

RE: Florida Mining and Materials;
Hernando County

Dear Mr. Fancy:

Our firm has been retained by Hernando County (County) to represent and assist in their input to your Department on permit related matters pertaining to the stationary sources of air pollution in Hernando County including Florida Mining and Materials Company (FMM).

I have just been made aware of FMM's request for a permit amendment to allow for waste fuel utilization in one of their cement kilns. This request was received by DER on October 3, 1990. The thirty (30) day period for completeness review, according to my calculation is November 2, 1990.

The County is sending today by Federal Express copies of the material provided to them by your Bureau for my review and comments. The County's comments on the completeness review will be submitted as early as possible but no later than 4:00 p.m. tomorrow, November 2, 1990.

Thank you for your cooperation on this matter. If you have any questions, please call me.

Sincerely,

JPSubramani

J. P. Subramani

JPS:gg

cc: Bruce Mitchell
    Bruce Snow, Esq.
    Kathy Liles

Board of County Commissioners

Hernando County

PLANNING DEPARTMENT

Government Center / Administration Building
20 North Main Street, Room 262
Brooksville, Florida 34601-2807

Manager's Office - (904) 754-4051
Planning - (904) 754-4057
Fax - (904) 754-4420

November 1, 1990

Mr. Bruce Mitchell
Department of Enviromental Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Dear Mr. Mitchell:

Pursuant to your request for comments from Hernando County regarding Florida Mining & Materials' application to burn hazardous waste as fuel, Mr. Segundo Fernandez, Attorney with the law firm of Oertel, Hoffman, Fernandez & Cole, P.A. represents Hernando County on this issue. Any comments appropriate at this time will be forthcoming from Mr. Fernandez regarding this specific request. Additionally, as Mr. Fernandez represents Hernando County on this issue, all correspondence should be directed to his attention.

If you should need any additional information, please contact me.

Sincerely,

Lawrence Jennings

Lawrence Jennings, Manager
Planning Department

mre

cc: Charles B. Hetrick, County Administrator
Robert Bruce Snow, Esq., County Attorney
Segundo Fernandez, Esq., Attorney

P 256 396 249

RECEIPT FOR CERTIFIED MAIL

NO INSURANCE COVERAGE PROVIDED
NOT FOR INTERNATIONAL MAIL
(See Reverse)

☆U.S.G.P.O. 1989-234-555

Sent to Mr. C. M. Coleman, FM&M	
Street and No. P. O. Box 6	
P.O., State and ZIP Code Brooksville, FL 34605-0006	
Postage	$
Certified Fee	
Special Delivery Fee	
Restricted Delivery Fee	
Return Receipt showing to whom and Date Delivered	
Return Receipt showing to whom, Date, and Address of Delivery	
TOTAL Postage and Fees	$
Postmark or Date Mailed: 11-1-90 Permit: AC 27-187498	

PS Form 3800, June 1985

● **SENDER:** Complete items 1 and 2 when additional services are desired, and complete items 3 and 4.

Put your address in the "RETURN TO" Space on the reverse side. Failure to do this will prevent this card from being returned to you. The return receipt fee will provide you the name of the person delivered to and the date of delivery. For additional fees the following services are available. Consult postmaster for fees and check box(es) for additional service(s) requested.

1. ☒ Show to whom delivered, date, and addressee's address. *(Extra charge)*
2. ☐ Restricted Delivery *(Extra charge)*

3. Article Addressed to:

Mr. C. M. Coleman, Jr.
Vice President & Gen. Manager
Florida Mining and Materials
P. O. Box 6
Brooksville, Florida 34605-0006

4. Article Number
P 256 396 249

Type of Service:
☐ Registered
☐ Insured
☒ Certified
☐ COD
☐ Express Mail
☐ Return Receipt for Merchandise

Always obtain signature of addressee or agent and DATE DELIVERED.

5. Signature — Addressee
X

6. Signature — Agent
X

7. Date of Delivery
11-5-90

8. Addressee's Address *(ONLY if requested and fee paid)*

PS Form **3811**, Apr. 1989 ★U.S.G.P.O. 1989-238-815 **DOMESTIC RETURN RECEIPT**

File Copy

Florida Department of Environmental Regulation
Twin Towers Office Bldg. ● 2600 Blair Stone Road ● Tallahassee, Florida 32399-2400
Bob Martinez, Governor
Dale Twachtmann, Secretary
John Shearer, Assistant Secretary

November 1, 1990

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. C. M. Coleman, Jr.
Vice President & General Manager
Florida Mining and Materials
Post Office Box 6
Brooksville, Florida 34605-0006

Dear Mr. Coleman:

Re: Completeness Review for an Application to Modify/Construct AC 27-187498: No. 2 ~~Lime~~ Cement Kiln

The Department has reviewed the above referenced application package received October 3, 1990. Based on a technical review, the application is deemed incomplete. Please submit to the Department's Bureau of Air Regulation the following information, including all assumptions, reference material and calculations, and the status will, again, be ascertained:

1. Please provide in full detail the protocol and procedures that will be used to analyze and determine the type(s) of all hazardous waste fuels prior to accepting and receiving them at the facility.

2. Please describe in detail the handling, storage, and processing procedures for each type of hazardous waste fuel (i.e., liquid, solid, etc.) that will be required once these fuels arrive at the facility.

3. Please describe in detail the handling of the delivery vehicle(s), which should include storage, wash-out, venting, etc.

4. Provide a listing and description of all waste materials/ fuels that this facility will not accept nor receive for this proposal. The description should include, but not be

limited to, the chemical name and CASR (Chemical Abstract Services Registry) numbers, their state (i.e., gas, liquid, solid, etc.), quantification of limitation (i.e., <50 ppm, >760 mm Hg V.P., etc.), and any other screening criteria.

5. Since PSD does evaluate and compare the emissions of "actuals to proposed potentials" for all pollutants, please provide the synopsis page of the most recent compliance tests performed on the No. 2 ~~lime~~ cement kiln for each pollutant tested.

6. From Table II-1, which of these kilns listed have after-burners?

7. Please list all waste fuel constituents and their CASR numbers that you intend to receive and process at this facility. Also, provide the maximum ambient off-property concentrations (i.e., 1-hr, 3-hr, 8-hr, 24-hr, and annual) of the individual pollutants that will be expected from the combustion of the various constituents.

8. Since the net emissions increase per pollutant in Table V-5 are so close to the PSD significant levels contained in F.A.C. Chapter 17-2, Table 500-2, what reasonable assurances can you provide the Department that these levels will not be exceeded? Please explain in detail.

9. Please explain in detail the facility's procedures for an emergency shut-down of the No. 2 ~~Lime~~ Cement Kiln (i.e., burn out, fan loss, etc.) for each type of the hazardous waste fuels (i.e., liquid, solid, etc.).

10. Will there be a system electrical interlock utilized in an emergency shut-down of the No. 2 ~~Lime~~ cement Kiln? Please explain in detail.

11. Please provide a detailed cost analysis for an after-burner/incinerator, or an equivalent, that meets the criteria of 40 CFR 264.343 (July, 1988 version) and could be retrofitted to the No. 2 ~~lime~~ cement kiln.

12. Will the facility, under this proposal, be receiving and processing any TSCA substances, such as PCBs for example, that would require U.S. EPA approval? If so, please describe in detail and provide the approval from the U.S. EPA.

13. If available, please provide us with all pollutant stack test data from like and similar sources (i.e., raw material processed, size, etc.) burning similar type fuels that are proposed for the No. 2 ~~Lime~~ cement Kiln.

If there are any questions, please call Bruce Mitchell at (904)488-1344 or write to me at the above address.

Sincerely,

C. H. Fancy, P.E.
Chief
Bureau of Air Regulation

CHF/BM/t

cc: B. Thomas, SW District
J. Harper, EPA
C. Shaver, NPS
L. Jennings, HCPD
J. Tessitore, P.E., CT & A
S. Kastury, DER: RCRA
S. Fernandez, OHF&C
Reading File
Bruce Mitchell } 11-1-90 RBL

Florida Department of Environmental Regulation

Twin Towers Office Bldg. • 2600 Blair Stone Road • Tallahassee, Florida 32399-2400

Bob Martinez, Governor · Dale Twachtmann, Secretary · John Shearer, Assistant Secretary

October 26, 1990

Mrs. Kathy Liles
20 North Main Street, Room 262
Brooksville, Florida 34601

Dear Mrs. Liles:

Re: Request for Waste Fuel Utilization
Florida Mining and Materials - No. 2 Kiln
DER File No. AC 27-187498

The above referenced permit application has been received by the Bureau of Air Regulation and a copy is enclosed for your review and comments. If you have any questions, please contact Bruce Mitchell at (904)488-1344 or write to me at the above address.

Sincerely,

Patricia G. Adams

for C. H. Fancy, P.E.
Chief
Bureau of Air Regulation

CHF/kt

enclosure

cc: B. Mitchell

Florida Department of Environmental Regulation
Twin Towers Office Bldg. ● 2600 Blair Stone Road ● Tallahassee, Florida 32399-2400
Bob Martinez, Governor Dale Twachtmann, Secretary John Shearer, Assistant Secretary

October 11, 1990

Mrs. Chris Shaver, Chief
Permit Review and Technical Support Branch
National Park Service
Air Quality Division
P. O. Box 25287
Denver, Colorado 80225

Send copy to
Dist, Eng, Cleve,
Satish

Dear Mrs. Shaver:

Re: Florida Mining and Materials
Waste Fuel Utilization No. 2 Kiln
AC 27-184798, PSD-FL-124 Amendment

Enclosed for your review is the permit application for the above referenced project. Please address your questions or comments to Barry Andrews at the above address or at 904-488-1344 by October 26, 1990.

Sincerely,

Patricia G. Adams

Patricia G. Adams
Planner
Bureau of Air Regulation

PA/plm

Enclosure

Florida Department of Environmental Regulation

Twin Towers Office Bldg. ● 2600 Blair Stone Road ● Tallahassee, Florida 32399-2400

Bob Martinez, Governor
Dale Twachtmann, Secretary
John Shearer, Assistant Secretary

October 11, 1990

Ms. Jewell A. Harper, Chief
Air Enforcement Branch
U.S. EPA, Region IV
345 Courtland Street, N.E.
Atlanta, Georgia 30365

Dear Ms. Harper:

Re: Florida Mining and Materials
Waste Fuel Utilization No. 2 Kiln
AC 27-184798, PSD-FL-124 Amendment

Enclosed for your review is the permit application for the above referenced project. Please address your questions or comments to Barry Andrews at the above address or at 904-488-1344 by October 26, 1990.

Sincerely,

Patricia G. Adams

Patricia G. Adams
Planner
Bureau of Air Regulation

PA/plm

Enclosure

CROSS/TESSITORE & ASSOCIATES, P.A.
4763 S. CONWAY ROAD, SUITE F
ORLANDO, FLORIDA 32812
407/851-1484

March 5, 1991

RECEIVED
MAR 7 1991
DER - BAQM

Mr. Bruce Mitchell
FDER-Tallahassee
Bureau of Air Regulation
Twin Towers Office Bldg.
2600 Blair Stone Rd.
Tallahassee, FL 32399-2400

SUBJECT: Response to FDER Completeness Review for an Application to Modify Permit AC27-187498, Florida Mining and Materials No. 2 Cement Kiln

Dear Bruce:

In response to your telephone conversation, nine copies of revised subject item are submitted under my signature and seal for your review and consideration.

If you have any questions, and/or require any additional data, please do not hesitate to call upon me.

Sincerely,

Joseph L. Tessitore

Joseph L. Tessitore
Cross/Tessitore & Associates, P.A.
4763 S. Conway Road, Suite F Orlando, FL 32812
Florida Registration No. 23374 Date: 3/5/91 Telephone No. 407/851-1484

JLT/sr
cc: Diane Schenke - Southdown, Inc.
C.M. Coleman - Florida Mining & Materials

REGISTERED PROFESSIONAL ENGINEERS
Federal ID # 59-1638534

RESPONSE TO FDER COMPLETENESS REVIEW FOR AN APPLICATION TO MODIFY PERMIT AC27-187498 FLORIDA MINING AND MATERIALS NO. 2 CEMENT KILN

February 14, 1991
Revised: February 26, 1991

Cross/Tessitore & Associates, P.A.
4763 South Conway Road, Suite F.
Orlando, Florida 32812
(407) 851-1484
F03.178/R5147.Doc

Question 1

1. **Please provide in full detail the protocol and procedures that will be used to analyze and determine the type(s) of all hazardous waste fuels prior to accepting and receiving them at the facility.**

   This information has been previously submitted to the Department as part of the Application for a Hazardous Waste Fuels Storage Facility Permit as required by 40 CFR Part 270 and DER 17-730.900.

   Attached is the Waste Analysis Plan included in the Storage Facility Permit Application.

A.6 Waste Analysis Plan

INTRODUCTION

This document describes the chemical and physical nature and characteristics of the hazardous waste derived fuel ("HWF") received, stored and blended at Florida Mining and Materials. FM&M is one of the largest producers of cement in the Southeast. The cement plant, located in Brooksville, Hernando County, proposes to burn HWF as a partial substitute for coal. Many of the substances burned as HWF are either characteristic or listed as hazardous wastes under the Resource Conservation and Recovery Act (RCRA). The primary basis for defining these materials as hazardous is their flash point is below 1400°F, and therefore, these fuels meet the criteria for ignitability.

FUEL CHARACTERIZATION

Hazardous Waste Fuels (HWF)

FM&M proposes to burn industrial waste solvents including those from such industries as paint, coating, ink and solvent recycling (including solids contaminated with those materials), and used oils. Table II.6 presents the current U.S. EPA hazardous waste numbers and descriptions of hazardous waste materials that may be received for use as HWF. Used oil does not appear in Table II.6 inasmuch as the U.S. EPA has specifically excluded it as a hazardous waste. FM&M primarily uses independent suppliers of preblended fuel for this project, however, on-site generated waste solvents, solvent contaminated solids, and used oil are also employed. Suppliers of HWF are RCRA-interim status or permitted hazardous waste TSD installations or RCRA regulated generators which are well equipped to furnish consistent quality and quantity of fuels. These prequalified suppliers provide a manifest and a chemical analysis report with each shipment. The chemical load report will be filed with the manifest's permanent records. FM&M samples all shipments received from RCRA-permitted suppliers (see Table II.10). FM&M utilizes accepted supplemental fuel industry methods for the analysis of these fuels as shown in Table II.7.

Two categories of waste are received consisting of liquid and nonpumpable (solid) fuel from the same industry and waste code types. The liquid fuels have a minimum average heat value of 10,000 Btu per lb. and solid fuels have a minimum average heat value range of 5,000 Btu per lb. Typically, six gallon container packaged fuel modules are used to directly introduce the solid HWF to the cement kiln. Quality checks are run to assure that fuel burning specifications in Table II.8 are satisfied. A preliminary check is run on HWF shipments as specified in Table II.10 prior to off-loading.

FM&M will not accept pesticides, as screened out during the prequalification review. PCB's, metals and other materials are restricted as indicated in the specifications in Table II.8. The limits placed on metals and chlorinated materials in the fuels will provide assurance that only materials meeting precise fuel specifications are accepted at the facility.

Uniform Hazardous Waste Manifest forms (EPA Form 8700-22, current edition) accompany each load of HWF received by FM&M. Any combination of the EPA hazardous waste numbers shown in Table II.6 may appear on a manifest.

Materials not meeting the specification of Table II.8 or not capable of being readily blended to this specification for burning are rejected. The final blended fuel product will meet the specification. Blending will not be conducted to meet the minimum heat content requirement of 5,000 Btu/lb as specified by the EPA Sham Recycling Policy (1983 or as revised).

Liquid HWF System Residues

The solids that accumulate in the liquid HWF system as filtrate, and incidental spill cleanup residues and absorbents, are removed and placed in containers. These containers, which are labeled "Hazardous Waste," are accumulated within a containment area for approximately one month before being introduced to the kiln.

The technical staff will, through their knowledge of the process that generated the waste, for those waste not generated in handling HWF, determine if the waste is restricted from disposal in a landfill and note such in their HWF lab operating file.

QUALITY ASSURANCE PLAN

FM&M will receive all HWF from fuel marketers previously qualified under U.S. EPA/RCRA Authority, from other waste stream generators prequalified by FM&M or from on-site generation. All must have U.S. EPA assigned ID numbers when hazardous waste fuel (HWF) is involved. The following levels of testing HWF are in use:

(1) Prequalification evaluation of all waste streams (Table II.10 , Column A).

(2) Sampling and testing prior to acceptance of fuel shipments is outlined in Table II.10, Columns B and C.

If a shipment is rejected for any reason, FDER will be notified.

A quality assurance/quality control program is used by the laboratory to confirm proper control.

PREQUALIFICATION

The purpose of the preacceptance review (Exhibit II.11) is; (1) to determine whether a preblended waste fuel can be managed at FM&M in accordance with current permits, applicable regulations and company policy; (2) to ensure that all wastes ultimately approved for treatment or storage are handled so as to protect human health and the environment; (3) to confirm the chemical and physical properties of the waste as described by the generator; (4) to provide an information base to assist FM&M in verifying the identity of the incoming waste shipment; and (5) minimize operational problems.

Safety Concerns

FM&M has submitted a detailed employee training program as part of its RCRA storage permit application. That program is premised on our belief that a knowledge of the properties of materials accepted as HWF is necessary to ensure that the materials can be handled safely. Understanding the nature of the industries that supply acceptable materials, and the probable sources of undesirable materials, is essential in ensuring safety in handling candidate wastes. Potential fuels are subjected to exhaustive prequalification evaluation and analysis before they will be accepted into the HWF program. After acceptance, further analysis is conducted on the fuels as shown in Table II.10 before the fuels can be burned in the kiln.

Operational Concerns

In addition to health and safety concerns, FM&M and fuel suppliers such as Cadence Chemical Resource, Inc. have minimized operational problems that could develop through the use of HWF. The prevention of operational or handling problems is effected largely through the comprehensive prequalification evaluation and subsequent representative sampling and testing of each load prior to acceptance. Materials that would interfere with safety or the cement manufacturing process are excluded during the prequalification testing and load receipt testing. Prequalification evaluations assure that only compatible materials are placed in the storage tanks. The material will be checked by fuel suppliers prior to receipt at FM&M. Checks of the individual shipments prior to acceptance will confirm that only compatible materials are received.

SAMPLE PARAMETERS

The Table II.7 lists the sample parameters and referenced test methods used to determine whether health, safety, or operational problems may develop from use of candidate HWF.

To accomplish testing, analytical equipment is employed with procedures that have been jointly developed with the manufacturer of the equipment. Additionally, although standard ASTM or EPA methods are employed at the suppliers and FM&M laboratories during prequalification testing, confirmation of the results will be accomplished through samples of all loads taken at FM&M with analysis taking place in the FM&M laboratory using the above noted methods.

MAJOR LABORATORY EQUIPMENT

FM&M operates an analytical laboratory equipped with modern analyzers. The following discussion elaborates on some important analyzers found in the laboratory: the bomb calorimeter, the gas chromatograph, the atomic absorption spectrophotometer, and the radioactive screening device.

Bomb Calorimeter

The FM&M laboratory is equipped with a Bomb Calorimeter. The bomb calorimeter is capable of measuring the heat value of single samples. The combustion residues in the test bomb are used to determine ash content, sulfur, and halogen content. The sulfur content is determined by using the ash and analyzing for sulfate concentration and back calculating.

Gas Chromatograph

The gas chromatograph is a versatile instrument capable of analyzing a broad range of organic compounds that can be thermally volatilized and passed through the separation column. General gas chromatography uses a wide array of columns, detectors, and temperature profiles. In addition to the above, it will be used for PCB analysis. Samples are diluted with an appropriate solvent and injected directly into the gas chromatograph. Results are reported as an area % of the chromatogram.

Atomic Absorption Spectrophotometer or Inductively Coupled Plasma Arc

The atomic absorption spectrophotometer (AA) and inductively coupled plasma arc are capable of analyzing many elements. The analytical sensitivity for this method of determining metals of concern is 50 ppm and can be made more specific for critical elements.

Radioactive Screening Diffraction Device

A portable unit such as a halogen quenched G.M. tube will be utilized for radioactive screening purposes. Typical energy sensitivities are as follows:

Alpha	2.5 MEV
Beta	50 KEV
Gamma & X-Ray	10 KEV

Any readings above background will be the basis for rejection.

SHIPMENT ANALYSES

In addition to the prequalification evaluation performed by FM&M, each fuel shipment is sampled. Shipments, from fuel marketers that hold U.S. EPA/RCRA authority as hazardous waste fuel suppliers and have fully qualified laboratories, are accompanied by a chemical analysis of batch report and certification as provided in Exhibit II.12A. Shipments from other prequalified waste stream sources and on-site generated materials are tested according to the prequalification requirements to verify that the material meets the HWF specification. A typical batch report and certification form for this requirement is provided in Exhibit II.12B. A portion of each sample analyzed is retained for 90 days for any additional analysis that may be determined to be necessary at a later time.

Liquid HWF

As each HWF shipment is delivered to the FM&M Facility, a core sample of the tank truck or rail car will be taken using the sampler shown in Exhibit II.9. This sampler works on the same basic principle as the composite liquid waste sampler ("COLIWASA") specified for use by EPA to obtain a representative sample of liquid wastes in a large vessel. A positive seal in the sampler used by FM&M will be guaranteed by a ball valve with an extended handle which impacts the bottom of the tank. The handle will be pushed to the closed position which seals the sampled material in a small diameter pipe. The advantage of this sampler is that it will provide a more positive seal and will be more durable than the standard specified unit. However, the difference in the sealing process does not change the basic nature of the sampling mechanism.

Solid HWF

Solid HWF, typically received in six gallon containerized fuel modules, is a preblended fuel delivered to FM&M meeting fuel specifications as shown in Table II.8. Shipments from a fuel supplier normally consist of containers placed on a pallet and wrapped with heat shrink plastic. One pallet typically contains 36 containers with 20 pallets arriving per average truckload. The fuel has been characterized by the supplier who also certifies that the analyses represents a single batch. Typically, one batch is of sufficient quantity (i.e., 720 containers) for one truckload. However, more than one batch can be on a particular shipment. Each batch of solid HWF shipped to FM&M will be accompanied with analysis (Exhibit II.12A or II.12B) and a copy of the manifests from the sources comprising the batch. For example, if four individual generator's waste streams were blended together, then the original manifest from each of the four generators will accompany the shipment of the preblended batch of solid HWF to FM&M.

The contents of a single container can range from semidry sludge-like material, to a combination of physically dissimilar shredded materials such as contaminated rags and filters, elastomeric materials (contaminated gloves, gaskets, etc.), paint solids and cured adhesives. Sampling of the containers is accomplished using a variety of sampling devices such as an auger-type core sampler, long-handled spoon, sampling thief or tongs. Whichever device enables extraction of a representative sample through the vertical cross-section of a container is selected for use. The individual extracting the sample is trained to collect representative samples from each randomly selected container. Exhibit II.9 shows these typical sampling devices. Normally 10 samples are collected and composited as representing the shipment and submitted for shipment analysis. This number of samples is determined in accordance with Table II.9. One container per selected pallet is randomly chosen for sampling. The attached Exhibit II.10 shows the random selection procedure for the containers.

The overall sampling procedure provides the ability to correlate any effects on the process or any environmental emissions with the composition of the HWF fired in the kiln, and allows specific identification should any unique materials be present in HWF streams. Current records containing the results of analysis and quantities of materials inventories will be maintained and readily available for use by the Emergency Coordinator when responding to an emergency.

BLEND/STORAGE TANK ANALYSIS

The hazardous waste fuel received into the blend/storage tanks will also be from authorized fuel blenders. The loads received will meet the specifications as shown on Table II.8 Consequently, there is no need to analyze the contents of the blend/storage tanks.

ASSESSMENT OF HWF SYSTEM RESIDUES

Any residue generated (as discussed above) will be evaluated in accordance with this waste analysis plan for management in the kiln. Waste that cannot be effectively processed on-site will be evaluated, as required, to determine appropriate off-site treatment or disposal options. The technical staff will evaluate the waste based on material flash point and the presence of free liquid to ascertain the appropriate disposal option.

REVISION TO THE ANALYSIS PLAN

This plan will be reviewed by the FM&M Management on an annual basis. The plan will also be reviewed if a change occurs in the applicable regulations, operating procedures, the process or the fuel characteristics. Any necessary revisions to the plan will be forwarded to FDER for its review thirty days before being implemented by FM&M. If FDER objects to a proposed revision in that time period, FM&M will not implement it as proposed.

TABLE II.6

MATERIALS FOR USE AS ALTERNATIVE/HAZARDOUS WASTE FUELS

EPA Hazardous Waste Number	Waste Code	Contaminants
D001	I	Characteristic of Ignitability
D004	T	Arsenic
D005	T	Barium
D006	T	Cadmium
D007	T	Chromium
D008	T	Lead
D009	T	Mercury
D010	T	Selenium
D011	T	Silver
D018	T	Benzene
D021	T	Chlorobenzene
D023	T	o-Cresol
D024	T	m-Cresol
D025	T	p-Cresol
D026	T	Cresol
D027	T	1,4-Dichlorobenzene
D028	T	1,2-Dichloroethane
D029	T	1,1-Dichloroetylene
D030	T	2,4-Dinitrotoluene
D035	T	Methyl Ethyl Ketone
D036	T	Nitrobenzene
D038	T	Pyridine

TABLE II.6 (continued)

MATERIALS FOR USE AS ALTERNATIVE/HAZARDOUS WASTE FUELS

EPA Hazardous Waste Number	Waste Code	Contaminants
F001	T	Tetrachloroethylene, Methylene Chloride, Carbon Tetrachloride, 1,1,1-Trichloroethane, Chlorinated Fluorocarbons, Trichloroethylene
F002	T	Chlorobenzene ,1,1,2 Trichloroethane, 1,2,2 Trifluoroethane, Orthodichlorobenzene, Trichlorofluoromethane, Tetrachloroethylene, Methylene Chloride, Trichloroethylene, 1,1,1-Trichloroethane
F003	I,T	Xylene, Acetone, Ethyl Acetate, Ethyl Benzene, Ethyl Ether, Methyl Isobutyl Ketone, N-Butyl Alcohol, Cyclohexanone, Methanol
F004	T	Cresylic Acid, Nitrobenzene
F005	I,T	Toluene, Methyl Ethyl Ketone, Carbon Disulfide, Isobutanol, Pyridine
F024	T	Chloromethane, Dichloromethane, Trichloromethane, Carbon Tetrachloride, Choroethylene, 1,1-Dichloroethane, 1,2-Dichloroethane, trans-1,2-Dichloroethylene, 1,2-Dichloroethylene, 1,1,1-Trichloroethane, 1,1,2-Trichloroethane, Trichloroethylene, 1,1,1,2-Tetrachloroethane, 1,1,2,2-Tetrachloroethane, Tetrachloroethylene, Pentachloroethane, Hexachloroethane, Allyl Chloride (3-Chloropropene), Dichloropropane, Dichloropropene, 2-Chloro-1,3-butadiene, Hexachloro-1,3-butadiene, Hexachlorocyclopentadiene, Hexachlorocyclohexane, Benzene, Chlorbenzene, Dichlorobenzenes, 1,2,4-Trichlorobenzene, Tetrachlorobenzene, Pentachlorobenzene, Hexachlorobenzene, Toluene, Naphthalene

TABLE II.6 (continued)

MATERIALS FOR USE AS ALTERNATIVE/HAZARDOUS WASTE FUELS

EPA Hazardous Waste Number	Waste Code	Contaminants
K001	T	Pentachlorophenol, Phenol, 2-Chlorophenol, p-Chloro-m-cresol, 2,4-Dimethylphenyl, 2,4-Dinitrophenol, Trichlorophenols, Tetrachlorophenols, 2,4-Dinitrophenol, Creosote, Chrysene, Naphthalene, Fluoranthene, Benzo(b)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-cd)pyrene, Benz(a)anthracene, Dibenz(a)anthracene, Acenaphthalene
K009	T	Chloroform, Formaldehyde, Methylene Chloride, Methyl Chloride, Paraldehyde, Formic Acid
K010	T	Chloroform, Formaldehyde, Methylene Chloride, Methyl Chloride, Paraldehyde, Formic Acid, Chloroacetaldehyde
K022	T	Phenol, Tars (Polycyclic Aromatic Hydrocarbons)
K023	T	Phthalic Anhydride, Maleic Anhydride
K024	T	Phthalic Anhydride, 1,4-Naphthoquinone
K025	T	Meta-dinitrobenzene, 2,4-Dinitrotoluene
K026	T	Paraldehyde, Pyridines, 2-Picoline
K035	T	Creosote, Chrysene, Naphthalene, Fluoranthene, Benzo(b)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-cd)pyrene, Benz(a)anthracene, Dibenz(a)anthracene, Acenaphthalene
K048**	T	Hexavalent Chromium, Lead
K049**	T	Hexavalent Chromium, Lead
K050**	T	Hexavalent Chromium
K051**	T	Hexavalent Chromium, Lead
K052**	T	Lead
K083	T	Anilene, Diphenylamine, Nitrobenzene, Phenylenediamine
K085	T	Benzene, Dichlorobenzenes, Trichlorobenzenes, Tetrachlorobenzenes, Pentachlorobenzene, Hexachlorobenzene, Benzyl Chloride
K086	T	Lead, Hexavalent Chromium
K087	T	Phenol, Naphthalene
K088	T	Cyanide (complexes)
K093	T	Phthalic Anhydride, Maleic Anhydride
K094	T	Phthalic Anhydride
K101	T	Arsenic
K102	T	Arsenic
K103	T	Aniline, Nitrobenzene, Phenylenediamine
K104	T	Aniline, Benzene, Diphenylamine, Nitrobenzene, Phenylenediamine
K111	C,T	2,4-Dinitrotoluene
K112	T	2,4-Toluenediamine, o-Toluidine, p-Toluidine, Aniline

** Wastes from petroleum refining operations.

TABLE II.6 (continued)

MATERIALS FOR USE AS ALTERNATIVE/HAZARDOUS WASTE FUELS

EPA Hazardous Waste Number	Waste Code	Contaminants
K113	T	2,4-Toluenediamine, o-Toluidine, p-Toluidine, Aniline
K114	T	2,4-Toluenediamine, o-Toluidine, p-Toluidine
K115	T	2,4-Toluenediamine
K116	T	Carbon Tetrachloride, Tetrachloroethylene, Chloroform, Phosgene

TABLE II.6 (continued)

MATERIALS FOR USE AS ALTERNATIVE/HAZARDOUS WASTE FUELS

EPA Hazardous Waste Number	Waste Code	Contaminants
U001	I	Acetaldehyde
U002	I	2-Propanone
U003	I,T	Acetonitrile
U004	T	Acetophenone
U005	T	2-Acetylaminefluorene
U006	C,R,T	Acetyl Chloride
U007	T	Acrylamide
U012	I,T	Aniline
U014	T	Auramine
U015	T	Azaserine
U016	T	Benz(c)acridine
U017	T	Benzal Chloride
U018	T	Benz(a)anthracene
U019	I,T	Benzene
U024	T	Dichloromethoxy Ethane
U027	T	Dichloroisopropyl Ether
U031	I	1-Butanol
U034	T	Acetaldehyde, Trichloro
U037	T	Chlorobenzene
U038	T	Chlorobenzilate
U039	T	p-Chloro-m-cresol
U046	T	Chloromethyl Methyl Ether
U048	T	o-Chlorophenol
U051	T	Creosote
U052	T	Cresol (Cresylic Acid)
U053	T	Crotonaldehyde
U055	I	Cumene
U056	I	Cyclohexane
U057	I	Cyclohexanone
U063	T	Dibenz[a,h]anthracene
U064	T	Dibenz[a,i]pyrene
U069	T	Dibutyl Phthalate
U070	T	o-Dichlorobenzene
U071	T	m-Dichlorobenzene
U072	T	p-Dichlorobenzene
U073	T	3,3'-Dichlorobenzidine
U074	I,T	1,4-Dichloro-2-butene
U076	T	Ethylidene Dichloride
U078	T	1,1-Dichloroethylene
U079	T	1,2-Dichloroethylene
U081	T	2,4-Dichlorophenol
U082	T	2,6-Dichlorophenol
U083	T	Propylene Dichloride
U085	I,T	1,2:3,4-Diepoxybutane
U088	T	Diethyl Phthalate

TABLE II.6 (continued)

MATERIALS FOR USE AS ALTERNATIVE/HAZARDOUS WASTE FUELS

EPA Hazardous Waste Number	Waste Code	Contaminants
U101	T	2,4 Dimethylphenol
U102	T	Dimethylphthalate
U107	T	Di-n-octyl Phthalate
U108	T	1,4-Dioxane
U112	I	Ethyl Acetate
U113	I	Ethyl Acrylate
U117	I	Ethyl Ether
U118	T	Ethyl Methacrylate
U122	T	Formaldehyde
U124	I	Furan
U125	I	Furfural
U130	T	Hexachlorocyclopentadiene
U140	I,T	Isobutyl Alcohol
U147	T	Maleic Anhydride
U148	T	Maleic Hydrazide
U152	I,T	Methacrylonitrile
U153	I,T	Thimethanol
U154	I	Methyl Alcohol
U155	T	Methapyrilene
U159	I,T	Methyl Ethyl Ketone
U161	I	Methyl Isobutyl Ketone
U162	I,T	Methyl Methacrylate
U164	T	Methylthiouracil
U165	T	Napthalene
U166	T	1,4-Naphthoquinone
U167	T	alpha-Naphthylamine
U168	T	beta-Naphthylamine
U169	I,T	Nitrobenzene
U170	T	p-Nitrophenol
U171	I,T	2-Nitropropane
U186	I	1,3-Pentadiene
U187	T	Phenacetin
U188	T	Phenol
U190	T	Phthalic Anhydride
U191	T	2-Picoline
U194	I,T	n-Propylamine
U196	T	Pyridine
U201	T	Resorcinol
U202	T	Saccharin, Saccharin Salts
U203	T	Safrole
U213	I	Tetrahydrofuran
U219	T	Thiourea
U220	T	Toluene
U221	T	Toluenediamine
U222	T	o-Toluidine Hydrochloride

TABLE II.6 (continued)

MATERIALS FOR USE AS ALTERNATIVE/HAZARDOUS WASTE FUELS

EPA Hazardous Waste Number	Waste Code	Contaminants
U223	R,T	Toluene Diisocyanate
U226	T	1,1,1-Trichloroethane
U231	T	2,4,6-Trichlorophenol
U238	I	Ethyl Carbamate (urethane)
U239	I	Xylene
U243	T	Hexachloropropene
U248	T	Warfarin (when present at concentrations less than 0.3%)
U328	T	o-Toluidine
U353	T	p-Toluidine
U359	T	Ethylene Glycol Monoethyl Ether

TABLE II.6a

MATERIALS FOR USE AS ALTERNATIVE/HAZARDOUS WASTE FUELS (Expected only on a "Derived From" basis)*

EPA Hazardous Waste Number	Waste Code	Contaminants
D012	T	Endrin
D013	T	Lindane
D014	T	Methoxychlor
D015	T	Toxaphene
D016	T	2,4-D (2,4-Dichlorophenoxyacetic Acid)
D017	T	2,4,5-TP (Silvex)
D019	T	Carbon Tetrachloride
D020	T	Chlordane
D022	T	Chloroform
D031	T	Heptachlor (and its hydroxide)
D032	T	Hexachlorobenzene
D033	T	Hexachloro-1,2-butadiene
D034	T	Hexachloroethane
D037	T	Pentachlorophenol
D039	T	Tetrachloroethylene
D040	T	Trichloroethylene
D041	T	2,4,5-Trichlorophenol
D042	T	2,4,6-Trichlorophenol
D043	T	Vinyl Chloride

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* These listed compounds are expected only on a "Derived From" basis and will be accepted if the characteristics of the waste fuel as generated meet the fuel specification provided in Section II-A.6 of this application. The waste fuel generated by the fuel processors are generated in accordance with the USEPA "Sham Recycling" policy. This is consistent with with USEPA's interpretation of the 1983 guidance (48 CFR 1157-60 (March 16, 1983): letter to Richard G. Stoll from Robert Holloway - Chief, Combustion Section; July 1990).

TABLE II.6a (continued)

MATERIALS FOR USE AS ALTERNATIVE/HAZARDOUS WASTE FUELS
(Expected only on a "Derived From" basis)*

EPA Hazardous Waste Number	Waste Code	Contaminants
K011	R,T	Acrylonitrile, Acetonitrile, Hydrocyanic Acid
K013	R,T	Hydrocyanic Acid, Acrylonitrile, Acetonitrile
K014	T	Acetonitrile, Acrylamide
K015	T	Benzyl Chloride, Chlorobenzene, Toluene, Benzotrichloride
K016	T	Hexachlorobenzene, Hexachlorobutadiene, Carbon Tetrachloride, Hexachloroethane, Perchloroethylene
K017	T	Epichlorohydrin, Chloroethers [bis(chloromethyl) ether and bis(2-chloroethyl) ether], Trichloropropane, Dichloropropanols
K018	T	1,2-Dichloroethane, Trichloroethylene, Hexachlorobutadiene, Hexachlorobenzene
K019	T	Ethylene dichloride, 1,1,1-Trichloroethane, 1,1,2-Trichloroethane, Tetrachloroethanes (1,1,2,2-Tetrachloroethane and 1,1,1,2-Tetrachloroethane), Trichloroethylene, Tetrachloroethylene, Carbon Tetrachloride, Chloroform, Vinyl Chloride, Vinylidene Chloride
K020	T	Ethylene dichloride, 1,1,1-Trichloroethane, 1,1,2-Trichloroethane, Tetrachloroethanes (1,1,2,2-Tetrachloroethane and 1,1,1,2-Tetrachloroethane), Trichloroethylene, Tetrachloroethylene, Carbon Tetrachloride, Chloroform, Vinyl Chloride, Vinylidene Chloride
K021	T	Antimony, Carbon Tetrachloride, Chloroform
K027	R,T	Toluene Diisocyanate, Toluene-2,4-diamine
K028	T	1,1,1-Trichloroethane, Vinyl Chloride
K029	T	1,2-Dichloroethane, 1,1,1-Trichloroethane, Vinyl Chloride, Vinylidene Chloride, Chloroform
K030	T	Hexachlorobenzene, Hexachlorobutadiene, Hexachloroethane, 1,1,1,2-Tetrachloroethane, 1,1,2,2-Tetrachloroethane, Ethylene Dichloride
K031	T	Arsenic
K032	T	Hexachlorocyclopentadiene
K033	T	Hexachlorocyclopentadiene
K034	T	Hexachlorocyclopentadiene

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* These listed compounds are expected only on a "Derived From" basis and will be accepted if the characteristics of the waste fuel as generated meet the fuel specification provided in Section II-A.6 of this application. The waste fuel generated by the fuel processors are generated in accordance with the USEPA "Sham Recycling" policy. This is consistent with with USEPA's interpretation of the 1983 guidance (48 CFR 1157-60 (March 16, 1983): letter to Richard G. Stoll from Robert Holloway - Chief, Combustion Section; July 1990).

TABLE II.6a (continued)

MATERIALS FOR USE AS ALTERNATIVE/HAZARDOUS WASTE FUELS (Expected only on a "Derived From" basis)*

EPA Hazardous Waste Number	Waste Code	Contaminants
K036	T	Toluene, Phosphorodithioic and Phosphorothioic Acid Esters
K037	T	Toluene, Phosphorodithioic and Phosphorothioic Acid Esters
K038	T	Phorate, Formaldehydes, Phosphorodithioic and Phosphorothioic Acid Esters
K039	T	Phosphorodithioic and Phosphorothioic Acid Esters
K040	T	Phorate, Formaldehydes, Phosphorodithioic and Phosphorothioic Acid Esters
K041	T	Toxaphene
K042	T	Hexachlorobenzene, Ortho-Dichlorobenzene
K043	T	2,4-Dichlorophenol, 2,6-Dichlorophenol, 2,4,6-Trichlorophenol
K046	T	Lead
K047	R	N.A. (Waste is hazardous because it fails the test for the characteristic of iginitability, corrosivity, or reactivity.)
K060	T	Cyanide, Naphthalene, Phenolic Compounds, Arsenic
K061	T	Hexavalent Chromium, Lead, Cadmium
K062	C,T	Hexavalent Chromium, Lead
K069	T	Hexavalent Chromium, Lead, Cadmium
K073	T	Chloroform, Carbon Tetrachloride, Hexachloroethane, Trichloroethane, Tetrachloroethylene, Dichloroethylene, 1,1,2,2-Tetrachloroethane
K095	T	1,1,1,2-Tetrachloroethane, 1,1,2,2-Tetrachloroethane, 1,1,2-Trichloroethane
K096	T	1,2-Dichloroethane, 1,1,1-Trichlorethane, 1,1,2-Trichloroethane
K097	T	Chlordane, Heptachlor
K098	T	Toxaphene
K099	T	2,4-Dichlorophenol, 2,4,6-Trichlorophenol
K105	T	Benzene, Monochlorobenzene, Dichlorobenzene, 2,4,6-Trichlorophenol
K106	T	Mercury
K117	T	Ethylene Dibromide
K118	T	Ethylene Dibromide
K123	T	Ethylene Thiourea

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* These listed compounds are expected only on a "Derived From" basis and will be accepted if the characteristics of the waste fuel as generated meet the fuel specification provided in Section II-A.6 of this application. The waste fuel generated by the fuel processors are generated in accordance with the USEPA "Sham Recycling" policy. This is consistent with with USEPA's interpretation of the 1983 guidance (48 CFR 1157-60 (March 16, 1983): letter to Richard G. Stoll from Robert Holloway - Chief, Combustion Section; July 1990).

TABLE II.6a (continued)

MATERIALS FOR USE AS ALTERNATIVE/HAZARDOUS WASTE FUELS (Expected only on a "Derived From" basis)*

EPA Hazardous Waste Number	Waste Code	Contaminants
K124	C,T	Ethylene Thiourea
K125	T	Ethylene Thiourea
K126	T	Ethylene Thiourea
K136	T	Ethylene Dibromide

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* These listed compounds are expected only on a "Derived From" basis and will be accepted if the characteristics of the waste fuel as generated meet the fuel specification provided in Section II-A.6 of this application. The waste fuel generated by the fuel processors are generated in accordance with the USEPA "Sham Recycling" policy. This is consistent with with USEPA's interpretation of the 1983 guidance (48 CFR 1157-60 (March 16, 1983): letter to Richard G. Stoll from Robert Holloway - Chief, Combustion Section; July 1990).

TABLE II.6a (continued)

MATERIALS FOR USE AS ALTERNATIVE/HAZARDOUS WASTE FUELS (Expected only on a "Derived From" basis)*

EPA Hazardous Waste Number	Waste Code	Contaminants
U010	T	Mitomycin C
U011	T	Amitrole
U021	T	Benzidene
U022	T	Benz[a]pyrene
U023	C,R,T	Benzotrichloride
U025	T	Dichloroethyl Ether
U026	T	Chlornaphazine
U028	T	Diethylhexyl Phthalate
U029	T	Methyl Bromide
U030	T	4-Bromophenyl Phenyl Ether
U036	T	Chlordane, Chlrodane (alpha & gamma isomers)
U041	T	Epichlorohydrin
U042	T	2-Chloroethyl Vinyl Ether
U043	T	Vinyl Chloride
U044	T	Chloroform
U045	I,T	Methyl Chloride
U047	T	beta-Chloronaphthalene
U050	T	Chrysene
U058	T	Cyclophosphamide
U059	T	Daunomycin
U060	T	DDD, Benzene, 1,1'-(2,2-dichloroethylidene)bis[4-chloro-
U061	T	DDT, Benzene, 1,1'-(2,2-trichloroethylidene)bis[4-chloro-
U062	T	Diallate
U066	T	1,2-Dibromo-3-chloropropane
U067	T	Ethylene Dibromide
U068	T	Methylene Bromide
U075	T	Dichlorodifluoromethane
U077	T	Ethylene Dichloride
U080	T	Methylene Chloride
U084	T	1,3-Dichloropropene
U086	T	N,N'-Diethylhydrazine
U087	T	O,O-Diethyl S-Methyl Dithiophosate
U089	T	Diethylstilbesterol
U090	T	Dihydrosafrole

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* These listed compounds are expected only on a "Derived From" basis and will be accepted if the characteristics of the waste fuel as generated meet the fuel specification provided in Section II-A.6 of this application. The waste fuel generated by the fuel processors are generated in accordance with the USEPA "Sham Recycling" policy. This is consistent with with USEPA's interpretation of the 1983 guidance (48 CFR 1157-60 (March 16, 1983): letter to Richard G. Stoll from Robert Holloway - Chief, Combustion Section; July 1990).

TABLE II.6a (continued)

MATERIALS FOR USE AS ALTERNATIVE/HAZARDOUS WASTE FUELS (Expected only on a "Derived From" basis)*

EPA Hazardous Waste Number	Waste Code	Contaminants
U091	T	3,3'-Dimethoxybenzidine
U093	T	p-Dimethylaminoazobenzene
U094	T	7,12-Dimethylbenz[a]anthracene
U095	T	3,3'-Dimethylbenzidine
U097	T	Dimethylcarbamoyl Chloride
U098	T	1,1-Dimethylhydrazine
U099	T	1,2-Dimethylhydrazine
U103	T	Dimethyl Sulfate
U105	T	2,4-Dinitrotoluene
U106	T	2,6-Dinitrotoluene
U111	T	Di-n-propylnitrosamine
U114	T	Ethylenebisdithiocarbamic Acid, Salts & Esters
U116	T	Ethylenethiourea
U119	T	Ethyl Methanesulfonate
U120	T	Fluoranthene
U121	T	Trichloromonofluoromethane
U123	C,T	Formic Acid
U126	T	Glycidyladehyde
U127	T	Hexachlorobenzene
U128	T	Hexachlorobutadiene
U129	T	Lindane
U131	T	Hexachloroethane
U132	T	Hexachlorophene
U134	C,T	Hydrogen Fluoride
U135	T	Hydrogen Sulfide
U137	T	Indeno[1,2,3-cd]pyrene
U138	T	Methyl Iodide
U139	T	Iron Dextran
U141	T	Isosafrole
U142	T	Kepone
U143	T	Lasiocarpine
U144	T	Lead Acetate
U145	T	Lead Phosphate
U146	T	Lead Subacetate
U149	T	Malononitrile
U150	T	Melphalan

---

* These listed compounds are expected only on a "Derived From" basis and will be accepted if the characteristics of the waste fuel as generated meet the fuel specification provided in Section II-A.6 of this application. The waste fuel generated by the fuel processors are generated in accordance with the USEPA "Sham Recycling" policy. This is consistent with with USEPA's interpretation of the 1983 guidance (48 CFR 1157-60 (March 16, 1983): letter to Richard G. Stoll from Robert Holloway - Chief, Combustion Section; July 1990).

TABLE II.6a (continued)

MATERIALS FOR USE AS ALTERNATIVE/HAZARDOUS WASTE FUELS (Expected only on a "Derived From" basis)*

EPA Hazardous Waste Number	Waste Code	Contaminants
U156	I,T	Methylchlorocarbonate
U157	T	3-Methylcholanthrene
U158	T	4,4'-Methylenebis(2-chloroaniline)
U160	R,T	Methyl Ethyl Ketone Peroxide
U163	T	Guanidine, N-Methyl-N'-nitro-N-nitroso
U172	T	N-Nitrosodi-n-butylamine
U173	T	N-Nitrosodiethanolamine
U174	T	N-Nitrosodiethylamine
U176	T	N-Nitroso-N-ethylurea
U177	T	N-Nitroso-N-methylurea
U178	T	N-Nitroso-N-methylurethane
U179	T	N-Nitrosopiperidine
U180	T	N-Nitrosopyrrolidine
U181	T	5-Nitro-o-toluidine
U182	T	Paraldehyde
U183	T	Pentachlorobenzene
U184	T	Pentachloroethane
U185	T	Pentachloronitrobenzene (PCNB)
U192	T	Pronamide
U193	T	1,3-Propane Sultone
U197	T	p-Benzoquinone
U200	T	Reserpinen
U206	T	Streptozotocin
U207	T	1,2,4,5-Tetrachlorobenzene
U208	T	1,1,1,2-Tetrachloroethane
U209	T	1,1,2,2-Tetrachloroethane
U210	T	Tetrachloroethylene
U211	T	Carbon Tetrachloride
U218	T	Thioacetamide
U225	T	Bromoform
U227	T	1,1,2-Trichloroethane
U228	T	Trichloroethylene
U234	R,T	1,3,5-Trinitrobenzene
U235	T	Tris(2,3-dibromopropyl)phosphate
U236	T	Trypan Blue
U237	T	Uracil Mustard

---

* These listed compounds are expected only on a "Derived From" basis and will be accepted if the characteristics of the waste fuel as generated meet the fuel specification provided in Section II-A.6 of this application. The waste fuel generated by the fuel processors are generated in accordance with the USEPA "Sham Recycling" policy. This is consistent with with USEPA's interpretation of the 1983 guidance (48 CFR 1157-60 (March 16, 1983): letter to Richard G. Stoll from Robert Holloway - Chief, Combustion Section; July 1990).

TABLE II.6a (continued)

MATERIALS FOR USE AS ALTERNATIVE/HAZARDOUS WASTE FUELS
(Expected only on a "Derived From" basis)*

EPA Hazardous Waste Number	Waste Code	Contaminants
U240	T	Acetic Acid, (2,4-Dichlorophenoxy)-, Salts & Esters
U247	T	Methoxychlor
U248	T	Warfarin Salts (when present at concentrations less than 0.3%)
U249	T	Zinc Phosphide (when present at concentrations of 10% or less)

---

* These listed compounds are expected only on a "Derived From" basis and will be accepted if the characteristics of the waste fuel as generated meet the fuel specification provided in Section II-A.6 of this application. The waste fuel generated by the fuel processors are generated in accordance with the USEPA "Sham Recycling" policy. This is consistent with with USEPA's interpretation of the 1983 guidance (48 CFR 1157-60 (March 16, 1983): letter to Richard G. Stoll from Robert Holloway - Chief, Combustion Section; July 1990).

TABLE II.6a (continued)

MATERIALS FOR USE AS ALTERNATIVE/HAZARDOUS WASTE FUELS
(Expected only on a "Derived From" basis)*

EPA Hazardous Waste Number	Waste Code	Contaminants
P001	T	Warfarin, Warfarin Salts (when present at concentrations greater then 0.3%)
P002	T	1-Acetyl-2-thiourea
P003	T	Acrolein
P004	T	Aldrin
P005	T	Allyl Alcohol
P007	T	5-(Aminomethyl)-3-isoxazolol
P008	T	4-Aminopyridine
P014	T	Thiophenol
P016	T	Dichloromethyl Ether
P017	T	Bromoacetone
P018	T	Brucine
P020	T	Dinoseb
P022	T	Carbon Disulfide
P023	T	Chloroacetaldehyde
P024	T	p-Chloroaniline
P026	T	1-(o-Chlorophenyl) Thiourea
P027	T	3-Chloropropionitrile
P028	T	Benzyl Chloride
P034	T	2-Cyclohexyl-4,6-dinitrophenol
P037	T	Dieldrin
P039	T	Disulfoton
P040	T	O,O-Diethyl O-Pyrazinyl Phosphorothioate
P041	T	Diethyl-p-nitrophenyl Phosphate
P042	T	Epinephrine
P043	T	Diisopropylfluorophosphate (DFP)
P044	T	Dimethoate
P045	T	Thiofanox
P046	T	alpha, alpha-Dimethylphenethylamine
P047	T	Dinitro-o-cresol, and Salts
P048	T	2,4-Dinitrophenol
P049	T	Dithiobiuret
P050	T	Endosulfan
P051	T	Endrin, Endrin Metabolites
P054	T	Ethyleneimine
P057	T	Fluoroacetamide

---

* These listed compounds are expected only on a "Derived From" basis and will be accepted if the characteristics of the waste fuel as generated meet the fuel specification provided in Section II-A.6 of this application. The waste fuel generated by the fuel processors are generated in accordance with the USEPA "Sham Recycling" policy. This is consistent with with USEPA's interpretation of the 1983 guidance (48 CFR 1157-60 (March 16, 1983): letter to Richard G. Stoll from Robert Holloway - Chief, Combustion Section; July 1990).

TABLE II.6a (continued)

MATERIALS FOR USE AS ALTERNATIVE/HAZARDOUS WASTE FUELS (Expected only on a "Derived From" basis)*

EPA Hazardous Waste Number	Waste Code	Contaminants
P058	T	Fluoroacetic Acid, Sodium Salt
P059	T	Heptachlor
P060	T	Isodrin
P062	T	Hexaethyl Tetraphosphate
P064	T	Methyl Isocyanate
P066	T	Methomyl
P067	T	1,2-Propylenimine
P069	T	2-Methyllactonitrile
P070	T	Aldicarb
P071	T	Methyl Parathion
P072	T	alpha-Naphthylthiourea
P075	T	Nicotine, Nicotine Salts
P077	T	p-Nitroaniline
P081	R	Nitroglycerin
P082	T	N-Nitrosodimethylamine
P084	T	N-Nitrosomethylvinylamine
P085	T	Octamethylpyrophosphoramide
P088	T	Endothall
P089	T	Parathion
P092	T	Phenylmercury Acetate
P093	T	Phenylthiourea
P094	T	Phorate
P095	T	Phosgene
P096	T	Phosphine
P097	T	Famphur
P102	T	Propargyl Alcohol
P103	T	Selenourea
P108	T	Strychnine, Strychnine Salts
P109	T	Tetraethyldithiopyrophosphate
P110	T	Tetraethyl Lead
P111	T	Tetraethylpyrophosphate
P112	R	Tetranitromethane
P116	T	Thiosemicarbazide
P118	T	Trichloromethanethiol
P122	R,T	Zinc Phosphide (when present at concentrations of greater then 10%)
P123	T	Toxaphene

---

* These listed compounds are expected only on a "Derived From" basis and will be accepted if the characteristics of the waste fuel as generated meet the fuel specification provided in Section II-A.6 of this application. The waste fuel generated by the fuel processors are generated in accordance with the USEPA "Sham Recycling" policy. This is consistent with with USEPA's interpretation of the 1983 guidance (48 CFR 1157-60 (March 16, 1983): letter to Richard G. Stoll from Robert Holloway - Chief, Combustion Section; July 1990).

TABLE II.7

SAMPLE PARAMETERS AND METHODS*

Parameter	Reason for Analysis	Test Method Reference
1. Heat content (Btu/lb)	Determines primary fuel setting to assure continued calcining activity in kiln.	Bomb Calorimeter/ASTM D240.
2. Viscosity *Liquid HWF*	Ensures pumpability and proper atomization of the alternate fuel.	Viscosity meter or zahn cup following manufacturer directions/ASTM D2196.
3. Ash content	Ensures process control as ash content affects clinker quality.	Gravimetric on ash residue remaining in bomb cup. ASTM D3174, D432 or D482.
4. Water *Liquid HWF*	Ensures process control as water quantity affects temperature and calcining activity in kiln. Also affects flow (freezing) in tanks, filters, and other process equipment.	Centrifuge HWF, measure separate phase/ASTM D-1796-83 or E203.
5. Halogens, (CL, BR, F)	Ensures process control as chlorinated materials affect clinker quality and kiln and pre-heater operations.	Ion Chromatography. Selective ion probed or A_gNO_3 titration of bomb washings manufacturers instructions/ASTM D808.
6. Sulfur	Could affect the manufacturing process equipment or environment.	Ion chromatography of bomb washings or leco sulfur analyzer operated per manufacturers instructions/ASTM D129, D3177A, D1551.
7. PCB's	Ensures these materials will not be received above 50 ppm.	Gas chromatography, electron capture detector/ASTM D3534.
8. Extractable pH	Ensures against corrosion or adverse reactions in the receiving tank, handling system, and kiln and accessories.	Meter/ASTM D2110.
9. Metals	Ensures that metals content conforms to the specifications and process control as metals may affect the environment, clinker quality and composition of kiln dust.	Atomic adsorption**, Inductively Coupled Plasma Arc: All methods will conform to manufacturer's specifications/ SW846-7000, SW846-6010.
10. Organic Analysis (Volatile)	Ensures that material conforms to pre-qualification review and the general specifications.	Gas Chromatography/ASTM D260
11. Radioactivity	Ensures that radioactive materials will not be received at the facility.	Radiation monitor G.M. tube/ manufacturer's specifications.

TABLE II.7

SAMPLE PARAMETERS AND METHODS*
(continued)

Parameter	Reason for Analysis	Test Method Reference

NOTE:

* The reason for the selection of an ASTM or other test method in place of SW846 method is given below.

Heat Content - ASTEM Method D240 (modified) was chosen because SD846 does not have a test method for this parameter.

Ash - ASTEM method D2174 - Same as above.

Sulphur - ASTM Method D129 - Same as above.

Fluorine - ASTEM Method D808 - Same as above.

Chlorine - ASTEM Method D808 - Same as above.

Bromine - ASTEM Method D808 - Same as above.

Water (separate phase) ASTEM Method D1796-83.

pH (Extracted) Method D2110. The SW846 method is adequate to test this parameter.
Specific Gravity - ASTM Method D2196 - Same as heat content above.

Metals - The digestion described in SW846 does not completely digest the matrix normally found in HWF consequently not all of the metals are extracted. The variations would be dependent on the matrix and the metal with no consistent patter.

PCB - ASTEM Method D3534. The SW 846 Method was designed to analyze for PCB's in oils not solvents. Because of the differences in polarity of the solvents the PCB's are frequently lost during the extraction process.

Fingerprint Scan (Volatile Organics) - ASTM D260 D2908. SW846 does not have a test method for this parameter.

** The company and our technical consultants are evaluating X-Ray Fusion (XRF) analysis of metals which when operated consistent with manufacturers specifications may be used for metals screening for those metals which require > 50 ppm detection.

TABLE II.8

SPECIFICATION FOR HAZARDOUS WASTE FUELS (HWF)

	Liquid HWF	Solid HWF
Heat Content, minimum	10,000 Btu per lb	5,000 Btu per lb
Suspended Solids, maximum	30 percent	N/A
Sulfur, maximum	1 percent maximum	1 percent maximum
Halogens	5 percent	5 percent
Inorganic Acids and Bases	Extractable pH between 4.0 and 11.0	Extractable pH between 4.0 and 11.0
Water, maximum	1 percent as separate phase	No free standing liquid
Metals, maximum each		
Cadmium	250 ppm	1,000 ppm
Chromium	3,000 ppm	4,000 ppm
Lead	4,000 ppm	8,000 ppm
Barium	4,000 ppm	12,000 ppm
Antimony	See Note	See Note
Arsenic	See Note	See Note
Beryllium	See Note	See Note
Mercury	See Note	See Note
Silver	See Note	See Note
Thallium	See Note	See Note
PCB's	Less than 50 ppm	Less than 50 ppm

NOTE: This specification is subject to FDER Air Quality Section Review and is subject to change.

TABLE II.9

CONTAINER SAMPLING PLAN FOR SHIPMENT

Drums	Solid	Thief (solid), Trier (semi-solid), Zone powder sampler (solid)	See Footnote for number of containers and boxes of the same product to be sampled and composited.	Each Shipment

Footnote	Number of Containers Of Same Waste Stream	Number of Containers Sampled and Composited
ASTM Method D140-70	1	1
	2-8	2
	9-27	3
	28-64	4
	65-125	5
	126-216	6
	217-343	7
	344-512	8
	513-729	9
	730-1000	10

TABLE II.10
WASTE ANALYSIS PLAN - OUTLINE

Parameter Method	A Fuel/Marketer /Generator Qualification	B Truck/Rail Car Receipt for Liquids	C Containerized Solids - Receipt
Heat Content ASTM Method D240	X	X	X
Ash ASTM Method D2174	X	X	X
Sulphur ASTM Method D129	X	X	X
Fluoride ASTM Method D808	X		
Chloride ASTM Method D808	X	X	X
Bromide ASTM Method D808	X		
Water (Separate Phase) ASTM D1796-83	X		
pH (Extracted) ASTM Method D2110	X		
Specific Gravity ASTM Method D2196	X	X	X*
Solids	X		
Metals (As per Specification SW846)	X	X+	X
PCB's ASTM Method D3534	X	X+	X

TABLE II.10
WASTE ANALYSIS PLAN - OUTLINE
(continued)

Parameter Method	A Fuel/Marketer /Generator Qualification	B Truck/Rail Car Receipt for Liquids	C Containerized Solids - Receipt
Volatile Organics Analysis			
Analysis	X		
Fingerprint			
ASTM D260, D2908			
Radioactivity			
Radiation Monitor	X	X	X

Every test noted above is performed at intervals noted:

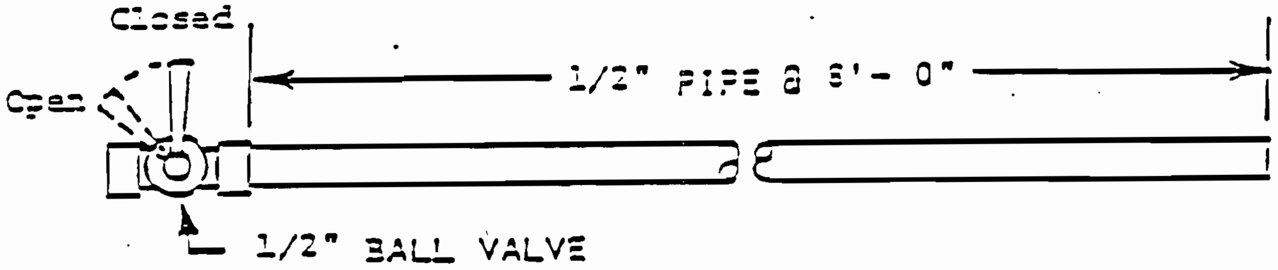
A. Requalification will occur every 6 months or more often if discrepancies occur between material qualified & materials tested at plant. If a generator does not ship on a regular schedule and misses the 6 month requalification the very next shipment will be subjected to requalification analysis.
B. Prior to unloading every truck or rail car.
C. Prior to accepting every truck or rail car. (See Exhibit II.10)

\+ During Phase I Operations, these parameters will be checked for verification on each discrete shipment or shipments of HWF.

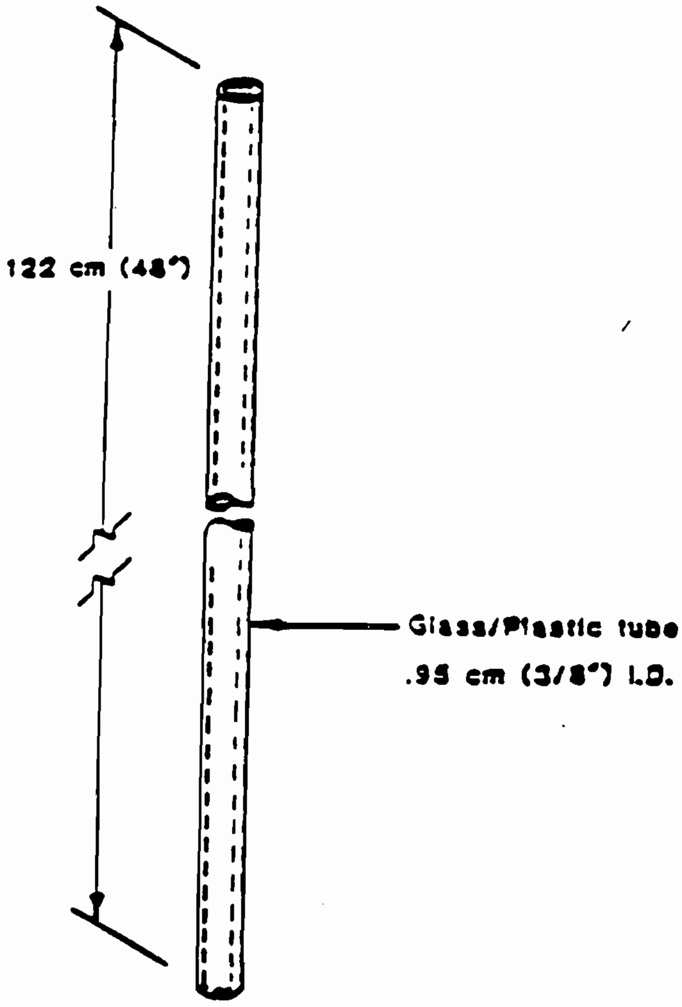
NOTE: If any fuel shipment is rejected, FDER will be notified.

EXHIBIT II.9

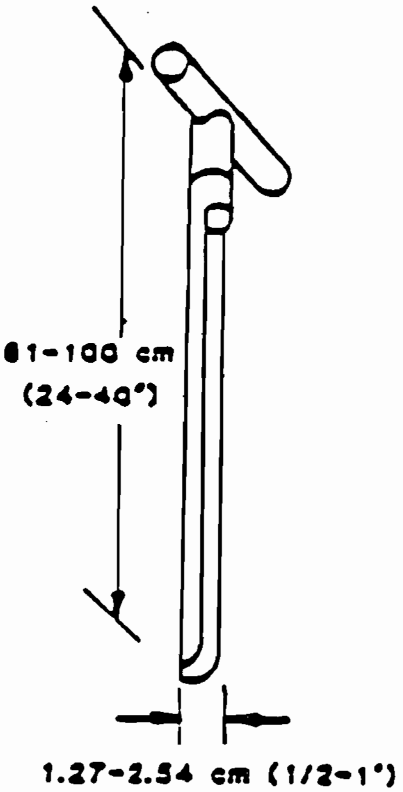
SUPPORTING DATA ON WASTE ANALYSIS



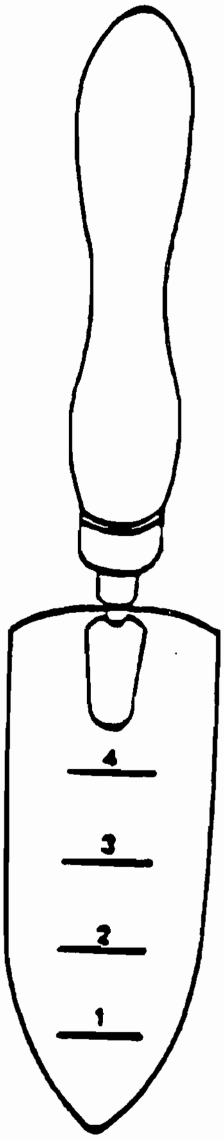
LIQUID FUEL SAMPLE TUBE



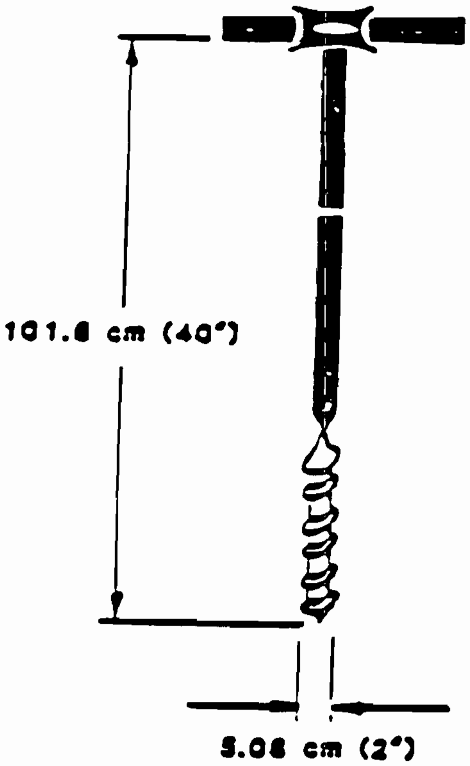
SOLID FUEL SAMPLING DEVICE
THIEF



SOLID FUEL SAMPLING DEVICE
TRIER



SOLID FUEL SAMPLING DEVICE
TROWEL



SOLID FUEL SAMPLING DEVICE
SOIL AUGER

EXHIBIT II.10

SOLID FUEL* SAMPLING PROTOCOL

The following describes the procedure for implementing the Sampling Protocol. The person implementing this protocol (Sampler) must follow the procedure outlined here exactly, in order to ensure that a statistically random sample is obtained. If strict adherence to this procedure is not possible, contact the site laboratory immediately for further instructions.

GENERAL

This procedure requires that each truck load of fuel have an exactly defined group of 10 containers selected for sampling. In order to ensure this, the 10 containers must be selected and removed according to a specific pattern.

This pattern is determined by the use of a computer to generate a random number procedure which randomly identifies the Pallet #, level, and Container # to be sampled. The container numbering procedure is shown at the end of this protocol. The choice of protocol will be determined by an impartial random number generator in order to ensure that it, too, is selected at random.

Each protocol consists of lists of pallet numbers generated from a random number table. The containers to be sampled are described by the protocols in terms of pallet numbers and level (top, middle or bottom). Each protocol requires the identification of the individual pallet specified for a given sample, and the level from which a container is removed.

(RECEIVING) PROCEDURE

1. Inspect and receive the Solid Fuel load.
2. Remove pallets from the truck and stage them in a manner that allows the sampler to gain access to each one. Note that the sampling procedure requires that the sampler be able to remove the stretch wrap on the top two levels of containers if necessary. In addition, the pallets are staged on an impervious surface.

(SAMPLING) PROCEDURE

3. Based upon random number procedure a container will be selected from a pallet.
4. Note the date, processor name, load record number and manifest number on the selected protocol form.
5. Proceed to the load staged to be sampled. Clearly mark each pallet with a number starting with 1 and going until the final pallet is numbered (usually 20 or 22).
6. Note the number of the first pallet to be sampled and identify its location. Also, note the level from which the sample container is to be taken. Remove the necessary stretch wrap and containers to allow proper access.

EXHIBIT II.10

SOLID FUEL SAMPLING PROTOCOL

7. Remove the identified container from the appropriate level and take that container to the sample gathering area. This area will consist of an empty pallet designated for transporting the container to the kiln after they have been sampled.
8. Repeat steps one through seven as outlined above for each of the remaining nine containers. Note that this is a random procedure. Therefore, it is imperative that a high level of accuracy be maintained while identifying the proper pallets, levels and container numbers.
9. During the selection of the containers, be sure and verify each selection with the appropriate notation on the sampling protocol.
10. After all 10 containers are selected, take an 8 ounce sample from each container and deposit it in a sample container suitable for transportation to the laboratory. A suitable sampling device is to be selected based on the nature of the materials in the opened containers.
11. Reseal and rewrap each sampled container for transport to the kiln, along with the rest of the load.
12. Sign the sample protocol form in order to certify that the procedure was properly followed and that the form will be returned with the sample.

EXHIBIT II.10

22 PALLET SAMPLING PROTOCOL 1

Pail Location		Container # Sampled
Pallet #	Level*	
8	B	3
21	M	6
3	T	7
13	T	9
7	B	11
22	B	2
7	M	1
7	B	7
4	B	8
4	B	4

PALLET SAMPLING PROTOCOL 1

Pail Location		Container # Sampled
Pallet #	Level*	
18	B	1
9	T	6
14	M	3
9	B	9
19	M	8
5	M	4
8	T	10
18	M	12
1	T	5
3	T	7

Date ____ Processor ____ L.R. # ____ Manifest # ____ Sampled By ____

*Level indicates the tier on the pallet:
Top
Middle
Bottom

EXHIBIT II.11

FLORIDA MINING AND MATERIALS

WASTE FUELS QUALIFICATION FORM

GENERAL INFORMATION

Company: ____________________

Generators EPA ID No.: ____________________

Address: ____________________

City: ____________________

State: ____________________ Zip: __________

Contact: ____________________

Title: ____________________ Tele: (   ) __________

Waste Description: ____________________

WASTE INFORMATION:

Metals, ppm	Metals, ppm	Volatile, Relative Area Percent	
PB ______	HG ______	______	______
CR ______	BE ______	______	______
ZN ______	AN ______	______	______
CD ______	BA ______	______	______
AS ______	AG ______	______	______
TH ______		______	______

FUEL VALUE:

Heat Content ____________________ Btu/lb.
Total Halogen (Titration) ____________________ % Wt. as CL
Ash (from Bomb) ____________________ % Wt.

INORGANICS:

CL ____________________ % Wt.
BR ____________________ % Wt.
F ____________________ % Wt.
S ____________________ % Wt.
P ____________________ % Wt.

EXHIBIT II.11A

PROCEDURES FOR THE SCREENING OF RADIOACTIVITY IN WASTE FUELS

1. SCOPE AND APPLICATION

1.1 This procedure is to "screen" Hazardous Waste Fuel (HWF) for levels of radioactivity at greater than background.

2. SUMMARY OF METHOD

2.1 A sample is passed within 2-3.0 inches of the detector window of a portable Geiger counter, and the reaction of the meter is noted in the laboratory records.

3. SIGNIFICANCE AND USE

3.1 Hazardous waste fuel blenders do not handle fuels containing radioactive materials. Dixie Cement needs a straightforward, reliable screening procedure for verifying that Hazardous Waste Fuels (HWF) being received are not radioactive above background.

4. INTERFERENCES

4.1 Due to the natural omnidirectional background radiation, occasional background noise (clicks or needle deflections) may be noticed.

4.2 Any person with a pacemaker or other apparatus which uses a low level radioactive source as an energy source ("battery"), including radium watch dials, or energy sources in some forms of smoke detectors, may cause interference. Such interference can usually be tracked to its source using this portable instrument.

5. MATERIALS

5.1 Geiger counter/survey meter including a halogen quenched GM tube detector with a thin mica end window, 1.5-2.0 mg/cm2 in thickness capable of detecting alpha radiation down to 2.5 MeV, beta radiation down to 50 KeV, and gamma radiation down to 10 KeV with a readout down to 0.1 mr/nr (Note 1).

5.2 Low-level radioactive calibration/check source.

6. SAMPLE COLLECTION, PRESERVATION AND HANDLING

6.1 No special sample collection or preservation is necessary. Sample containers used shall be of a standard laboratory glass with a screw top seal. The long-term exposure of any probe to a radioactive sample and/or radioactive check source should be avoided.

6.2 All samples shall be collected in accordance with the current version of the "Quality Assurance Plan" for Dixie Cement Company's HWF program. The current version of the plan calls for an 8 oz. sample of Solid HWF (a liquid HWF sample is typically 1 pint). The radiation screen is the first test run.

7. PROCEDURE

7.1 The collected and sealed sample is taken to the laboratory and placed in the laboratory fume hood.

7.2 The open top of the sample container is placed within two to three (2 - 3) inches of the survey meter. Hold this position for at least 5 seconds, making sure the probe does not contact the sample.

7.3 Note the presence of radiation by the increased frequency of clicks or deflection of the meter needle.

8. CALCULATIONS

8.1 None.

9. QUALITY CONTROL

9.1 Instrument performance is evaluated each day the instrument is used.

9.2 Since there is no aliquot to be removed from the sample container, no other special QC procedures need be performed.

10. PRECISION AND BIAS

Since the results of the test are only intended to give a positive/negative rating to the material being tested, no statement is made about the precision of this method.

(NOTE 1) Meter successfully used: Radiation Alert Monitor 4.

EXHIBIT II.12A *

FLORIDA MINING AND MATERIALS

TYPICAL CHEMICAL ANALYSIS OF BATCH REPORT AND CERTIFICATION

GENERAL INFORMATION

Company:____

Generators EPA ID No.:________________________________

Address:____

City:____

State:_______________________________ Zip:__________

Contact:____

Title:___________________________ Tele:_(___)_______________

Waste Description:___________________________________

Is this material or was this material blended with a pesticide product/by-product/off-specification pesticide? ______ Yes ______ No

HWF Test Parameters		Liquid HWF	Solid HWF
Heat content (Btu/lb.)		______	______
Suspended Solids (% Wt.)		______	______
Sulphur (% Wt.)		______	______
Halogens (% Wt.)		______	______
Inorganic Acids and Bases		______	______
Metals (ppm)	Cadmium	______	______
	Chromium	______	______
	Lead	______	______
	Barium	______	______
	Zinc	______	______
	Arsenic	______	______
	Thallium	______	______

	Liquid HWF	Solid HWF
Mercury		
Beryllium		
Antimony		
Silver		
PCBs (ppm)		

The analysis provided herein is representative of a single batch of HWF.

I hereby certify that the above description is complete and accurate to the best of my knowledge and ability to determine and that no deliberate or willful omissions of composition or properties exists. Furthermore, I certify that the HWF supplied satisfies the objectives of the U.S. EPA Sham Recycling Policy (1983 or as revised) as it relates to HWF burned for the purpose of energy recovery.

Authorized Signature

Date

* This form is to be used for shipments from fuel marketers who hold U.S. EPA/RCRA authority as hazardous waste fuel suppliers and have fully qualified laboratories.

EXHIBIT II.12B *

FLORIDA MINING AND MATERIALS

TYPICAL CHEMICAL ANALYSIS OF BATCH REPORT AND CERTIFICATION

GENERAL INFORMATION

Company:______________________________

Generators EPA ID No.:______________________________

Address:______________________________

City:______________________________

State:____________________ Zip:________

Contact:______________________________

Title:____________________ Tele:_(___)__________

Waste Description:______________________________

Is this material or was this material blended with a pesticide product/by-product/off-specification pesticide? ______ Yes ______ No

WASTE INFORMATION

Metals	Volatile Organics	Relevant Area Percent
PB		
CR		
ZN		
CD		
AS		
TH		
HG		
BE		
AN		
AG		

FUEL VALUE

Heat Content	__________	Btu/lb
Total Halogen (Titration)	__________	% Wt. as CL
Ash (from Bomb)	__________	% Wt.

INORGANICS

CL____________________ % Wt.
BR____________________ % Wt.
F____________________ % Wt.
S____________________ % Wt.
P____________________ % Wt.

The analysis provided herein is representative of a single batch of HWF.

I hereby certify that the above description is complete and accurate to the best of my knowledge and ability to determine and that no deliberate or willful omissions of composition or properties exists. Furthermore, I certify that the HWF supplied satisfies the objectives of the U.S. EPA Sham Recycling Policy (1983 or as revised) as it relates to HWF burned for the purpose of energy recovery.

____________________ ____________________
Authorized Signature Date

* This form is to be used for shipments from fuel marketers who hold U.S. EPA/RCRA authority as hazardous waste fuel suppliers and have fully qualified laboraties.

Question 2

2. **Please describe in detail the handling, storage, and processing procedures for each type of hazardous waste fuel (i.e., liquid, solid, etc.) that will be required once these fuels arrive at the facility.**

3. **Please describe in detail the handling of the delivery vehicle(s), which should include storage, wash-out, venting, etc.**

   The response to Questions 2 and 3 have been combined. Attachment 1, included in the response to Question 3, provides information which has been previously submitted to the Department as part of the Application for a Hazardous Waste Storage Facility Permit. Attachment 2, which is also included in the response to Question 3, provides supplemental information not included in the Storage Facility Permit Application.

Question 3

2. **Please describe in detail the handling, storage, and processing procedures for each type of hazardous waste fuel (i.e., liquid, solid, etc.) that will be required once these fuels arrive at the facility.**

3. **Please describe in detail the handling of the delivery vehicle(s), which should include storage, wash-out, venting, etc.**

Attachment 1 provides information which has been previously submitted to the Department as part of the Application for a Hazardous Waste Storage Facility Permit. Attachment 2 provides supplemental information not included in the Storage Facility Permit Application.

ATTACHMENT 1

B. Containers

Florida Mining and Materials, in order to operate a supplemental fuels program for its two cement kilns, will construct a hazardous waste storage facility. The facility will consist of five storage areas or units, which may be operated both independently and as integral parts of the total system. Unit 1 will consist of an unloading area designed to accommodate one rail car. Liquid hazardous waste fuels may be pumped from this area either directly to the kiln for burning or to a tank storage area. Unit 2 will consist of an unloading area designed to accommodate two tank trucks. Just as the rail unloading area, liquid hazardous waste fuels may be pumped from this area directly to the kiln or to the tank storage area. This tank farm will comprise Unit 3 of the facility, and will include four tanks with a total capacity of 100,000 gallons. Unit 4 will consist of an area for unloading or prepackaged, nonpumpable hazardous waste fuels. This area will be designed to store the contents of two trucks of 20 to 22 pallets each. The prepackaged fuel containers may be transferred directly to the kiln for burning or to a warehouse storage area. The warehouse will comprise Unit 5. This section provdes details of Units 4 and 5, the container storage areas.

Containers Without Free Liquids

The containers will contain and be compatible with the waste fuels outlined in the Waste Analysis Plan. It is assumed that there will be some phase separation of materials during transit or in storage. Consequently, the storage and handling of containers will be carried out as though the containers contained free liquids.

Basic Design Parameters, Dimensions, and Materials of Construction

The Container Storage Building is designed for container storage and management and secondary containment. Details of the building foundation, structural components, and containment can be found in Figure II.8. The Container Storage Building has been designed in accordance with NFPA 30, Flammable and Combustible Liquids Code, Chapter 4, Section 4-5.7, Liquid Warehouses requirements and other applicable provisions of NFPA 30.

The foundation design will consist of:

- 8 inches of Econocrete with not less than 2000 psi strength.
- A polyethylene film barrier of appropriate strength and weight.
- 8 inches of reinforced concrete slab with a minimum compressive strength of 3000 psi in 28 days. All concrete work to conform to A.C.I. Standard 318.
- 4 inch concrete sill around inside perimeter of building as required by NFPA 30.

In addition, the concrete floor will be coated with a material, such as Chem-Master Corporation's "Dura-Kote 3," or equivalent, that is impervious to solvents. To eliminate potential contamination at joints, all joints will contain waterstops that are nonmetallic such as a flexible Teflon waterstop or similar.

The floor slab in the container storage building has been designed to slope towards a steel lined collection trench that will be situated near the middle of the building. This collection trench will be covered with heavy duty bar grating and will be sloped to drain to an interior, steel-lined concrete sump. The trench and sump will be inspected daily and liquids removed by pumping or other effective methods, such as manual bailing, the use of a vacuum truck, a mop or other absorbent materials. Figures II.9 and II.9A provide design details of the truck unloading area.

Secondary Containment System Design

Figures II.8 through II.8C provide design drawings of the container storage building. The proposed container storage arrangement within the container storage building is illustrated in Figure II.8C. Table II.12 shows the capacity calculations for the containment system associated with the container storage area. The capacity of the containment system exceeds the requirement to contain 10 percent of the total volume of the containers. Given the fact that the facility will be completely enclosed and surrounded by a 4-inch high curb, no adjustments have been made for precipitation volumes.

Ignitable or Reactive Wastes in Containers

Figure I.2 of this application shows the FM&M property and location of HWF storage areas. The ignitable wastes managed in these areas will be well beyond 50 feet of the facility property line. No reactive wastes will be handled.

Description of Containers

The containers used to hold the hazardous waste solids for injection into the kiln for energy recovery will conform to the DOT specification set forth in 49 CFR Part 173.24. Paragraph C.1V of 49 CFR Part 173.24 specifically references 49 CFR Part 178 and 179 (Part 179 is not applicable as it refers to tank cars).

Part 178 is a complete description of all specification containers that could be used. This includes steel, wood paper and plastic containers each with and without liners and various body and head configurations. Subpart H (specifications for Portable tanks) and Sub-part J (specifications for containers for motor vehicle transpiration, tank trucks) would not be applicable. In these specifications, the CFR generally restricts the volume of these containers to less than 110 gallons. FM&M would use containers specified by the 49 CFR Part 178 (with any subsequent amendments made by DOT) and a working size limitation of an average straight side diameter measurement of not more than 13" and a height (head to head) of less than 22". This size limitation is consistent with the physical limitations of the equipment used to insert the containers into the kiln for energy recovery. A container of these dimensions would not have a theoretical volume greater than 13 gallons, with a working volume of approximately 10 gallons. Total storage capacity of the container warehouse would be limited to a volume of 172,800 gallons in containers as described above of what ever container size, rather than a specific number of containers.

Container Management Practices

The shipment of solid waste filled containers will be palletized and wrapped with heat shrink plastic (to facilitate movement with forklifts) when received at the Brooksville facility. Florida Mining and Materials will ensure that incoming containerized wastes are stored in containers that are compatible with the physical and chemical characteristics of the waste. The containers will be handled by plant personnel trained in such and will not be handled or stored in any way which might cause the containers to rupture or leak.

Incoming containers will first be placed in a designated testing area. Each shipment will be tested for compatibility to the waste analysis plan. After testing, if approved, containers will be moved to a permanent storage area for future processing into the cement kiln. The storage area is designed to accommodate first in, first out management of container operations. If the shipment is disapproved, the pallets of containers are immediately removed from the container storage building and placed on the truck that brought them and returned to the supplier.

Each container storage area will be inspected daily. Adequate aisle space will be maintained so that areas can be properly inspected and local fire codes can be satisfied. If a container is identified to be in poor condition, the contents of that container will be transferred to a container which is compatible with the contents and is in good condition. Inspection logs to be used for ~~all the~~ HWF storage areas are provided as Exhibit II.13 in Section C of this application.

C. Tanks

As discussed previously, storage of liquid HWF will involve three areas: Unit 1 providing an unloading area for truck shipments, Unit 2 providing an unloading area for rail shipments, and Unit 3, a tank storage area. This section provides details for each of these storage areas.

Truck/Rail Unloading

Florida Mining and Materials proposes to receive liquid hazardous waste fuels by truck and/or rail car. The waste fuels are those outlined in the Waste Analysis Plan. The waste fuels will either be pumped directly to the cement kiln for energy recovery or pumped to storage tanks for future energy recovery.

Truck Area

Trucks arriving on-site will be directed to the truck unloading area. All testing and unloading of the hazardous waste fuels will occur in this area. The entire truck will be contained within a concrete containment area. The area will be covered with a structure to eliminate the possibility of rain water being collected in the secondary containment. The truck unloading facility has been designed in accordance with NFPA 30. The foundation design consists of:

- 8 inches of Econocrete with not less than 2000 psi strength.
- A polyethylene film barrier of appropriate strength and weight.
- 8 inches of reinforced concrete slab with a minimum compressive strength of 3000 psi in 28 days. All concrete work to conform to A.C.I. Standard 318.
- Concrete curbs around the inside perimeter of the area for containment purposes.

In addition, the floor slab will be coated with a material that is impervious to solvents, such as Chem-Master Corporation's "Dura-Kote 3" or equivalent. All joints will contain waterstops that are nonmetallic such as flexible Teflon waterstop or similar.

The floor slab has been designed to slope towards a steel lined collection trench. This collection trench will be covered with heavy duty bar grating and will be sloped to drain to an interior, steel lined concrete sump. The trench and sump will be inspected daily and liquids removed by pumping as needed. Figures II.9 and II.10 provide design details of the truck unloading area.

Capacity of the Containment System

The maximum anticipated volume of hazardous waste fuels in one truck is 5,000 gallons. The unloading area is designed to accommodate two trucks. The secondary containment area is, therefore, designed to store a minimum of 10,000 gallons of liquid in case of a truck rupture. This is in accordance with requirements specified in NFPA 30.

Table II.13 shows the capacity calculations for the containment area. Given the fact that the facility will be enclosed sufficient to eliminate the possibility of rain water intrusion, no adjustments have been made for precipitation in the volumes.

Rail Area

Rail cars transporting hazardous waste fuels for energy recovery will be directed to the rail unloading facility. The rail facility consists of:

- Steel lined trench under the unloading nozzle of the rail car
- Secondary containment area
- Kiln feed and/or transfer pumps.

Figures II.11, II.11a, II.12, and II.13 show the design of the rail facility. The rail car unloading nozzle will be positioned directly over the concrete trench. The hose from the unloading pumps is located within the trench. The trench is designed to direct any spills to the secondary containment areas. The trench is steel lined and is inspected daily. No fuels will be allowed to pond within the trench.

The trench is covered with a heavy duty grate. Rain that falls directly on the trench will be conveyed to a steel reservoir located within the secondary containment facility. This reservoir is designed to hold the 24 hour, 25 year storm based on the area of the trench that is exposed to the rain. The remaining facility, pumps and secondary containment, are covered with a roof structure.

The secondary containment is designed to collect and hold the volume of one railroad tank car, or 25,000 gallons (see Table II.14). The area is constructed of 8" reinforced concrete slab sitting upon 8" of Econocrete with not less than 2000 psi strength separated by a polyethylene film barrier of appropriate strength and weight. The concrete is coated with a material that is impervious to solvents, such as Chem-Master Corporation's "Dura-Kote 3" or equal. All joints will contain waterstops that are nonmetallic such as a flexible Teflon waterstop or similar.

Hazardous Waste Fuel Management

The shipment of hazardous waste fuel will be tested in accordance with the Waste Analysis Plan. The extraction of samples from the rail/truck will occur within the secondary containment areas. Upon approval of the fuels, an authorized plant employee will begin fuel transfer operations. The waste fuels can either be pumped directly to the kiln or to the storage/blending tanks.

To Kiln

Fuels can be pumped directly to the kiln for energy recovery from the rail/truck. Kiln feed pumps located within the containment areas pump fuels directly out of the rail/truck to the kiln. The feed rate of the pumps are controlled to ensure proper feed rates into the kiln. The pumps are controlled and monitored by pressure and flow sensors. These sensors provide the cement kiln control center necessary information so that the energy recovery process is correctly and safely operated within the confines of the permit.

The pipeline between the containment areas and the kiln are continuously welded steel pipe. For the areas outside of the containment areas, the pipes are enclosed in sealed pipe trays. The trays are sloped such that any leaks can be directed to observation ports. These ports will then be inspected daily for detection of deterioration or leaks. If a leak is detected, the kiln feed is stopped and a thorough investigation is conducted to determine the source of the leak. All leaks will be dealt with and stopped upon detection.

To Storage Tank

Fuels can also be pumped to storage tanks. Transfer pumps located within the containment areas or pumps on the trucks or rail cars, pump fuels directly from the rail/truck into a storage tank. Storage tanks are equipped with level detectors which allow the operator the ability to monitor the level of the fuel in any tank so as to not overfill the tank (see section on Tanks). Piping, pumps, and valves for transferring of fuels are all contained within secondary containment facilities and, therefore, are not in trays. The containment areas are inspected daily for pipe, pump or valve deterioration and/or leaks. If a leak is detected, proper procedures are followed to eliminate the source of the leak.

Tanks

Description of Tanks:

Exhibits II.14 through II.17 provide an assessment of the tank design and P.E. certification. There will be four 25,000 gallon vertical steel tanks with a total holding capacity of 100,000 gallons for storage\blending of liquid HWF. These tanks have been designed to meet or exceed the minimum requirements of API Standard 650, Revision No. 3, Appendix F dated October 15, 1979. All shell design stresses are less than 21 thousand pounds per square inch (KSI) per Appendix "F" with a joint efficiency of 0.7 for vertical joints. Each tank will be hydrostatically tested per API 650.

The four 25,000 gallon above ground tanks are each 12.0 feet in diameter and approximately 35 feet in height. The material of construction will be mild steel throughout all the tanks. The shell thickness will be 1/4" and the bottom of the tanks will be 1/2". The gaskets to be used in the assembly of the pumps and valves will be spiral wound flexitallic Style CG-150 pound pressure or equivalent. Figure II.14 illustrates the storage\blending tank details. Figure II.15 illustrates the general arrangement of the storage tanks.

All the tanks will be used to store/blend HWF. The specific gravity of the HWF will range from 0.77 to 1.25. The maximum liquid level in the tanks will be 1.0 feet below the top.

Daily pressure variations in the tank system will be handled by a nitrogen vapor suppression and control system as illustrated on Figure II.16. The fuels to be used will be within a pH of more than 4 and less than 11, thus the fuels will not be reactive with steel or concrete.

Each tank will be structurally supported on a concrete cylinder slab within the spill containment area, as shown in Figures II.14 and II.15. Each tank will be elevated above the containment area floor. The tank bottom may be observed through observation ports. The tanks will be secured to the slab with anchor bolts.

Tank venting will be accomplished by a nitrogen vapor suppression and control system. Figure II.16 illustrates this system. The low-pressure nitrogen system will have an automatic valving system to keep the manifolded tanks under a positive pressure between 0.5 psig and 2.0 psig in the space above the liquids. Tank vapors will be displaced to a VOC control system only when the tank pressure exceeds 2.0 psig. Under ordinary operating conditions there are no displaced vapors because liquid HWF will be continuously withdrawn from the tank system. Vapor displacement may occur when the fuel delivery rate exceeds the fuel burn rate. The vapors emitted during tank venting required by tank filling or thermal breathing will be conveyed through a welded pipeline directly to the kiln hood and burned in the rotary cement kiln. This pipeline will be fitted with automatic valving and appropriate monitors to ensure that no excess oxygen or heat will be available for combustion. During filling of tanks, displaced vapors will be vented to return to the transportation vessel. The quantity of vapors will be addressed in the air permit applications associated with this project.

The tank foundation will maintain the load of a full tank as shown on Exhibit II.16. Attached calculations show a maximum loading of 388 thousand pounds, including the weight of the tank, the full content of the tank, concrete foundation and 50-year snowfall for each of the 25,000 gallon tanks. Distributing this load over 214 square feet of tank foundation results in a maximum soil bearing load of 1.82 thousand pounds per square feet (KSF). The soil bearing capacity has been conservatively estimated at 2 KSF. Consequently, the soil bearing capacity is more than adequate to support the weight of the tank system.

The steel storage tanks will be constructed on reinforced concrete pads. The concrete and reinforcing have been designed to the following standards:

ACI 211.1-70	Recommended practice for selecting proportions for normal weight concrete.
ACI 301-72	Specifications for structural concrete for buildings.
ACI 302-69	Recommended practice for concrete floor and slab construction.
ACI 315-74	Manual of standard practice for detailing reinforced concrete structures.
ACI 318-77	Building code requirements for reinforced concrete.

In all cases, the steel to concrete ratio is more than adequate to resist all bending forces for both tension and compression, overturning of containment walls, bond between reinforcing steel and concrete, shear stresses and temperature.

The Brooksville, Florida area is not seismically active and consequently not listed in Appendix VI of 40 CFR Part 264. No portion of the facility is located within 200 feet of a fault which has been displaced in holocene time. The tanks will be bolted to the concrete foundation which will be constructed on soil that is not in the saturated zone. The facility is not in the 100-year flood plain. Consequently, the tank system will not float or be dislodged from its foundation and the foundation is stable.

The concrete foundation will be constructed on compacted soil covered with sand to an average depth of six inches. In addition, concrete grade beams will be constructed at a depth of 28" along the perimeter of the concrete foundation. The area below the tank system and below the concrete grade beams will not be subjected to frost conditions and the tank system will not be subjected to frost heave.

The tanks will each have a three-way alarm system that works off of an ultrasound transducer placed in each tank. When the tank level is 3.5 feet from the top, a light will light up on the indicating panel for the particular tank. When the level is 1.0 feet from the top, a siren will sound warning of the possible tank overflow. The liquid level indicating device in each tank will be a remote ultrasound system. Output will be converted to a level indication on the kiln burner floor and at the tank storage area. Audible high level and low level alarms will sound at the storage area and the kiln floor. The overfill alarm will be detected by the person unloading fuel from the transport truck to the tank, allowing immediate stoppage of pumping. Low level alarms will be used by the console operators to prevent running out of fuel. HWF can also be transferred between tanks to aid management of tank levels.

An inventory of feed on hand and a record of the volume of material consumed as fuel will be maintained on a daily basis. The alarm and procedures described are designed to prevent overfilling or running out of fuel. The fuel tank will be situated in a diked area to contain potential spills. The steel-reinforced concrete walls are 8 inches thick and 5 feet tall. Total secondary containment volume is 100,000 gallons.

Tank Corrosion and Erosion

The HWF will be a mixture of common industrial solvents and other organic compounds. These materials are noncorrosive and will be screened so that those materials exhibiting an extractable pH of less than 4 or greater than 11 will not be received. These criteria have been established to ensure that the HWF does not react with the mild steel tank walls. Due to the noncorrosive nature of HWF, no internal coatings or linings will be used. External surfaces will be painted with a 6 mil primer made of Glidden Company epoxy and the finish coat will be Glidden's Gliddthane II at 1.5 to 2 mils thickness or equal. The color will be white. The gaskets used in the assembly of the pumps and valves will be spiral wound Flexitallic Style CG-150 lb. pressure or equivalent solvent resistant material. The tanks will be hydrostatically tested in place after erection to check for leaks. In addition, as means of checking corrosion, all the tanks will be tested for shell thickness using a nondestructive ultrasonic thickness gauge on an annual basis. External inspections of the tanks to detect corrosion and leaks will be conducted daily. The readings will be recorded and updated to develop a corrosion history. The rate of tank corrosion is expected to be less than 0.001 inches per year. The tanks are expected to last a minimum of twenty years.

Tank Management Practices

HWF will be received and pumped into one of the four storage\blending tanks. Each tank can be released to the plant for energy recovery in the rotary cement kiln when tested and approved. A simplified flow diagram is shown in Figure II.17. To ensure that the tanks are operated in accordance with design specifications, the plant will monitor receipts, fuel inventories, HWF use, and fuel characteristics on a daily basis. All materials received will be thoroughly tested as described in the Waste Analysis plan. A record of these analyses will be maintained. Information on the characteristics and quantities of materials moved through the fuel system will ensure that the tanks are operated according to design. The three primary activities involved with tank management (off-loading, storage, and injection into the kiln for energy recovery) are discussed in more detail below.

Off-Loading

The HWF being transported to the Plant will be sampled from the truck or rail car, preliminary tests run, and if okay, then off-loaded. The off-loading system design includes a three inch cam-lock fitting ahead of a filter which will be compatible with fittings on the delivery trucks or rail cars. Facility employees connect the rail cars and trucks to the off-loading system. Off-loading will be done using transport truck pumps and or facility pumps. All connections in the off-loading system will be checked by the plant material handler before off-loading begins.

Storage

Variables influencing tank management practices such as line pressure, flow level, and specific gravity and viscosity will be monitored to aid better management. Fuel temperature will be ambient and thus is of little concern. The HWF will be under a nitrogen blanket in order to maintain the pressure inside the tanks between 0.5 psig and 2.0 psig. The fuel flow level will be continuously measured on the fuel flow indicator in the kiln control room and recorded on a strip chart. The HWF in the storage\blending tanks will be mechanically agitated to ensure homogeneous fuel composition and to prevent settling of solids.

All of the piping outside of the secondary containment areas will be fabricated with welded joints and installed above ground. Secondary containment will consist of the areas around the tanks, concrete containment at rail unloading facility, and floors of existing structures (the Burner-Cooler Building and the Control Room) which house the hazardous waste firing system. All piping, tanks, pumps, filter, gauges, etc. will be inspected daily. The tank system, piping, safety devices, etc., are designed to prevent failures caused by contact, pressure gradients and climatic conditions. This will be accomplished by gauges, relief valves on tanks manufactured with Underwriters Laboratories approval and API Standard 650 design standards.

The piping and ancillary equipment, like the tanks, are designed to prevent failures caused by contact, pressure gradients and climatic conditions in accordance with ANSI B31.3. Valves (1-1/2" and smaller) will have socket weld ends. Hoses to connect to piping will be flexonics type 401M corrugated type 303 SS hose and braid or equal. Pressure gauges will be threaded and have a socket welded valve installed between the HWF line and the gauge that can be closed in the event of leakage in the line or in the gauge. The shift foreman will make the daily, weekly, and monthly inspections. The plant superintendent will oversee this activity, read and follow up on items marked with an X, which will be other than routine.

Injection into the Kiln

Fuel will be delivered to the kiln through a closed loop circulation system utilizing centrifugal pumps and pressure relief valves. Piping for the HWF system is shown in Figure II.17. Exhibit II.11A provides general specifications for the piping system.

In addition to the three primary components of the tank management practices there are two other important components. These two are the tank entry program and the secondary containment system which are discussed below.

Tank Entry Program

Entry into the HWF storage tanks may be necessary to repair the agitators or to remove sludges. Therefore, a program has been developed for tank entry which will prevent employee exposure to dangerous air contamination and/or oxygen deficiency when working inside the tanks.

Tank entry will be by authorization only. The entry authorization provides a checklist of necessary precautions and provides for review of these precautions by supervisory and safety personnel who provide authorization for such entry by their signatures. A copy of the entry authorization is included in Exhibit II.12. The authorization will be issued for the period of one shift only and must be updated for each additional shift. All employee access entrances to the tanks will be posted with the following warning:

DANGER
DANGEROUS AIR CONTAMINATION
AND/OR OXYGEN DEFICIENCY
MAY BE PRESENT. TANK ENTRY
BY AUTHORIZATION ONLY

Table II.15 outlines the procedures to be followed prior to any entry into a fuel storage and/or mixing tank. Table II.16 lists the work procedures to be adhered to when dangerous air contamination and/or an oxygen deficiency may be encountered.

Training for tank entry will be provided before each scheduled tank entry for the following personnel: supervisor of tank entry crew, tank entry crew, standby personnel and rescue personnel. Training will include both instruction, demonstration, and practice in all aspects of tank entry. In addition, general information regarding hazards associated with tank entry will be included in the orientation training of all employees involved in the HWF program.

Liquid Fuels Containment Area

The plans for the containment areas are shown in Figure II.15. The containment area foundation system will consist of one of the following:

- 6-inches of Econocrete with not less than 2500 psi strength.
- A polyethylene film barrier of appropriate strength and weight.
- An 8 inch thick of reinforced concrete slab will be constructed. The concrete surface will be sealed with an epoxy material rated for use with HWF.

The tank farm and containment area will be covered by a roof to prevent precipitation from entering the secondary containment area. Table II.17 shows the calculations for the containment volume.

Procedures for prevention of ignition of the materials within the tank and secondary containment areas include:

- Posting the area to prevent open flame.
- Use of nonsparking shovels, scrapers and tools.
- All electrical equipment in the area including motors, wiring, switch gear and instrumentation will be explosion proof.
- Pumps will be equipped with 125 lb. by-pass valves to prohibit pumps overheating due to a plugged line.
- Fuel lines will be equipped with 100 PSI pressure relief to prevent high line pressure.
- Spill clean-up system will be established for leaks, large and small.
- A written tank entry system will be followed.
- Properly trained personnel to handle the loading of tanks and the transfer of tested fuel to the burning tank.

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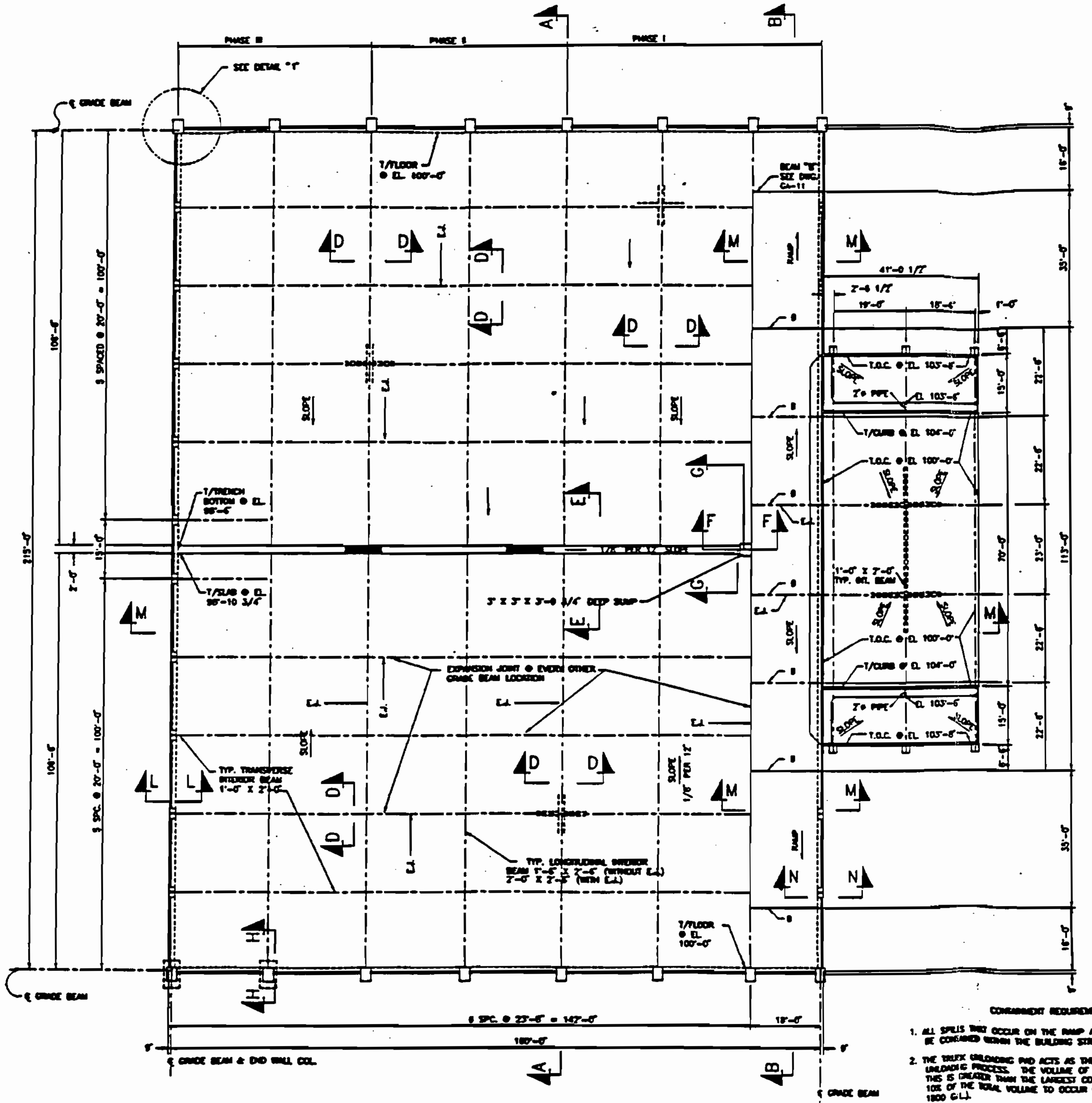
FIGURE II.8

THE PHASING REPRESENTS CONSTRUCTION SEQUENCING. PHASE 1 IS A STAND ALONE FACILITY. SUBSEQUENT PHASES WILL BE ADDED AS RECEIPTS DICTATE.

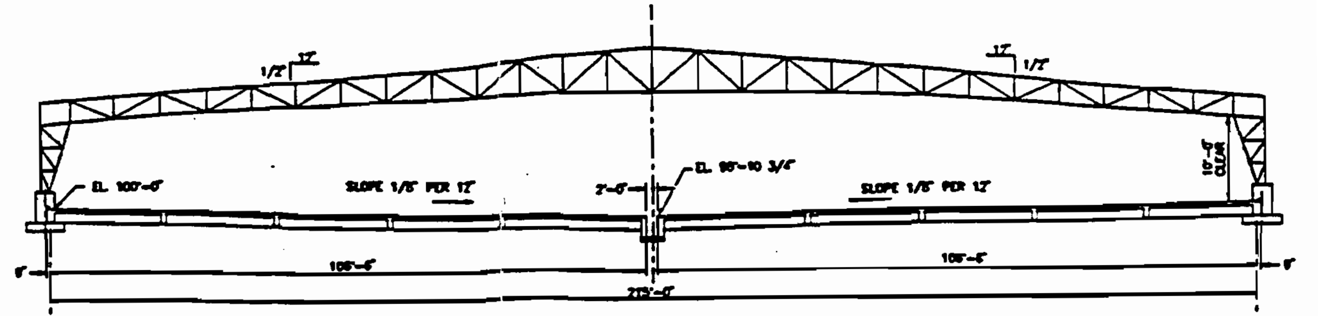


FOUNDATION PLAN

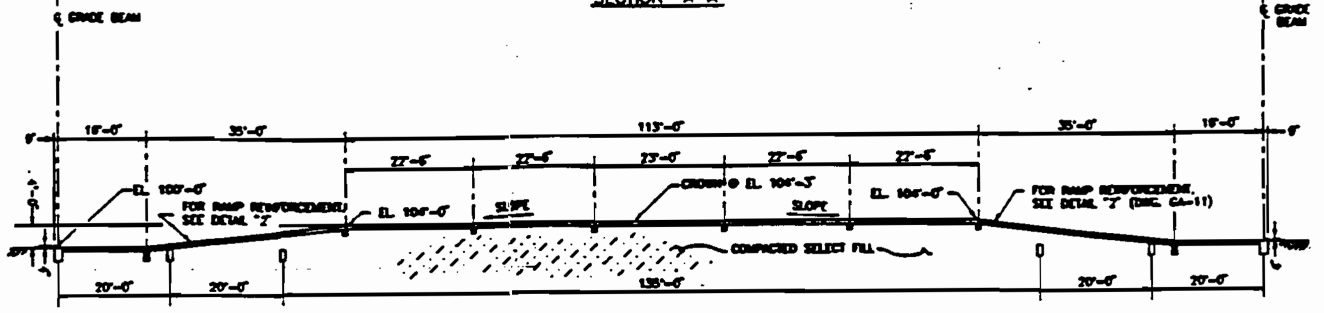
CONTAINMENT REQUIREMENTS

1. ALL SPILLS THAT OCCUR ON THE RAMP AND IN THE CONTAINMENT BUILDING WILL BE CONTAINED WITHIN THE BUILDING STRUCTURE.

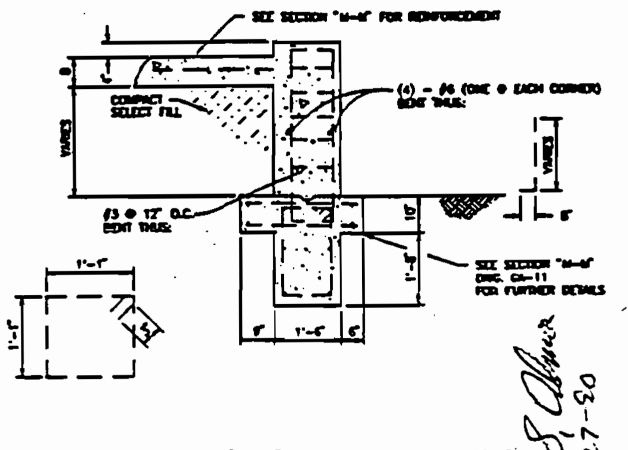
2. THE TRUCK UNLOADING PAD ACTS AS THE CONTAINMENT FOR THE TRUCK UNLOADING PROCESS. THE VOLUME OF CONTAINMENT IS APPROXIMATELY 2000 GAL. THIS IS GREATER THAN THE LARGEST CONTAINER (ONE PALLET OR 180 GAL.) AND 10% OF THE TOTAL VOLUME TO OCCUR ON THE PAD DURING IN ONE TIME (5 TRUCKS OR 1800 GAL.).



SECTION "A-A"



SECTION "B-B"



SECTION "N-N" (TYP @ COL. LOCATIONS)
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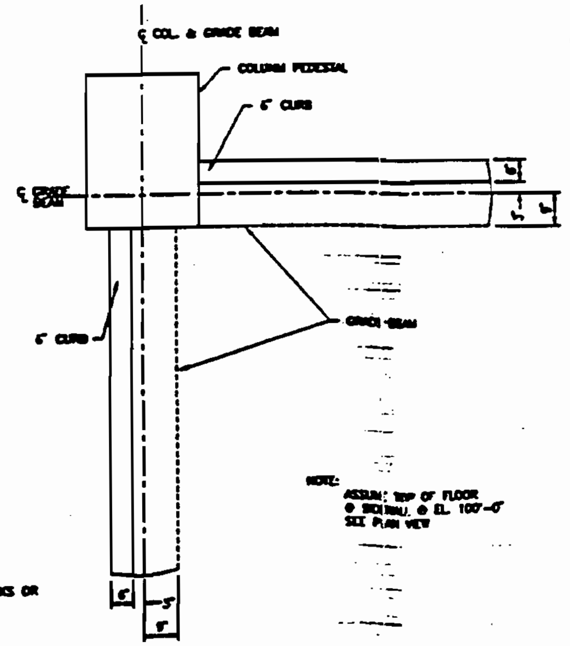
8-27-90



DETAIL "1" (TYP)
SCALE 1/2"=1'-0"

GENERAL NOTES

1) ALL CONCRETE WORK SHALL CONFORM WITH CURRENT A.C.I. STANDARD 318.
2) CONCRETE STRENGTH SHALL DEVELOPE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 3,000 p.s.i. IN 28 DAYS.
3) REINFORCING STEEL SHALL BE NEW AMERICAN BILLET A.S.T.M. A615, GRADE 60.
4) CHAMFER ALL EXPOSED CONCRETE EDGES 3/4".
5) FILLS, IF ANY, SHALL BE CONSTRUCTED IN HORIZONTAL LAYERS NOT EXCEEDING 6" IN UNCOMPACTED THICKNESS. EACH LAYER SHALL BE THOROUGHLY COMPACTED TO 95% OF THE MAXIMUM DENSITY AT OPTIMUM MOISTURE CONTENT AS DETERMINED BY A.S.T.M. D698.
6) ANY DISTURBED SUBGRADE MUST BE COMPACTED AS PER NOTE #5.
7) ALL CONCRETE TO BE COATED WITH CHEM-MASTER CORP. " DURA KOTE 3 " OR EQUIVALENT.
8) WORK THIS DWG. WITH DWGS. CA-10 & CA-11.

PERMIT DRAWING

08/10/90

NO. | DATE | REVISION | BY | CH'D | APP'D | W.O.NO.

SOUTHDOWN, INC.

The BenhamGroup
17120 Dallas Parkway
Suite 240
Dallas, Texas 75248
214-248-6601
TBC # 3389-0180

SCALE: 1/16" = 1'-0"
DESIGN:
DRAWN: DAH
DATE: 01-11-90
CHECKED:
MICROFILMED DATE:

APPROVED | DATE
ISSUED BY | DATE

FLORIDA MINING AND MATERIALS
BROOKSVILLE FLORIDA

WORK ORDER NO.
BROOKSVILLE
PLANT

DEPARTMENT
HAZARDOUS WASTE FUELS SYSTEM
CONCRETE-CONTAINER STORAGE BUILDING
PLAN, SECTIONS AND DETAILS
DRAWING NUMBER
REV

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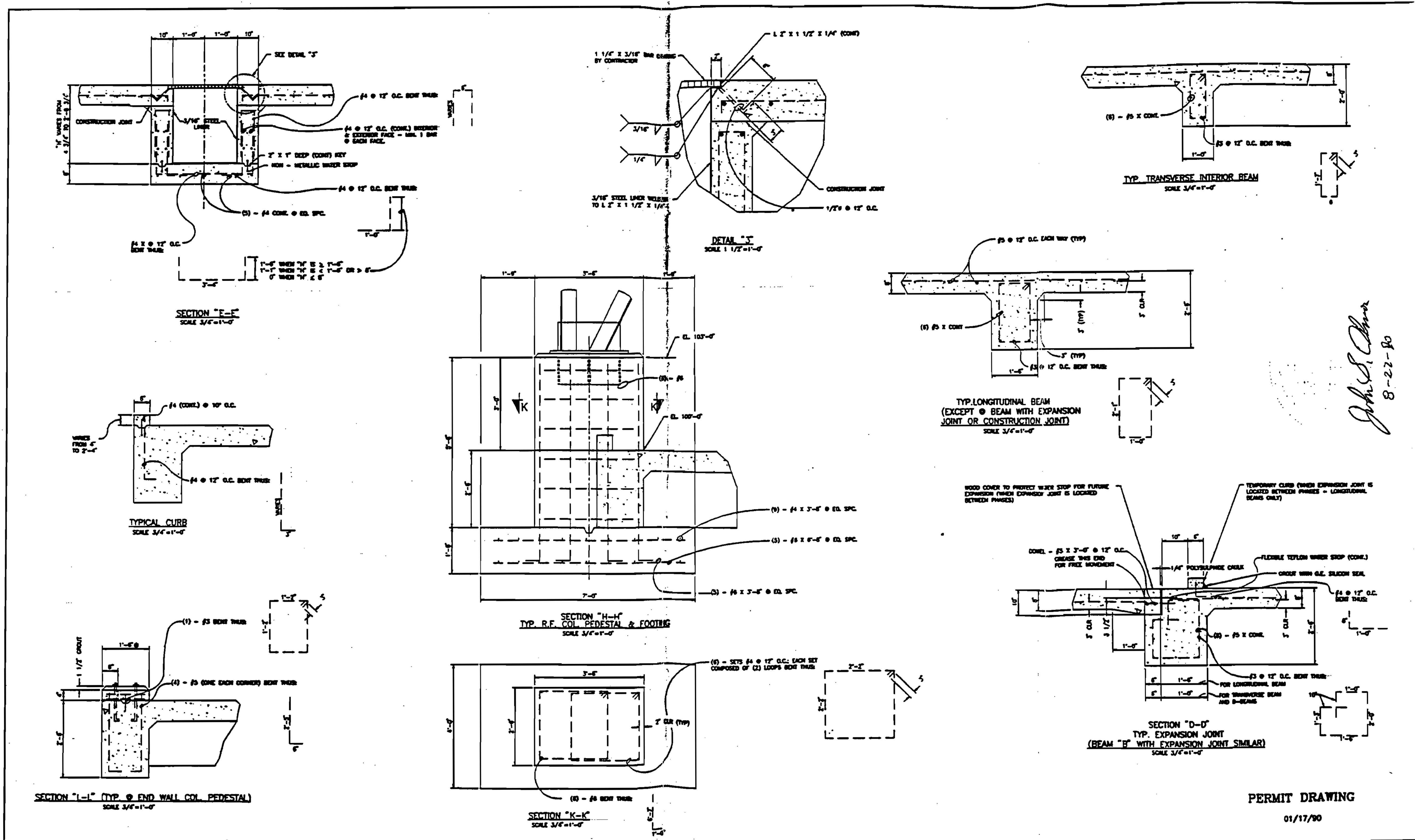
FIGURE II.8A



SECTION "E-E"
SCALE 3/4"=1'-0"

DETAIL "3"
SCALE 1 1/2"=1'-0"

TYP. TRANSVERSE INTERIOR BEAM
SCALE 3/4"=1'-0"

TYP. LONGITUDINAL BEAM
(EXCEPT @ BEAM WITH EXPANSION JOINT OR CONSTRUCTION JOINT)
SCALE 3/4"=1'-0"

SECTION "H-H"
TYP. R.F. COL. PEDESTAL & FOOTING
SCALE 3/4"=1'-0"

TYPICAL CURB
SCALE 3/4"=1'-0"

SECTION "I-I" (TYP. @ END WALL COL. PEDESTAL)
SCALE 3/4"=1'-0"

SECTION "K-K"
SCALE 3/4"=1'-0"

SECTION "D-D"
TYP. EXPANSION JOINT
(BEAM "B" WITH EXPANSION JOINT SIMILAR)
SCALE 3/4"=1'-0"

PERMIT DRAWING

01/17/90

NO.	DATE	REVISION	BY	CHKD	APPD	W.O. NO.

SOUTHDOWN, INC.

The BenhamGroup
17120 Dallas Parkway, Suite 240
Dallas, Texas 75248
214-248-8803
TBG # 3390-01300

SCALE: AS SHOWN
DESIGN:
DRAWN: DCB
DATE: 01-10-90
CHECKED:

APPROVED DATE
ISSUED BY DATE

FLORIDA MINING AND MATERIALS
BROOKSVILLE FLORIDA

WORK ORDER NO.
BROOKSVILLE
PLANT

DEPARTMENT
HAZARDOUS WASTE FUELS SYSTEM
CONCRETE-CONTAINER STORAGE BUILDING
SECTIONS AND DETAILS
DRAWING NUMBER
REV

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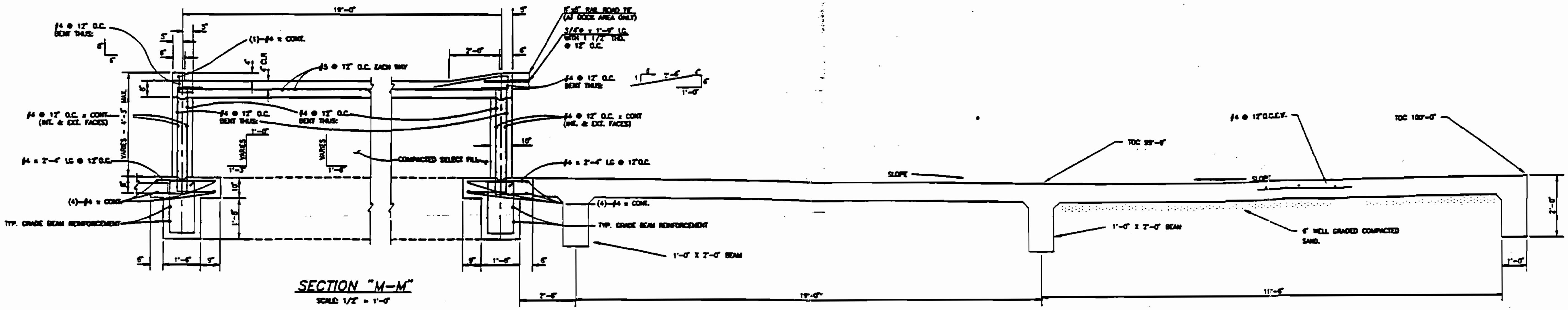
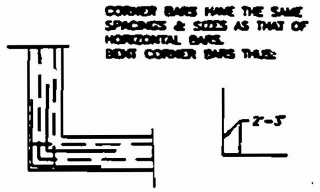
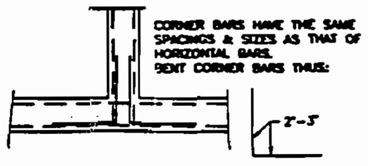
FIGURE II.8B



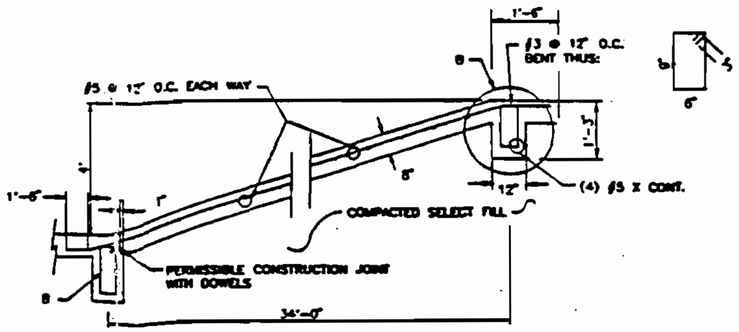
SECTION "M-M"
SCALE: 1/2" = 1'-0"



TYPICAL BAR SPLICE AT CORNER N.T.S.
(FOR BEAMS AND WALL)

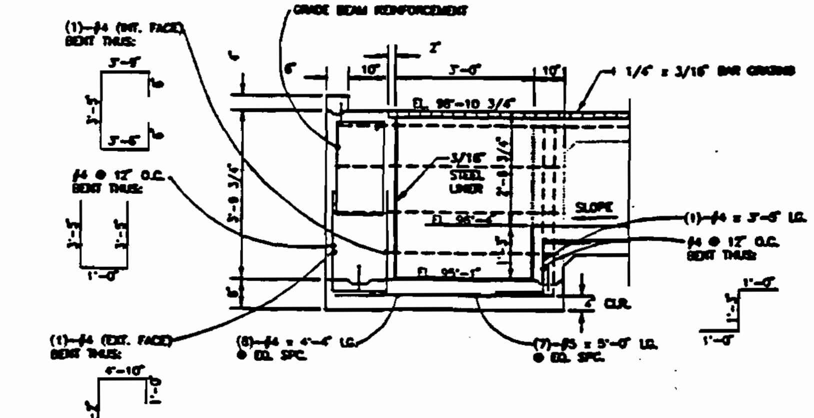


TYPICAL BAR SPLICE AT INTERSECTION N.T.S.
(FOR BEAMS)

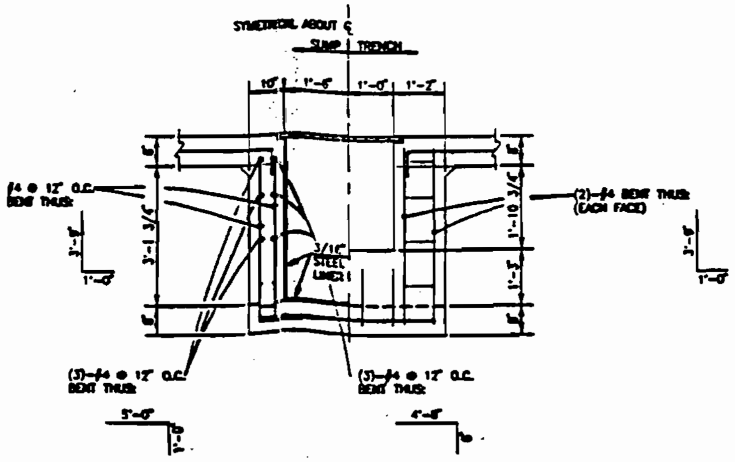


DETAIL "2" AND BEAM "B" DETAIL
N.T.S.

NOTE:
GRADE BEAM AND FOUNDATION DESIGN TO BE CHECKED FOR COMPATIBILITY WITH BUILDING FOUNDATION DESIGN AT TIME OF SELECTION OF PREFABRICATED BUILDING.



SECTION "F-F"
SCALE: 1/2" = 1'-0"



SECTION "G-G"
SCALE: 1/2" = 1'-0"

8-27-90

PERMIT DRAWING

01/17/90

FILE NAME: GA-11

SOUTHDOWN, INC.

17120 Dallas Parkway
Suite 240
Dallas, Texas 75248
214-248-0801

SCALE: AS SHOWN
DESIGN:
DRAWN: KAB
DATE: 01-11-90

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FLORIDA MINING AND MATERIALS

WORK ORDER NO.
BROOKSVILLE

DEPARTMENT
HAZARDOUS WASTE FUELS SYSTEM
CONCRETE-CONTAINER STORAGE BUILDING
SECTIONS AND DETAILS

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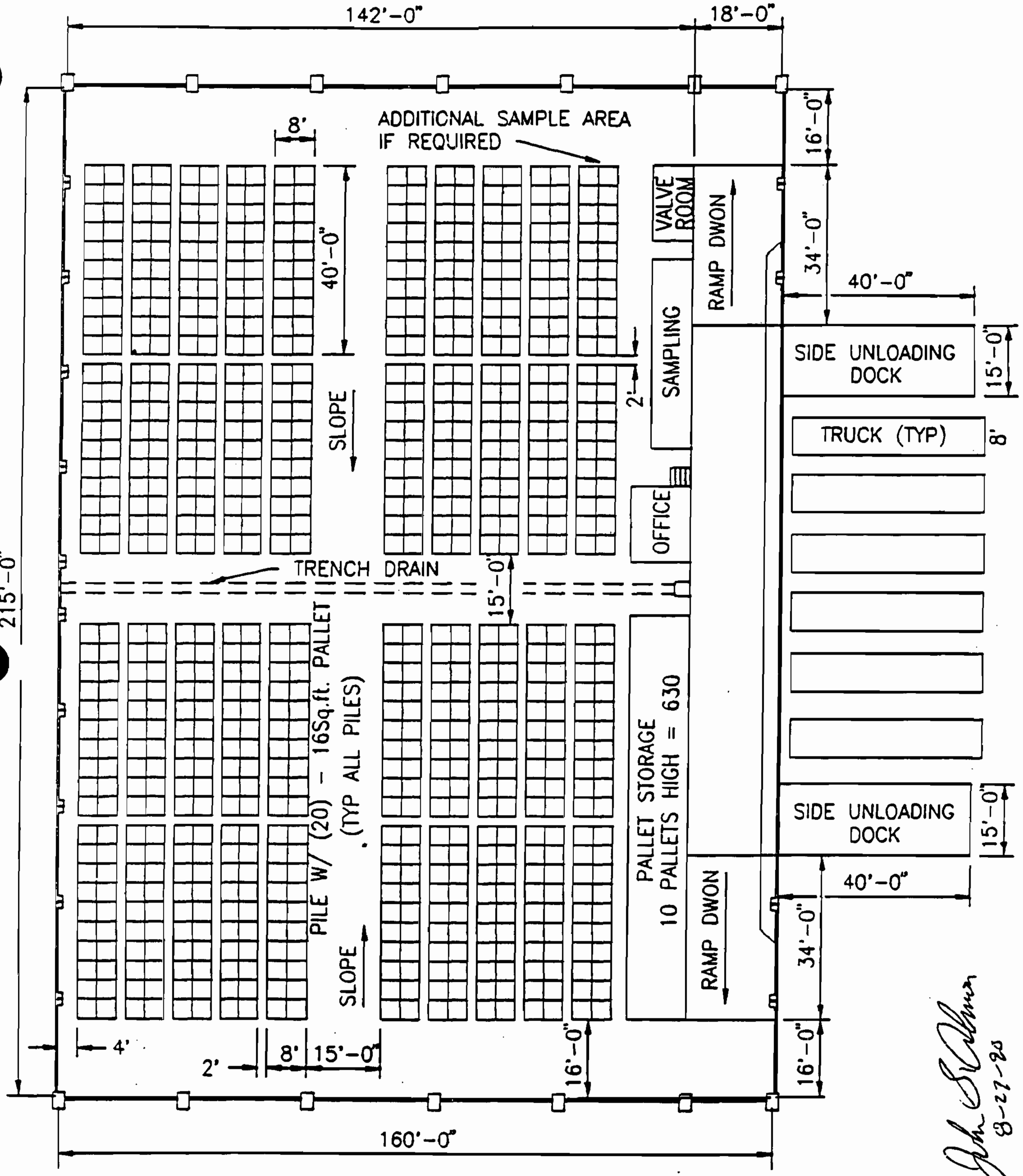
FIGURE II.8.C



8-27-90

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8/14/90

PRELIMINARY LAYOUT

The BenhamGroup

17120 Dallas Parkway
Suite 240
Dallas, Texas 75248
214-248-9901

TBG # PROJECT#

FLORIDA MINING
AND MATERIALS

BROOKSVILLE FLORIDA

BROOKSVILLE

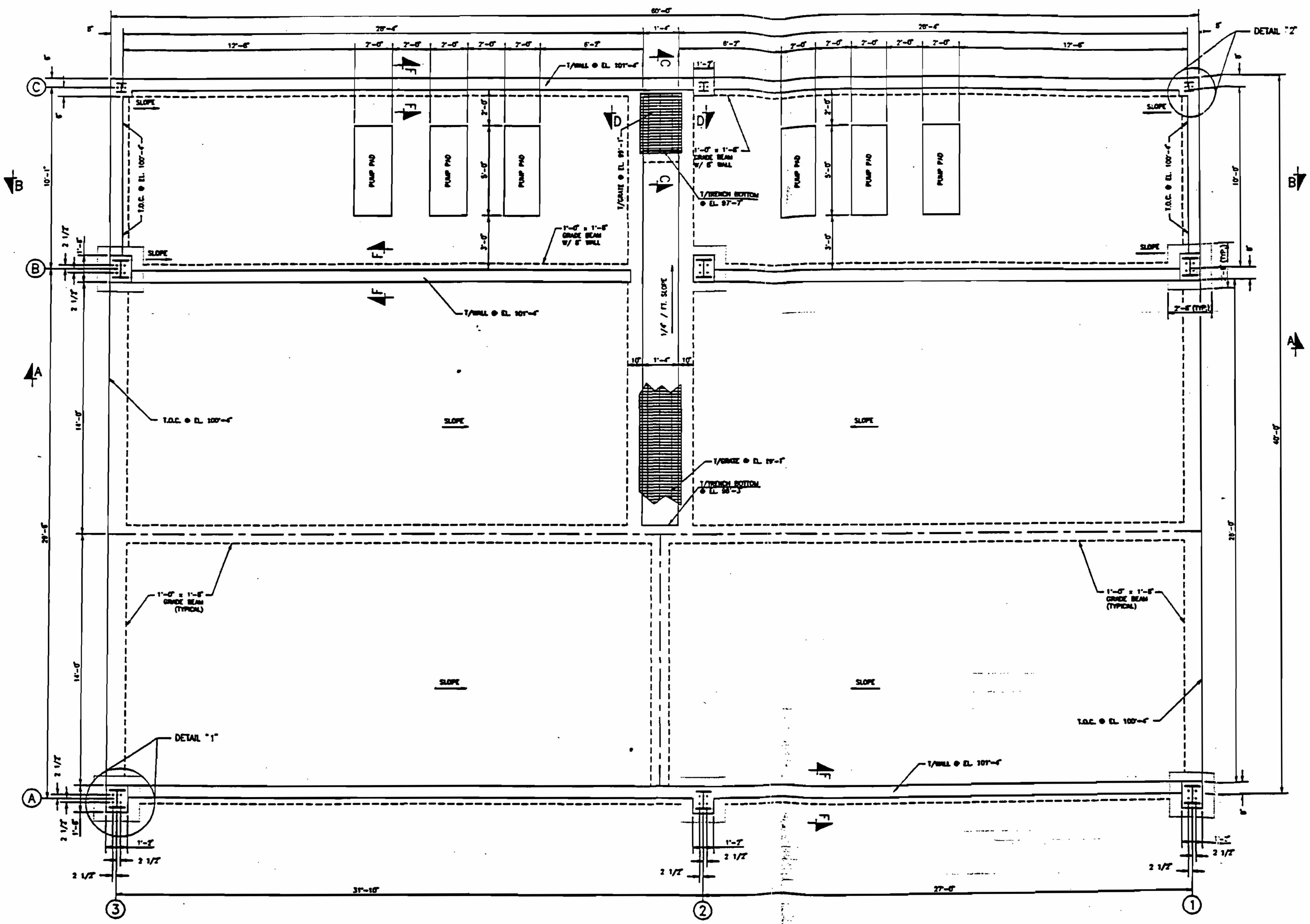
PLANT

HAZARDOUS WASTE FUEL SYSTEMS

CONTAINER STORAGE ARRANGEMENT

DRAWING NUMBER

FIGURE II.9



TRUCK UNLOADING CONCRETE PLAN

GENERAL NOTES

1) ALL CONCRETE WORK SHALL CONFORM WITH CURRENT A.C.I. STANDARD 318.

2) CONCRETE STRENGTH SHALL DEVELOPE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 3,000 p.s.i. IN 28 DAYS.

3) REINFORCING STEEL SHALL BE NEW AMERICAN BILLET A.S.T.M. A615, GRADE 60.

4) CHAMFER ALL EXPOSED CONCRETE EDGES 3/4".

5) FILLS, IF ANY, SHALL BE CONSTRUCTED IN HORIZONTAL LIFTS NOT EXCEEDING 6" IN UNCOMPACTED THICKNESS. EACH LAYER SHALL BE THOROUGHLY COMPACTED TO 95% OF THE MAXIMUM DENSITY AT OPTIMUM MOISTURE CONTENT AS DETERMINED BY A.S.T.M. D698.

6) ANY DISTURBED SUBGRADE MUST BE COMPACTED AS PER NOTE #5.

7) ALL CONCRETE TO BE COATED WITH CHEM-MASTER CORP. " DURA KOTE 3 " OR EQUIVALENT.

8-27-90

PERMIT DRAWING

08/10/90

FILE NAME: CA-5

NO. | DATE | REVISION | BY | CHK'D | APP'D | W.O.NO.

SOUTHDOWN, INC.

The BenhamGroup
17120 Dallas Parkway
Suite 240
Dallas, Texas 75248
214-248-0801
TBG # 3389-03800

SCALE: 3/8" = 1'-0"
DESIGN:
DRAWN: KAB
DATE: 01-02-90
CHECKED:
MICROFILMED DATE:

APPROVED DATE
ISSUED BY DATE

FLORIDA MINING AND MATERIALS
BROOKSVILLE FLORIDA

WORK ORDER NO.
BROOKSVILLE
PLANT

DEPARTMENT
HAZARDOUS WASTE FUELS SYSTEM
CONCRETE-TRUCK UNLOADING
PLAN AND SECTIONS
DRAWING NUMBER
REV

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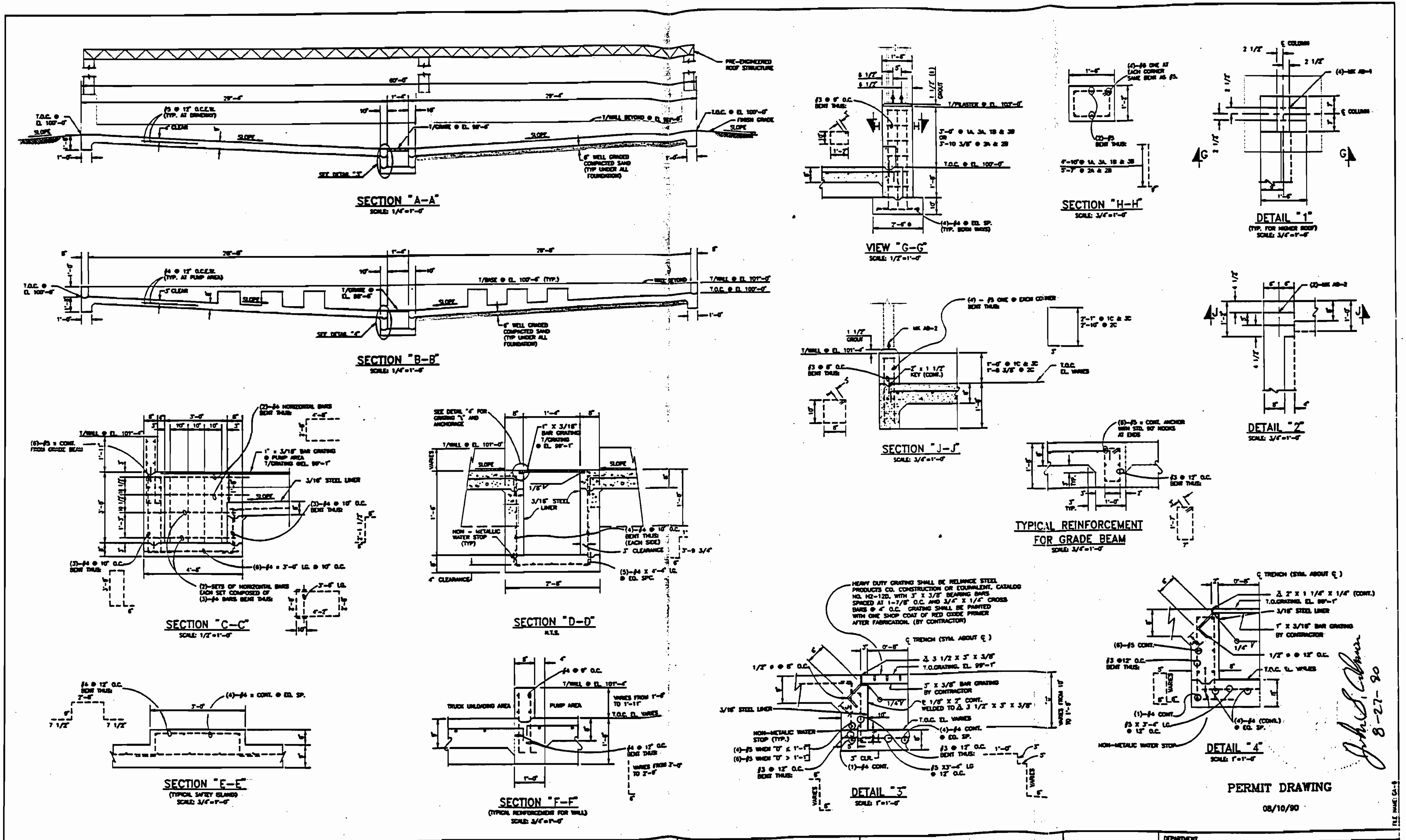
FIGURE II.9A



8-27-90

SOUTHDOWN, INC.

17120 Dallas Parkway
Suite 240
Dallas, Texas 75248
214-248-0003

SCALE: AS SHOWN
DESIGN:
DRAWN: KAB
DATE: 01-08-90
APPROVED
DATE

FLORIDA MINING AND MATERIALS

WORK ORDER NO.
BROOKSVILLE

DEPARTMENT
HAZARDOUS WASTE FUELS SYSTEM
CONCRETE-TRUCK UNLOADING
SECTIONS AND DETAILS
DRAWING

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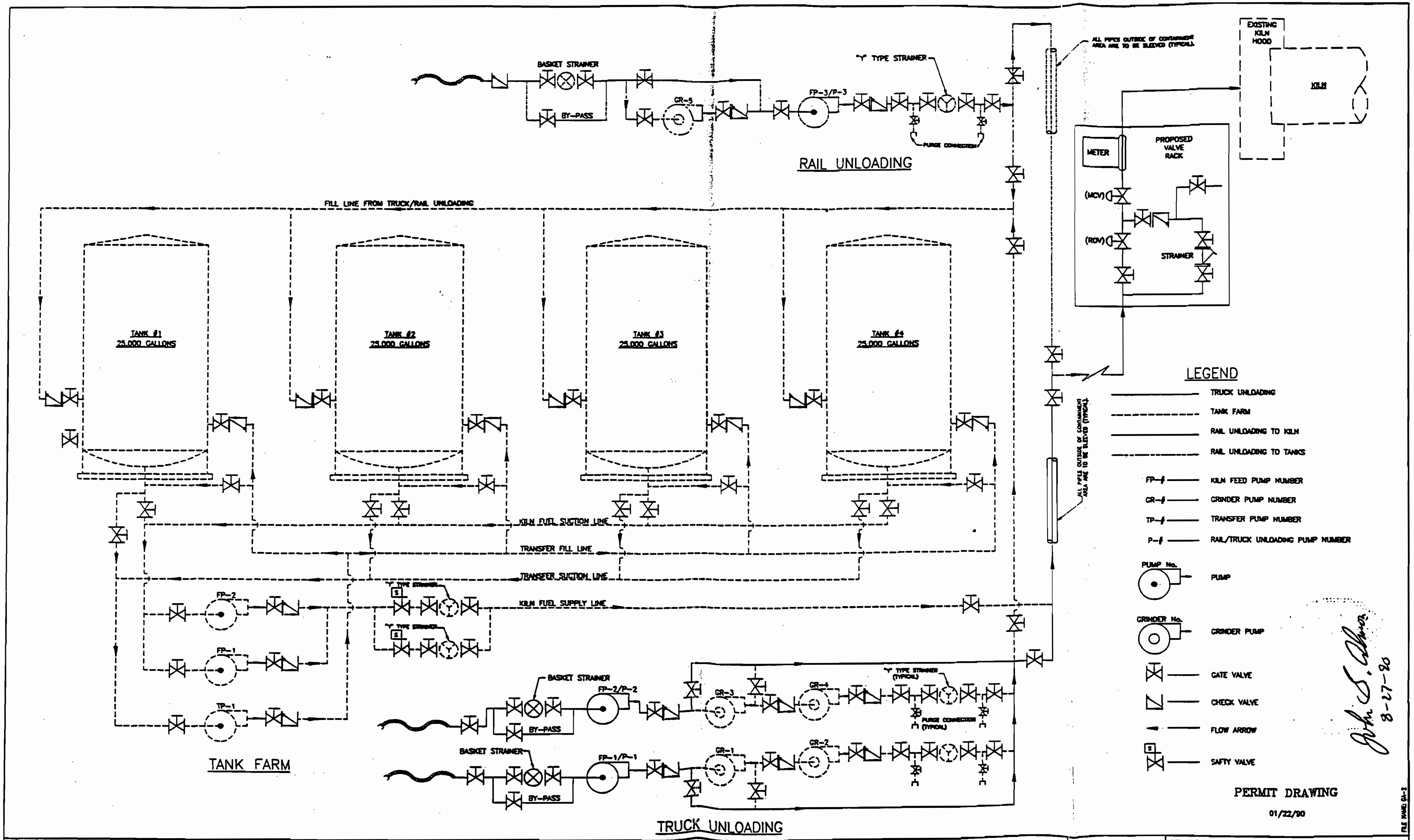
FIGURE II.10



8-27-90

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01/22/90

FILE NAME: GA-2

SOUTHDOWN, INC.

17120 Dallas Parkway
Suite 240
Dallas, Texas 75248
214-248-0000

SCALE: N.T.S.
DESIGN:
DRAWN: KAB
DATE: 01-03-90

APPROVED | DATE

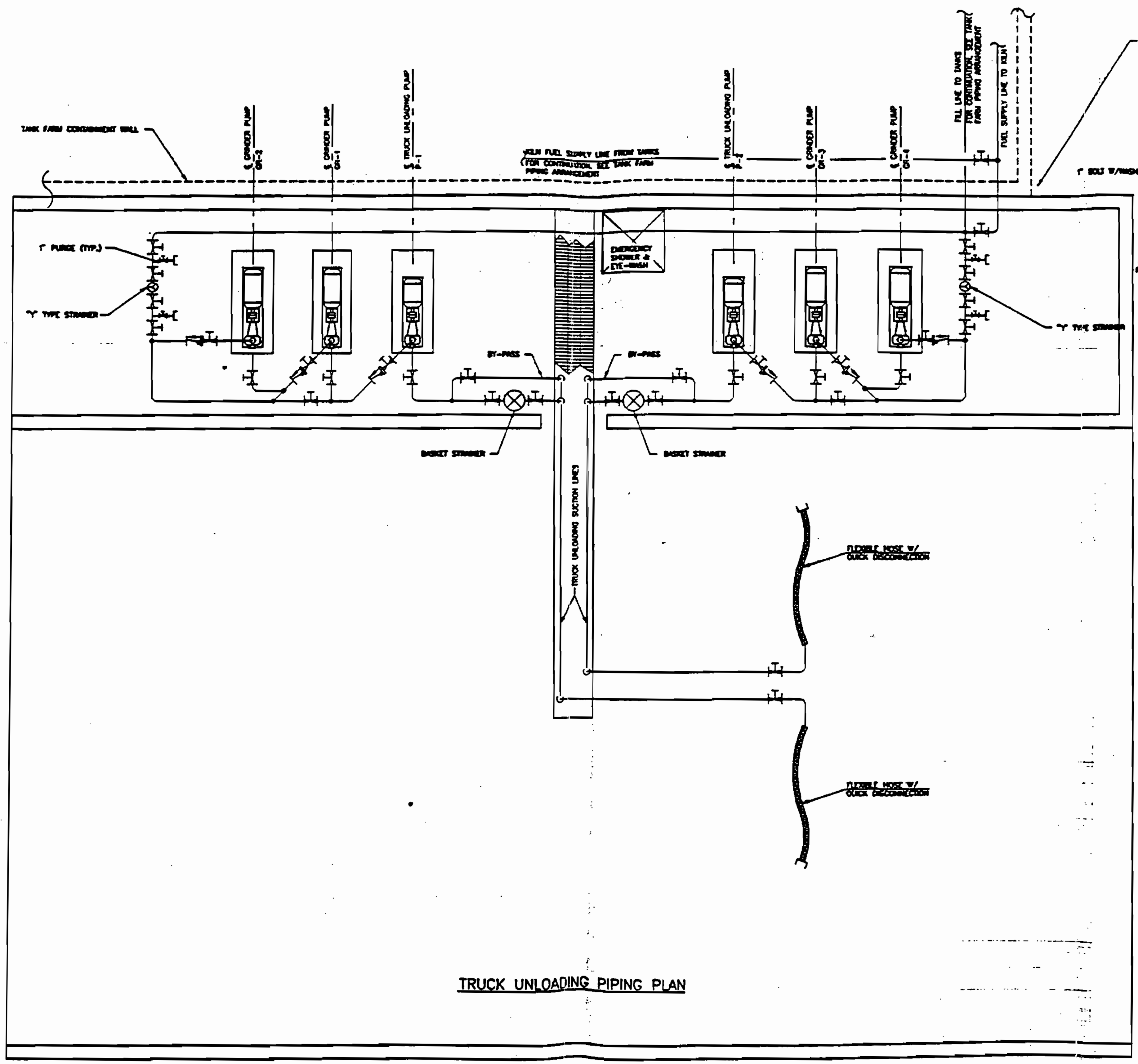
FLORIDA MINING AND MATERIALS

WORK ORDER NO.

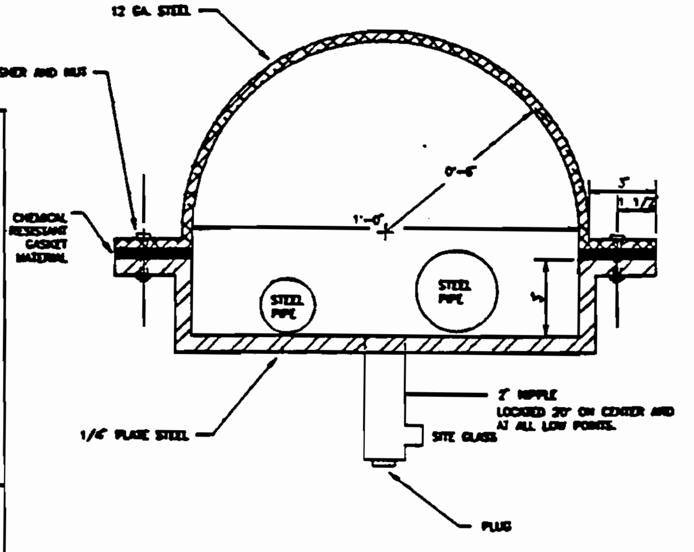
DEPARTMENT
HAZARDOUS WASTE FUELS SYSTEM
PROCESS FLOW DIAGRAM

Best Available Copy

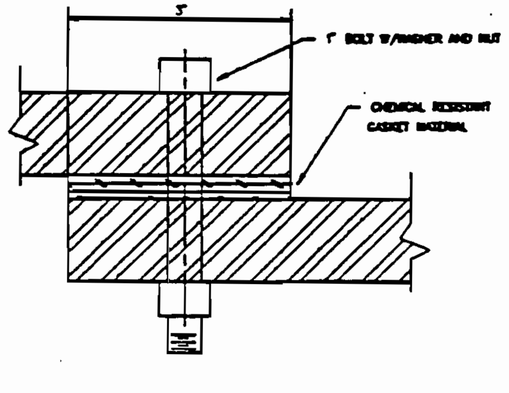
FIGURE II.10A



TRUCK UNLOADING PIPING PLAN



PAN DETAIL



PAN JOINT DETAIL

CONSTRUCTION NOTES:

STEEL CONTAINMENT PAN SHALL BE CONSTRUCTED OF A36 STEEL.

PAN LENGTHS SHALL NOT BE GREATER THAN 10-FEET.

ALL JOINTS SHALL BE MADE USING 3 - 1" BOLTS WITH CHEMICAL RESISTANT GASKET MATERIAL BETWEEN PAN CONNECTIONS. JOINT OVERLAP SHALL BE DOWNSTREAM.

8-27-90

PERMIT DRAWING

01/22/90

FILE NAME: GA-17

NO.	DATE	REVISION	BY	CH'D	APP'D	W.O.NO.

SOUTHDOWN, INC.

The BenhamGroup
17120 Dallas Parkway
Suite 240
Dallas, Texas 75248
214-248-0601
TBG # 3389-03800

SCALE: 3/8" = 1'-0"
DESIGN:
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DATE: 01-16-90
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ISSUED BY DATE

FLORIDA MINING AND MATERIALS
BROOKSVILLE FLORIDA

WORK ORDER NO.
BROOKSVILLE
PLANT

DEPARTMENT
HAZARDOUS WASTE FUELS SYSTEM
MECHANICAL-TRUCK UNLOADING
PIPING ARRANGEMENT
DRAWING NUMBER
REV

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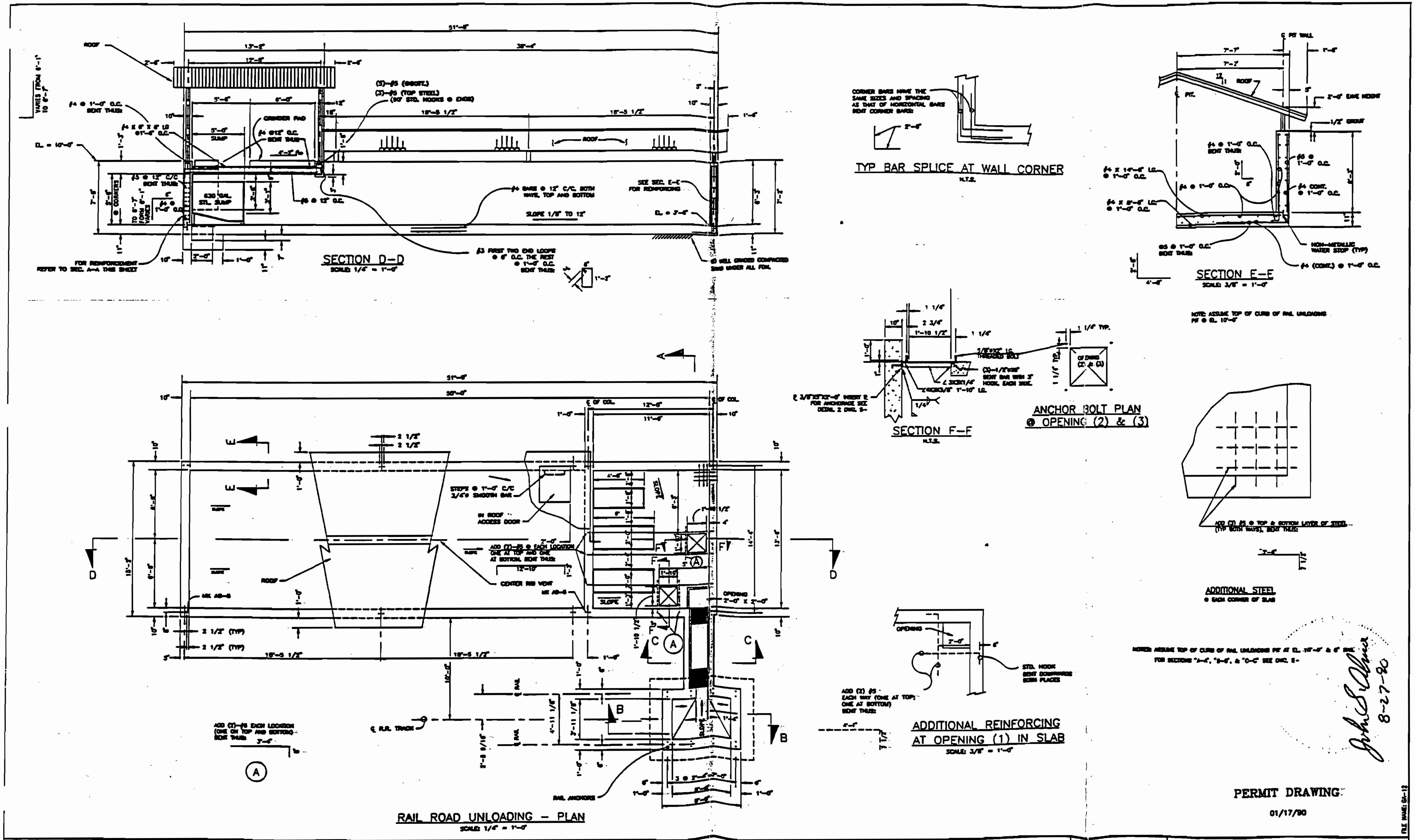
FIGURE II.11



8-27-90

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01/17/90

FILE NAME: GA-12

SOUTHDOWN, INC.

The BenhamGroup

SCALE: AS SHOWN

DATE: 01-11-90

APPROVED DATE

FLORIDA MINING AND MATERIALS

FLORIDA

WORK ORDER NO.

BROOKSVILLE

PLANT

DEPARTMENT

HAZARDOUS WASTE FUELS SYSTEM

CONCRETE-RAIL UNLOADING FACILITY

PLAN, SECTIONS AND DETAILS

DRAWING NUMBER

NO. DATE REVISION

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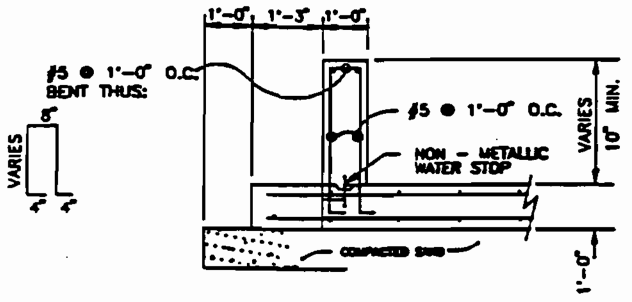
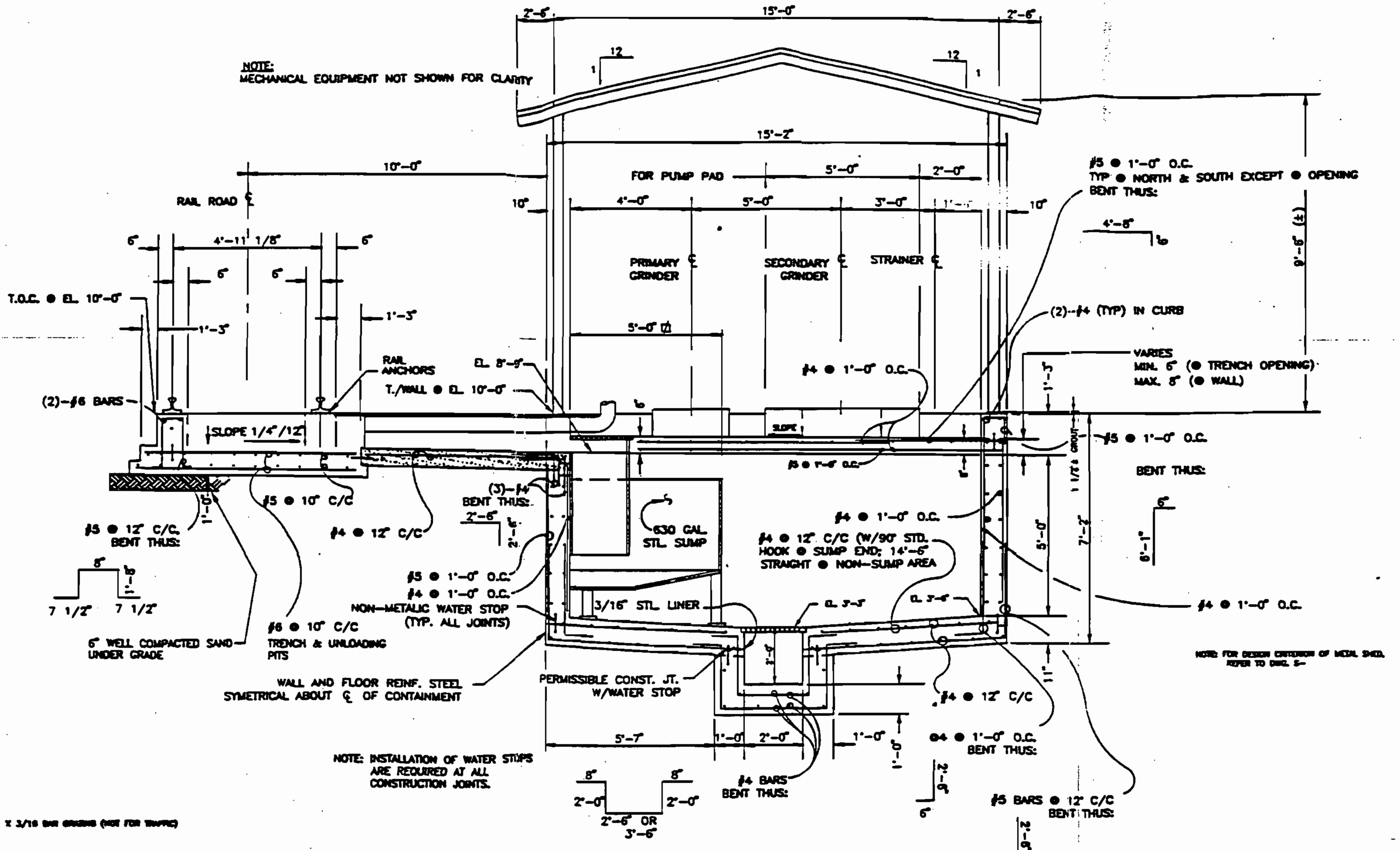
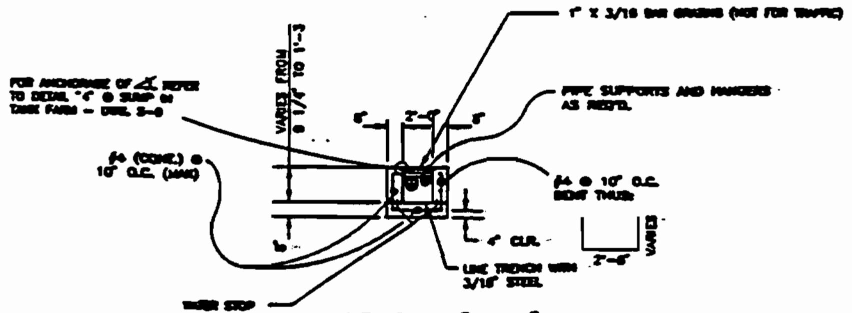
FIGURE II.11A



SECTION "B-B"
SCALE 1/2"=1'-0"



SECTION "A-A"
SCALE 1/2"=1'-0"



SECTION "C-C"
SCALE: 1/4" = 1'-0"

8-27-90

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01/17/90

FILE NAME: 0A-13

SOUTHDOWN, INC.	SCALE: AS SHOWN DESIGN: DRAWN: DCB DATE:	APPROVED / DATE	FLORIDA MINING AND MATERIALS	WORK ORDER NO.	DEPARTMENT HAZARDOUS WASTE FUELS SYSTEM RAIL UNLOADING FACILITY SECTIONS AND DETAILS

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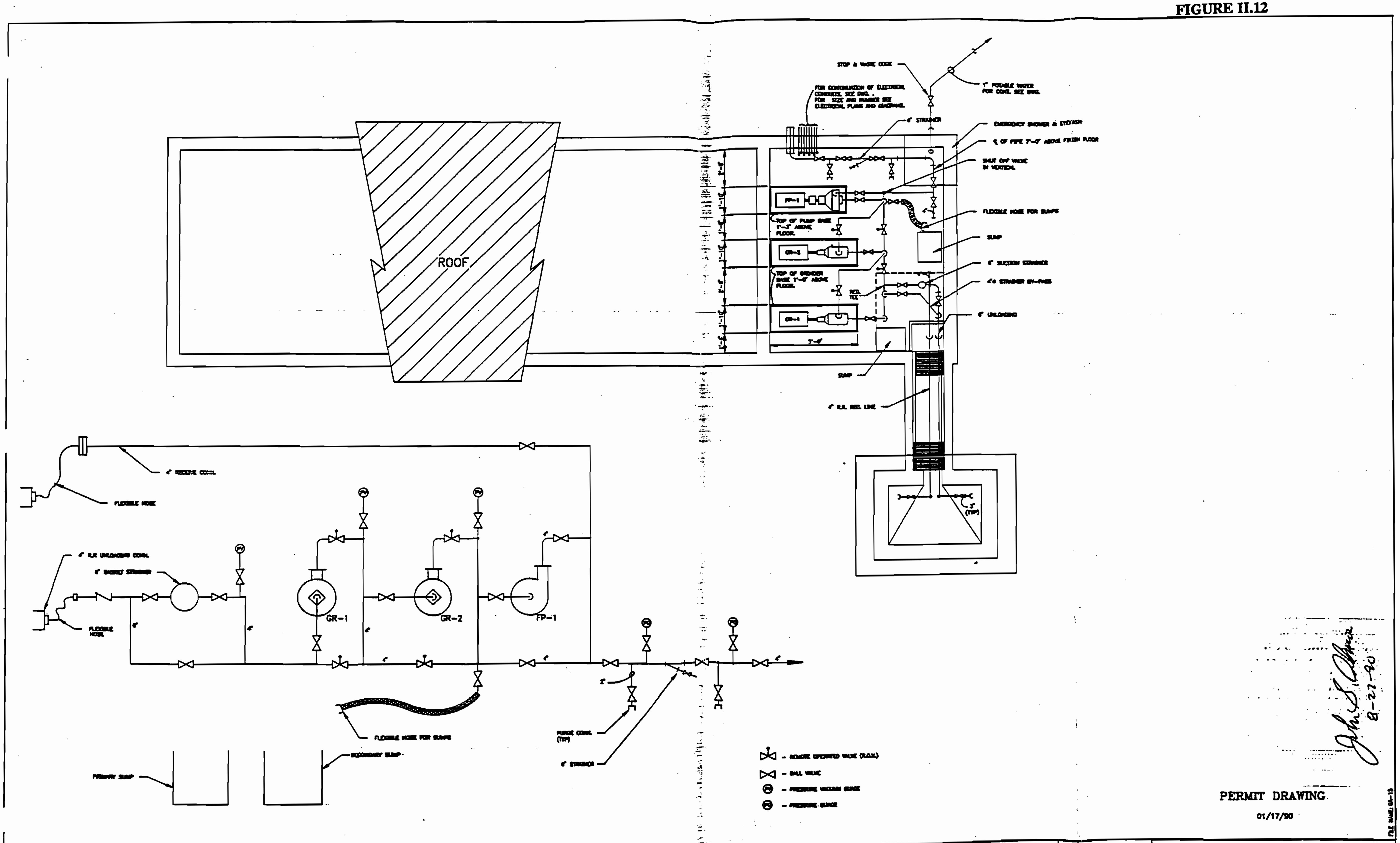
FIGURE II.12



John S. [illegible]
8-27-90

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01/17/90

FILE NAME: GA-18

SOUTHDOWN, INC.

The BenhamGroup
17120 Dallas Parkway Suite 240 Dallas, Texas 75248 214-248-0581

SCALE: AS SHOWN
DESIGN:
DRAWN: DJB
DATE: 11-11-89
CHECKED:

APPROVED
DATE

FLORIDA MINING AND MATERIALS

WORK ORDER NO.

BROOKSVILLE

DEPARTMENT
HAZARDOUS WASTE FUELS SYSTEM
RAIL UNLOADING FACILITY
PIPING PLAN, DETAILS AND SCHEMATIC
DRAWING NUMBER

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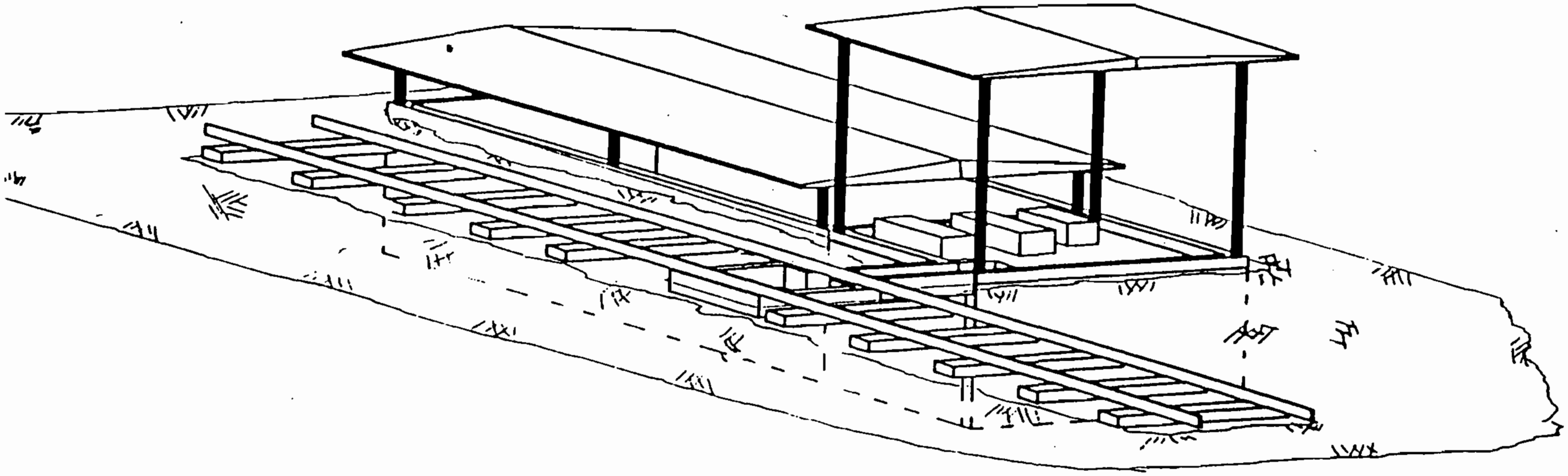
FIGURE II.13



RAIL UNLOADING FACILITY

The BenhamGroup

17120 Dallas Parkway
Suite 240
Dallas, Texas 75248
214-248-9901

TBG # 3389-03900

FLORIDA MINING
AND MATERIALS

BROOKSVILLE
FLORIDA

BROOKSVILLE
PLANT

HAZARDOUS WASTE FUEL SYSTEMS
ISOMETRIC
BROOKSVILLE, FLORIDA

DRAWING
NUMBER

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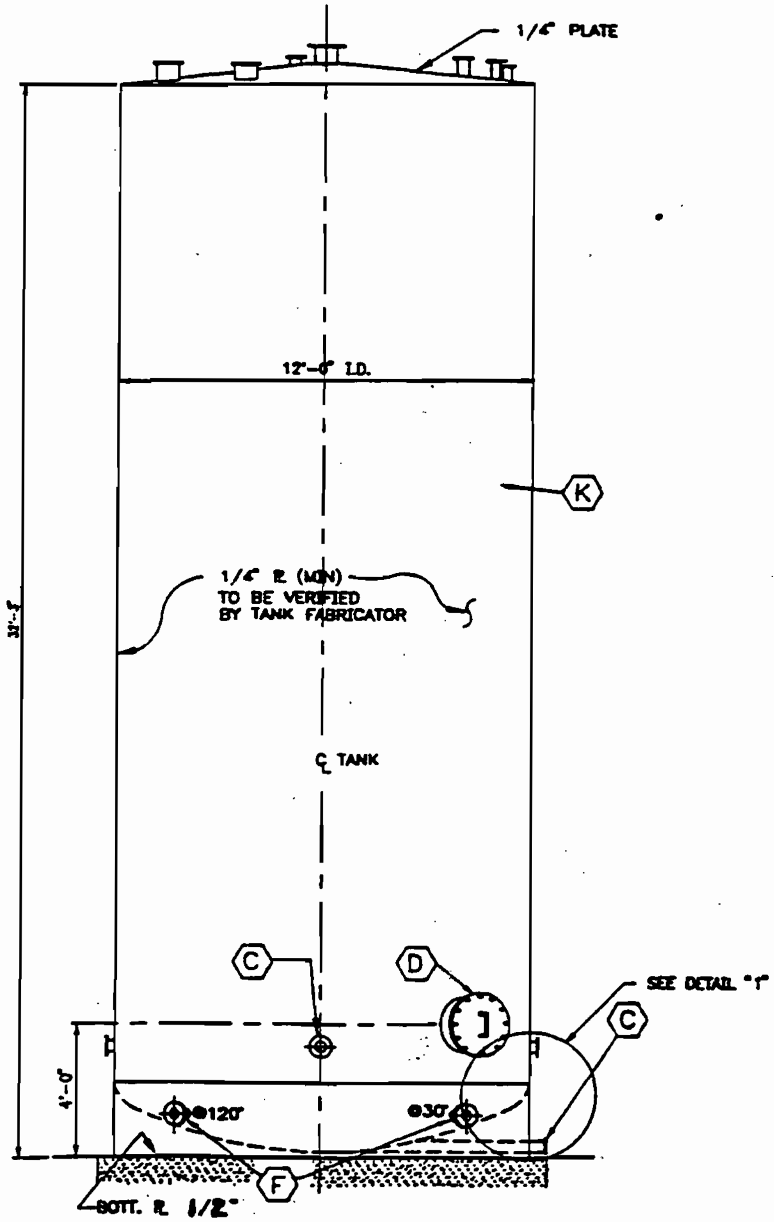
FIGURE II.14

GENERAL NOTES:

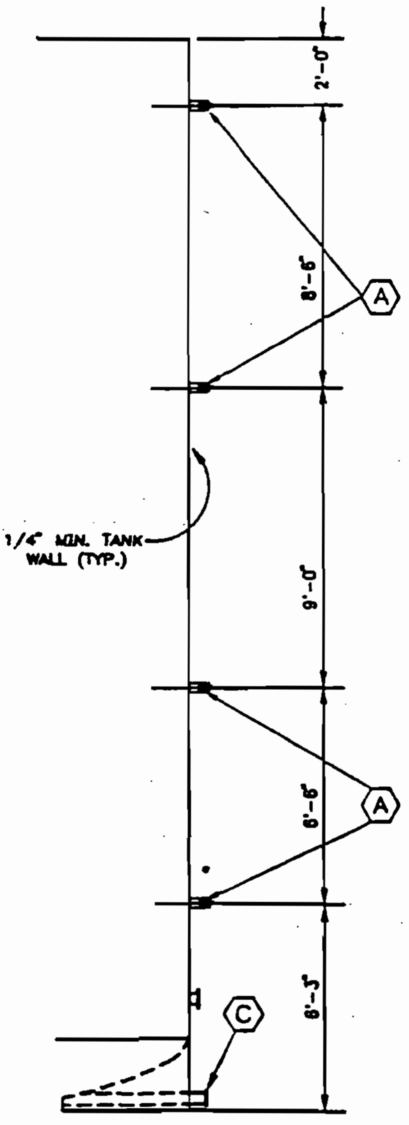
1. TANK NOZZLES SHALL CONFORM WITH API STANDARD 650, INCLUDING APPENDIX F. ALL WELDS TO BE WATERPROOF.
2. NOZZLE LOCATIONS AND ELEVATIONS ARE TYPICAL FOR TANKS T-1 THRU T-4.
3. TANK NOZZLES BY FABRICATOR IN ACCORDANCE WITH API 650 STANDARDS.
4. TANK ROOFS ARE TO BE SLOPED 3/4" PER 12".
5. TANK FABRICATOR TO PROVIDE STRUCTURAL DESIGN FOR TANK. DESIGN TO BE SUBMITTED TO ENGINEER FOR APPROVAL PRIOR TO CONSTRUCTION. MINIMUM DESIGN PARAMETERS: MAXIMUM WORKING PRESSURE = 2.5 PSI. CONFORM TO NFPA 30.
6. INSIDE OF TANK SHALL BE SMOOTH AND FLUSH – NO PROTRUSIONS WILL BE ALLOWED.
7. GASKETS TO BE SPIRAL WOUND FLEXITALLIC STYLE CG OR EQUAL RATING AS REQUIRED.
8. ALL FLANGE BOLT HOLES SHALL STRADDLE THE CENTERLINES.

BILL OF MATERIAL–PER TANK

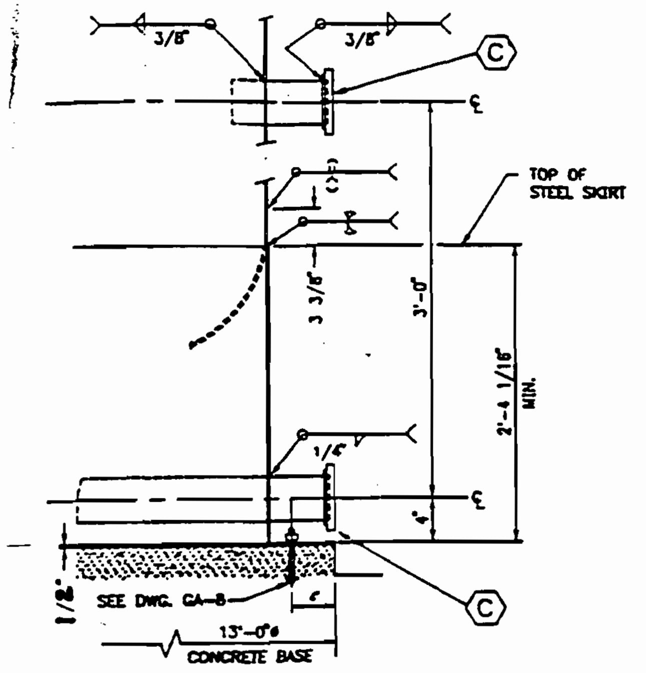
MARK	REQ'D.	DESCRIPTION	REMARKS	FURN. BY
A	4	1"ø 3000# FULL THREADED COUPLING WITH PLUG		TANK FABRICATOR
B	1	10"ø, 150# FLANGE	FOR EMERGENCY PRESSURE VENT	
C	6	4"ø, 150# FLANGE, FUEL INLET/OUTLET		
D	2	20"ø MANWAY WITH COVER PLATE		
E	1	AGITATOR MOUNT	PER AGITATOR SUPPLIER'S INSTRUCTIONS	
F	2	OBSERVATION PORTS		
G	5	4"ø – 150# FLANGE	G1 – FOR N2 INLET G2 – FOR PRESSURE SENSING G3 – FOR VAPOR OUTLET G4 – FOR VACUUM RELIEF VALVE G5 – SPARE	
H	1	12-1/2"ø CUTOUT WITH TANK TOP DRILLED FOR 12"ø 150# FLANGE	FOR MICROWAVE LEVEL SENSOR	
I	2	3/4" NPT HALF – COUPLING	FOR HIGH LEVEL SENSORS	
K	1	25,000 GALLON TANK	TANK FABRICATOR TO PROVIDE CERTIFIED DESIGN FOR TANK	



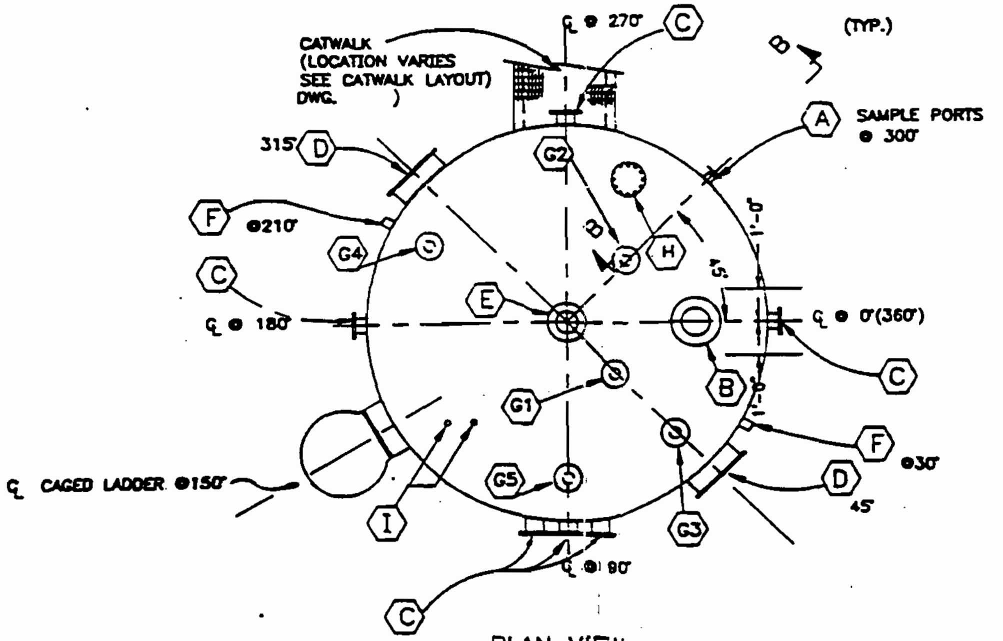
TANK ELEVATION
SCALE 3/8"=1'-0"



SECTION B–B
SCALE 3/8"=1'-0"



DETAIL "1"
SCALE 1-1/2"=1'



PLAN VIEW
SCALE 3/8"=1'-0"

8-27-90

PERMIT DRAWING

01/17/90

SOUTHDOWN, INC.

The Benham Group

FLORIDA MINING AND MATERIALS

WORK ORDER NO.

BROOKSVILLE

PLANT

DEPARTMENT

HAZARDOUS WASTE FUELS SYSTEM
25,000 GALLON TANK DETAILS
PLAN, ELEVATIONS AND DETAILS

DRAWING NUMBER

APPROVED

DATE

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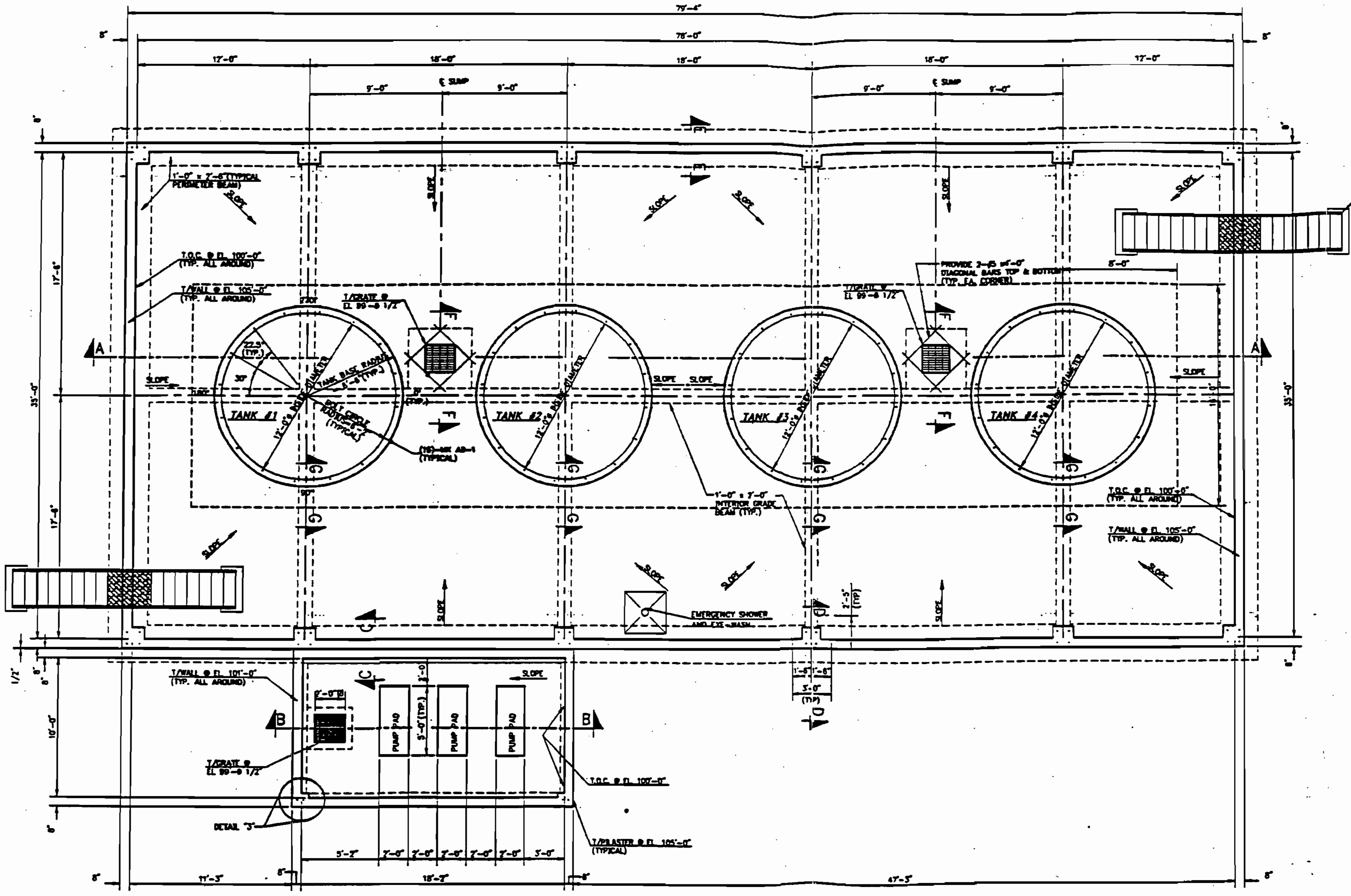
FIGURE II.15



CONTRACTOR TO FURNISH STEEL STILE AND CONCRETE PADS FOR ACCESS ACROSS WALL. STILE SHALL BE 2'-6" WIDE WITH 8" RISERS AND 10" TREADS. HANDRAILS SHALL CONSIST OF 2 RAILS. 1 1/2"⌀ STD. PIPE WITH VERTICAL POST SPACED A MAXIMUM OF 6'-0" CENTER TO CENTER. STILE STRINGER SHALL BE C8 x 11.5. CONTRACTOR TO VERIFY LOCATION WITH PLANT ENGINEER PRIOR TO CONSTRUCTION. (TYPICAL 2 (TWO) PLACES

GENERAL NOTES

1) ALL CONCRETE WORK SHALL CONFORM WITH CURRENT A.C.I. STANDARD 318.
2) CONCRETE STRENGTH SHALL DEVELOPE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 3,000 p.s.i. IN 28 DAYS.
3) REINFORCING STEEL SHALL BE NEW AMERICAN BILLET A.S.T.M. A615, GRADE 60.
4) CHAMFER ALL EXPOSED CONCRETE EDGES 3/4".
5) FILLS, IF ANY, SHALL BE CONSTRUCTED IN HORIZONTAL LIFTS NOT EXCEEDING 6" IN UNCOMPACTED THICKNESS. EACH LAYER SHALL BE THOROUGHLY COMPACTED TO 95% OF THE MAXIMUM DENSITY AT OPTIMUM MOISTURE CONTENT AS DETERMINED BY A.S.T.M. D698.
6) ANY DISTURBED SUBGRADE MUST BE COMPACTED AS PER NOTE #5.
7) ALL CONCRETE TO BE COATED WITH CHEM-MASTER CORP. " DURA KOTE 3 " OR EQUIVALENT.
8) STRUCTURE DESIGNED FOR AIR BLAST OVERPRESSURE OF .5PS1

LEGEND

T.O.C. —— TOP OF CONCRETE
T/WALL —— TOP OF WALL
T/GRATE —— TOP OF GRATE

8-27-90

PERMIT DRAWING

08/22/90

FILE NAME: GA-4

NO.	DATE	REVISION	BY	CH'D	AP'D	P.O.NO.

SOUTHDOWN, INC.

The BenhamGroup
17120 Dallas Parkway
Suite 240
Dallas, Texas 75248
214-248-6800
TBG # 3380-63800

SCALE: 1/4" = 1'-0"
DESIGN:
DRAWN: KAB
DATE: 01-04-90
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MICROFILMED DATE:

APPROVED DATE
ISSUED BY DATE

FLORIDA MINING AND MATERIALS
BROOKSVILLE FLORIDA

WORK ORDER NO
BROOKSVILLE
PLANT

DEPARTMENT
HAZARDOUS WASTE FUELS SYSTEM
CONCRETE TANK FARM
PLAN AND SECTIONS
DRAWING NUMBER
REV

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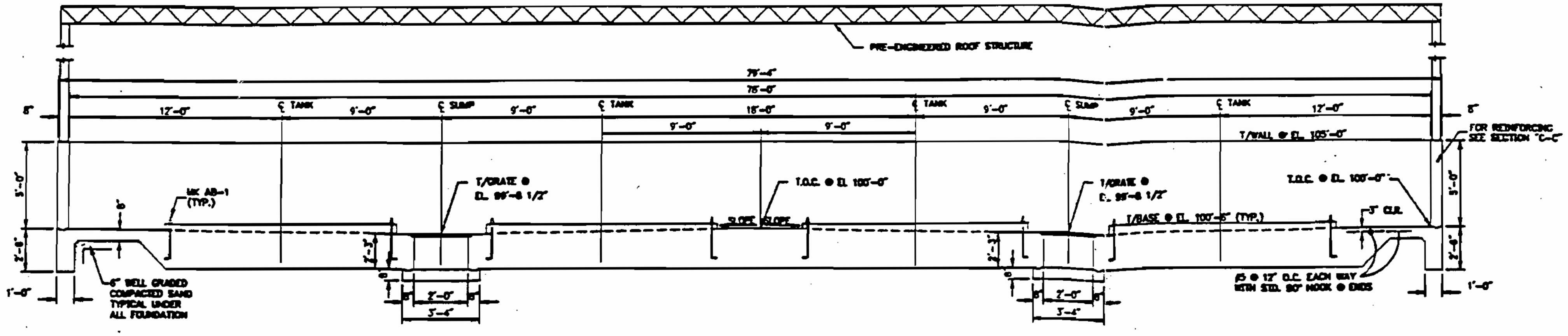
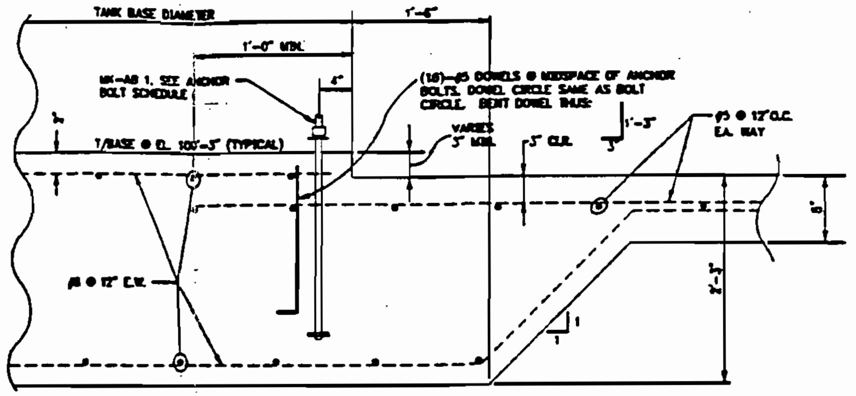
FIGURE II.15A



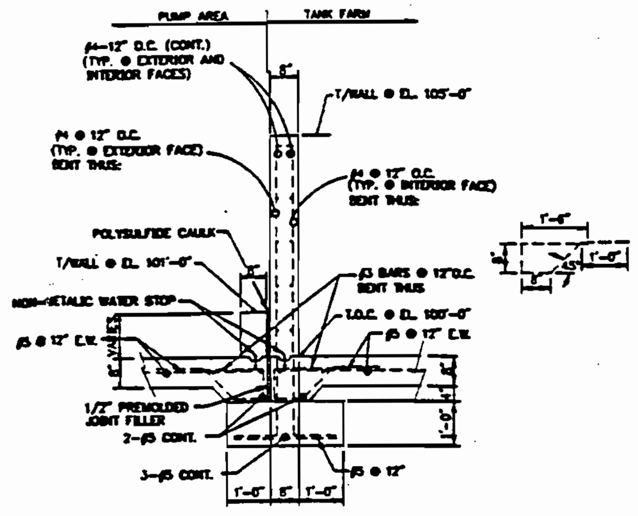
SECTION "A-A"

SCALE: 1/4"=1'-0"



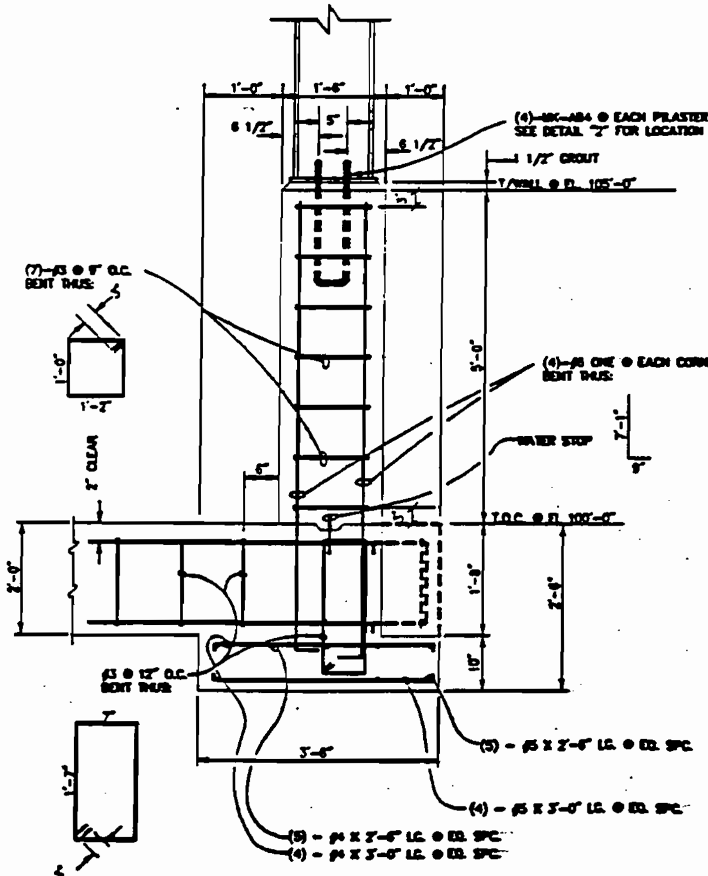
SECTION "G-G"

NOT SCALE SCALE



SECTION "C-C"
TYPICAL REINFORCEMENT OF
TANK FARM & PUMP AREA WALL
SECTION "E-E" SIMILAR @ TANK FARM WALL

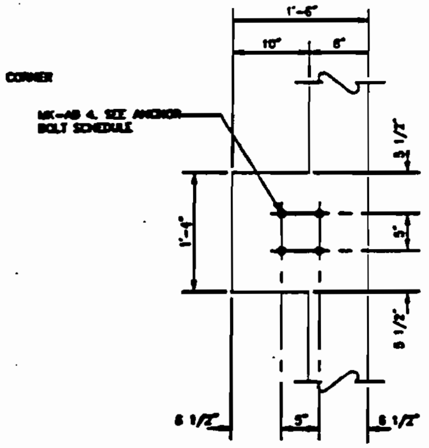
SCALE: 1/2" = 1'-0"



SECTION "D-D"

(TYPICAL REINFORCEMENT AT PILASTER)

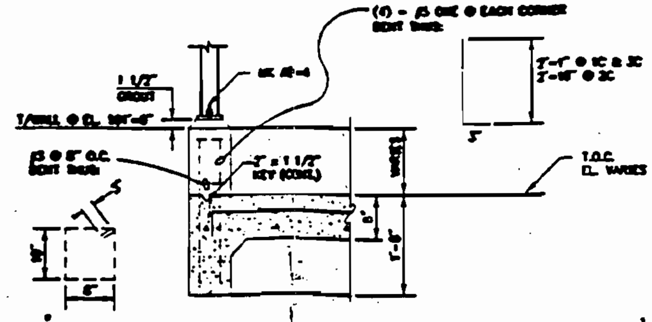
SCALE: 3/4"=1'-0"



DETAIL "2"
TYPICAL ANCHOR BOLT
PLAN @ PILASTER

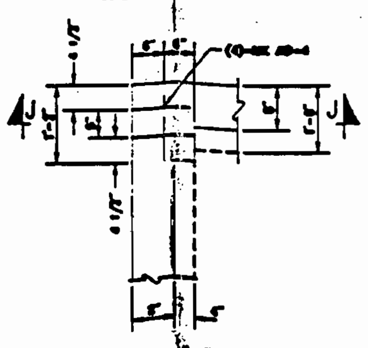
SCALE: 1"=1'-0"

FINAL DESIGN OF FOUNDATION (FOOTING WITH PILASTER) SHALL BE VERIFIED WITH ENGINEER AT TIME OF BUILDING SELECTION.



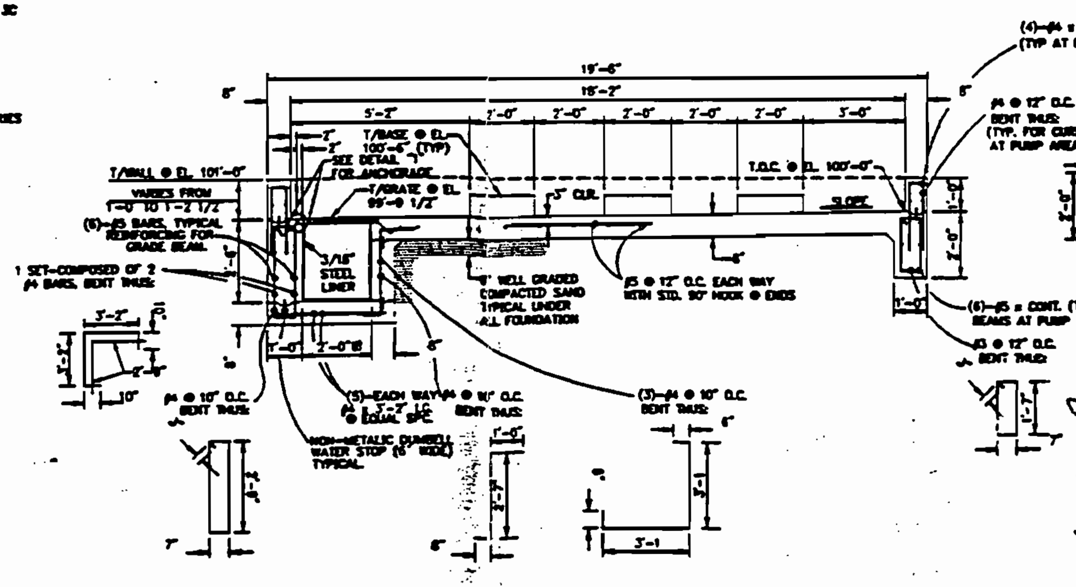
SECTION "J-J"

SCALE: 3/4"=1'-0"



DETAIL "3"

SCALE: 3/4"=1'-0"



SECTION "B-B"

SCALE: 3/8"=1'-0"

John S. Olms
8-27-90

PERMIT DRAWING

08/22/90

FILE NAME: GA-7

SOUTHDOWN, INC.

17120 Dallas Parkway
Suite 240
Dallas, Texas 75248
[illegible]

SCALE: AS SHOWN
DESIGN:
DRAWN: EJB
DATE:

APPROVED
DATE

FLORIDA MINING AND MATERIALS

WORK ORDER NO.

DEPARTMENT
HAZARDOUS WASTE FUELS SYSTEM
CONCRETE-TANK FARM
SECTIONS AND DETAILS

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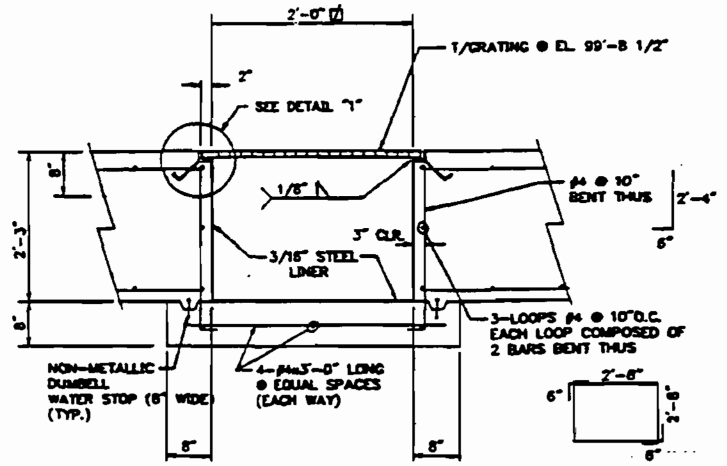
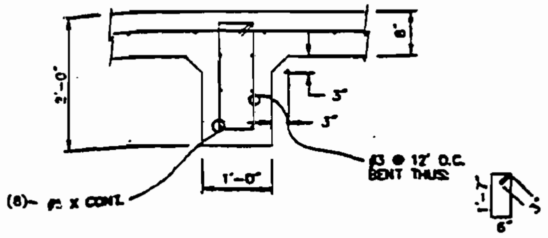
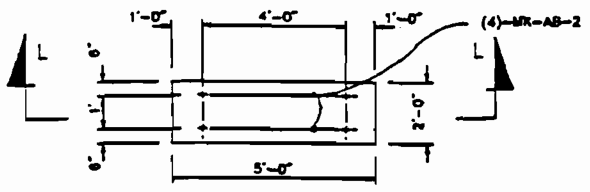
FIGURE II.15B



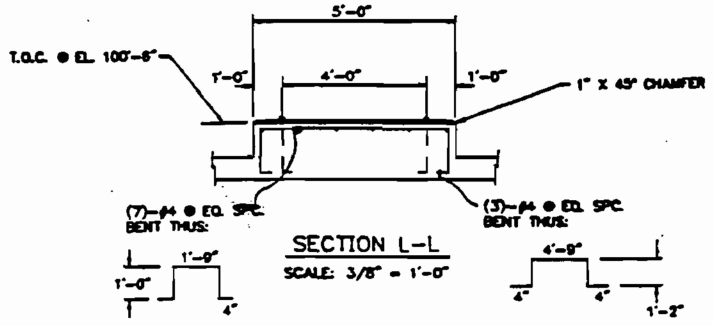
SECTION "F-F"
SIMILAR IN TANK AREA
SCALE 3/4"=1'



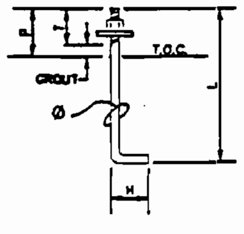
TYPICAL INTERIOR BEAM
SCALE: 3/4" = 1'-0"



PUMP BASE
PLAN VIEW
SCALE: 3/8" = 1'-0"



SECTION L-L
SCALE: 3/8" = 1'-0"



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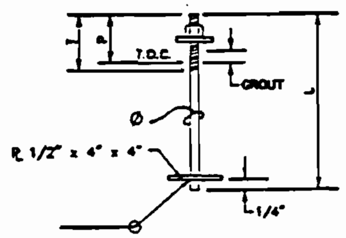
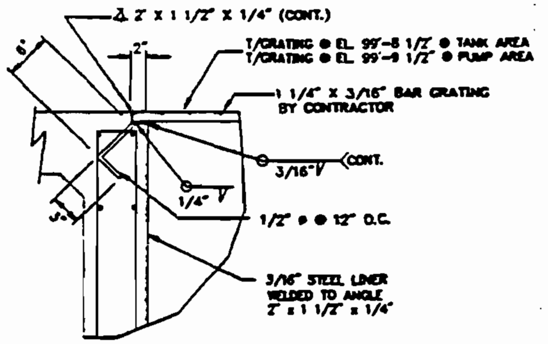
N.T.S.



TYPE II
N.T.S.

8-27-90



DETAIL "1"
SCALE: 1" =1'-0"

ANCHOR BOLT SCHEDULE

MARK	Ø DIA.	REQ'D	TYPE	L LENGTH	P PROJ.	T THREAD	GROUT	H HOOK	REMARKS
AB-1	3/4"	64	II	2'-0"	2"	2"	—	—	FOR TANKS
AB-2	5/8"	20	I	1'-7"	5 3/4"	3"	1"	3"	FOR KILN FEED AND TRANSFER PUMPS
AB-3	5/8"	18	I	1'-7"	5 3/4"	3"	1"	3"	FOR GRINDER PUMPS
AB-4	3/4"	32	I	2'-0"	4"	4"	1 1/2"	3"	FOR TANK FARM ROOF

NOTE:
ALL ANCHOR BOLT INFORMATION IS PRELIMINARY PENDING RECEIPT OF CERTIFIED DRAWINGS FROM MANUFACTURERS.

PERMIT DRAWING

08/22/90

NO. DATE REVISION BY CHD MFD W.O.NO.

SOUTHDOWN, INC.

The BenhamGroup
17120 Dallas Parkway
Suite 240
Dallas, Texas 75248
214-248-6601
TBB # 3389-63889

SCALE: AS SHOWN
DESIGN:
DRAWN: KAB
DATE: 01-10-90
CHECKED:
MICROFILMED DATE:

APPROVED DATE
ISSUED BY DATE

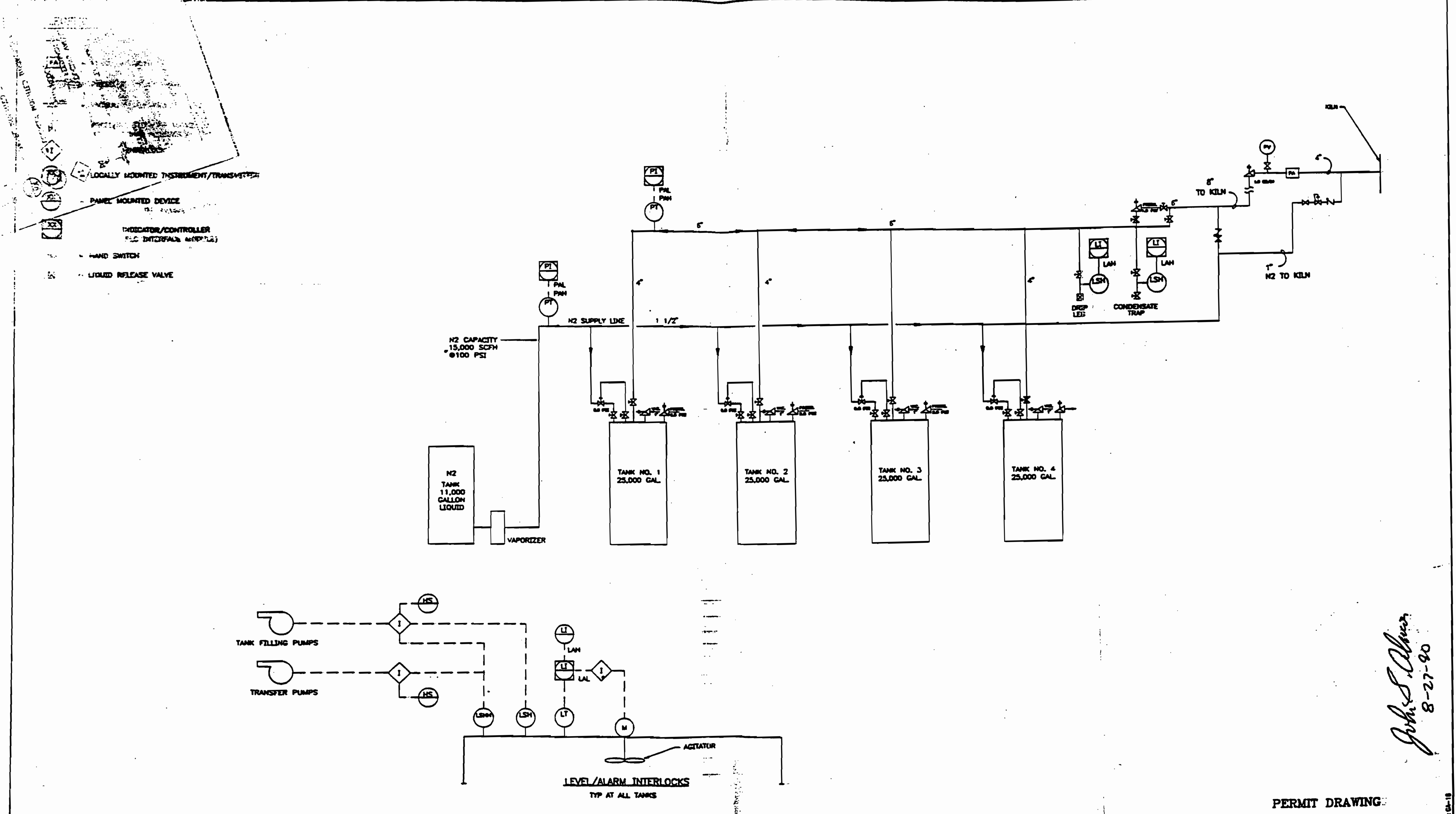
FLORIDA MINING AND MATERIALS
BROOKSVILLE FLORIDA

WORK ORDER NO.
BROOKSVILLE
PLANT

DEPARTMENT
HAZARDOUS WASTE FUELS SYSTEM
CONCRETE-TANK FARM
SECTIONS AND DETAILS
DRAWING NUMBER
REV

BEST AVAILABLE COPY

FIGURE II.16



8-27-90

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01/22/90

DATE	REVISION	BY	CHKD	APPD	W.O.NO.

SOUTHDOWN, INC.

The BenhamGroup
17120 Dallas Parkway
Suite 240
Dallas, Texas 75248
214-248-0801

SCALE: N.T.S.	
DESIGN:	
DRAWN: RAB	APPROVED DATE
DATE: 01-22-90	
CHECKED:	
MICROFILMED DATE:	ISSUED BY DATE

FLORIDA MINING AND MATERIALS

BROOKSVILLE FLORIDA

WORK ORDER NO.

BROOKSVILLE
PLANT

DEPARTMENT
HAZARDOUS WASTE FUELS SYSTEM
MECHANICAL PIPING
NITROGEN VENT SYSTEM

DRAWING NUMBER

REV

FILE NAME: GA-1

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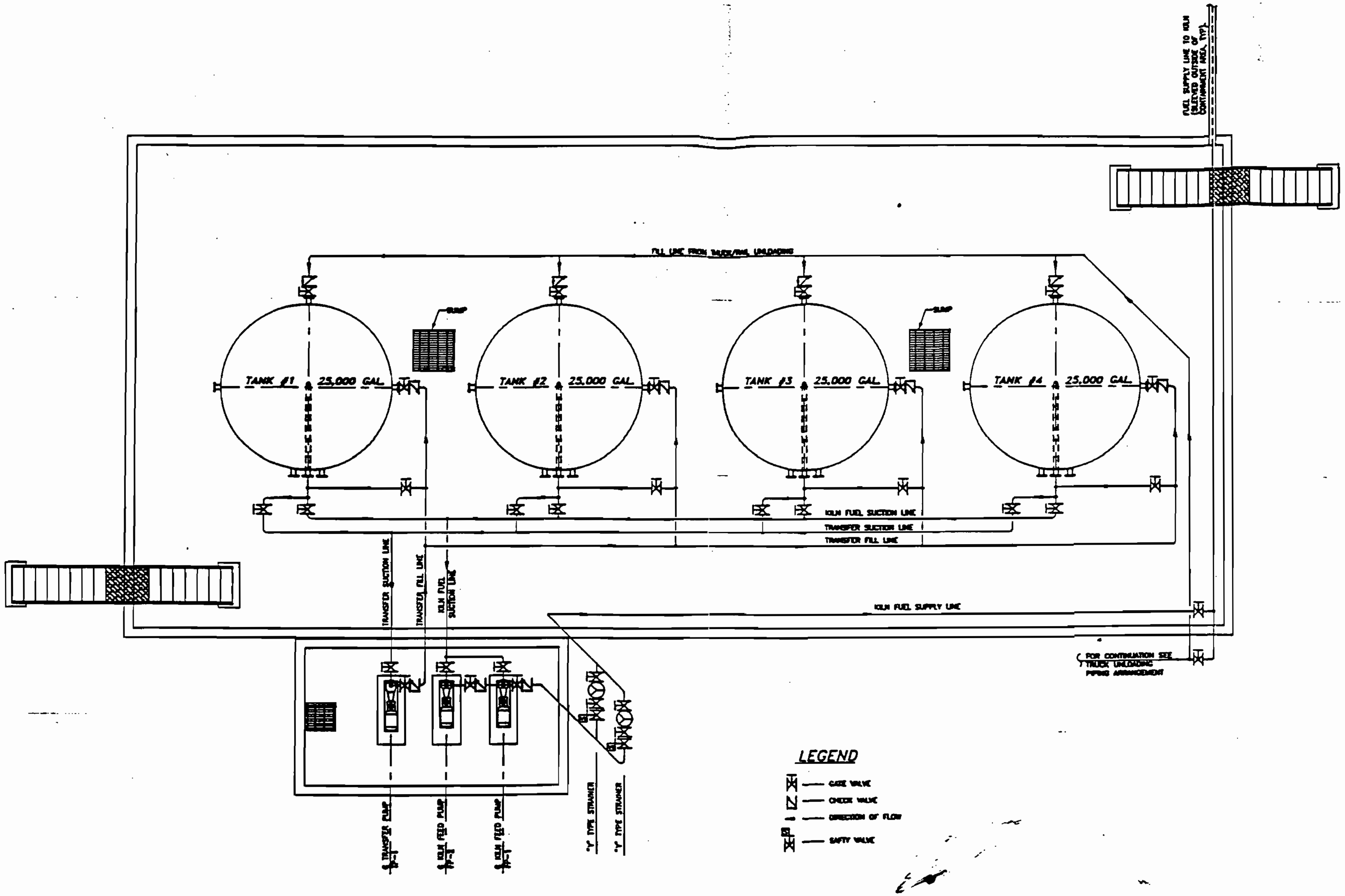
FIGURE II.17



8-27-90

PERMIT DRAWING

01/22/90

FILE NAME: 04-10

NO.	DATE	REVISION	BY	CHK'D	APP'D	W.O.NO.

SOUTHDOWN, INC.

The BenhamGroup
17120 Dallas Parkway
Suite 240
Dallas, Texas 75248
214-248-6001
TBG # 3380-63800

SCALE: AS SHOWN
DESIGN
DRAWN: RAQ
DATE: 01-16-90
CHECKED
MICROFILMED DATE:

APPROVED DATE
ISSUED BY DATE

FLORIDA MINING AND MATERIALS
BROOKSVILLE FLORIDA

WORK ORDER NO.
BROOKSVILLE
PLANT

DEPARTMENT
HAZARDOUS WASTE FUELS SYSTEM
MECHANICAL—TANK FARM
PIPING ARRANGEMENT
DRAWING NUMBER
REV

TABLE II.12

CONTAINER STORAGE FACILITY CONTAINMENT CALCULATIONS:

Storage Description: The container storage building will be a pre-engineered building with the floor depressed in order to contain 10% of the total volume of the containers stored within the facility, The ramps are designed to convey and spills into the container building to the floor trench system. The truck unloading pad is designed to contain any spills resulting from the unloading of the trucks. This will be covered with a pre-engineered building in order to keep rain out of the containment area.

Total Building Containment Requirements:

Total Designed Storage Capacity: 172,800 gallons

Required Storage Volume Equals 10% of total volume or

172,800 gal x10% = 17,280 gallons
17,280 gal/7.48 gal/CF. = 2304 CF

Storage Provided:

Total Floor Area: 142'0" x 215'0" = 30,530 SF

Area Occupied by One Pallet: 4 ft. x 4 ft. = 16 SF

Total Number of Pallets: 800

Total Sq. Footage Occupied by Pallets: 800 x 16 SF = 12,800 SF

Total Area for Containment: 30, 530 SF - 12,800 SF = 17,730 SF

Storage Provided: Area x Average Depth

17,730 SF x (1.104'/2) = 9787 CF

9787 CF > 2304 CF OK for Container Building

Truck Unloading Pad at Container Building

Required Storage Volume Equals One Pallet or 196 Gallons.

Storage Provided: Width x Length x Depth

41'0" x 70'0" x .125' = 359 CF
or 359 CF x 7.48 Gal/CF = 2685 Gal

2685 Gal > 196 Gal OK for Truck Unloading Area

TABLE II.13

TRUCK UNLOADING PAD CONTAINMENT

Storage Description: The truck unloading pad will be covered with a pre-engineered roof structure in order to direct rain water away from the concrete containment area. The concrete pad is designed to contian any spills resulting in the unloading of trucks.

Total Containment Required: 10,000 gallons

Required Storage Volume: 10,000 Gal. /7.48 Gal/CF = 1337 CF

Storage Provided:

Total Volume:

Pad	38'8" x 60'0' x (1'3"/2)	= 1425 CF
Collection Area	24'8" x 1'4" x 1'	= 1458 CF

Subtract Areas Not Availbe for Storage:

Curb	8" x 58'8" x (1'3'/2)	= 25 CF
Pump Pad	2' x 5' x 6" x 6	= 30 CF
Truck Wheels	2' x 8" x (1'3"/2) x 36	= 60 CF
	Total	= 115 CF

Total Storage Provided:

1458 CF - 115 CF = 1343 CF

1343 CF > 1337 CF OK

TABLE II.14

RAIL UNLOADING FACILITY CONTAINMENT CALCULATIONS

Storage Required:

Total Number of Railroad Cars: 2

Capacity Per Railroad Car: 25,000 Gal.

Total Capacity: 50,000 Gal.

10% of Total Capacity: 5,000 Gal.

Required containment is the larger capacity of one railroad car:

25,000 (Gal.)/7.5 (Gal/Cf.) = 3,334

Rainwater:[3.92′ x 6′ x 2 + 2′ x 17.63′] 5.5" Rainfall = 38 Cf.

TOTAL CONTAINMENT REQUIRED: 3372 CU. FT.

Storage Provided (Covered):

Total Floor Area: 13.5′ x 50′ = 675 Sf.

Total Volume: 675′ x 6′-3" High = 4218 Cf.

- 12.42′ x 13.5′ x 1.25 h. = -210 Cf.

+ Sumps @ 2′ x 2′ x 2′ = 8 Cf.

Transverse Slope + 13′ x 50′ x .25′ = 169 Cf.

Slope to Center + 13′ x 50′ x .5 = 84 Cf.

Total Containment Provided = 4269 Cf.

TABLE II.15

TANK PRE-ENTRY PRECAUTIONS

The following precautions are to be implemented before any entry into a fuel storage or mixing tank is allowed:

1. Assure valves on all lines which convey fuel materials into the tank are closed and locked.
2. All mechanical devices which could cause injury to persons inside tanks will be made inoperative through standard lockout/tagout procedures.
3. Fuel and sludge are to be removed from the tank and rinse solvents are to be used to clean the tank further.
4. Blowers will be used to purge fuel vapors from the tanks.
5. Depending on the reason for tank entry and the duration of tank work, it may be necessary to steam clean the tank prior to entry.
6. Vehicular and foot traffic in the tank area are to be restricted.
7. The air inside the tank is to be tested to determine oxygen content, concentrations of major fuel constituents, and flammable/explosive concentrations. A record is to be kept of these monitoring results and will be available for inspection.
8. If these tests show the absence of any dangerous air contamination and/or oxygen deficiency, entry will be permitted and air tests will be repeated at least once each shift. If air tests show the presence of any dangerous air contamination and/or oxygen deficiency, additional precautions, as described in Table II.13 are to be followed.

TABLE II.16

ENTRY AND WORK PROCEDURES WHEN DANGEROUS AIR CONTAMINATION AND/OR OXYGEN DEFICIENCY MAY BE PRESENT

When the absence of dangerous air contamination and/or oxygen deficiency cannot be ensured, the following precautions will be implemented:

1. NIOSH/MSHA-approved self-contained breathing apparatus and full-body protective clothing will be worn.
2. An approved safety belt with attached line will be worn. The line is to be secured outside the tank entrance.
3. A second employee, provided with a readily accessible, NIOSH/MSHA-approved self-contained breathing apparatus, will be stationed outside the tank entrance. A third employee will be required to be within sight and call of the standby employee at all times. The standby employee will enter the tank only in event of emergency and only after notifying at least one other employee of the emergency and plans to enter the tank.
4. When tank entry is made through the top opening, the safety belt will be replaced with a safety harness, and a hoisting device will be used.
5. No work involving a source of ignition (flame, spark, etc.) will be permitted if air testing shows that a flammable/explosive atmosphere is present or could develop.
6. Only lighting and electrical equipment approved in accordance with the Low-Voltage Electrical Safety Orders will be used.
7. An employee trained in first aid and cardiopulmonary resuscitation (CPR) will be immediately available at all times. That self-contained breathing apparatus is in use for tank entry.
8. Visual or radio communication will be maintained at all times between employee working inside tanks and the standby employee.

TABLE II.17

STORAGE TANK AREA CONTAINMENT CALCULATIONS

REQUIRED STORAGE VOLUME:

= 100,000 Gallons or 13,370 Cf.

STORAGE PROVIDED:

Available storage due to slope of Tank Farm = Vs
Using inverse frustrum of a pyramid (per sump):

$V1 = 1/_3(A_1 + A_2 + (A_1 * A_2)^5)h$

$V_1 = {}^1/_3(1365 + 9 + (1365 \text{ x } 9).^5)(0.2917)$

V_1 = 144.38 cf.
V_1 = 144.38 * 2 = 288.76 cf.--- Subtract tank bases

V_{TB} = 0.25 * 3.14 * D^2 * Avg. height = Volume of one tank base

V_{TB} = .025 * 3.14$(13)^2$ * $({}^2/_{12})$ = 22.12 cf.

Volume of four tank bases = 4 * V_{TB} = 88.51 cf.

Vss = V_1 - (4 * V_{TB}) = 288.76 - 88.51 = 200.25 cf.

Available Storage to Top of Containment above the sloping
base portion = V_C

V_2 = 78′ x 35′ x 5′ = 13,650 cf.

TOTAL STORAGE PROVIDED:

= V_S + V_C = 13,650 + 200.25=13,850.25c.f.
= 13,850.25 x 7.48 = 103,600 gal.

Storage Provided exceeds Required Storage.

EXHIBIT II.11A

PIPING MATERIAL SPECIFICATION

PART 1 - GENERAL

A. DESCRIPTION: This specification identifies the material requirements for the construction and installation of piping for the transportation of liquid hazardous waste fuels.

B. MATERIALS: All piping and equipment associated with the piping shall meet the following minimum requirements.

PIPING: Hydrocarbon piping, butt-welded, schedule 40, using socket-weld connections (150 lb. flanges only as required at pumps and valves) for any piping over one inch. Piping under one inch may have threaded connections. All piping outside of the containment area shall be protected by one of two methods:

METHOD 1 - Enclosed in a schedule 10 pipe jacket 2 sizes larger than the hydrocarbon pipe with a spacer between them. The spacer shall consist of the inner portion (spider) of a standard pipe guide located at each pipe support and similar to tri-state industries standard pipe guide.

METHOD 2 - Placed in a formed steel pan made of 1/8" thick A36 steel plate. Pan will have 1/8" steel plate cover, gasketed and bolted in placed. More than one pipe may be placed in metal pan.

VALVES: Ball valves, ANSI 150 pound class, carbon steel body with 316 stainless steel ball and stem, reinforced PTFE gaskets and seats. Under one inch - threaded connections; over one inch - flanged connections. Test at 50 PSI, after installation but before operation, to assure that all valves are bubble tight and show no visible leaks. Watts, Contromatis, or equal.

BASKET STRAINERS: Basket strainers, steel body, stainless basket with 3/8" size openings, 150 pound ANSI, Mueller, or equal.

HOSE CONNECTIONS: Hose connections for liquid shall be Kam Valok, or equal, dry disconnect couplings (Dover Corporation).

Y-STRAINERS: Y-strainers, steel body, stainless steel basket W/3/8" size openings, 150 pound ANSI, Sarco, or equal.

GASKETS: Gaskets for 1-1/2" to 6" flanges will be flexitallic type gasket (spiral-wound gasket), gasket material for 8" or larger flanges will be 1/8" garlock or equal, gasket materials for tank manways will be Gore-Tex Teflon rope packing.

EXHIBIT II.12

TANK ENTRY AUTHORIZATION FORM

Date: ________ **Time From** ________ **a.m. p.m.** ________ **to** ________ **a.m. p.m.** ________

Tank Identification: ________________________________

Work to be Performed: ________________________________

Employees assigned to work: ________________________________

Work Performed by: ________________________________

TANK PREPARATION

Drained to floor level of ________________ inches.

Purged with air for ________________ hours.

ATMOSPHERIC TESTS

Date	Time	Test	Location	Reading
________	________	oxygen	________	________
________	________	flammability	________	________
________	________	hydrocarbons	________	________

Tests performed by: ________________________________

CHECKLIST

1.	Are valves on all lines closed and locked?	Y	N	N/A
2.	Is electrical equipment properly locked out and tagged?	Y	N	N/A
3.	Is area roped off?	Y	N	N/A
4.	Are caution signs posted?	Y	N	N/A

EXHIBIT II.12

TANK ENTRY AUTHORIZATION FORM

HAZARD CHECKLIST

Y N Flammable/explosive atmosphere

Y N Toxic vapor concentration

Y N Oxygen deficiency

Y N Toxic residues

Y N Other (specify)____

____

EQUIPMENT CHECKLIST

Blower

SCBA

Chemical-Resistant Suits, Gloves, Boots

Communications Radio (intrinsically safe)

Approved Lighting and Electrical Equipment

Special Tools (specify)____________________________________

PROCEDURES IMPLEMENTATION CHECKLIST

Y N Tank entry procedures reviewed by all personnel

Y N Stand-by person assigned

Y N Contact person assigned

AUTHORIZATIONS

Emergency Coordinator__________________________________

Cognizant Supervisor___________________________________

NOTES:____

____

EXHIBIT II.13

GENERAL SPECIFICATIONS

PART 1 - GENERAL

1.1 Description

Furnish and install PVC flexible membrane lining in the areas shown on the drawings. All work shall be done in strict accordance with the project drawings, these specifications and the membrane lining Supplier's approved shop drawings.

Sufficient lining material shall be furnished to cover all lined areas shown on the plans including panel overlaps at field seams. One percent shall be added to the length of each panel to allow for shrink and wrinkles.

The liner shall be installed in a relaxed condition and shall be free of tension or stress upon completion of the installation. Stretching of the line to fit will not be allowed.

It is the intent of these specifications to ensure a quality finish product. It shall be the responsibility of the Contractor to ensure that this requirement is met.

PART 2 - PRODUCTS

2.1 Materials

The lining material shall be a Polyvinyl Chloride (PVC) Membrane and shall be manufactured by the calendering process. The lining material shall be uniform in color, thickness, size and surface texture. The finished liner shall be free from pinholes, blisters, and contaminants.

The PVC liner shall have smooth or matte finishes on both sides and shall not be embossed.

The membrane shall be manufactured for a composition of high quality ingredients specifically compounded for use in hydraulic structures. Only domestic materials shall be used. Reprocessed or reground materials will not be acceptable.

The lining material must have the minimum property values shown in Table A.

PART 3 - EXECUTION

3.1 Subgrade Preparation

Lining installation shall not begin until a proper base has been prepared to accept the membrane lining. Base material shall be free from angular rocks, roots, grass and vegetation. Foreign materials and protrusions shall be removed and all cracks and voids shall be filled and the surface made level or uniformly sloping as indicated on the drawings. The prepared surface shall be free from loose earth, rocks, rubble and other foreign matter. The subgrade shall be uniformly compacted to ensure against settlement and shall be steel wheel rolled prior to liner installation.

The surface on which the lining is to be placed shall be maintained in a firm, clean, dry and smooth condition during lining installation. If groundwater is present within 12 inches below the surface to be lined, the General Contractor shall dewater the area prior to and during installation of the liner.

3.2 Lining Installation

The PVC lining shall be placed over the prepared surface in such a manner as to assure minimum handling. Anchor trench excavation and any structure seal preparation should be completed before lining installation begins. The sheets shall be of such lengths and widths and shall be placed in such a manner as to minimize field seaming. Horizontal field seams on the slopes shall be kept to a minimum. Only those sheets of lining material which can be anchored and sealed together that same day shall be unpackaged and placed in position.

In areas where wind is prevalent, lining installation should be started at the upwind side of the project and proceed downwind. The leading edge of the liner shall be secured at all times with sandbags or other means sufficient to hold it down during high winds.

Sandbags or rubber tires may be used, as required, to hold the lining in position during installation. Tires shall not have exposed steel cords or other sharp edges which may snag or cut the lining. Materials, equipment or other items shall not be dragged across the surface of the liner or be allowed to slide down slopes on the lining. All parties walking or working upon the lining material shall wear soft-sole shoes.

Lining sheets shall be closely fit and sealed around inlets, outlets, and other projects through the lining. Lining to concrete seals shall be made with a mechanical anchor or as shown on the drawings. All piping, structures and other projections through the lining shall be sealed with approved sealing methods.

The liner shall be installed in a relaxed condition and shall be free of tension or stress upon completion of the installation. Stretching of the liner to fit will not be allowed.

3.3 Field Seams

All seaming adhesives, caulking and mastics shall be of a type or types recommended and supplied by the Manufacturer or Fabricator of the PVC panels and shall be delivered in original one gallon containers each with an indelible label bearing the brand name and complete directions as to proper storage and use.

Field lap joints shall be formed by lapping the edge of panels a minimum of six (6) inches. The contact surfaces of panels to be seamed shall be wiped clean to remove all dirt, dust, moisture and other foreign materials. Sufficient liner to liner bonding adhesive shall be applied to the joint area so as to form a continuous solvent weld approximately 2 - 3 inches wide. In applying adhesive, care must be taken to tie-in to the end of the previously completed seamed area so that leak paths or weak points in the seam do not occur. The surfaces should be pressed together immediately and a roller or flat wooden paddle used to squeeze the adhesive toward the leading edge of the panel. Any wrinkles shall be smoothed out. A small amount of adhesive should extrude and appear at the edge of the seam to indicate that sufficient adhesive has been applied. Excess adhesive should be wiped off with a clean rag. Seams shall be inspected after the initial seal and any loose edges shall be resealed, using the same procedure, to eliminate all free edges.

Extreme care shall be taken to avoid fishmouths in the field seams. Where fishmouths do occur, they shall be slit out far enough from the seam to dissipate them, lapped, seamed together in the lapped area and patched. Any portion of the lining damaged during installation, by any cause, shall be removed or repaired by using an additional piece of PVC lining, as specified hereinafter.

3.4 Patching

Any repairs to the PVC lining shall be patched with the lining material and liner-to-liner bonding adhesive. The patch material shall have rounded corners and shall extend a minimum of four (4) inches in each direction from the damaged area.

3.5 Earth Cover

Earth cover shall be placed over the PVC lining as shown on the drawings. Cover material shall be approved by the Engineer prior to placement. Soil containing sharp, jagged rock, roots, debris or any other material which may be abrasive to or may puncture the membrane, shall not be used as cover material.

The Contractor must satisfactorily demonstrate to the Engineer that the use of chosen cover material will not have any detrimental effects on the liner. Onsite materials approved by the Engineer shall be stockpiled as excavated for backfill over the liner.

The cover material shall be placed over the lining as soon after liner placement as possible. The cover soil shall be placed over the lining in such a manner and with such equipment as the Contractor may choose, provided it is satisfactorily demonstrated to the Engineer that such manner and such equipment does not damage the lining. In general, low ground pressure (LGP) equipment shall be used to spread the earth cover.

END OF SECTION

TABLE A

MINIMUM MATERIAL PROPERTIES

Property	Test Method	Test Value 20 mils
Gauge (Nominal) Thickness, minimum	ASTM D792 Par. 9.1.3	19 mils
Specific Gravity	ASTM D792 MTD A-1	1.24 to 1.30
Minimum Tensile Properties (each direction)	ASTM D882	
1. Breaking Factor	MTD A or B	46 lbs/in width
2. Elongation at Break	MTD A or B	300%
3. Modulus (Force) @ 100% Elongation	MTD A or B	18 lbs/in width
Tear Resistance (minimum average pounds)	ASTM D1004 Die C	6 lbs (300 lbs/in)
Low Temperature Impact (50% pass)	ASTM D1790	-15°F
Dimensional Stability (each direction, percent change maximum)	ASTM D1204 212°F 15 min.	+5%
Water Extraction (maximum % wt loss)	ASTM D3083 (as modified by NSF)	0.35%
Volatile Loss (maximum % wt loss)	ASTM D1203 MTF A	0.9%
Resistance to Soil Burial (% change maximum in original value)	ASTM D3083 (as modified by NSF)	
1. Breaking Factor		5%
2. Elongation at Break		20%
3. Modulus @ 100% Elongation		20%
Hydrostatic Resistance (pounds/sq in minimum)	ASTM D751 MTD A	60 psi

STEEL PIPE

PART 1 - GENERAL

1.1 Description

This section covers the requirements for schedule 40 and schedule 80 steel pipe and fittings.

PART 2 - PRODUCTS

2.1 Materials

A. Pipe

1. Steel pipe shall conform to the provisions of NFPA 30, Chapter 3 and ANSI B31.4.

B. Fittings

1. Flanges shall be used at all connections to equipment for dismantling of the piping. Flanges shall be standard class 125 lb. ANSI 31.4 for 125 psi service.
2. All flanged joints shall have ring gaskets conforming to ANSI B31.4. Gaskets shall be made of materials which are not injuriously affected by the fluid in the piping system and shall be capable of withstanding the pressures and temperatures to which they will be subjected.
3. Welding fittings shall conform to ANSI Standard B31.4. Shaped nipples or fishmouth fittings will not be permitted.
4. Valves shall be flanged and conform to ANSI Standard B31.4.

PART 3 - EXECUTION

3.1 Installation

A. Steel pipe shall be installed as shown on the drawings.

B. All pipe fittings and joints shall be welded in accordance with API Standard 1104.

C. All external piping shall be painted with a material suitable to eliminate corrosion.

D. All pipe shall be hydrostatically tested in accordance with API Standard RP1110.

MISCELLANEOUS ITEMS

PART 1 - GENERAL

1.1 Description

This section covers the requirements for waterstops and concrete sealer.

PART 2 - PRODUCTS

2.1 Materials

A. Waterstops

1. Waterstops shall be PVC and comply with Corps of Engineer CRD-C572. Waterstops shall be Greenstreak dumbbell of labyrinth of equal.

B. Concrete Sealer

1. Concrete shall be a two-part epoxy resin rated for use on interior masonry wall. Sealer shall resist chemicals to be stored. Sealer shall be ChemMaster, "Durakote 3" or equal.

PART 3 - EXECUTION

3.1 Installation

A. Waterstops shall be installed at all construction joints and other joint types and sizes shown on the plans.

B. Concrete sealer shall be installed on all interior concrete surfaces.

END OF SECTION

EXHIBIT II.14

TANK REPORT AND ASSESSMENT

Florida Mining and Materials
Brooksville, Florida

Introduction

This assessment of the structural integrity and adequacy of the tank system designed by Florida Mining and Materials and The Benham Group for installation at the Brooksville, Florida cement plan has been prepared to satisfy the requirements of 40 CFR 264.192. The assessment shows that the foundation structural support, seams and connections are sufficient to ensure that the tank system should not collapse, rupture or fail. The tank system is compatible with the wastes and adequately protected against corrosion. The foundation is adequate to support the weight of full tanks and to resist the effect of frost heave, flotation or seismic activity for the location proposed.

1. Design standards for Tanks

   The tank design meets or exceeds the minimum requirement of API 650 Appendix "F". All shell design stresses are less than 21 KSI per Appendix "F" with joint efficiency of 0.7 for the vertical joints. The tank will be hydro tested per API 650.

2. Hazardous Characteristics of Wastes to be Handled

   The wastes stored in the tank system are primarily common industrial solvents from the paint, coatings, ink and chemical manufacturing industries. Xylenes, toluene, mixed aliphatic and aeromatic compounds and acetone, make up most of the waste mixtures. In addition, small quantities of alcohols, ketones, ether-alcohols and halogenated solvents are present. .The waste mixtures also contain solid residues including resins and paint pigments. These waste characteristics are described in greater detail in Section II.7 of this Permit Application.

   All of the blended waste materials stored in the tank system exhibit the hazardous waste characteristic of ignitability. The materials have a pH between 4 and 11 and do not exhibit the characteristic of corrosivity. In addition, these wastes do not have any of the properties characteristic of reactive wastes. Some of the wastes stored in these tanks will exhibit the characteristics of EP toxicity. The wastes are all compatible with the mild steel materials of construction and no special coatings or other corrosion protection are required.

3. External Corrosion

   The tank system is designed so that no external metal will be in contact with the soil or in water. Standards and recommended practices for control of external corrosion on buried or submerged storage systems prescribed by the National Association of Corrosion Engineers are not applicable. Corrosion protection in the form of coatings, special alloys, cathodic protection of electrical isolation are not needed to insure that the tank system will not collapse, rupture or otherwise fail.

4. Underground Components and Vehicular Traffic

There are no buried components in the tank system which could be adversely affected by vehicular traffic.

5. Foundation Design and Climatic Considerations

The tank foundation will maintain the load of a full tank. Attached calculations how a maximum loading of 239 thousand pounds, including the weight of the tank, the full content of the tank, concrete foundation and 50-year snowfall for each of the 25,000 gallon tanks. Distributing this load over the tank foundation results in a maximum soil bearing load of 1.55 thousand pounds per square feet (KSF). The soil bearing capacity has been conservatively estimated at 4 KSF. consequently,, the soil bearing capacity is more than adequate to support the weight of the tank system.

The steel storage tanks will be constructed on a concrete foundation reinforced with 1/2" and 5/8" steel bar. The concrete and reinforcing have been designed to the following standards.

ACI 211.1-70	Recommended practice for selecting proportion of normal weight concrete.
ACI 301-72	Specifications for structural concrete for buildings.
ACI 302-69	Recommended practice for concrete floor and slab construction.
ACI 315-74	Manual of standard practice for detailing reinforced concrete structures.
ACI 318-77	Building code requirements for reinforced concrete.
Order No. 78-6	Hernando County Mining Ordinance for air blast over pressure.

In all cases, the steel to concrete ratio is more than adequate to resist all bending forces or both tension and compression, overturning of containment walls, bond between reinforcing steel and concrete, shear stresses and temperature.

The Brooksville, Florida area is not seismicly active and consequently not listed in Appendix VI of 40 CFR Part 264. No portion of the facility is located with 200 feet of a fault which has been displaced in holocene time. The tanks will be bolted to the concrete foundation which will be constructed on soil which is not in the saturated zone. The facility is not in the 100-year flood plain. consequently, the tank system will not float or be dislodged from its foundation and the foundation is stable.

The concrete foundation will be constructed on compacted soil covered with sand to an average depth of six inches. In addition, concrete grade beams will be constructed at a depth of 2 - 6 inches along the perimeter of the concrete foundation. The area below the tank system and below the concrete grade beams will not be subject to frost conditions and the tank system will not be subjected to frost heave.

The concrete foundation for the tank and containment structure has been designed to comply with Hernando County Ordinance No. 78-6 concerning blast resistance due to mining activities. Tank overturning was checked based on an air blast overpressure of 0.5 lbs/sf, which is the ordinance design criteria. The tank foundation exceeds this design parameter. The containment structure and tank foundation design was also checked to determine if the structures could withstand a blast with a particle velocity of 1.0 in/sec. Based on the united States Department of the Interior publication RI 8507 and the Corp of Engineers, Engineer manual EM 1110-2-3800, both dealing with minimum design criteria for blasting, the foundations as designed will meet the County requirement concerning particle speed.

(EXAMPLE)

EXHIBIT II.15

TANK INSTALLATION CERTIFICATION

This is to certify that the new above-ground storage tank system located at the Florida Mining and Materials, Brooksville, Florida Cement Plant, has been inspected by me under requirements of 40 CFR 262.192(b). This installation was inspected for the following items:

1. Weld breaks
2 Punctures
3. Scrapes of protective coatings
4. Cracks
5. Corrosion
6. Other structural damage or inadequate construction and/or installation

My inspection determined that there were no construction deficiencies detected prior to placing this tank system in service.

This tank system was also tested for tightness and there were no leaks in the tanks or auxiliary equipment prior to being placed in service.

I have also reviewed the installation of the auxiliary equipment and it is properly supported and protected against physical damage and excessive stress due to factors such as settlement, vibration, expansion, or contraction.

Signed

____
Professional Engineer

State of Florida No. ________

EXHIBIT II.16

Florida Mining and Materials
Brooksville, Florida

ASSESSMENT OF HAZARDOUS WASTE STORAGE TANK SYSTEM
25,000 GALLON TANK

Weight of Tank:

Roof	1/4" plate	$10.2 \times 1/4 \times 3.14 \times 12^2$	=	1,153	lbs
Wall	3/16" plate	$7.65 \times 3.14 \times 12 \times 30$	=	8,648	lbs
Base	1/2" plate	$20.4 \times 1/4 \times 3.14 \times 13.25^2$	=	2,811	lbs
Summation:			=	12,612	lbs

Weight of Snow:

Estimated ground snow load from the Climate Atlas of the United States", U.S. Dept. of Commerce, page 54

Roof (Snow) 1.0×10.0 psf = 10 psf < 20 psf

$3.14 \times 6^2 \times 20$ = 2,261 lbs

Fuel $V = 1/4(3.14) \times 12^2 \times 28.5 = 3{,}222$ ft^3

$62.4 \times 3{,}222$ = 201,053 lbs

Summation: = 203,314 lbs

Weight of Foundation:

$150 \times 12/12 \times 3.14 \times 7$ = 23,079 lbs

Total Weight = 12.61 + 203.1 + 23.08 = 239.0 k

Bearing Load = $\frac{239.0}{3.14 \times 7^2}$ = 1.55 SF < 4 KSF - estimated bearing capacity of soil

Per: "Structural Engineering Handbook", by Gaylord and Gaylord, page 5-2.

The depth of frost penetration at the Brooksville plant is about 10 inches.

EXHIBIT II.17

Assessment of Hazardous Waste Storage Tank System

CERTIFICATION

This certification applies only to the assessment of the hazardous waste storage tank system document and pertinent drawings for the 25,000 gallon tank which I have signed and sealed as a registered professional engineer.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to be the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signed:

8-27-90

Professional Engineer
State of Florida
License No. 31420

EXHIBIT II.18

INSPECTION SCHEDULE

Area/Equipment	Specific Item	Type of Problem	Inspection Frequency
Monitoring Equipment	Ultrasonic tank level & overfill devices	Proper function, calibration	Daily
	Fuel flow indicator	Proper function, calibration	Daily
	Torch pressure gauge	Proper function, calibration	Daily
	Pump pressure gauge	Proper function, calibration	Daily
	Tank level gauge differential press.	Proper function, calibration	Daily
	Containment ultrasound leak detection system	Proper function, cleanliness	Daily
Safety & Emergency Equipment	Protective clothing (impermeable full body coveralls, gloves, boots)	Adequate supply, clean condition	Weekly/after use
	Half & full-face piece respirators	Seals, air delivery system	Weekly/after use
	Mechanical spark-resistant tools	Stored properly, damaged	Weekly/after use
	Emergency shower & eyewash (4)	Water pressure, leaking, drainage	Weekly
	Organic vapor sensor	Vapor levels	Monthly/investigation
	Self-contained breathing apparatus (SCBA)	Located at supplier (Sheridan Supply 278-4845)	Monthly
	Absorbent material (kiln dust)	Adequate supply	Monthly/after use
	55-gallon drums	Corrosion, adequate supply, covers	Monthly
	First aid equipment & supplies	Adequate supply	Monthly/after use
	Decontamination facility	Upkeep	Monthly/after use
	Telephone system	Power failure	Annually
	Emergency lighting system (aux.)	Battery failure, lights	Annually
	Fire extinguishers	Needs recharging	Monthly/after use
	Foam fire fighting system	Not enough water pressure, frozen foam, dirty nozzles	Semiannually
	Fire control water	Lubrication, struck valve, freeze	Monthly
	Emergency alarm	Power failure, damaged	Monthly/after use
	Emergency vehicle	Proper function	Monthly
	Face shield and extra protective equipment	Broken or dirty equipment	Monthly
		Overfilled, dump mechanism	Weekly

EXHIBIT II.18

INSPECTION SCHEDULE
(Cont.)

Area/Equipment	Specific Item	Type of Problem	Inspection Frequency
Security Device	Television camera	Dirt buildup	Weekly
	Waring signs	Readability, obstruction	Weekly
Operating and Structural Equipment	Dikes	Cracks, deterioration	Daily
	Bases	Erosion, uneven settlement, cracks in base, deterioration of water seal between tank bottom and foundation, wet spots, dead vegetation	
	Protective coating on tanks	Rust spots, blisters	Daily
	Tank (external)	Corrosion, discoloration, cracks, buckles, bulges, malfunction of seals	Daily
	Tank (internal)	Corrosion - ultrasonic inspection	Annually
	Tank ladder	Damaged, structural stability	Daily
	Tank structural supports	Concrete deterioration and cracking, corrosion of pipe supports	Daily
	Pipes	Loss of metal thickness, leaks, corrosion or deterioration, crack	Daily
	Fuel storage area	Leaks, spills, wet spots	Daily
	Off-loading area	Leaks, spills, wet spots	Daily
	Fuel pumps	Power, pressure drop, leaks	Daily
	Filters	Pressure increase, cleanout	Daily
	Valves	Corrosion, deterioration, leaks	Daily
	Agitators	Leaks, lubrication	Daily
	Fittings	Corrosion, deterioration, leaks	Daily
	Overfill control and level indicator	Proper function	Daily
	Nozzles - fire-fighting	Deterioration, deformation	Monthly
	Sump pumps	Power, clogging, air supply	Daily
	Containers	Leaks, spills, cleanliness	Daily
	Epoxy coating - containment area floor	Wear out, leaks	Daily

EXHI[illegible] II.19

DAILY INSPECTION LOG

Inspector's Name/Title: ____________________

Date of Inspection: ____________________(Inspect on 1st shift)

Time of Inspection: ____________________

Area/Equipment: MONITORING EQUIPMENT Specific Item	Type of Problems	Status (A) Acceptable (U) Unacceptable	Observation	Date & Nature of Repair/ Remedial Action
Ultrasonic tank level and overfill devices				
Fuel flow indicator	Proper function, calibration			
Torch pressure gauge	Proper function, calibration			
Pump pressure gauge	Proper function, calibration			
Tank level gauge differential press.	Proper function, calibration			
Containment ultrasound leak detection system	Proper funciton, cleanliness			

Area/Equipment: OPERATING & STRUCTURAL EQUIPMENT Specific Item	Type of Problems	Status (A) Acceptable (U) Unacceptable	Observation	Date & Nature of Repair/ Remedial Action
Dikes	Cracks, deterioration			
Bases	Erosion, uneven settlement, cracks in base, deterioration of water seal between tank bottom & foundation, wet spots, dead vegetation			
Protective coating on tanks	Rust spots, blister			
Tank (external)	Corrosion, discoloration, cracks, buckles, bulges, malfunction of seals			
Tank ladder	Damaged, structural stability			
Tank structural supports	Concrete deterioration, Cracking, corrosion of pipe supports			

Inspector's Name/Title: ______________________

Date of Inspection: ______________________(Inspect on 1st shift)

Time of Inspection: ______________________

Area/Equipment: OPERATING & STRUCTURAL EQUIPMENT Specific Item	Type of Problems	Status (A) Acceptable (U) Unacceptable	Observation	Date & Nature of Repair/ Remedial Action
Pipes	Loss of metal thickness, leaks, corrosion, deterioration, cracks			
Fuel storage Area	Leaks, spills, wet spots			
Off-loading area	Leaks, spills, wet spots			
Fuel pumps	Power, pressure drop			
Filters	Pressure increase			
Valves	Corrosion, deterioration, leaks			
Agitators	Leaks, lubrication			
Fittings	Corrosion, deterioration, leaks			
Overfill control & level indicator	Proper function			
Sump pumps	Power, clogging, air supply			
Containers	Leaks, spills, cleanliness			
Epoxy coating - containment area floor	Wear out, leaks			

EXHIBIT II.20

WEEKLY INSPECTION LOG

Inspector's Name/Title: ______________________

Date of Inspection: ______________________(Inspect on 2nd shift on Tuesday)

Time of Inspection: ______________________

Area/Equipment: SAFETY & EMERGENCY EQUIPMENT		Status (A) Acceptable (U) Unacceptable	Observation	Date & Nature of Repair/ Remedial Action
Specific Item	Type of Problems			
Protective clothing (impermeable full body, coveralls, gloves, boots)	Adequate supply, clean condition			
Half & full-face respirators	Seals, air delivery system			
Mechanical spark-resistant tools	Stored properly, damaged			
Emergency shower, eye wash	Water pressure, leaking drainage			
	Overfilled,			

Area/Equipment: SAFETY & EMERGENCY EQUIPMENT		Status (A) Acceptable (U) Unacceptable	Observation	Date & Nature of Repair/ Remedial Action
Specific Item	Type of Problems			
Television Camera	Dirt buildup			
Warning Signs	Readability, obstruction			

EXHIBIT II.21

MONTHLY INSPECTION LOG

Area/Equipment: SAFETY & EMERGENCY EQUIPMENT

Specific Item	Type of Problems	Status (A) Acceptable (U) Unacceptable	Observation	Date & Nature of Repair/ Remedial Action
Organic vapor sensor	Vapor levels			
Self-contained breathing apparatus (SCBA)	Seals, air delivery system			
Absorbent material (kiln dust)	Adequate supply			
55-gallon containers	Corrosion, adequate supply			
First aid equipment and supplies	Adequate supply or inoperative			
Decontamination facility	Upkeep			
Fire extinguishers	Need recharging			
Foaming eductor & foam concentrate	Not fuctioning, adequate supply			
Fire control water	Lubrication, stuck valve			
Emergency alarm	Power failure, damaged			
Face shields & extra protective equipment	Broken or dirty eqipment			

EXHIBIT II.22

SEMI-ANNUAL AND ANNUAL INSPECTION LOG

Area/Equipment: SAFETY & EMERGENCY EQUIPMENT		Status (A) Acceptable (U) Unacceptable	Observation	Date & Nature of Repair/ Remedial Action
Specific Item	Type of Problems			
Telephone system	Power failure			
Emergency lighting system (auxiliary)	Battery failure, lights			
*Foam Fighting System	Not enough water pressure frozen foam, dirty nozzles			

* Inspect 1st Tuesday in April and October, day shift

Area/Equipment: OPERATING & STRUCTURAL EQUIPMENT		Status (A) Acceptable (U) Unacceptable	Observation	Date & Nature of Repair/ Remedial Action
Specific Item	Type of Problems			
Tanks (internal)	Corrosion (ultrasonic inspection)			

EXHIBIT II.23

WEEKLY RAIL INSPECTION CHECKLIST

ITEM	CONDITIONS			ACTION REQUIRED
	NEEDS REPAIRS	FAIR	GOOD	
VERTICAL ALIGNMENT				
HORIZONTAL ALIGNMENT				
GAGE				
DAMAGED TIES				
BALLAST CONDITION				
LOOSE JOINT				
GREASED SWITCH POINTS				
GREASED JOINTS				
CROSSING STRUCTURES				
CROSSING MARKINGS				
RAIL SIDE				
ROAD SIDE				
SIGNALS				
WEED CONTROL				

ATTACHMENT 2

Prequalification and Scheduling of HWF

As described in the waste analysis plan in the Part "B" application, each HWF supplier submits a completed prequalification form (see subattachement A) and a sample of the HWF for analysis. A comparison of this analysis to the prequalification form and the acceptance criteria is performed, as well as an examination of the waste codes of the proposed HWF in comparison to the approved list of waste codes. All of this is described in detail in the waste analysis plan.

Receipt on-site

The HWF transport vehicle arrives on-site on or about its scheduled time. If the vehicle is unable to be immediately sent to a sampling/unloading area, it is directed to a designated parking area. The alternative to this is to send the vehicle off-site. Generally, these delays in receipt are due to early arrival or problems with the preceding receipt and are of short duration.

The manifest, a land ban certification and a chemical analysis of land report, are given to an individual trained in receipt inspection and documentation. If the documents conform to the parameters in the waste analysis plan and applicable regulations, the vehicle is examined. If the seals are undamaged and their numbers match the numbers listed on the manifest, the vehicle will be moved to a sampling/unload station. In most cases the examination of the documents and vehicle will occur at this station.

Sampling HWF

There are two types of HWF, Liquid (LHWF) and Solid (SHWF). LHWF is received in truck transports or railroad tank cars. SHWF is received in DOT containers of various descriptions delivered by a truck transport.

Sampling of the SHWF conforms to the method described in the WAP. Briefly the transport is backed onto a concrete apron up to an unloading dock. The doors are opened and the condition of the load examined. The containers must be in a fit condition to contain the SHWF and be properly labeled. The containers are unloaded from the transport using a forklift or other mechanical device suitable for the task by an operator trained in the proper and safe operation of the equipment and the proper and safe handling of hazardous waste. The containers are set down in a hazardous waste containment area. Following the sampling plan in the WAP the containers are sampled. The containers are then set aside in a contained storage area. No washout of the HWF transports is done on the site. When the analysis is complete and compared to the acceptance criteria and determined that it does conform, the SHWF containers are scheduled for processing in the kiln for energy recovery. If the analysis does not conform, the containers are loaded back onto the transport and the load rejected. The manifest is not signed as accepted until the analysis is complete and determined to conform to the acceptance criteria.

Sampling of LHWF in tank trucks and tank cars conforms to the WAP as well. The vehicles are moved onto a sampling/unloading area and secured (i.e., wheels chock-blocked, brakes set and transport grounded). Garbed in the appropriate protective equipment an operator will connect the vent connection of the vehicle to the vapor vent system. The valve on the vent line is opened and any pressure in the vehicle is vented into the system. (This vent system is intended to transport VOC vapors from tank to tank, or tank to transport, during transfers. Additionally, any excess vapors or any tank breathing losses will vent to the kiln hood into the combustion air. In the event the kiln is not operating, these vapors would vent through a VOC control device such as an activated carbon bed.) After it is determined that the vehicle is free of pressure, the manway is opened. Sampling will proceed as detailed in the WAP. The operator will secure the manway when his sampling is complete and take the sample to the laboratory for analysis. The analytical procedures are detailed in the WAP. Comparisons to the acceptance criteria and acceptance or rejection of the LHWF loads is performed. If rejected, the transport is reinspected to be sure it is fit as a transport. The vent closed, the vent line disconnected, the ground disconnected and the chock blocks removed preparatory to the movement of the transport. If accepted, the transfer of the LHWF from the transport to the storage tanks is initiated. When complete, the transfer is documented, the transport vehicle is secured, all liquid and vapor lines disconnected, the ground disconnected and chock blocks removed and the vehicle released to the transporter. No wash out of the HVF transports is done.

All handling of hazardous waste fuel is done by individuals trained in the proper and safe handling procedures. These procedures include but are not limited to: Selection and use of the proper personal protective equipment; the selection and use of the proper equipment to open, sample, and close the containers; acceptable container management practices; proper spill containment and cleanup practices; emergency procedures; and other HWF facility operating procedures and practices.

SOUTHDOWN, INC.

PREQUALIFICATION PROCEDURES

SOLVENT DERIVED FUEL

I. HWF APPROVAL PROCESS
What Suppliers must do to qualify HWF stream

II. WHO MUST APPROVE THE HWF SUPPLIER
Waste Stream must go through approval process

III. RECEIVING FACILITIES RESPONSIBILITIES
Approving Waste Stream

IV. ANALYTICAL DATA
Who is responsible for analytical data for waste stream

V. FINGERPRINT ANALYSIS
What happens if fingerprinting analysis does not meet prequalification

VI. REQUALIFICATION
When must a waste stream be requalified

EXHIBIT 1. Generator or Supplier Notification of Fuel Derived from Hazardous Waste

REGULATION: 40 CFR 266.34
Section: B

EXHIBIT 2. Cement Kiln (Industrial Furnace) Notification

REGULATION: 40 CFR 260.10
40 CFR 266.35
Section: B

EXHIBIT 3. Hazardous Waste Fuel Checklist

EXHIBIT 4. Waste Fuels Qualification

REGULATION: 40 CFR 264.13
Section: A1
Figure: 2

I. HWF APPROVAL PROCESS

Before any Southdown kiln will accept hazardous waste fuel for burning in one of its cement kiln, the waste stream must be prequalified by the generator or supplier. At a minimum, this analysis must contain all the information that is known by the supplier in order to burn the waste safely to ensure that Southdown stays in compliance with state and federal regulations.

Before hazardous waste fuel is initially accepted by one of Southdown's cement kilns, a sample of the hazardous waste fuel must be sent to an outside lab for complete analysis. In the event the analysis is done by Southdown, or contracted to an outside laboratory by Southdown, the results of the analysis will be sent to the Director of Resource Recovery Operations and will be forwarded to the generator for inclusion in the prequalification. When the analysis is complete, the supplier must complete (Exhibit 1) Waste Fuels Qualification, sign off the certification statement, and send to Southdown for approval.

II. WHO MUST APPROVE WASTE STREAM FOR BURNING

Upon receipt of the completed Waste Fuel Qualification, the approval process begins. The waste profile and all other analytical data will be checked against the receiving facility's acceptance criteria for waste fuel. If all analytical data on the Qualification meets all the standards set forth by Southdown's Waste Analysis Plan for the receiving facility, the waste will be approved for acceptance. If for some reason, there is a problem with any of the analytical results, Southdown will not approve the HWF supplier until further clarification is provided. Southdown has the option to require a requalification of HWF that we believe or have reason to believe that the process or operation at the suppliers or fuel blender has changed.

In addition, Southdown can require additional analysis of incoming loads, if for some reason, the waste that is received does not match the waste designated on the manifest.

III. RECEIVING FACILITIES RESPONSIBILITY

The Waste Fuel Qualification will be reviewed by the Corporate Resource Recovery Compliance Manager, with the sign off by the Hazardous Waste Fuel Coordinator at the receiving facility. Final approvals will be given by the Director of Resource Recovery Operations.

IV. ANALYTICAL DATA

The Waste Fuel Qualification along with all other supporting documentation such as the outside lab analytical data will be kept at the receiving facility by the Chief Chemist with copies of such to be kept in the RCRA operating files for back-up.

V. FINGERPRINTING ANALYSIS

When a load of waste fuel is accepted at one of Southdown's facilities, there will be a fingerprint analysis done on the load to ensure that it meets the original Waste Fuel Qualification. In doing this, it will ensure that all requirements are met for Interim Status, Part B permits, and appropriate air permits. This will help ensure that Southdown's facilities stay in compliance.

If for some reason the fingerprint does not match the prequalification, the load of waste will be assessed for rejection.

VI REQUALIFICATION

On an annual basis, the supplier must requalify his Hazardous Waste Fuel Stream. This must be done to ensure that Southdown's facilities are not accepting a waste stream that will jeopardize the health and safety of its employees and that all operations are not harmed in any way.

The requalification process will be exactly the same as the original qualification process (see Section II).

All paperwork, analytical data, and waste profile must be on file for the requalification before a load of Hazardous Waste Fuel is accepted.

Southdown will notify all suppliers or generators one month before their annual requalification date, to ensure their waste stream is requalified and that all necessary paperwork is in place at all Southdown facilities, so that no operations will be affected.

If a load must be cancelled from Cadence Chemical Resources, the contacts at Cadence are as follows:

Jim Ward	-	Work	(219) 879-0371
		Home	(219) 874-4591
Ken Derksen	-	Work	(219) 879-0371
		Home	(219) 256-3074
		Beeper	(219) 256-4784

Also, in the event of a load being cancelled or rejected, please notify the following:

Dave Constans	-	Work	(713) 653-6868
		Home	(713) 292-9469
		Pager	1-800-759-7354 Pin # 18718
Brenda Parfitt	-	Work (Kosmos)	(502) 935-7331
		(Fairborn)	(513) 878-8651
		Home	(502) 845-2717

FLORIDA MINING & MATERIALS

WASTE FUELS QUALIFICATION

GENERAL INFORMATION
COMPANY ____________ GENERATORS EPA ID NO. ____________
ADDRESS ____________ CITY ____________ STATE ______ ZIP ______
CONTACT ____________ TEL ( ) ____________ TITLE ____________
WASTE DESCRIPTION (INCLUDE DOT DESCRIPTION) ____________
PROCESS GENERATING WASTE ____________

MAJOR VOLATILE ORGANICS (RELATIVE AREA PERCENT)

____________ ______
____________ ______
____________ ______
____________ ______

METALS. PPM
PB ______
CR ______
CD ______
AS ______
HG ______
BE ______

HEAT CONTENT ____________ BTU/LB.
ASH (FROM BOMB) ____________ %WT.
TOTAL HALOGEN (TITRATION) ______ %WT. AS CL
S ____________ %WT.
PH (DIRECT/EXTRACTED) ______ / ______
LIQUID HWF SOLIDS (CENTRIFUGE) ______ %VOL.
WATER (TOTAL) ____________ %WT.
VISCOSITY ____________ CP
ECIFIC GRAVITY ____________
S ____________ PPM
FLASH POINT (CLOSED CUP) ____________ F

EPA WASTE CODE NUMBER(S) ____________

SAMPLE
______ COMPOSITE
______ GRAB
______ BASED ON KNOWLEDGE OF PROCESS
______ BASED ON ACTUAL ANALYTICALS

DETERMINATIONS REPORTED ABOVE WERE CHOSEN BASED ON THE SAMPLE MATRIX. THE COMPOSITION OF THE WASTE FUEL WILL NOT CHANGE SO AS TO RENDER THIS SURVEY AND THE SAMPLE SUBMITTED NON-REPRESENTATIVE WHEN ASSESSED AGAINST THE RECEIVING FACILITY'S FUEL SPECIFICATION. THE GENERATOR SUBMITTING THIS WASTE FUELS QUALIFICATION FURTHER WARRANTS THAT HWF SUPPLIED TO FM&M CEMENT WILL SATISFY THE OBJECTIVES OF THE U.S. EPA SHAM RECYCLING POLICY (1983, OR AS REVISED) AS IT RELATES TO HWF BURNED FOR THE PURPOSE OF ENERGY RECOVERY.

____________ ______
AUTHORIZED SIGNATURE DATE

____________ HEREBY WARRANTS THE WASTE STREAM REPRESENTED BY THE SURVEY AND SAMPLE SUBMITTED IS ACCEPTABLE AT THIS FACILITY AND THAT SAID FACILITY HAS/HAVE THE APPROPRIATE PERMITS AND CAN ACCEPT THIS WASTE AS LONG AS ALL HAZARDS ASSOCIATED WITH THE WASTE HAVE BEEN FAIRLY DISCLOSED ON THE SURVEY.

____________ ____________ ______
FLORIDA MINING AND MATERIALS REVIEW
CEMENT PLANT APPROVAL
DATE

Question 4

4. **Provide a listing and description of all waste materials/fuels that this facility will not accept or receive for this proposal. The description should include, but not be limited to, the chemical name and CASR (Chemical Abstract Services Registry) numbers, their state (i.e., < 50 ppm, > 760 mm Hg V.P., etc.), and any other screening criteria.**

   Table III-5, "Specification for Hazardous Waste Fuels (HWF)" included in the application, provides for a maximum concentration for PCB's of 50 ppm in any waste materials/fuels accepted at the facility.

   As part of the Application for a Hazardous Waste Fuels Storage Facility Permit previously submitted to the Department, the list of hazardous wastes and corresponding RCRA waste code numbers, which may be accepted at the facility has been defined. This list excludes both dioxin containing materials and pesticides, and is attached as part of the response for Item 7 in this submission. No material will be accepted at FM&M which is contaminated with dioxins or pesticides. No material will be accepted which contains PCB's in excess of 50 ppm.

TABLE III-5

SPECIFICATION FOR HAZARDOUS WASTE FUELS (HWF)

	Liquid HWF	Solid HWF
Heat Content, minimum	10,000 Btu per lb	5,000 Btu per lb
Suspended Solids, maximum	30 percent	N/A
Sulfur, maximum	1 percent maximum	1 percent maximum
Halogens	5 percent	5 percent
Inorganic Acids and Bases	Extractable pH between 4.0 and 11.0	Extractable pH between 4.0 and 11.0
Water, maximum	1 percent as separate phase	No free standing liquid
Metals, maximum each		
Cadmium	250 ppm	1,000 ppm
Chromium	3,000 ppm	4,000 ppm
Lead	4,000 ppm	8,000 ppm
Barium	4,000 ppm	12,000 ppm
Antimony	See Note	See Note
Arsenic	See Note	See Note
Beryllium	See Note	See Note
Mercury	See Note	See Note
Silver	See Note	See Note
Thallium	See Note	See Note
PCB's	Less than 50 ppm	Less than 50 ppm

NOTE: This specification is subject to FDER Air Quality Section Review and is subject to change.

Question 5

5. **Since PSD does evaluate and compare the emissions of "actuals to proposed potentials" for all pollutants, please provide the synopsis page of the most recent compliance tests performed on the No. 2 lime kiln for each pollutant tested.**

Table V-5 included in the Application provided current actual emissions for eight PSD compounds. For carbon monoxide, nitrogen dioxide (NO_x), sulfur dioxide, ozone (VOC) and particulate, the actual emissions listed have been established through the past two years of available test data and have been accepted by the Department under current Permit AC27-173474. Since these values were established, no further testing has been conducted on the No. 2 Kiln.

TABLE V-5

PSD REGULATED EMISSIONS SUMMARY

Compound	Current Actual Emissions (lb/hr)	Current Actual Emissions (T/yr)	Proposed Potential Emissions (lb/hr)	Proposed Potential Emissions (T/yr)	Net Emissions Increase (T/yr)	Significant* Emissions Increase (T/yr)
Carbon Monoxide	41.1	162.3	64.0	262.2	99.9	100
Nitrogen Dioxide (NO_X)	158.4	625.4	162.3	665.3	39.9	40
Sulfur Dioxide	1.8	7.1	11.5	47.0	39.9	40
Ozone (VOC)	5.4	21.3	7.4	31.2	9.9	40
Particulate	7.7	30.4	13.5	55.3	24.9	25
Lead	0.00003	0.00014	0.04305	0.17650	0.17636	0.6
Mercury	0.0	0.0	0.02182	0.08947	0.08947	0.1
Beryllium	0.00006	0.0002459	0.000157	0.0006456	0.0003997	0.0004

* From Table 500-2 DER 17-2.500 (2)(e)2

Question 6

6. **From Table II-1, which of these kilns listed have afterburners?**

None of the facilities listed in Table II-1 have afterburners operating with a cement kiln. It should be noted that cement kilns burning HWF do not have afterburners since they achieve satisfactory destruction of the HWF compounds due to their high operating temperatures and long, hot gas retention times.

When HWF is fed to the main burner at the discharge end of a cement kiln, the organic compounds are exposed to gas temperatures exceeding 3,500°F as the material temperatures in this part of the kiln exceed 2,450°F. Gas retention time in the temperature range above 1,800°F is five to six seconds. These conditions provide complete destruction/removal efficiencies (DRE's) greater than 99.99%, as shown in Figure 1 for various difficult to destroy organic compounds.

Also, when HWF is fed to the feed end of the rotary kiln, as containerized HWF through the feed shelf, the organic compounds are exposed to gas temperatures of 1,950 to 2,000°F for more than 1.5 to 2.0 seconds. Again, these conditions provide complete DRE's of greater than 99.99%. As demonstrated in the attached Figure V-1 showing the temperature and retention time profile for the FM&M No. 2 Kiln, the proposed environment for the solid and liquid HWF meets or exceeds the RCRA requirement and, therefore, all of the organic compounds which are included in the HWF will be destroyed with 99.99% or greater efficiency.

A significant amount of testing of cement kilns firing hazardous waste fuel has established the level of destruction for various organic compounds. The attached table summarizes the results of the testing data in Reference 1 through 6. This summary shows that cement kilns have demonstrated high levels of destruction efficiency for thermally stable compounds without the use of an afterburner. For example, Reference 5 shows destruction efficiencies of greater than 99.99% for Trichlorobenzene which is classified by EPA as a Class 1 Stable Compound (EPA/625/6-89/019). This POHC was added to fuel fed to the feed shelf of a kiln similar to FM&M's Kiln No. 2.

FIGURE V-1

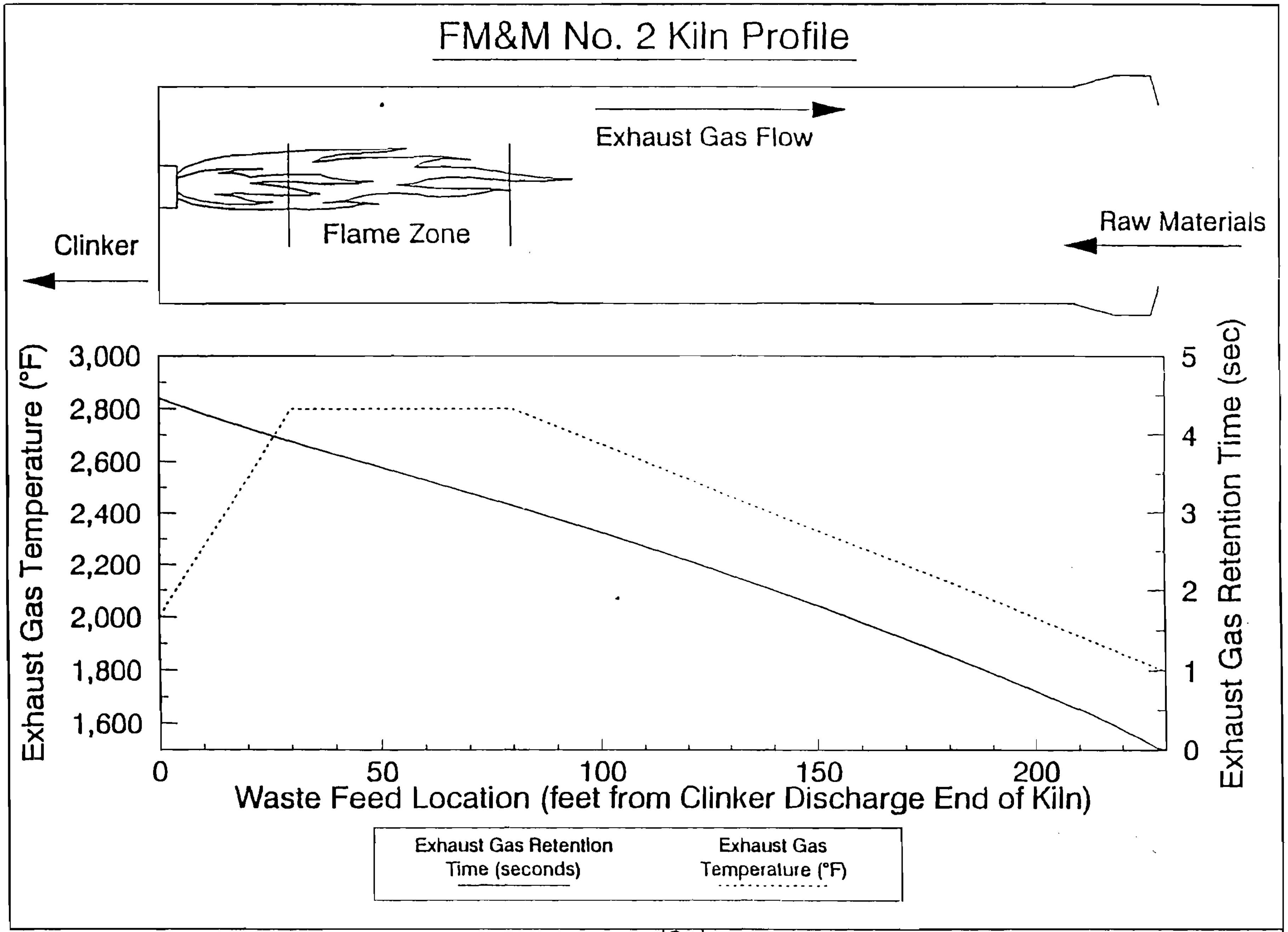
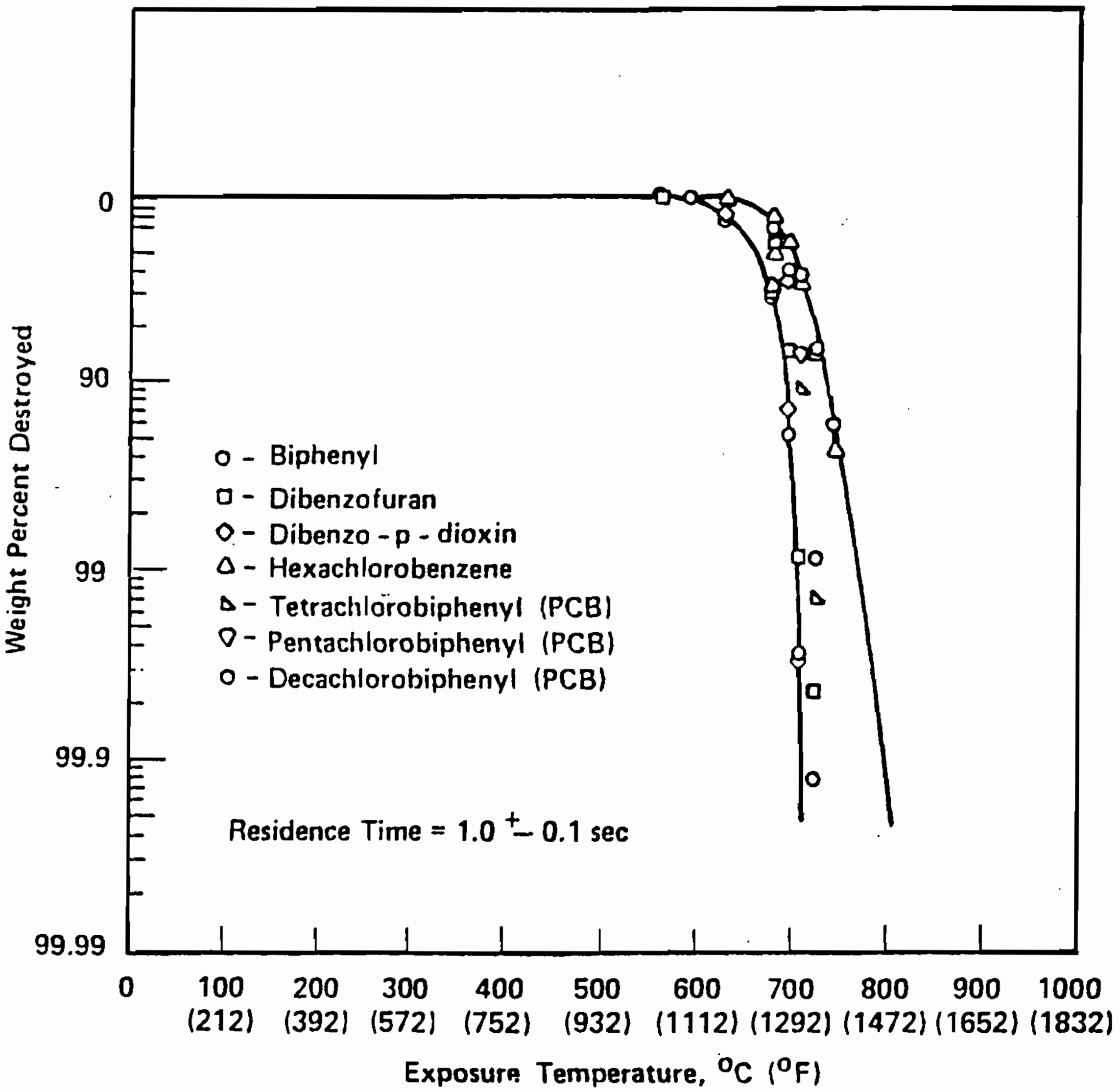

FM&M No. 2 Kiln Profile
Exhaust Gas Flow
Flame Zone
Clinker
Raw Materials
Exhaust Gas Temperature (°F)
3,000
2,800
2,600
2,400
2,200
2,000
1,800
1,600
Exhaust Gas Retention Time (sec)
5
4
3
2
1
0
0
50
100
150
200
Waste Feed Location (feet from Clinker Discharge End of Kiln)
Exhaust Gas Retention Time (seconds)
Exhaust Gas Temperature (°F)

FIGURE 1

COMPARISON OF THERMAL STABILITY OF TYPICAL PCB ISOMERS TO TYPICAL HEXACHLOROBENZENE DIOXIN, FURAN AND BIPHENYL COMPOUNDS (DUVALL AND RUBEY, 1977)



DATA SUMMARY
(References 1 through 6)

DESTRUCTION REMOVAL EFFICIENCIES
(For Cement Kilns Burning HWF)

Reference	Carbon Tetrachloride	Trichlorobenzene	Methylene Chloride	Methylethyl Ketone	1,1,1 - Trichloroethane	Toluene
1	----	----	----	----	>99.999	----
2	----	>99.999	----	----	----	----
3	----	----	99.96	99.998	>99.999	99.995
4*	----	----	99.879	99.96	99.677	99.61
5						
A**	99.9959	----	----	----	----	
B***	99.9961	----	----	----	----	
6	> 99.9992	> 99.995				

* The DRE's indicated have been adjusted by a sensitivity analysis approach to include the impact of random measurement errors on the DRE calculations. The stated values therefore actually represent the minimum DRE's observable in the cement kiln by employing the test methods described in this report.

** POHC's introduced to kiln system at burner location thereby maximizing retention time.

*** POHC's introduced to kiln system along with waste tires at raw materials feed shelf thereby minimizing retention time.

Question 7

7. **Please list all waste fuel constituents and their CASR numbers that you intend to receive and process at this facility. Also, provide the maximum ambient off-property concentrations (i.e., 1-hr, 3-hr, 8-hr, 24-hr, and annual) of the individual pollutants that will be expected from the combustion of the various constituents.**

   As part of the Application for a Hazardous Waste Fuels Storage Facility Permit previously submitted to the Department, the list of hazardous wastes which may be accepted at the facility has been defined. This list is included in the response to Question 1 as Table II.6 and II.6A.

   Tables VII-2 and VII-3, included in the subject Air Permit Application, provide maximum ambient off-property concentrations (8-hr, 24-hr, and annual) for typical organic compounds and all metal compounds expected in the waste fuels accepted at the facility. As requested, maximum 1-hr and 3-hr concentrations have been calculated and are provided as attached Tables VII-2A and VII-3A. These tables provide a comparison of the projected concentrations with the Florida Air Toxics Permitting Strategy No Threat Levels. While the No Threat Levels are not specified for 1-hr and 3-hr averaging times, it can be assumed that each would be higher than the 8-hr level for any given compound. A review of Tables VII-2 and VII-3 shows that the calculated 1-hr and 3-hr concentrations are conservatively estimated to be below the 8-hr No Threat Level.

   The maximum ambient off-property concentrations are based on the assumptions presented in Table A-1. Additionally, the maximum ambient off-property concentrations are considered conservative, since the emission rates for each compound were assumed to be substantially higher than the typical concentration of the compound in the hazardous waste fuel. For example, Benzene is assumed to exist in the hazardous waste fuel at 500,000 ppm when in actuality the typical expected concentration is 34.7 ppm.

TABLE A-1

DISPERSION MODELING PROTOCOL
INDUSTRIAL SOURCE COMPLEX - SHORT TERM

---

1) Highest and Second Highest Groundlevel Concentrations were calculated for the following averaging times: 1-hour, 3-hour, 8-hour and 24-hour.

2) Annual Concentrations were obtained from ISCST's N-day Average Concentration.

3) Receptor Grid: Rectangular coordinate system, receptors spaced every 100 meters, and grid extends far enough beyond property boundary to determine off-site maximums.

4) Discrete Receptors: Rectangular coordinate system with receptors placed every 500 meters along the eastern edge of the Chassahowitzka Wilderness Area to determine Class I Area maximum concentrations.

5) Terrain is assumed to be flat (no terrain elevations input).

6) Meteorological Data: 5 years of hourly preprocessed data from Tampa (NWS 12842), 1985 through 1989.

7) Rural Dispersion Mode.

8) Regulatory Default Option was used:

   - Final plume rise used at all down wind receptors;
   - Stack-tip downwash effects included;
   - Buoyancy-induced dispersion effects are parameterized;
   - Default wind profile coefficients are used;
   - Default vertical potential temperature gradients are used;
   - Calm processing routine used to handle concentrations during calm periods;
   - Revised building wake effects procedure is selected, either Huber-Snyder or Schulman-Scire depending on stack height and building dimensions;
   - No decay assigned to SO_2 in the rural dispersion mode.

9) Source Data:

   - Emission Rate = 1.0 gram/sec (to determine dispersion coefficients);
   - Stack Height = 90 ft;
   - Stack Diameter = 14 ft;
   - Stack Gas Exit Flow Rate = 300,000 ACFM @ 386°F.

10) Wind Direction Specific Building Dimensions for downwash and building wake effects calculations were calculated using the model BREEZE WAKE by Trinity Consultants, Inc. BREEZE WAKE produces the direction-specific, building wake effect calculations required by ISCST.

11) No gravitational settling was considered for particulate emissions.

TABLE VII-2

EVALUATION OF NO-THREAT LEVELS - ORGANIC COMPOUNDS

	HWF Concentration (ppm)		Assumed(1) Emission Rate	Maximum Groundlevel Concentration (µg/cu.m.)			No-Threat Level(2) (µg/cu.m.)		
Compound	**Typical**	**Assumed**	**(lb/hr)**	**8-hour**	**24-hour**	**Annual**	**8-hour**	**24-hour**	**Annual**
Acrolein	100	500000	0.3751531	0.3615992	0.1500680	0.0156458	2.5	0.6	N/D
Acrylonitrile	100	500000	0.3751531	0.3615992	0.1500680	0.0156458	45	11	0.015
Benzene	34.7	500000	0.3751531	0.3615992	0.1500680	0.0156458	30	7.1	0.12
Bromoform	10	500000	0.3751531	0.3615992	0.1500680	0.0156458	50	12	N/D
Carbon Tetrachloride	10	500000	0.3751531	0.3615992	0.1500680	0.0156458	126	30	0.07
Chlorobenzene	185	500000	0.3751531	0.3615992	0.1500680	0.0156458	460	110	N/D
Chloroethane	10	500000	0.3751531	0.3615992	0.1500680	0.0156458	52000	12381	N/D
Chloroform	47.1	500000	0.3751531	0.3615992	0.1500680	0.0156458	98	23	0.04
1,2-Dichlorobenzene	55.2	500000	0.3751531	0.3615992	0.1500680	0.0156458	N/D	N/D	10
1,4-Dichlorobenzene	10	500000	0.3751531	0.3615992	0.1500680	0.0156458	4020	1071	10
Dichlorobromonethane	10	500000	0.3751531	0.3615992	0.1500680	0.0156458	N/D	N/D	N/D
Dichlorodifluoromethane	10	500000	0.3751531	0.3615992	0.1500680	0.0156458	94000	73571	200

---

(1) Destruction Removal Efficiency = 99.99%

(2) As specified in the "Florida Air Toxics Permitting Strategy - Appendix A".
N/D = Not Defined for this averaging time in the "Florida Air Toxics Permitting Strategy - Appendix A"

TABLE VII-2

EVALUATION OF NO-THREAT LEVELS - ORGANIC COMPOUNDS (continued)

	HWF Concentration (ppm)		Assumed(1) Emission Rate	Maximum Groundlevel Concentration (µg/cu.m.)			No-Threat Level(2) (µg/cu.m.)		
Compound	**Typical**	**Assumed**	**(lb/hr)**	**8-hour**	**24-hour**	**Annual**	**8-hour**	**24-hour**	**Annual**
1,1-Dichloroethane	10	500000	0.3751531	0.3615992	0.1500680	0.0156458	4000	952	0.04
1,2-Dichloroethane	10.2	500000	0.3751531	0.3615992	0.1500680	0.0156458	40	9.5	0.04
1,1-Dichloroethylene	10	500000	0.3751531	0.3615992	0.1500680	0.0156458	40	9.5	0.02
1,2-Dichloroethylene	10	500000	0.3751531	0.3615992	0.1500680	0.0156458	7400	1881	N/D
1,2-Dichloropropane	10	500000	0.3751531	0.3615992	0.1500680	0.0156458	3500	833	N/D
1,3-Dichloropropylene(3)	10	95	0.0000712	0.0000687	0.0000285	0.0000029	50	12	0.000003
Ethylbenzene	3560	500000	0.3751531	0.3615992	0.1500680	0.0156458	4350	1036	N/D
Methyl Bromide	10	500000	0.3751531	0.3615992	0.1500680	0.0156458	200	48	N/D
Methyl Chloride	10	500000	0.3751531	0.3615992	0.1500680	0.0156458	1050	250	N/D
Methylene Chloride	171	500000	0.3751531	0.3615992	0.1500680	0.0156458	1750	417	3

---

(1) Destruction Removal Efficiency = 99.99%

(2) As specified in the "Florida Air Toxics Permitting Strategy - Appendix A".
N/D = Not Defined for this averaging time in the "Florida Air Toxics Permitting Strategy - Appendix A"

(3) 1,3-Dichloropropylene will be controlled through prequalification review
at the processing location to ensure that it is not inappropiately blended into the fuel.

TABLE VII-2

EVALUATION OF NO-THREAT LEVELS - ORGANIC COMPOUNDS (continued)

Compound	HWF Concentration (ppm)		Assumed(1) Emission Rate (lb/hr)	Maximum Groundlevel Concentration (μg/cu.m.)			No-Threat Level(2) (μg/cu.m.)		
	Typical	Assumed		8-hour	24-hour	Annual	8-hour	24-hour	Annual
1,1,2,2-Tetrachloroethane	10	500000	0.3751531	0.3615992	0.1500680	0.0156458	70	17	0.02
Tetrachloroethylene	225	500000	0.3751531	0.3615992	0.1500680	0.0156458	3350	798	N/D
Toluene	9500	500000	0.3751531	0.3615992	0.1500680	0.0156458	2000	N/D	N/D
1,1,1-Trichloroethane	512	500000	0.3751531	0.3615992	0.1500680	0.0156458	N/D	N/D	0.02
1,1,2-Trichloroethane	10	500000	0.3751531	0.3615992	0.1500680	0.0156458	450	107	N/D
Trichloroethylene	50.9	500000	0.3751531	0.3615992	0.1500680	0.0156458	2700	643	0.77
Trichlorofluoromethane	10	500000	0.3751531	0.3615992	0.1500680	0.0156458	N/D	N/D	300
Vinyl Chloride	10	500000	0.3751531	0.3615992	0.1500680	0.0156458	100	24	0.14

---

(1) Destruction Removal Efficiency = 99.99%

(2) As specified in the "Florida Air Toxics Permitting Strategy - Appendix A".
N/D = Not Defined for this averaging time in the "Florida Air Toxics Permitting Strategy - Appendix A"

TABLE VII-2A

EVALUATION OF NO-THREAT LEVELS - ORGANIC COMPOUNDS

Compound	HWF Concentration (ppm)		Assumed(1) Emission Rate (lb/hr)	Maximum Groundlevel Concentration (μg/cu.m.)		No-Threat Level(2) (μg/cu.m.)	
	Typical	Assumed		1-hour	3-hour	1-hour	3-hour
Acrolein	100	500000	0.3751531	0.8730189	0.539063	N/D	N/D
Acrylonitrile	100	500000	0.3751531	0.8730189	0.539063	N/D	N/D
Benzene	34.7	500000	0.3751531	0.8730189	0.539063	N/D	N/D
Bromoform	10	500000	0.3751531	0.8730189	0.539063	N/D	N/D
Carbon Tetrachloride	10	500000	0.3751531	0.8730189	0.539063	N/D	N/D
Chlorobenzene	185	500000	0.3751531	0.8730189	0.539063	N/D	N/D
Chloroethane	10	500000	0.3751531	0.8730189	0.539063	N/D	N/D
Chloroform	47.1	500000	0.3751531	0.8730189	0.539063	N/D	N/D
1,2-Dichlorobenzene	55.2	500000	0.3751531	0.8730189	0.539063	N/D	N/D
1,4-Dichlorobenzene	10	500000	0.3751531	0.8730189	0.539063	N/D	N/D
Dichlorobromonethane	10	500000	0.3751531	0.8730189	0.539063	N/D	N/D
Dichlorodifluoromethane	10	500000	0.3751531	0.8730189	0.539063	N/D	N/D

---

(1) Destruction Removal Efficiency = 99.99%

(2) As specified in the "Florida Air Toxics Permitting Strategy - Appendix A".
N/D = Not Defined for this averaging time in the "Florida Air Toxics Permitting Strategy - Appendix A"

TABLE VII-2A

EVALUATION OF NO-THREAT LEVELS - ORGANIC COMPOUNDS
(continued)

Compound	HWF Concentration (ppm) Typical	HWF Concentration (ppm) Assumed	Assumed(1) Emission Rate (lb/hr)	Maximum Groundlevel Concentration (μg/cu.m.) 1-hour	Maximum Groundlevel Concentration (μg/cu.m.) 3-hour	No-Threat Level(2) (μg/cu.m.) 1-hour	No-Threat Level(2) (μg/cu.m.) 3-hour
1,1-Dichloroethane	10	500000	0.3751531	0.8730189	0.539063	N/D	N/D
1,2-Dichloroethane	10.2	500000	0.3751531	0.8730189	0.539063	N/D	N/D
1,1-Dichloroethylene	10	500000	0.3751531	0.8730189	0.539063	N/D	N/D
1,2-Dichloroethylene	10	500000	0.3751531	0.8730189	0.539063	N/D	N/D
1,2-Dichloropropane	10	500000	0.3751531	0.8730189	0.539063	N/D	N/D
1,3-Dichloropropylene(3)	10	95	0.0000712	0.000167	0.0001023	N/D	N/D
Ethylbenzene	3560	500000	0.3751531	0.8730189	0.539063	N/D	N/D
Methyl Bromide	10	500000	0.3751531	0.8730189	0.539063	N/D	N/D
Methyl Chloride	10	500000	0.3751531	0.8730189	0.539063	N/D	N/D
Methylene Chloride	171	500000	0.3751531	0.8730189	0.539063	N/D	N/D

---

(1) Destruction Removal Efficiency = 99.99%

(2) As specified in the "Florida Air Toxics Permitting Strategy - Appendix A".
N/D = Not Defined for this averaging time in the "Florida Air Toxics Permitting Strategy - Appendix A"

(3) 1,3-Dichloropropylene will be controlled through prequalification review
at the processing location to ensure that it is not inappropiately blended into the fuel.

TABLE VII-2A

EVALUATION OF NO-THREAT LEVELS - ORGANIC COMPOUNDS (continued)

Compound	HWF Concentration (ppm)		Assumed[1] Emission Rate (lb/hr)	Maximum Groundlevel Concentration (μg/cu.m.)		No-Threat Level[2] (μg/cu.m.)	
	Typical	Assumed		1-hour	3-hour	1-hour	3-hour
1,1,2,2-Tetrachloroethane	10	500000	0.3751531	0.8730189	0.539063	N/D	N/D
Tetrachloroethylene	225	500000	0.3751531	0.8730189	0.539063	N/D	N/D
Toluene	9500	500000	0.3751531	0.8730189	0.539063	N/D	N/D
1,1,1-Trichloroethane	512	500000	0.3751531	0.8730189	0.539063	N/D	N/D
1,1,2-Trichloroethane	10	500000	0.3751531	0.8730189	0.539063	N/D	N/D
Trichloroethylene	50.9	500000	0.3751531	0.8730189	0.539063	N/D	N/D
Trichlorofluoromethane	10	500000	0.3751531	0.8730189	0.539063	N/D	N/D
Vinyl Chloride	10	500000	0.3751531	0.8730189	0.539063	N/D	N/D

---

(1) Destruction Removal Efficiency = 99.99%

(2) As specified in the "Florida Air Toxics Permitting Strategy - Appendix A".
N/D = Not Defined for this averaging time in the "Florida Air Toxics Permitting Strategy - Appendix A"

TABLE VII-3

EVALUATION OF NO-THREAT LEVELS - METAL COMPOUNDS

	Fuel Concentration (ppm)				Maximum Groundlevel Concentration (μg/cu.m.)			No-Threat Level(2) (μg/cu.m.)		
Compound	**Liquid HWF**	**Non-Pumpable HWF**	**Coal**	**Emission(1) Rate (lb/hr)**	**8-hour**	**24-hour**	**Annual**	**8-hour**	**24-hour**	**Annual**
Antimony	100	200	0.0	0.00411	0.0039652	0.0016456	0.0001715	5.0	1.2	N/D
Barium	4000	12000	136.3333	0.00853	0.0082181	0.0034106	0.0003555	5.0	1.2	N/D
Lead	4000	10000	1.7	0.04305	0.0414933	0.0172202	0.0017953	1.5	0.36	0.09
Mercury	5	7.5	0.0	0.02182	0.0210332	0.0087290	0.0009100	0.1	0.024	N/D
Silver	300	600	0.0	0.01791	0.0172631	0.0071644	0.0007469	N/D	N/D	3.0
Thallium	50	100	0.0	0.00355	0.0034254	0.0014215	0.0001482	N/D	N/D	0.3
Arsenic	5	7.5	5.8233	0.00002	0.0000161	0.0000067	0.0000007	2.0	0.5	0.0002
Cadmium	250	500	0.0	0.01166	0.0112341	0.0046623	0.0004860	0.5	0.12	0.0006
Chromium	3000	6000	16.5333	0.00966	0.0093114	0.0038643	0.0004028	0.5	0.12	N/D
Beryllium	8	10	1.3333	0.000157	0.0001517	0.0000629	0.0000065	0.02	0.005	0.0004

---

(1) As determined in Section V of the application.

(2) As specified in the "Florida Air Toxics Permitting Strategy - Appendix A".
N/D = Not Defined for this averaging time in the "Florida Air Toxics Permitting Strategy - Appendix A"

TABLE VII-3A

EVALUATION OF NO-THREAT LEVELS - METAL COMPOUNDS

	Fuel Concentration (ppm)			Emission(1) Rate (lb/hr)	Maximum Groundlevel Concentration (μg/cu.m.)		No-Threat Level(2) (μg/cu.m.)	
Compound	Liquid HWF	Non-Pumpable HWF	Coal		1-hour	3-hour	1-hour	3-hour
Antimony	100	200	0.0	0.00411	0.009564	0.005906	N/D	N/D
Barium	4000	12000	136.3333	0.00853	0.019850	0.012257	N/D	N/D
Lead	4000	10000	1.7	0.04305	0.100182	0.061859	N/D	N/D
Mercury	5	7.5	0.0	0.02182	0.050777	0.031354	N/D	N/D
Silver	300	600	0.0	0.01791	0.061678	0.025735	N/D	N/D
Thallium	50	100	0.0	0.00355	0.008261	0.005101	N/D	N/D
Arsenic	5	7.5	5.8233	0.00002	0.000047	0.000029	N/D	N/D
Cadmium	250	500	0.0	0.01166	0.027134	0.016754	N/D	N/D
Chromium	3000	6000	16.5333	0.00966	0.011480	0.013881	N/D	N/D
Beryllium	8	10	1.3333	0.000157	0.000365	0.000226	N/D	N/D

---

(1) As determined in Section V of the application.

(2) As specified in the "Florida Air Toxics Permitting Strategy - Appendix A".
N/D = Not Defined for this averaging time in the "Florida Air Toxics Permitting Strategy - Appendix A"

Question 8

8. **Since the net emissions increase per pollutant in Table V-5 are so close to the PSD significant levels contained in F.A.C. Chapter 17-2, Table 500-2, what reasonable assurances can you provide the Department that these levels will not be exceeded? Please explain in detail.**

Calculations provided in the Application and used to estimate potential emissions were conducted based on maximum levels of contaminants required by the fuel specification (Table III-5). All calculations were conducted in order to limit the fuel specification to comply with the Florida Air Toxics Permitting Strategy as well as PSD and NAAQS requirements.

No significant increase in the levels for the pollutants listed in Table V-5 are expected. This conclusion is based on the following:

(1) For the case of Sulfur Dioxide, Lead, Mercury and Beryllium, the hazardous waste fuel limitations were based on a "mass balance" approach to meet the PSD Significant Emissions Increase Criteria.

(2) For the case of Carbon Monoxide, Nitrogen Dioxide, VOC, and Particulates, the proposed potential emissions are based on testing conducted by EPA and other cement kiln/hazardous waste fuel facilities.

A more detailed discussion on the justification for the proposed potential emissions are presented below for each pollutant:

(a) CARBON MONOXIDE (CO)

CO emissions from dry-process cement kilns are strongly based on the oxygen availability in the kiln and the combustion efficiency in the process which includes the time/temperature requirements for the conversion of CO to CO_2. EPA data in Reference 3 states that baseline testing (no hazardous waste fuel) on dry-process kilns achieved CO levels of 35 to 40 ppm, while hazardous waste fuel burning results showed CO levels of 39 ppm. Further, they state "The difference between CO concentrations during the baseline and waste fuel test conditions is not significant."

(b) NITROGEN DIOXIDE (NO_x)

The NO_x concentrations in dry-process cement kilns is strongly dependent on excess air availability during the combustion process. In general, increases in excess air (O_2) yield corresponding increases in NO_x emissions. It is anticipated during the burning of hazardous waste fuel that NO_x emissions will decrease due to better distribution of heat release and less fixation of atmospheric nitrogen. EPA (Reference 3) states that "NO_x emissions are not obviously affected by burning waste fuels." Testing data in Reference 4 shows a reduction in NO_x emissions when firing liquid waste fuels when compared to firing coal only.

TABLE III-5

SPECIFICATION FOR HAZARDOUS WASTE FUELS (HWF)

	Liquid HWF	Solid HWF
Heat Content, minimum	10,000 Btu per lb	5,000 Btu per lb
Suspended Solids, maximum	30 percent	N/A
Sulfur, maximum	1 percent maximum	1 percent maximum
Halogens	5 percent	5 percent
Inorganic Acids and Bases	Extractable pH between 4.0 and 11.0	Extractable pH between 4.0 and 11.0
Water, maximum	1 percent as separate phase	No free standing liquid
Metals, maximum each		
Cadmium	250 ppm	1,000 ppm
Chromium	3,000 ppm	4,000 ppm
Lead	4,000 ppm	8,000 ppm
Barium	4,000 ppm	12,000 ppm
Antimony	See Note	See Note
Arsenic	See Note	See Note
Beryllium	See Note	See Note
Mercury	See Note	See Note
Silver	See Note	See Note
Thallium	See Note	See Note
PCB's	Less than 50 ppm	Less than 50 ppm

NOTE: This specification is subject to FDER Air Quality Section Review and is subject to change.

(c) SULFUR DIOXIDE (SO_2)

SO_2 emissions should not increase since the fuel specification limits the Sulfur content of the hazardous waste fuel based in terms of "lb of S/10^6 Btu" which is consistent with the existing coal input. This approach limits the Sulfur mass input (lb/hr) to the kiln to the existing rate and, therefore, no significant increase in SO_2 emissions are expected.

(d) OZONE (VOC)

VOC emissions for this process are dependent on the process combustion efficiency. Due to the high temperatures and long retention time, VOC emissions are not expected to increase.

EPA (Reference 3) states that total hydrocarbon testing results showed average results of 2 to 4 ppm for a dry-process kiln during baseline operation compared to an average of 5 ppm for three waste fuel burn cases.

Also, testing results in Reference 4 (Table II) showed a significant decrease in hydrocarbons (as measured by Method 25) when burning liquid waste fuels as compared to coal burning in the baseline case.

(e) LEAD, MERCURY AND BERYLLIUM

The proposed metal increases, as presented in Table V-5, are based on; (1) hazardous waste fuel concentration limits, and (2) metal removal efficiencies, as stated in Table V-4 (which has been attached for convenience). These metal removal efficiencies are based on testing results from Southdown, Inc. A summary of Southdown, Inc. test results for metal removal and organic compound destruction are presented in Reference 5.

TABLE V-4

EVALUATION OF METAL EMISSIONS

	Antimony	Barium	Lead	Mercury	Silver	Thallium	Arsenic	Cadmium	Chromium	Beryllium
Liquid HWF Concentration (ppm)	100	4000	4000	5	300	50	5	250	3000	8
Non-Pumpable HWF Concentration (ppm)	200	12000	10000	7.5	600	100	7.5	500	6000	10
Maximum HWF Input (ton/yr)	4.20933	252.56000	210.46667	0.16091	12.62800	2.10467	0.15785	10.52333	126.28000	0.23642
Maximum HWF Input (lb/hr)	1.02667	61.60000	51.33333	0.03925	3.08000	0.51333	0.03850	2.56667	30.80000	0.05766
Coal Concentration (ppm)	0.0	136.33333	1.7	0.0	0.0	0.0	5.8233333	0.0	16.533333	1.3333333
Coal Input (ton/yr)	0.0	12.26746	0.15297	0.00000	0.0	0.0	0.52399	0.0	1.48769	0.10810
Coal Input (lb/hr)	0.0	2.99206	0.03731	0.00000	0.0	0.0	0.12780	0.0	0.36285	0.02636
System Removal Efficiency	99.5993%	99.9868%	99.9162%	44.4000%	99.4185%	99.3077%	99.9899%	99.5459%	99.9690%	99.8126%
HWF Emissions (lb/hr)	0.00411	0.00813	0.04302	0.02182	0.01791	0.00355	0.00000	0.01166	0.00955	0.00011
HWF Emissions (lb/yr)	33.73360	66.67584	352.74213	178.93720	146.86364	29.14121	0.03189	95.57291	78.29360	0.88609
Coal Emissions (lb/hr)	0.0	0.00039	0.00003	0.00000	0.0	0.0	0.00001	0.0	0.00011	0.00005
Coal Emissions (lb/yr)	0.0	3.23861	0.25637	0.00000	0.0	0.0	0.10585	0.0	0.92237	0.40515
Estimated Potential Emissions (lb/hr)	0.00411	0.00853	0.04305	0.02182	0.01791	0.00355	0.00002	0.01166	0.00966	0.000157
Estimated Potential Emissions (lb/yr)	33.73360	69.91445	352.99851	178.93720	146.86364	29.14121	0.13773	95.57291	79.21597	1.29124
Estimated Potential Emissions (ton/yr)	0.01687	0.03496	0.17650	0.08947	0.07343	0.01457	0.00007	0.04779	0.03961	0.0006456

TABLE V-5

PSD REGULATED EMISSIONS SUMMARY

Compound	Current Actual Emissions (lb/hr)	Current Actual Emissions (T/yr)	Proposed Potential Emissions (lb/hr)	Proposed Potential Emissions (T/yr)	Net Emissions Increase (T/yr)	Significant* Emissions Increase (T/yr)
Carbon Monoxide	41.1	162.3	64.0	262.2	99.9	100
Nitrogen Dioxide (NO_X)	158.4	625.4	162.3	665.3	39.9	40
Sulfur Dioxide	1.8	7.1	11.5	47.0	39.9	40
Ozone (VOC)	5.4	21.3	7.4	31.2	9.9	40
Particulate	7.7	30.4	13.5	55.3	24.9	25
Lead	0.00003	0.00014	0.04305	0.17650	0.17636	0.6
Mercury	0.0	0.0	0.02182	0.08947	0.08947	0.1
Beryllium	0.00006	0.0002459	0.000157	0.0006456	0.0003997	0.0004

* From Table 500-2 DER 17-2.500 (2)(e)2

Question 9

9. **Please explain in detail the facility's procedures for an emergency shutdown of the No. 2 Lime Kiln (i.e., burn out, fan loss, etc.) for each type of the hazardous waste fuels (i.e., liquid, solid, etc.).**

10. **Will there be a system electrical interlock utilized in an emergency shutdown of the No. 2 Lime Kiln? Please explain in detail.**

The response to Questions 9 and 10 have been combined since both emergency conditions and system interlock would be involved in the kiln system shutdown.

Kiln shutdown during the burning of HWF can occur for the following reasons:

1) System interlock shutdown due to process parameters.
2) System interlock shutdown due to emission monitoring parameters.
3) Emergency shutdown due to process equipment malfunction.
4) Emergency shutdown due to other factors such as power interruption or lightening.

In general, it should be stated that during any emergency or interlock, shutdown will result in HWF feed cut-off and will be implemented in full compliance with the BIF Regulations which the EPA adopted on December 31, 1990. These regulations require the installation of Continuous Emission Monitors (CEM's) for CO, HC, SO_2, NO_x and O_2. In the event that combustion conditions in the kiln deteriorate, for example the hourly rolling average of HC exceeds 20 ppm (corrected to 7% O_2), HWF feed shutoff will occur. Also, if the gas temperature at the feed end of the kiln falls below 1,800°F for more than 5 minutes, the HWF feed will be shut off.

In conjunction with the above, an "operating window" for the FM&M No. 2 Kiln, which defines the kiln operating conditions during HWF burning, will be defined during a series of test burns, as stipulated in the BIF regulations. Should the kiln system drift outside of this "operating window," the HWF feed will be shut off and operations would proceed as required by BIF regulations.

A more detailed description and discussion of the FM&M No. 2 Kiln emergency shutdown procedure and electrical interlock system, are presented in Attachment 1 and Attachment 2, respectively. These attachments are included in the response to Question 10.

In conclusion, it should be stated that regardless of the reasons for shutdown, HWF feed (solid or liquid) will be cut-off, and in most cases the kiln combustion process will continue as long as possible to destroy any feed residuals. In the worst case, where solid feed is terminated but the kiln combustion process ceases, the "thermal inertia" of the kiln will continue to maintain temperature (> 1,800°F) for at least one hour after shutdown (Attachment 1, Figure 1). This will ensure thermal destruction of any feed residuals under the worst case conditions.

Question 10

9. **Please explain in detail the facility's procedures for an emergency shutdown of the No. 2 Lime Kiln (i.e., burn out, fan loss, etc.) for each type of the hazardous waste fuels (i.e., liquid, solid, etc.).**

10. **Will there be a system electrical interlock utilized in an emergency shutdown of the No. 2 Lime Kiln? Please explain in detail.**

The response to Questions 9 and 10 have been combined since both emergency conditions and system interlock would be involved in the kiln system shutdown.

Kiln shutdown during the burning of HWF can occur for the following reasons:

1) System interlock shutdown due to process parameters.

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ATTACHMENT 1

KILN NO. 2 EMERGENCY SHUTDOWN PROCEDURES

While there normally are occasional interruptions in the operation of the kiln over the course of a year, very few would be classified as emergencies. In most cases, there exists prior knowledge of conditions which lead to these shutdowns and several hours are available to plan the exact time to take the kiln down. This allows sufficient time to stop introducing waste fuels into the system and to maintain full operating temperatures until they are destroyed before shutting down the process.

The attached #2 KILN SHUTDOWN SUMMARY shows that we had 42 interruptions of this process in 1990. Of these, only the nine Florida Power interruptions would have come with no warning and would be classified as emergency shutdowns. This is a fairly common occurrence in the summer months due to severe electrical storms which are typical of this climate. These interruptions are usually brief and the kiln is back on line in a matter of minutes.

Procedures will be in place and conditions will ensure that in the event of a nonemergency shutdown of the #2 kiln system the feed of both solid and liquid hazardous waste fuels will be shut off for a sufficient length of time prior to taking the process down to allow for complete purging of the system. On the infrequent occasions when this is not possible, the attached temperature charts and heat profiles show that the thermal inertia of the kiln system will provide sufficient heat to destroy all waste fuels that are in the system at the time.

Since it is impossible to measure temperature directly in the burning zone of the kiln, a correlation must be made to temperatures which are measurable to derive burning zone temperature during a shutdown period. For this purpose we will use a temperature which is measured in the lower stage of the preheater. This temperature averages approximately 1650°F when the kiln is in full production. It is a fact that the burning zone material temperature must be in excess of 2450°F to produce clinker for Portland cement. The attached graph titled KILN TEMPERATURE PROFILE shows the correlation between these two temperatures during a typical cool-down period. It clearly shows that we would maintain burning zone temperatures in excess of 1800°F for one hour after the fire is taken out of the kiln and in excess of 1200°F after two hours. This would be more than sufficient time and temperature for destruction of any waste fuels in the system.

The attached strip charts show the typical drop in the lower preheater temperature during several kiln shutdowns. The green, highlighted line on each of the charts is the recorded temperature. The scale on the strip charts is from 0 to 2200°F horizontally and one hour per inch vertically. The burning zone temperature can then be derived from the KILN TEMPERATURE PROFILE graph.

The following list of procedures details steps that are taken immediately following emergency shutdowns of #2 kiln system when there is no prior knowledge or time to prepare.

#2 KILN EMERGENCY SHUTDOWN PROCEDURES

1. STOP FEEDING OF ALL SOLID AND LIQUID HAZARDOUS WASTE FUELS IMMEDIATELY IF NOT PREVIOUSLY STOPPED BY INTERLOCKS.

2. STOP THE KILN DRIVE MOTOR AND CONNECT AUXILIARY DRIVE ENGINE FOR ROTATING KILN DURING THE SHUTDOWN.

3. REDUCE THE DRAFT ON THE KILN BY CLOSING THE DAMPER (M-2604) ON THE PREHEATER I.D. FAN (M-2602) TO MINIMUM OPENING REQUIRED TO MAINTAIN NEGATIVE PRESSURE.

4. REDUCE AIR FLOW ON CLINKER COOLER UNDERGRATE FANS TO MINIMUM TO MINIMIZE THERMAL SHOCK AND HEAT LOSS IN THE KILN.

5. KEEP A FIRE IN THE KILN AND MAINTAIN OPERATING TEMPERATURES IN THE BURNING ZONE UNTIL REPAIRS ARE MADE UNLESS THE NATURE OF THE SHUTDOWN MAKES THIS IMPOSSIBLE OR UNLESS IT HAS BEEN DETERMINED THAT A FULL COOL-DOWN WILL BE REQUIRED.

6. TURN THE KILN 1/3 OF A ROTATION EVERY 10 MINUTES WITH AUXILIARY DRIVE ENGINE UNTIL READY TO START BACK UP.

7. IF FULL COOL-DOWN IS REQUIRED THEN THE FREQUENCY OF KILN TURNS IS INCREASED BY FIVE MINUTES EVERY HOUR UP TO A MAXIMUM OF 30 MINUTES BETWEEN TURNS FOR FIRST 24 HOURS.

NOTE: Hazardous waste fuels will be utilized only in full production operation. Interlock system described in response to question 10 will insure that they will not be used for kiln warmups or in standby firing modes.

SUMMARY OF ALL #2 KILN SHUTDOWNS FOR 1990

DATE	REASON FOR SHUTDOWN	HOURS
16-Jan-90	VORTEX PLUGGED	5.7
17-Jan-90	M-2907 COOLER FAN (REPLACE WHEEL)	2.5
29-Jan-90	REFRACTORY REPAIRS	212.4
08-Feb-90	M-2864 COAL FAN DAMPER CHANGE-OUT	1.4
13-Feb-90	COAL MILL BEARING TEMP. (7.69.1)	0.1
15-Feb-90	STIFFENER RING BOLTS	0.5
01-Mar-90	COOLER GRATE OUT	4.5
02-Mar-90	MCC-13 TRANSFORMER OUT	2.4
12-Mar-90	REFRACTORY REPAIRS	52.4
16-Mar-90	FLORIDA POWER	0.1
03-Apr-90	LOST POWER ON MCC-13	0.2
08-Apr-90	M-2514 AEROPOL BLOWER	3.9
09-Apr-90	M-2514 AEROPOL BLOWER	2.7
12-Apr-90	COOLER GRATE OUT	4.1
29-Apr-90	MCC-9 TRANSFORMER JOB (ELECTRICAL DEPT.)	0.4
	NO DOWN TIME FOR MAY	
03-Jun-90	FLORIDA POWER INTERRUPTION	0.1
06-Jun-90	COOLER GRATE OUT	6.4
16-Jun-90	CLINKER COOLER (HYDRAULIC OIL COOLER LEAKING)	2.5
22-Jun-90	CLINKER COOLER (BAD DRIVE CYLINDER)	4.3
24-Jun-90	REFRACTORY REPAIRS	108.8
08-Jul-90	FLORIDA POWER INTERRUPTION	0.1
10-Jul-90	FLORIDA POWER INTERRUPTION	0.1
11-Jul-90	FLORIDA POWER INTERRUPTION	0.2
13-Jul-90	M-2925 CLINKER BREAKER CHUTE PLUGGED	5.4
15-Jul-90	REFRACTORY REPLACEMENT	90.6
18-Aug-90	FLORIDA POWER	0.1
23-Aug-90	FLORIDA POWER	1.5
02-Sep-90	FLORIDA POWER INTERRUPTION	0.2
26-Sep-90	REPLACE STIFFENER RING BOLT	0.5
02-Oct-90	REPLACE STIFFENER RING BOLT	0.4
06-Oct-90	REFRACTORY REPLACEMENT	144.6
18-Oct-90	COOLER GRATE REPLACEMENT	3.1
21-Oct-90	FLORIDA POWER INTERRUPTION	0.1
06-Nov-90	PLUG BOLT HOLE IN COAL MILL	0.1
08-Nov-90	TIGHTEN STIFFENER BOLT RING	0.3
09-Nov-90	M-2925 CLINKER BREAKER	3.0
14-Nov-90	REPLACE COOLER GRATE	4.0
21-Nov-90	REPLACE COOLER GRATE	4.0
30-Nov-90	DOWN WHEN #2 RAW MILL STARTED (CROSS TIE WAS IN)	0.3
03-Dec-90	M-2701 DRIVE MOTOR	10.5
07-Dec-90	M-2701 DRIVE MOTOR	4.8
20-Dec-90	REFRACTORY REPAIRS	270.5

FIGURE 1

KILN TEMPERATURE PROFILES

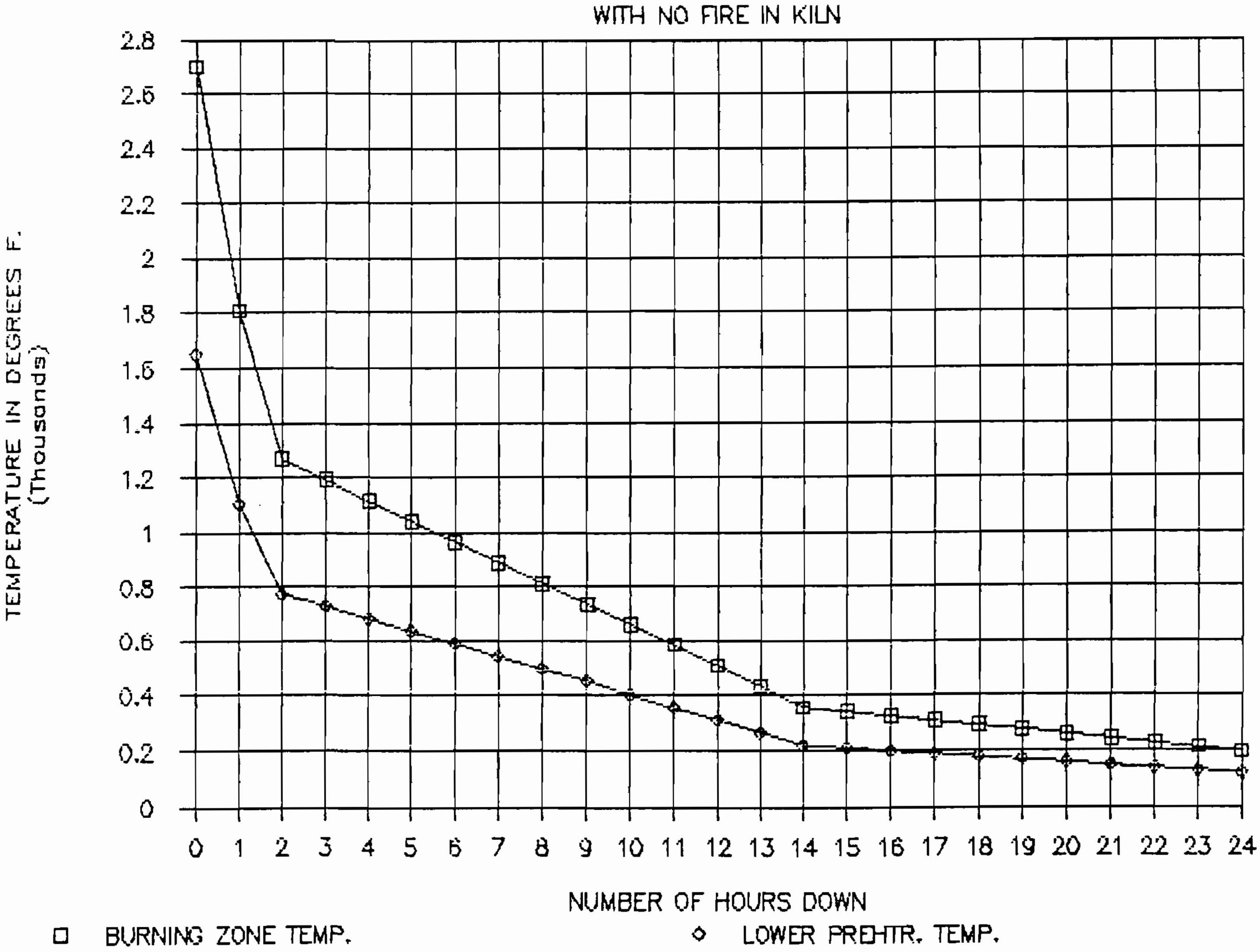


FIGURE 2

LOWER STAGE PREHEATER TEMPERATURE
(TEMPERATURE IN °F)

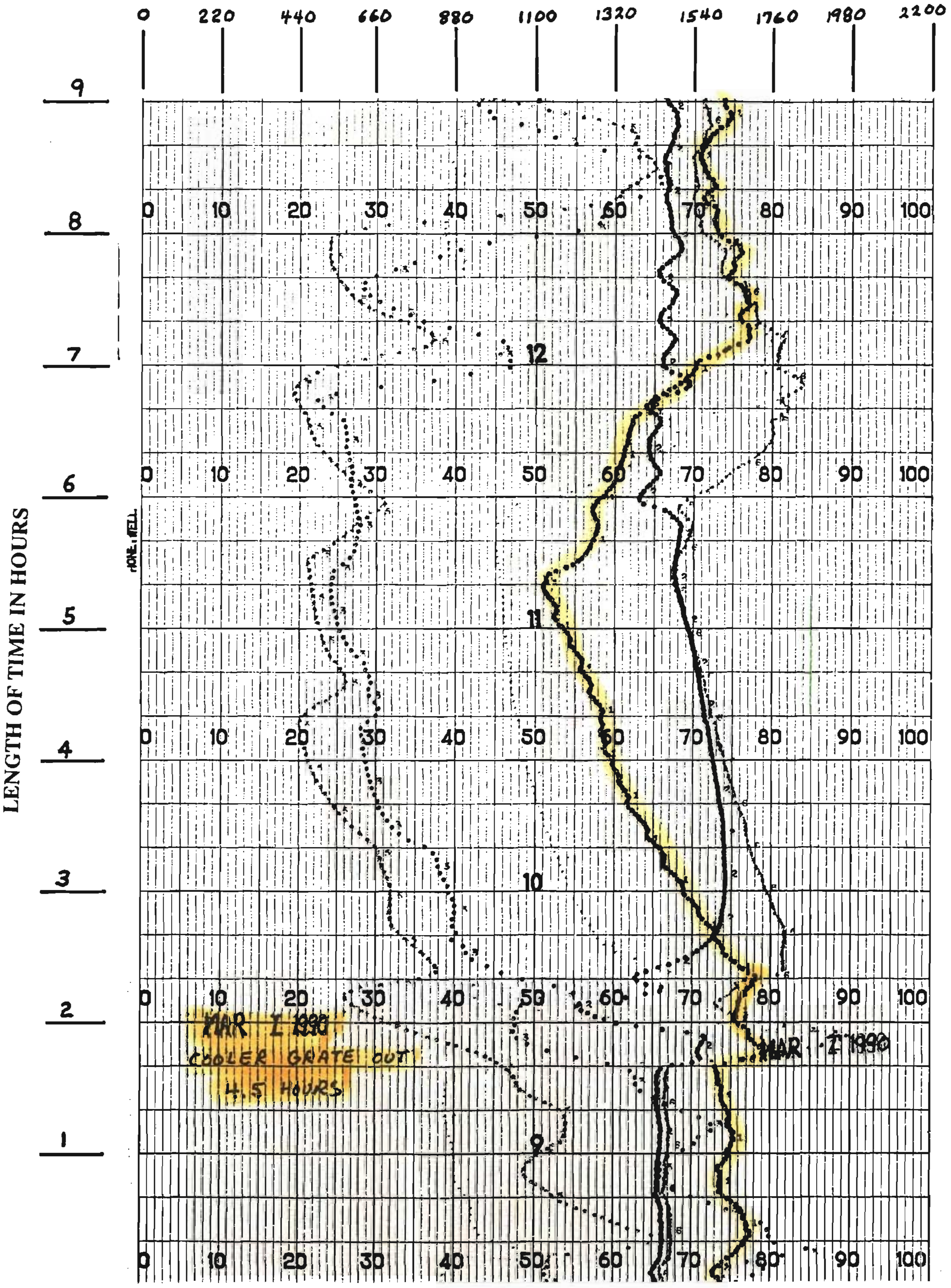


FIGURE 3

LOWER STAGE PREHEATER TEMPERATURE
(TEMPERATURE IN °F)

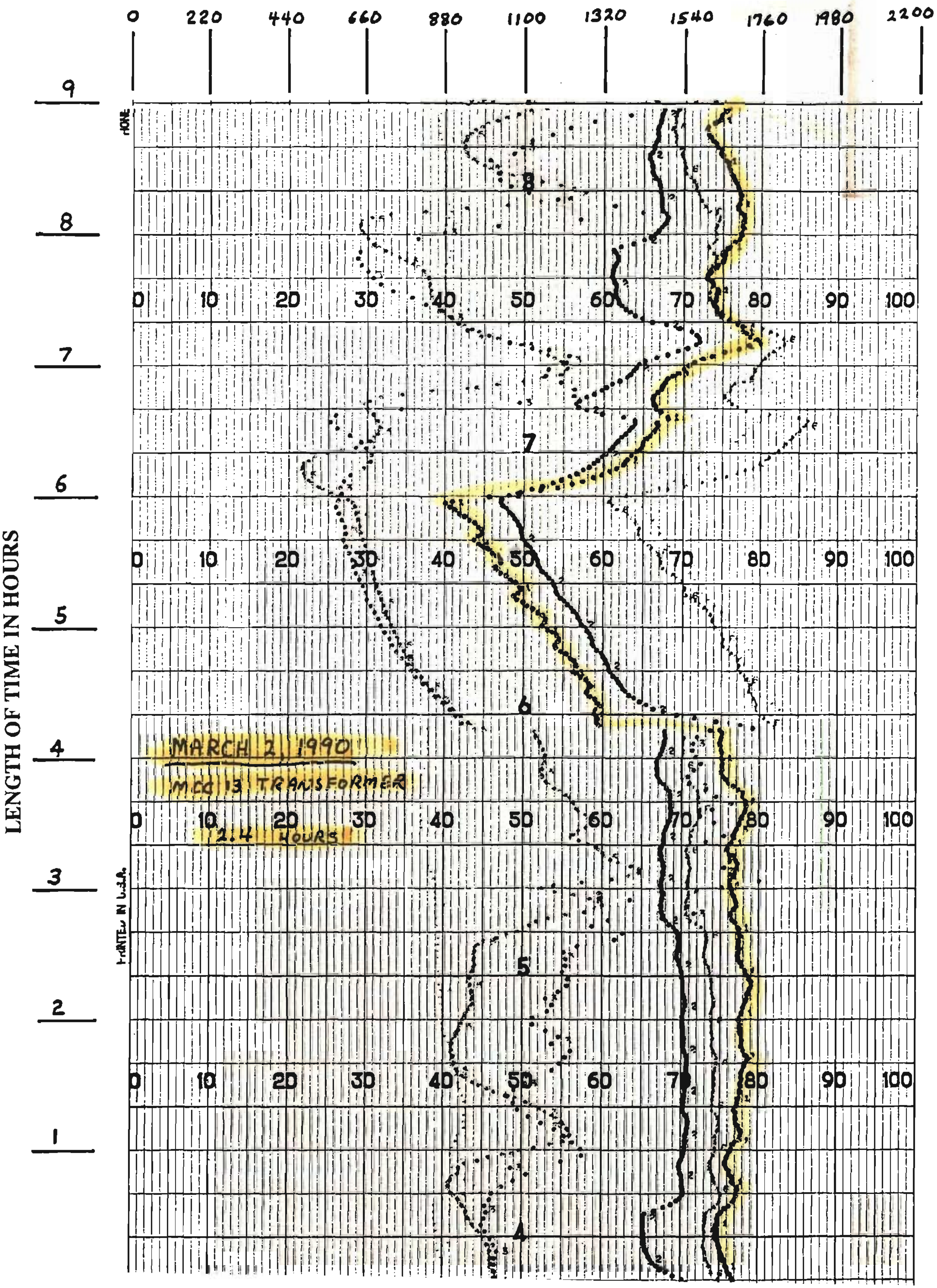
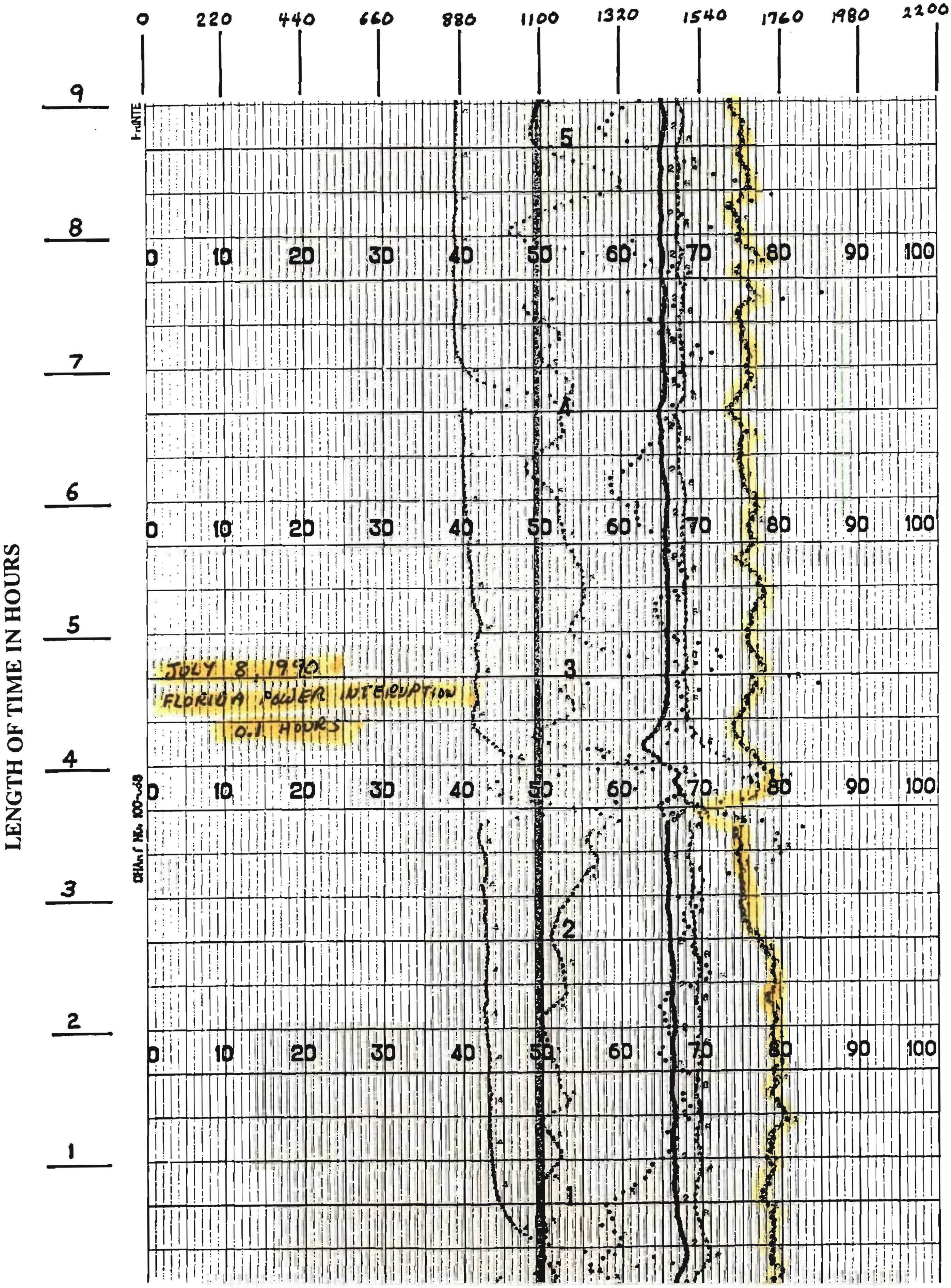


FIGURE 4

LOWER STAGE PREHEATER TEMPERATURE
(TEMPERATURE IN °F)



ATTACHMENT 2

KILN NO. 2 ELECTRICAL INTERLOCKS SYSTEM

System electrical interlocks are now and will continue to be utilized in emergency shutdown situations as well as during normal operating conditions on #2 kiln. The following is a detailed explanation of each of the interlocks in the present system as well as those which will be added specifically for firing with hazardous waste fuels.

1. Kiln/Mill Baghouse Inlet Temperature

This interlock already exists in the present #2 kiln system and is intended to prevent damage to the baghouse filter bags due to exposure to extremely high temperatures. This temperature is monitored with two thermocouples, each serving as a backup to the other. An audible alarm is sounded in the control room as the baghouse temperature approaches a threatening level. The Process Supervisor must then take immediate action to get the situation under control. If he is unable to do so and the temperature continues to rise then the firing system is shut down automatically to prevent equipment damage. The low temperature shutdown is designed to cause the system to "fail safe" if either thermocouple fails due to an open circuit giving a falsely low temperature reading. This insures that the system cannot be operated without properly functioning monitoring devices.

2. Clinker Cooler Baghouse Inlet Temperature

This interlock is also in use in the present system and is designed identical to the one described above and serves the same purpose of protecting the filter bags from damage due to exposure to extremely high temperatures.

3. Preheater I.D. Fan Inlet Temperature

This interlock also exists in the present system and is intended to prevent damage to the preheater fan due to exposure to extremely high temperatures. An audible alarm is sounded in the control room when the fan temperature reaches the initial alarm point. The Process Supervisor must then take immediate action to get the situation under control. If he is unable to do so and the temperature continues to rise then the firing system is shut down automatically to prevent fan damage.

4. Preheater I.D. Fan Exit Pressure

This interlock already exists and is designed to shut the system down if the kiln/mill baghouse shows signs of inability to handle the volume of gas currently being used in the process. The baghouse should be able to maintain safely negative pressures at the fan exhaust duct. If not, it shuts down firing systems so that excessive air volume can be reduced.

5. **Combustibles**

This is an existing interlock and is designed to assure that a sufficient amount of combustion air is available for complete combustion of fuels which are being fired in the kiln. Any deficiencies in oxygen will cause formation of carbon monoxide which is a highly combustible compound. If CO is detected at levels of 1% or more then the firing systems are shut down.

6. **Coal Mill I.D. Fan Shutdown**
7. **Preheater I.D. Fan Shutdown**
8. **Kiln/Mill Baghouse Exhaust Fan Shutdown**

All three of these fans are vital to kiln firing system and firing systems cannot be operated unless they are running.

9. **Waste Fuel Atomizing Air Pressure Low**

Waste fuels will be air atomized as they are introduced into the kiln to sustain rapid and complete combustion. If the required pressure is not indicated then the waste fuels will be shut off.

10. **Kiln Exit Gas Temperature Low**

Because it is our intention to introduce hazardous waste fuels into the process only when we have sufficient temperatures for rapid and complete combustion, we will install interlocks which will shut down waste fuel firing if we drop below minimum temperature requirements in this area.

11. **Coal Mill Drive Motor Shutdown**

Because it is our intention to use waste fuels only when operating at normal production rates and not during warmup and standby firing modes, we will install interlocks that allow for waste fuel firing only if the coal mill is running. Since the coal mill runs only during normal operating conditions this would assure the same for waste fuels.

12. **Manual-Only Restart**

Initial start-up of waste fuel firing system and any subsequent restart of the system would require the conscious action of the Process Supervisor. The system will not restart automatically following interruptions due to interlock systems, etc.

#2 KILN ELECTRICAL INTERLOCK SUMMARY

	INTERLOCK	ALARM	ACTION TAKEN
1	PREHEATER I.D.FAN INLET TEMPERATURE	800 °F	AUDIBLE ALARM ON C.O.P. IN CONTROL ROOM
		840 °F	COAL AND WASTE FUELS SHUT OFF
2	KILN/MILL BAGHOUSE INLET TEMPERATURE	520 °F	AUDIBLE ALARM ON C.O.P. IN CONTROL ROOM
		540 °F	COAL AND WASTE FUELS SHUT OFF
		30 °F	COAL AND WASTE FUELS SHUT OFF (FAIL SAFE)
3	CLINKER COOLER BAGHOUSE INLET TEMPERATURE	400 °F	AUDIBLE ALARM ON C.O.P. IN CONTROL ROOM
		440 °F	COAL AND WASTE FUELS SHUT OFF
		30 °F	COAL AND WASTE FUELS SHUT OFF (FAIL SAFE)
4	PREHEATER I.D. FAN EXIT PRESSURE	+5"WC	FAN MOTOR, COAL AND WASTE FUELS SHUT OFF
5	COMBUSTIBLES	1%	COAL MILL FEEDER AND WASTE FUELS SHUT OFF
6	COAL MILL I.D. FAN SHUTDOWN	MOTOR STOPS	COAL AND WASTE FUELS SHUT OFF
7	PREHEATER I.D. FAN SHUTDOWN	MOTOR STOPS	COAL AND WASTE FUELS SHUT OFF
8	KILN-MILL BAGHOUSE EXHAUST FAN SHUTDOWN	MOTOR STOPS	COAL AND WASTE FUELS SHUT OFF
9	LOW ATOMIZING AIR PRESSURE	UNKNOWN	WASTE FUELS SHUT OFF
10	KILN EXIT GAS TEMPERATURE LOW	1200°F	WASTE FUELS SHUT OFF
11	COAL MILL DRIVE MOTOR	MOTOR STOPS	WASTE FUELS SHUT OFF
12	MANUAL RE-START	N/A	FIRING OF WASTE FUELS NOT AUTOMATIC WHEN ALARM CLEARS

Question 11

11. **Please provide a detailed cost analysis for an afterburner/incinerator, or an equivalent, that meets the criteria of 40 CFR 264.343 (July, 1988 version) and could be retrofitted to the No. 2 Lime Kiln.**

Attached is a cost analysis conducted using the <u>EAB Control Cost Manual</u> EPA 450/5-87-001A, February, 1987. Design criteria of 2,000°F @ 2.0 seconds retention time would require three parallel thermal oxidizer chambers approximately 22 feet in diameter and 60 feet long to provide additional secondary combustion of kiln exhaust gases. This analysis demonstrates that the estimated total capital investment for a three-component thermal oxidizer system sized to operate with the No. 2 kiln would be $1,532,582.00. Operating costs would exceed $60,000,000.00 annually.

FLORIDA MINING AND MATERIALS
AFTERBURNER DESIGN CALCULATIONS

Flow Conditions @ Baghouse Exit:

Total Flow Rate = 300,000 acfm @ 380°F

H_2O = 10%

= 30,000 acfm @ 380°F

Specific Volume of H_2O @ 380°F = 34.08 cf/lb

H_2O Mass Flow = (30,000 cf/min) x (50 min/hr) ÷ (34.08 cf/lb)

= 52,817 lb/hr

Dry Gas Flow Rate = 199,000 dscfm

Specific Volume Dry Gas = 13.3 cf/lb

Dry Gas Mass Flow = (199,000 cf/min) x (60 min/hr) ÷ (13.3 cf/lb)

= 897,744 lb/hr

Enthalpy H_2O @ 380°F = 1202.38 Btu/lb

Enthalpy Dry Gas @ 380°F = 77.31 Btu/lb

Total Exhaust Gas Heat Content = [(897,744 lb/hr) x (77.31 Btu/lb)]

\+ [(52,817 lb/hr) x (1202.38 Btu/lb)]

= 132.91×10^6 Btu/hr

Afterburner Mass and Energy Balance

Assumptions:

Heat Loss = 5%

Operating Temperature = 2000°F

Combustion Air Inlet Temperature = 70°F

FLORIDA MINING AND MATERIALS
AFTERBURNER DESIGN CALCULATIONS

Results:

Total Flow Rate = 2,037,705 acfm @ 2000°F

Dry Gas Mass Flow = 1,709,950 lb/hr

H_2O Mass Flow = 164,658 lb/hr

Total Auxiliary Fuel Required = 1086 mmBtu/hr

Design Conditions:

Retention Time = 2 sec.

Velocity = 30 fps

Geometry = Vertical Cylinder

Case A - 2 Components
Case B - 3 Components

Total Volume Required = (2,037,705 cf/min) ÷ (60 min/sec) x (2 sec)

= 67,923.5 cf

CASE A (2 Components)

Component Volume = 67,923.5 cf ÷ 2

= 33,962 cf

Component Flow Rate = 2,037,705 acfm ÷ 2

= 1,018,852.5 acfm @ 2000°F

$$\text{Cross Sectional Area} = \pi \frac{D^2}{4}$$

= Flow Rate ÷ Velocity

$D = (\text{Flow Rate} \times 4 \div \pi \div \text{Velocity})^{1/2}$

$= (1{,}018{,}852.5 \text{ cf/min} \times 4 \div \pi \div 60 \text{ s/min} \div 30 \text{ fps})^{1/2}$

= 26.8 ft.

L = Velocity x Retention Time

= 30 fps x 2 s

= 60 ft.

FLORIDA MINING AND MATERIALS
AFTERBURNER DESIGN CALCULATIONS

CASE B (3 Components)

Component Volume = 67,923.5 cf ÷ 3

= 22641 cf

Component Flow Rate = 2,037,705 acfm ÷ 3

= 679,235 acfm @ 2000°F

$$\text{Cross Sectional Area} = \pi \frac{D^2}{4}$$

Flow Rate ÷ Velocity

$D = (679{,}235 \text{ cf/min} \times 4 \div \pi \div 60 \text{ s/min} \div 30 \text{ fps})^{1/2}$

= 21.9 ft.

L = Velocity x Retention Time

= 30 fps x 2 s

= 60 ft.

EQUIPMENT COST CALCULATIONS

CASE A:

Component Flow Rate = 1,018,853 acfm @ 2000°F

= 1,018,853 x (460 + 70) / (460 + 2000)

= 219,509 scfm

From Table 3-1. Equations for Incinerator Equipment Costs

EAB Control Cost Manual EPA 450/5-87-001A, February, 1987:

$\ln Eq = [14{,}402 - 992(\ln Q) + 70 (\ln Q)^2] (10^{-3})$

Where Eq = Equipment Cost (Each Component)

Q = Flow Rate (scfm)

FLORIDA MINING AND MATERIALS
AFTERBURNER DESIGN CALCULATIONS

ln Eq = [14,402 - 992 (12.3) + 70 (151.3)} (10^{-3})

= [14,402 - 12201.6 + 10591] (10^{-3})

= 12.8

Eq = $359,116 per component

Total Capital Equipment Cost = $718,232

Total Capital Investment = 1.9 (Total Equipment Cost)

= $1,364,641

<u>CASE B</u>:

Component Flow Rate = 679,235 acfm @ 2000°F

= 679,235 x (460 + 70) / (460 + 2000)

= 146,339 scfm

ln Eq = [14,402 - 992 (lnQ) + 70 $(\text{lnQ})^{2}$] (10^{-3})

= [14,402 - 992 (11.9) + 70 (141.5)] (10^{-3})

= [14,402 - 11805 + 9905] (10^{-3})

= 12.5

Eq = $268,874 per Component

Total Capital Equipment Cost = $806,622

Total Capital Investment = $1,532,582

FLORIDA MINING AND MATERIALS
AFTERBURNER DESIGN CALCULATIONS

ANNUAL OPERATING COSTS

Direct Operating Costs (From Table 3-3)

Operating Labor = 0.5 hr/shift
3 shifts/day
365 days/yr
= (0.5) (3) (365)
= 547.5 hr/yr @ 12.50 $/hr
= $6,843.75

Supervisory Labor = 15% of operating labor
= 82 hr/yr @ 12.50 $/hr
= $1,025.00

Maintenance Labor = 0.5 hr/shift
= 547.5 hr/yr @ 12.50 $/hr
= $6,843.75

Maintenance Materials = 100% of maintenance labor
= 6843.75

Utilities = 1086 mmBtu/hr
(Fuel oil - 144,800 Btu/gal @ 1 $/gal)
8200 hr/yr
= (7337.8 gal/hr) (8200 hr/yr)
= $60,170,270 /yr

TOTAL = $60,191,826.25

TABLE 3-3. SUGGESTED FACTORS FOR ESTIMATING INCINERATOR ANNUAL COSTS

Item	Suggested Factor
Direct Operating Costs	
Operating labor[a]	0.5 hr/shift
Supervisory labor[a]	15% of operating labor
Maintenance labor	0.5 hr/shift
Maintenance materials[a]	100% of maintenance labor
Replacement parts	Thermal incinerators: None Catalytic incinerators: (See eq. 3-12)
Utilities:	
Fuel	The amount of fuel required is calculated from Step 5 (Q_3) of Section 3.2.
Electricity[b,c]	Use the following Δ P values in estimating electricity requirements:
	Thermal incinerators = 4 in. water
	Catalytic incinerators = 6 in. water
	Heat exchange of
	35% = 4 in. water
	50% = 8 in. water
	70% = 15 in. water
	Ductwork and stack = As required
Indirect Operating Costs	
Overhead	60% of sum of operating, supervisory, and maintenance labor and maintenance materials
Administrative charges	2% X TCI[d]
Property tax	1% X TCI[d]
Insurance	1% X TCI[d]
Capital recovery cost[e]	CRFs X [TCI - 1.08 x C_{cat}]

[a] Reference 11.

[b] The total Δ P of an incinerator system is the sum of base (i.e., incinerator) Δ P + heat exchanger Δ P.

[c] An equation to calculate electricity requirements (kWh per hour) is given in Item 3 of Section 3.2.2.

[d] TCI = Total capital investment.

[e] The CRFs (system capital recovery factor) is a function of the equipment life (10 years, typically) and the opportunity cost of the capital (i.e., interest rate). For instance, for a 10-year life and a 10% interest rate, CRF_s = 0.1628.

Question 12

12. **Will the facility, under this proposal, be receiving and processing any TSCA substances, such as PCB's for example, that would require U.S. EPA approval? If so, please describe in detail and provide the approval from the U.S. EPA.**

The facility will not accept any TSCA substances. Table III-5, "Specification for Hazardous Waste Fuels" provides for limiting PCB content of waste fuels to a maximum of 50 ppm.

TABLE III-5

SPECIFICATION FOR HAZARDOUS WASTE FUELS (HWF)

	Liquid HWF	Solid HWF
Heat Content, minimum	10,000 Btu per lb	5,000 Btu per lb
Suspended Solids, maximum	30 percent	N/A
Sulfur, maximum	1 percent maximum	1 percent maximum
Halogens	5 percent	5 percent
Inorganic Acids and Bases	Extractable pH between 4.0 and 11.0	Extractable pH between 4.0 and 11.0
Water, maximum	1 percent as separate phase	No free standing liquid
Metals, maximum each		
Cadmium	250 ppm	1,000 ppm
Chromium	3,000 ppm	4,000 ppm
Lead	4,000 ppm	8,000 ppm
Barium	4,000 ppm	12,000 ppm
Antimony	See Note	See Note
Arsenic	See Note	See Note
Beryllium	See Note	See Note
Mercury	See Note	See Note
Silver	See Note	See Note
Thallium	See Note	See Note
PCB's	Less than 50 ppm	Less than 50 ppm

NOTE: This specification is subject to FDER Air Quality Section Review and is subject to change.

Question 13

13. **If available, please provide us with all pollutant stack test data from like and similar sources (i.e., raw material processed, size, etc.) burning similar type fuels that are proposed for the No. 2 Lime Kiln.**

Attached as References 1 through 6, are test reports from the following facilities burning hazardous waste fuels:

Reference 1) Ash Grove Foreman Cement Company
Kiln Number 2
Foreman, Arkansas

Reference 2) Ash Grove Cement Company
Kiln Number 2
Louisville, Nebraska

Also provided are the following technical references:

Reference 3) Summary of Testing at Cement Kilns Cofiring Hazardous Waste
Marvin Branscome, Wayne Westbrook
Research Triangle Institute
Research Triangle Park, North Carolina

Reference 4) Evaluation of Hazardous Waste Incineration in a Dry Process Cement Kiln
Gregory M. Higgins and Arthur J. Helmstetter, P.E.
SYSTECH Corporation
Xenia, Ohio

Reference 5) The Behavior of Metals in Cement Kilns
Michael Von Seebach and J. Bruce Tompkins
Presented at: Rock Product's
26th International Cement Seminar
New Orleans, Louisiana

Reference 6) Source Emission Survey of Southwestern Portland Cement Company
Kosmos Cement Division
Kiln Stack
Kosmosdale, Kentucky
Volume 1, September, 1990

A summary of the DRE data included in each of these references is provided in the response to Question 6.

REFERENCE 1

BEST AVAILABLE COPY

ENVIRONME
P.O. Box 59
Addison, TX 7
(214) 931-71

SOURCE EMISSIONS SURVEY
OF
ASH GROVE FOREMAN CEMENT COMPANY
KILN NUMBER 2
NORTH AND SOUTH STACKS
FOREMAN, ARKANSAS

OCTOBER 1988

FILE NUMBER 88-170

BEST AVAILABLE COPY

88-170

$^{lb}/_{hr}$

Cr 0.021
0.021
0.017
0.051
0.026
0.0[illegible]1
0.061
0.017

$\bar{X}$ = 0.03275

σ_{n-1} = 0.01562

Pb 0.035
0.069
0.169
0.077
0.177
0.073
0.021
0.012

$\bar{Y}$ = 0.0791

σ_{n-1} 0.077

SUMMARY OF RESULTS

Kiln Number 2

Run Number	Kiln Fuel Firing Rates: Coal (tons/hr)	Kiln Fuel Firing Rates: K Blend (tons/hr)	Kiln Fuel Firing Rates: SWDF (lbs/hr)	Kiln Feed Rate (tons/hr)	Particulate Matter Emissions (lbs/hr)	Particulate Matter Emissions (lbs/ton Kiln Feed)	Hydrogen Chloride Emissions (ppm)	Hydrogen Chloride Emissions (lbs/hr)	Volatile Organic Compounds Emissions (ppm)	Volatile Organic Compounds Emissions (lbs/hr)	Carbon Monoxide Emissions (ppm)	Carbon Monoxide Emissions (lbs/hr)	Trichlorobenzene DRE (%)
1	7.5	0	60.0	45.0	6.88	0.153	114.2	19.8	7	1.47	46	6.14	>99.9999
2	7.3	0	60.0	45.0	7.12	0.158	178.0	28.4	12	2.31	40	4.90	>99.9999
3	6.9	0	60.0	45.0	4.67	0.104	96.7	16.4	22	4.52	33	4.31	>99.9999
Average	7.2	0	60.0	45.0	6.22	0.138	129.6	21.5	14	2.77	40	5.12	>99.9999
4	2.0	5.9	62.4	46.7	19.40	- 0.415 -	112.4	17.2	6	1.11	42	4.93	>99.9999
5	2.0	7.4	74.1	53.7	12.14	0.226	115.4	21.5	12	2.70	282	40.42	>99.9999
6	2.0	6.5	80.0	53.0	26.76	0.505	106.4	19.7	7	1.56	51	7.25	>99.9999
Average	2.0	6.6	72.2	51.1	19.43	0.382	111.4	19.5	8	1.79	125	17.53	>99.9999
7	3.5	5.0	75.1	53.0	5.39	0.102	116.4	20.2	7	1.47	61	8.16	>99.9999
8	3.1	5.0	80.0	53.0	23.63	0.446	122.0	22.2	9	1.98	44	6.16	>99.9999
Average	3.3	5.0	77.6	53.0	14.51	0.274	119.2	21.2	8	1.73	53	7.16	>99.9999

SUMMARY OF RESULTS

Kiln Number 2

Firing Coal and Solid Waste Derived Fuel

Stack	South	South	North
Run Number	1	2	3
Stack Flow Rate - ACFM	78,345	75,442	78,503
Stack Flow Rate - DSCFM*	30,612	28,106	29,959
% Water Vapor - % Vol.	32.35	34.04	31.52
% CO_2 - % Vol.	16.6	17.3	17.3
% O_2 - % Vol.	8.2	7.2	7.2
% Excess Air @ Sampling Point	70	56	56
Particulates Probe, Cyclone & Filter Catch grains/dscf*	0.0262	0.0295	0.0182
grains/cf @ Stack Conditions	0.0102	0.0110	0.0069
lbs/hr	6.88	7.12	4.67
Kiln Feed - tons/hr	45.0	45.0	45.0
Particulate Emissions - lbs/ton kiln feed	0.153	0.158	0.104
Hydrogen Chloride Emissions - ppm	114.2	178.0	96.7
Hydrogen Chloride Emissions - lbs/hr	19.8	28.4	16.4

* 29.92 "Hg, 68°F (760 mm Hg, 20°C)

SUMMARY OF RESULTS

Volatile Organic Compounds

Kiln Number 2

Firing Coal and Solid Waste Derived Fuel

Run Number	1	2	3	Ambient
Methane Concentration - ppm	1	1	1	3
Methane Emissions - lbs/hr	0.08	0.07	0.07	----
Ethane Concentration - ppm	1	1	1	0
Ethane Emissions - lbs/hr	0.14	0.13	0.14	----
Propane Concentration - ppm	----	----	----	----
Propane Emissions - lbs/hr	----	----	----	----
Non-Methane, Non-Ethane VOC Concentration as Propane - ppm	7	12	22	8
Non-Methane, Non-Ethane VOC Emissions as Propane - lbs/hr	1.47	2.31	4.52	----
Total Hydrocarbons Concentration as Propane - ppm	----	----	----	----
Total Hydrocarbons Emissions as Propane - lbs/hr	----	----	----	----

*29.92 "Hg, 69°F (760 mm Hg, 20°C)

SUMMARY OF RESULTS

Kiln Number 2

Firing Coal and Solid Waste Derived Fuel

Run Number		1	2	3
Carbon Monoxide - parts per million	Chart	55	48	40
	Actual	46	40	33
Carbon Monoxide Emissions -	lbs/hr	6.14	4.90	4.31

$$\text{Actual ppm CO} = \text{ppm CO (chart)} \times \left[1 - \frac{\%\ CO_2}{100}\right]$$

$$\text{CO (lbs/hr)} = \frac{\text{ppm CO} \times 28 \times 60 \times \text{DSCFM}^{*}}{385.1 \times 10^{6}}$$

* 29.92 "Hg, 68°F (760 mm Hg, 20°C)

SUMMARY OF RESULTS

Kiln Number 2

Metals Emissions

Firing Coal and Solid Waste Derived Fuel

	Run Number 1		Run Number 2		Run Number 3	
	Total µgs	lbs/hr	Total µgs	lbs/hr	Total µgs	lbs/hr
Arsenic	<1.0	$<9.89\times10^{-5}$	<1.0	$<9.58\times10^{-5}$	1.1	1.08×10^{-4}
Beryllium	<4.0	$<3.96\times10^{-4}$	<4.0	$<3.83\times10^{-4}$	<4.0	$<3.94\times10^{-4}$
Cadmium	4.7	4.65×10^{-4}	4.9	4.69×10^{-4}	2.6	2.56×10^{-4}
Chromium	506.0	0.050	638.0	0.061	194	0.019
Lead	228.0	0.023	220.0	0.021	118	0.012
Mercury	0.3	2.97×10^{-5}	0.3	2.87×10^{-5}	0.1	9.84×10^{-6}
Silver	<1.0	$<9.89\times10^{-5}$	<1.0	$<9.58\times10^{-5}$	<1.0	$<9.85\times10^{-5}$
Selenium	5.5	5.44×10^{-4}	3.5	3.35×10^{-4}	3.2	3.15×10^{-4}
Thallium	<100.0	$<9.89\times10^{-3}$	<100.0	$<9.58\times10^{-3}$	<100.0	$<9.85\times10^{-3}$

SUMMARY OF RESULTS

Kiln Number 2

DRE

Firing Coal and Solid Waste Derived Fuel

Stack	North	North	South
Run Number	1	2	3
Stack Flow Rate - ACFM	77,993	81,034	77,717
Stack Flow Rate - DSCFM*	31,058	30,562	29,247
% Water Vapor - % Vol.	31.27	33.24	32.02
% CO_2 - % Vol.	16.6	17.3	17.3
% O_2 - % Vol.	8.2	7.2	7.2
% Excess Air @ Sampling Point	70	56	56
Total Trichlorobenzene - µg	<1.151	<2.333	<1.275
Trichlorobenzene Emissions - lbs/hr	$<4.05 \times 10^{-5}$	$<8.36 \times 10^{-5}$	$<4.38 \times 10^{-5}$
Waste Feed Rate - lbs/hr	3,600.0	3,600.0	3,600.0
Trichlorobenzene in Waste Feed - %	5.4	5.4	5.4
Trichlorobenzene - lbs/hr in feed	194.4	194.4	194.4
Trichlorobenzene DRE - %	>99.9999	>99.9999	>99.9999

* 29.92 "Hg, 68°F (760 mm Hg, 20°C)

SUMMARY OF RESULTS

Kiln Number 2

Firing Coal, Liquid Waste Derived Fuel, and Solid Waste Derived Fuel

Stack	North	North	South
Run Number	4	5	6
Stack Flow Rate - ACFM	71,716	95,668	97,671
Stack Flow Rate - DSCFM*	26,927	32,854	32,602
% Water Vapor - % Vol.	31.25	35.79	34.69
% CO_2 - % Vol.	16.5	17.6	15.5
% O_2 - % Vol.	7.5	6.6	8.0
% Excess Air @ Sampling Point	59	49	65
Particulates Probe, Cyclone & Filter Catch grains/dscf*	0.0841	0.0431	0.0958
grains/cf @ Stack Conditions	0.0314	0.0147	0.0319
lbs/hr	19.40	12.14	26.76
Kiln Feed - tons/hr	46.7	53.7	53.0
Particulate Emissions - lbs/ton kiln feed	0.415	0.226	0.505
Hydrogen Chloride Emissions - ppm	112.4	115.4	106.4
Hydrogen Chloride Emissions - lbs/hr	17.2	21.5	19.7

* 29.92 "Hg, 68°F (760 mm Hg, 20°C)

SUMMARY OF RESULTS

Volatile Organic Compounds

Kiln Number 2

Firing Coal, Liquid Waste Derived Fuel, and Solid Waste Derived Fuel

Run Number	4	5	6	Ambient
Methane Concentration - ppm	3	10	3	3
Methane Emissions - lbs/hr	0.20	0.82	0.24	----
Ethane Concentration - ppm	2	2	2	2
Ethane Emissions - lbs/hr	0.25	0.31	0.30	0
Propane Concentration - ppm	----	----	----	----
Propane Emissions - lbs/hr	----	----	----	----
Non-Methane, Non-Ethane VOC Concentration as Propane - ppm	6	12	7	7
Non-Methane, Non-Ethane VOC Emissions as Propane - lbs/hr	1.11	2.70	1.56	----
Total Hydrocarbons Concentration as Propane - ppm	----	----	----	----
Total Hydrocarbons Emissions as Propane - lbs/hr	----	----	----	----

*29.92 "Hg, 69°F (760 mm Hg, 20°C)

SUMMARY OF RESULTS

Kiln Number 2

Firing Coal, Liquid Waste Derived Fuel, and Solid Waste Derived Fuel

Run Number		4	5	6
Carbon Monoxide - parts per million	Chart	50	342	60
	Actual	42	282	51
Carbon Monoxide Emissions -	lbs/hr	4.93	40.42	7.25

$$\text{Actual ppm CO} = \text{ppm CO (chart)} \times \left[1 - \frac{\%\ CO_2}{100}\right]$$

$$\text{CO (lbs/hr)} = \frac{\text{ppm CO} \times 28 \times 60 \times \text{DSCFM}^{*}}{385.1 \times 10^{6}}$$

* 29.92 "Hg, 68°F (760 mm Hg, 20°C)

SUMMARY OF RESULTS

Kiln Number 2

Metals Emissions

Firing Coal, Liquid Waste Derived Fuel, and Solid Waste Derived Fuel

	Run Number 4		Run Number 5		Run Number 6	
	Total µgs	lbs/hr	Total µgs	lbs/hr	Total µgs	lbs/hr
Arsenic	2.3	1.97×10^{-4}	1.5	1.21×10^{-4}	2.3	2.25×10^{-4}
Beryllium	<4.0	$<3.43 \times 10^{-4}$	<4.0	$<3.22 \times 10^{-4}$	<4.0	$<3.92 \times 10^{-4}$
Cadmium	47.8	4.10×10^{-3}	13.3	1.07×10^{-3}	26.9	2.64×10^{-3}
Chromium	226.0	0.019	423.0	0.034	267.0	0.026
Lead	2,180.0	0.187	957.0	0.077	2,130.0	0.209
Mercury	1.4	1.20×10^{-4}	0.3	2.42×10^{-5}	0.5	4.90×10^{-5}
Silver	<1.0	$<8.58 \times 10^{-5}$	<1.0	$<8.05 \times 10^{-5}$	<1.0	$<9.80 \times 10^{-5}$
Selenium	7.7	6.61×10^{-4}	2.7	2.17×10^{-4}	2.2	2.16×10^{-4}
Thallium	<100.0	$<8.58 \times 10^{-3}$	<100.0	$<8.05 \times 10^{-3}$	<100.0	$<9.80 \times 10^{-3}$

SUMMARY OF RESULTS

Kiln Number 2

DRE

Firing Coal, Liquid Waste Derived Fuel, and Solid Waste Derived Fuel

Stack	South	South	North
Run Number	4	5	6
Stack Flow Rate - ACFM	78,781	101,060	98,962
Stack Flow Rate - DSCFM*	28,427	34,540	33,262
% Water Vapor - % Vol.	33.46	34.94	34.17
% CO_2 - % Vol.	16.5	17.6	15.5
% O_2 - % Vol.	7.5	6.6	8.0
% Excess Air @ Sampling Point	59	49	65
Total Trichlorobenzene - µg	<1.226	<1.770	<1.100
Trichlorobenzene Emissions - lbs/hr	$<4.32\times10^{-5}$	$<6.13\times10^{-5}$	$<4.55\times10^{-5}$
Waste Feed Rate - lbs/hr	3,744.0	4,446.0	4,800.0
Trichlorobenzene in Waste Feed - %	5.4	5.4	5.4
Trichlorobenzene - lbs/hr in feed	202.2	240.1	259.2
Trichlorobenzene DRE - %	>99.9999	>99.9999	>99.9999

* 29.92 "Hg, 68°F (760 mm Hg, 20°C)

SUMMARY OF RESULTS

Kiln Number 2

Firing Coal, Liquid Waste Derived Fuel,
and Solid Waste Derived Fuel

Stack	South	South	
Run Number	7	8	
Stack Flow Rate - ACFM	92,681	98,560	
Stack Flow Rate - DSCFM*	30,661	32,107	
% Water Vapor - % Vol.	35.10	34.65	
% CO_2 - % Vol.	18.1	15.1	
% O_2 - % Vol.	6.7	7.9	
% Excess Air @ Sampling Point	51	63	
Particulates Probe, Cyclone & Filter Catch grains/dscf*	0.0205	0.0859	
grains/cf @ Stack Conditions	0.0068	0.0279	
lbs/hr	5.39	23.63	
Kiln Feed - tons/hr	53.0	53.0	
Particulate Emissions - lbs/ton kiln feed	0.102	0.446	
Hydrogen Chloride Emissions - ppm	116.4	122.0	
Hydrogen Chloride Emissions - lbs/hr	20.2	22.2	

* 29.92 "Hg, 68°F (760 mm Hg, 20°C)

SUMMARY OF RESULTS

Volatile Organic Compounds

Kiln Number 2

Firing Coal, Liquid Waste Derived Fuel, and Solid Waste Derived Fuel

Run Number	7	8	Ambient	
Methane Concentration - ppm	3	3	4	
Methane Emissions - lbs/hr	0.23	0.24	----	
Ethane Concentration - ppm	2	2	<1	
Ethane Emissions - lbs/hr	0.29	0.30	----	
Propane Concentration - ppm	2	3	2	
Propane Emissions - lbs/hr	0.42	0.66	----	
Non-Methane, Non-Ethane VOC Concentration as Propane - ppm	7	9	6	
Non-Methane, Non-Ethane VOC Emissions as Propane - lbs/hr	1.47	1.98	----	
Total Hydrocarbons Concentration as Propane - ppm	----	----	----	
Total Hydrocarbons Emissions as Propane - lbs/hr	----	----	----	

*29.92 "Hg, 69°F (760 mm Hg, 20°C)

SUMMARY OF RESULTS

Kiln Number 2

Firing Coal, Liquid Waste Derived Fuel,
and Solid Waste Derived Fuel

Run Number		7	8	
Carbon Monoxide - parts per million	Chart	75	52	
	Actual	61	44	
Carbon Monoxide Emissions -	lbs/hr	8.16	6.16	

$$\text{Actual ppm CO} = \text{ppm CO (chart)} \times \left[1 - \frac{\%\ CO_2}{100}\right]$$

$$\text{CO (lbs/hr)} = \frac{\text{ppm CO} \times 28 \times 60 \times \text{DSCFM}^{*}}{385.1 \times 10^{6}}$$

* 29.92 "Hg, 68°F (760 mm Hg, 20°C)

SUMMARY OF RESULTS

Kiln Number 2

Metals Emissions

Firing Coal, Liquid Waste Derived Fuel, and Solid Waste Derived Fuel

	Run Number 7		Run Number 8	
	Total µgs	lbs/hr	Total µgs	lbs/hr
Arsenic	<1.0	$<9.35\text{x}10^{-5}$	3.3	$3.13\text{x}10^{-4}$
Beryllium	<4.0	$<3.74\text{x}10^{-4}$	<8.0	$<7.59\text{x}10^{-4}$
Cadmium	5.5	$5.14\text{x}10^{-4}$	10.5	$9.96\text{x}10^{-4}$
Chromium	221.0	0.021	325.0	0.031
Lead	372.0	0.035	732.0	0.069
Mercury	0.3	$2.80\text{x}10^{-5}$	0.3	$2.84\text{x}10^{-5}$
Silver	<1.0	$<9.35\text{x}10^{-5}$	<3.0	$<2.84\text{x}10^{-4}$
Selenium	3.6	$3.37\text{x}10^{-4}$	0.9	$8.53\text{x}10^{-5}$
Thallium	<100.0	$<9.35\text{x}10^{-3}$	<100.0	$<9.48\text{x}10^{-3}$

SUMMARY OF RESULTS

Kiln Number 2

DRE

Firing Coal, Liquid Waste Derived Fuel, and Solid Waste Derived Fuel

Stack	North	North	
Run Number	7	8	
Stack Flow Rate - ACFM	97,964	99,635	
Stack Flow Rate - DSCFM*	32,539	32,875	
% Water Vapor - % Vol.	34.31	33.77	
% CO_2 - % Vol.	18.1	15.1	
% O_2 - % Vol.	6.7	7.9	
% Excess Air @ Sampling Point	51	63	
Total Trichlorobenzene - µg	<1.086	<0.854	
Trichlorobenzene Emissions - lbs/hr	$<4.34x10^{-5}$	$<3.55x10^{-5}$	
Waste Feed Rate - lbs/hr	4,506.0	4,800.0	
Trichlorobenzene in Waste Feed - %	5.4	5.4	
Trichlorobenzene - lbs/hr in feed	243.3	259.2	
Trichlorobenzene DRE - %	>99.9999	>99.9999	

* 29.92 "Hg, 68°F (760 mm Hg, 20°C)

DISCUSSION OF RESULTS

It should be noted that the emissions represent one stack from the source which has two stacks.

Runs Number 1, 2, and 3

The three tests for particulate matter and hydrogen chloride appeared to be valid representations of the actual emissions during the tests. The indicative parameters calculated from the field data were in close agreement. The moisture percentages for the three tests were within 4.3 percent of the mean value. The measured flow rates (Q_s) for the tests were within 4.9 percent of the mean value. The rates of sampling for the three tests were well within the specified limits, the greatest deviation being 2.5 percent.

The calculated emissions (pounds per ton of kiln feed) of particulate matter for the three tests showed a range of -24.8 percent to +14.2 percent variation from the mean value.

The three tests for hydrogen chloride appeared to be valid representations of the actual emissions during the tests. The calculated emissions (pounds per hour) of hydrogen chloride for the three tests showed a range of -23.8 percent to +31.9 percent variation from the mean value.

The three tests for volatile organic compounds appeared to be valid representations of the actual emissions during the tests. The calculated emissions (pounds per hour) of volatile organic compounds for the three tests showed a range of -46.9 percent to +63.4 percent variation from the mean value.

The three tests for carbon monoxide appeared to be valid representations of the actual emissions during the tests. The calculated emissions (pounds per hour) of carbon monoxide for the three tests showed a range of -15.8 percent to +20.0 percent variation from the mean value.

The three tests for trichlorobenzene and semivolatile compounds appeared to be valid representations of the actual emissions during the tests. The indicative parameters calculated from the field data were in close agreement. The moisture percentages for the three tests were within 3.3 percent of the mean value. The measured flow rates (Q_s) for the tests were within 3.4 percent of the mean value. The rates of sampling for the three tests were within the specified limits, the greatest deviation being 5.0 percent.

Runs Number 4, 5, and 6

The three tests for particulate matter and hydrogen chloride appeared to be valid representations of the actual emissions during the tests. The indicative parameters calculated from the field data were in close agreement. The moisture percentages for the three tests were within 7.8 percent of the mean value. The measured flow rates (Q_s) for the tests were within 12.6 percent of the mean value. The rates of sampling for the three tests were well within the specified limits, the greatest deviation being 3.9 percent.

The calculated emissions (pounds per ton of kiln feed) of particulate matter for the three tests showed a range of -40.8 percent to +32.2 percent variation from the mean value.

The three tests for hydrogen chloride appeared to be valid representations of the actual emissions during the tests. The calculated emissions (pounds per hour) of hydrogen chloride for the three tests showed a range of -11.6 percent to +10.4 percent variation from the mean value.

The three tests for volatile organic compounds appeared to be valid representations of the actual emissions during the tests. The calculated emissions (pounds per hour) of volatile organic compounds for the three tests showed a range of -38.0 percent to +50.8 percent variation from the mean value.

The three tests for carbon monoxide appeared to be valid representations of the actual emissions during the tests. The calculated emissions (pounds per hour) of carbon monoxide for the three tests showed a range of -71.9 percent to +130.5 percent variation from the mean value. The large variation is due to the much higher concentration of carbon monoxide measured during Run Number 5.

The three tests for trichlorobenzene and semivolatile compounds appeared to be valid representations of the actual emissions during the tests. The indicative parameters calculated from the field data were in close agreement. The moisture percentages for the three tests were within 2.2 percent of the mean value. The measured flow rates (Q_s) for the tests were within 11.4 percent of the mean value. The rates of sampling for the three tests were within the specified limits, the greatest deviation being 4.1 percent.

Runs Number 7 and 8

The two tests for particulate matter and hydrogen chloride appeared to be valid representations of the actual emissions during the tests. The indicative parameters calculated from the field data were in close agreement. The moisture percentages for the two tests were within 0.6 percent of the mean value. The measured flow rates (Q_s) for the tests were within 2.3 percent of the mean value. The rates of sampling for the two tests were well within the specified limits, the greatest deviation being 3.1 percent.

The calculated emissions (pounds per ton of kiln feed) of particulate matter for the two tests showed a range of -62.8 percent to +62.8 percent variation from the mean value.

The two tests for hydrogen chloride appeared to be valid representations of the actual emissions during the tests. The calculated emissions (pounds per hour) of hydrogen chloride for the two tests showed a range of -4.7 percent to +4.7 percent variation from the mean value.

The two tests for volatile organic compounds appeared to be valid representations of the actual emissions during the tests. The calculated emissions (pounds per hour) of volatile organic compounds for the two tests showed a range of -14.8 percent to +14.8 percent variation from the mean value.

The two tests for carbon monoxide appeared to be valid representations of the actual emissions during the tests. The calculated emissions (pounds per hour) of carbon monoxide for the two tests showed a range of -14.0 percent to +14.0 percent variation from the mean value.

The two tests for trichlorobenzene and semivolatile compounds appeared to be valid representations of the actual emissions during the tests. The indicative parameters calculated from the field data were in close agreement. The moisture percentages for the two tests were within 0.8 percent of the mean value. The measured flow rates (Q_s) for the tests were within 0.5 percent of the mean value. The rates of sampling for the two tests were within the specified limits, the greatest deviation being 4.7 percent.

METCO
ENVIRONMENTAL
P.O. Box 598
Addison, TX 7500
(214) 931-7127

SOURCE EMISSIONS SURVEY
OF
ASH GROVE FOREMAN CEMENT COMPANY
KILN NUMBER 2
NORTH AND SOUTH STACKS
FOREMAN, ARKANSAS

OCTOBER 1988

FILE NUMBER 88-170

CHLORIDE ANALYSIS

Run Number	1	2	3	4
Impinger #1 mg Cl^-	154.000	239.317	131.300	168.270
Impinger #2 mg Cl^-	40.878	48.601	30.895	26.208
Total mg Cl^-	194.878	287.918	162.195	194.478
Total mg HCl^-	200.375	296.040	166.770	199.964
ppm HCl	114.2	178.0	96.74	112.4
lbs/hr HCl	19.82	28.36	16.42	17.16

Run Number	5	6	7	8
Impinger #1 mg Cl^-	179.233	144.450	155.873	170.940
Impinger #2 mg Cl^-	80.264	50.625	54.530	56.887
Total mg Cl^-	259.497	195.075	210.403	227.827
Total mg HCl	266.817	200.578	216.338	234.254
ppm HCl	115.39	106.4	116.4	122.0
lbs/hr HCl	21.49	19.66	20.2	22.21

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88-170

Ashgrove Cement
#2 Kiln

CHLORIDE ANALYSIS

SAMPLE NO.	SAMPLE VOL.	SAMPLE IDENTITY RUN	IMP	DILUTION	DIL'N FACTOR	ALIQUOT (ML)	ABSORBANCE @ 360 nm	ug Cl⁻ PER ML	TOTAL ug Cl⁻ ✓
1	440	1	1	10/100	10	3	.263	21.0	154,000.0
2	415	2	1	"	"	3	.457	34.6	239,316.7
2'	"	"	1	"	"	3	.445	33.9	234,475.0
3	404	3	1	"	"	3	.242	19.5	131,300.0
4	426	4	1	"	"	3	.302	23.7	168,270.0
5	380	5	1	"	"	3	.369	28.3	179,233.3
6	405	6	1	"	"	3	.269	21.4	144,450.0
7	412	7	1	"	"	3	.287	22.7	155,873.3
8	407	8	1	"	"	3	.323	25.2	170,940.0
9	415	1	2	–	–	1	.245	19.7	40,877.5
[illegible]	262	2	"	–	–	1	.492	37.1	48,601.0
11	334	3	"	–	–	1	.227	18.5	30,895.0
12	273	4	"	–	–	1	.237	19.2	26,208.0
13	508	5	"	10/100	10	5	.188	15.8	80,264.0
14	375	6	"	–	–	1	.349	27.0	50,625.0
15	380	7	"	–	–	1	.374	28.7	54,530.0
16	326	8	"	–	–	1	.461	34.9	56,887.0

STANDARDS

ug Cl⁻ per ml	ABSORBANCE		
5	.033		
10	.165		
20	.244		
30	.395		
40	.531		

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88-170

CHLORIDE ANALYSIS

SAMPLE NO.	SAMPLE VOL.	SAMPLE IDENTITY	DILUTION	DIL'N FACTOR	ALIQUOT (ML)	ABSORBANCE @ 360 nm	ug Cl^- PER ML	TOTAL ug Cl^-
SPIKE A		3 ml #1 2 ml STD 40	—	—	5	.455	36.6	% RECOVERY 97.5
SPIKE B		3 ml #4 2 ml STD 30	—	—	5	.460	34.8	% Recovery 92.5
1 =	440	duplicate RUN 1 Imp 1	10/100	10	5	.442	33.5	147,400.0

STANDARDS

ug Cl^- per ml	ABSORBANCE		
5			
10			
20			
30			
40			

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TEI ANALYTICAL, INC.
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LABORATORY REPORT

December 16, 1988

#9704
Page 1 of 13 pa

Cadence Chemical
P.O. Box 770
Michigan City, IN 46360

Attn: Jim Ward

SAMPLE RECEIVED: 11-04-88

TEI NO. 60316
SAMPLE IDENTIFICATION: S Blend #1 10/25/88

1,2,4-Trichlorobenzene	9.0	%
1,2,3 Trichlorobenzene	5.3	%

TEI NO. 60317
SAMPLE IDENTIFICATION: S Blend #2 10/25/88

1,2,4-Trichlorobenzene	7.5	%
1,2,3 Trichlorobenzene	2.5	%

TEI NO. 60318
SAMPLE IDENTIFICATION: S Blend #3 10/25/88

1,2,4-Trichlorobenzene	4.4	%
1,2,3 Trichlorobenzene	2.5	%

TEI NO. 60319
SAMPLE IDENTIFICATION: S Blend #4 10/26/88

1,2,4-Trichlorobenzene	4.0	%
1,2,3 Trichlorobenzene	2.5	%

TEI NO. 60320
SAMPLE IDENTIFICATION: S Blend #5 10/26/88

1,2,4-Trichlorobenzene	3.6	%
1,2,3 Trichlorobenzene	2.2	%

TEI NO. 60321
SAMPLE IDENTIFICATION: S Blend #6 10/26/88

1,2,4-Trichlorobenzene	3.3	%
1,2,3 Trichlorobenzene	2.1	%

CC - Bill Mullins
METCO

Chem-Fuel Ash Grove Foreman

Gayle E. Marks, Ph.D.

December 16, 1988 **LABORATORY REPORT** #9704
Page 2 of 13 pa

Cadence Chemical
P.O. Box 770
Michigan City, IN 46360

Attn: Jim Ward

SAMPLE RECEIVED: 11-04-88

TEI NO. 60322
SAMPLE IDENTIFICATION: S Blend #7 10/27/88

1,2,4-Trichlorobenzene	4.5	%
1,2,3 Trichlorobenzene	3.6	%

TEI NO. 60323
SAMPLE IDENTIFICATION: S Blend #8 10/27/88

1,2,4-Trichlorobenzene	4.8	%
1,2,3 Trichlorobenzene	2.9	%

TEI NO. 60324
SAMPLE IDENTIFICATION: K Blend #4 10/26/88

1,2,4-Trichlorobenzene	<50	ppm
1,2,3 Trichlorobenzene	<50	ppm

TEI NO. 60325
SAMPLE IDENTIFICATION: K Blend #5 10/26/88

1,2,4-Trichlorobenzene	<50	ppm
1,2,3 Trichlorobenzene	<50	ppm

TEI NO. 60326
SAMPLE IDENTIFICATION: K Blend #6 10/26/88

1,2,4-Trichlorobenzene	<50	ppm
1,2,3 Trichlorobenzene	<50	ppm

TEI NO. 60327
SAMPLE IDENTIFICATION: K Blend #7 10/27/88

1,2,4-Trichlorobenzene	<50	ppm
1,2,3 Trichlorobenzene	<50	ppm

Chem-Fuel Ash Grove Foreman

Gayle E. Marks, Ph.D.

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December 20, 1988

LABORATORY REPORT

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Cadence Chemical Resources, Inc.
P.O. Box 770
Michigan City, IN 46360

Attn: Jim Ward

Sample received:
11-04-88

TEI No. 60329 - Sample S Blend #1 - 10/25/88

Heat Value	7470.	BTU/lb
Total Chlorine	5.73	%

TEI No. 60330 - Sample S Blend #2 - 10/25/88

Heat Value	8300.	BTU/lb
Total Chlorine	5.20	%

TEI No. 60331 - Sample S Blend #3 - 10/25/88

Heat Value	9380.	BTU/lb
Total Chlorine	4.33	%

TEI No. 60332 - Sample S Blend #4 - 10/26/88

Heat Value	9420.	BTU/lb
Total Chlorine	5.38	%

TEI No. 60333 - Sample S Blend #5 - 10/26/88

Heat Value	4200.	BTU/lb
Total Chlorine	3.77	%

Chem-Fuel - Ash Grove Foreman

g. e. Marks
Gayle E. Marks, Ph.D.

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December 20, 1988

LABORATORY REPORT

#9704
Page 5 of 13 Page

Cadence Chemical Resources, Inc.
P.O. Box 770
Michigan City, IN 46360

Attn: Jim Ward

Sample received:
11-04-88

TEI No. 60334 - Sample S Blend #6 - 10/26/88

Heat Value	7020.	BTU/lb
Total Chlorine	3.55	%

TEI No. 60335 - Sample S Blend #7 - 10/27/88

Heat Value	8750.	BTU/lb
Total Chlorine	8.31	%

TEI No. 60336 - Sample S Blend #8 - 10/27/88

Heat Value	8520.	BTU/lb
Total Chlorine	7.96	%

TEI No. 60337 - Sample K Blend #4 - 10/26/88

Heat Value	11900.	BTU/lb
Total Chlorine	2.32	%

TEI No. 60338 - Sample K Blend #5 - 10/26/88

Heat Value	13000.	BTU/lb
Total Chlorine	1.87	%

Chem-Fuel - Ash Grove Foreman

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December 16, 1988

LABORATORY REPORT

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Cadence Chemical
P.O. Box 770
Michigan City, IN 46360

Attn: Jim Ward

SAMPLE RECEIVED: 11-04-88

TEI NO. 60342
SAMPLE IDENTIFICATION: S Blend #1 10/25/88

Ash	40.53	%
Hexavalent Chromium	<2	ppm
Sample Preparation		
Arsenic	5.4	ppm
Beryllium	<3	ppm
Cadmium	24.0	ppm
Lead	5900.	ppm
Mercury	1.6	ppm
Selenium	<2	ppm
Silver	12.2	ppm
Thallium	<5	ppm

TEI NO. 60343
SAMPLE IDENTIFICATION: S Blend #2 10/25/88

Ash	38.84	%
Hexavalent Chromium	4	ppm
Sample Preparation		
Arsenic	4.6	ppm
Beryllium	<3	ppm
Cadmium	32.8	ppm
Lead	5680.	ppm
Mercury	4.7	ppm
Selenium	<2	ppm
Silver	22.2	ppm
Thallium	<5	ppm

Chem-Fuel Ash Grove Foreman

Gayle E. Marks, Ph.D.

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December 16,1988

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Cadence Chemical
P.O. Box 770
Michigan City, IN 46360

Attn: Jim Ward

SAMPLE RECEIVED: 11-04-88

TEI NO. 60344
SAMPLE IDENTIFICATION: S Blend #3 10/25/88

Ash	31.19	%
Hexavalent Chromium	17	ppm
Sample Preparation		
Arsenic	4.2	ppm
Beryllium	<3	ppm
Cadmium	49.0	ppm
Lead	4470.	ppm
Mercury	1.4	ppm
Selenium	<5	ppm
Silver	9.9	ppm
Thallium	<5	ppm

TEI NO. 60345
SAMPLE IDENTIFICATION: S Blend #4 10/26/88

Ash	30.80	%
Hexavalent Chromium	24	ppm
Sample Preparation		
Arsenic	4.3	ppm
Beryllium	<3	ppm
Cadmium	48.1	ppm
Lead	7120.	ppm
Mercury	2.6	ppm
Selenium	<5	ppm
Silver	9.6	ppm
Thallium	<5	ppm

Chem-Fuel Ash Grove Foreman

G. E. Marks
Gayle E. Marks, Ph.D.

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December 16, 1988

LABORATORY REPORT

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Cadence Chemical
P.O. Box 770
Michigan City, IN 46360

Attn: Jim Ward

SAMPLE RECEIVED: 11-04-88

TEI NO. 60346
SAMPLE IDENTIFICATION: S Blend #5 10/26/88

Ash	37.77	%
Hexavalent Chromium	<2	ppm
Sample Preparation		
Arsenic	1.1	ppm
Beryllium	<3	ppm
Cadmium	40.3	ppm
Lead	5870.	ppm
Mercury	3.4	ppm
Selenium	<5	ppm
Silver	10.2	ppm
Thallium	<5	ppm

TEI NO. 60347
SAMPLE IDENTIFICATION: S Blend #6 10/26/88

Ash	38.94	%
Hexavalent Chromium	<2	ppm
Sample Preparation		
Arsenic	5.9	ppm
Beryllium	<3	ppm
Cadmium	39.9	ppm
Lead	5100.	ppm
Mercury	4.7	ppm
Selenium	<5	ppm
Silver	8.4	ppm
Thallium	<5	ppm

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G. E. Marks
Gayle E. Marks, Ph.D.

December 16, 1988 **LABORATORY REPORT** #9704
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Cadence Chemical
P.O. Box 770
Michigan City, IN 46360

Attn: Jim Ward

SAMPLE
RECEIVED: 11-04-88

TEI NO. 60348
SAMPLE IDENTIFICATION: S Blend #7 10/27/88

Ash	34.49	%
Hexavalent Chromium	<2	ppm
Sample Preparation		
Arsenic	2.4	ppm
Beryllium	<3	ppm
Cadmium	19.1	ppm
Lead	4550.	ppm
Mercury	0.6	ppm
Selenium	<5	ppm
Silver	12.3	ppm
Thallium	<5	ppm

TEI NO. 60349
SAMPLE IDENTIFICATION: S Blend #8 10/27/88

Ash	35.79	%
Hexavalent Chromium	<2	ppm
Sample Preparation		
Arsenic	6.0	ppm
Beryllium	<3	ppm
Cadmium	17.9	ppm
Lead	4550.	ppm
Mercury	1.2	ppm
Selenium	<5	ppm
Silver	12.9	ppm
Thallium	<5	ppm

hem-Fuel Ash Grove Foreman

Gayle E. Marks, Ph.D.

REFERENCE 2

MULLINS ENVIRONMENTAL TESTING CO., INC.
P.O. Box 598
Addison, Tx 75001
(214) 931-7127

METCO

SOURCE EMISSIONS SURVEY
OF
ASH GROVE CEMENT COMPANY
KILN NUMBER 2 STACK
LOUISVILLE, NEBRASKA

APRIL 1988

FILE NUMBER 88-71

SUMMARY OF RESULTS

Kiln Number 2 Stack

Run Number	1	2	3	4	5	6
Particulate Matter Emissions - lbs/hr	93.8	16.0	6.4	8.0	11.3	8.
Particulate Matter Emissions - lbs/ton of kiln feed	0.853	0.145	0.058	0.073	0.100	0.07
Hydrogen Chloride Emissions - lbs/hr	14.1	19.3	19.9	13.5	14.3	19.
Total Hydrocarbon Emissions as Propane - lbs/hr	3.8	13.4	4.9	3.4	2.7	11.
Lead Emissions - lbs/hr	0.286	0.007	0.004	0.006	0.003	0.00
Chromium Emissions - lbs/hr	0.003	<0.001	<0.001	<0.001	<0.001	<0.00
Barium Emissions - lbs/hr	0.021	0.003	0.003	<0.001	0.002	<0.00
1,1,1-Trichloroethane DRE - %	>99.9999	>99.9999	>99.9999	99.997	>99.9999	>99.9999

SUMMARY OF RESULTS

Kiln Number 2 Stack

Run Number		1	2	3
Stack Flow Rate - ACFM		149,532	148,176	149,905
Stack Flow Rate - DSCFM*		80,123	78,149	79,296
% Water Vapor - % Vol.		16.29	18.41	18.10
% CO_2 - % Vol.		23.0	23.0	22.6
% O_2 - % Vol.		7.6	7.0	7.2
% Excess Air @ Sampling Point		70	61	63
Particulates Probe, Cyclone & Filter Catch grains/dscf*		0.1366	0.0239	0.0095
grains/cf @ Stack Conditions		0.0729	0.0125	0.0050
lbs/hr		93.8	16.0	6.4
Total Catch grains/dscf*		0.1653	0.0542	0.0518
grains/cf @ Stack Conditions		0.0882	0.0285	0.0273
lbs/hr		113.5	36.3	35.2
Kiln Feed -	tons/hr	110	110	110
Particulate Matter Emissions -	lbs/ton of kiln feed	0.853	0.145	0.058
Hydrogen Chloride Emissions -	ppm	31	44	44
Hydrogen Chloride Emissions -	lbs/hr	14.1	19.3	19.9

* 29.92 "Hg, 68°F (760 mm Hg, 20°C)

SUMMARY OF RESULTS

Kiln Number 2 Stack

Run Number		1	2	3
Total Lead -	µg	1,080	28	15
Lead Emissions -	lbs/hr	0.286	0.007	0.004
Total Chromium -	µg	11	<3	<3
Chromium Emissions -	lbs/hr	0.003	<0.001	<0.001
Total Barium -	µg	80	12	10
Barium Emissions -	lbs/hr	0.021	0.003	0.003

* 29.92 "Hg, 68°F (760 mm Hg, 20°C)

SUMMARY OF RESULTS

Kiln Number 2 Stack

Run Number	1	2	3
Total Hydrocarbon Emissions as Propane - ppm	7	25	9
Total Hydrocarbon Emissions as Propane - lbs/hr	3.8	13.4	4.9

SUMMARY OF RESULTS

Kiln Number 2 Stack

Run Number	4	5	6
Stack Flow Rate - ACFM	153,938	154,392	147,387
Stack Flow Rate - DSCFM*	82,001	78,618	76,751
% Water Vapor - % Vol.	17.40	20.87	17.89
% CO_2 - % Vol.	21.4	22.2	25.0
% O_2 - % Vol.	8.4	8.0	6.0
% Excess Air @ Sampling Point	82	76	49
Particulates Probe, Cyclone & Filter Catch grains/dscf*	0.0114	0.0167	0.0124
grains/cf @ Stack Conditions	0.0061	0.0085	0.0064
lbs/hr	8.0	11.3	8.2
Total Catch grains/dscf*	0.0405	0.0352	0.0409
grains/cf @ Stack Conditions	0.0215	0.0179	0.0212
lbs/hr	28.4	23.7	26.9
Kiln Feed - tons/hr	110	113	117
Particulate Matter Emissions - lbs/ton of kiln feed	0.073	0.100	0.070
Hydrogen Chloride Emissions - ppm	29	32	45
Hydrogen Chloride Emissions - lbs/hr	13.5	14.3	19.5

• 29.92 "Hg, 68°F (760 mm Hg, 20°C)

SUMMARY OF RESULTS

Kiln Number 2 Stack

Run Number		4	5	6
Total Lead -	µg	22	12	18
Lead Emissions -	lbs/hr	0.006	0.003	0.005
Total Chromium -	µg	<3	<3	<3
Chromium Emissions -	lbs/hr	<0.001	<0.001	<0.001
Total Barium -	µg	<5	10	<5
Barium Emissions -	lbs/hr	<0.001	0.002	<0.001

* 29.92 "Hg, 68°F (760 mm Hg, 20°C)

SUMMARY OF RESULTS

Kiln Number 2 Stack

Run Number	4	5	6
Total Hydrocarbon Emissions as Propane - ppm	6	5	22
Total Hydrocarbon Emissions as Propane - lbs/hr	3.4	2.7	11.6

SUMMARY OF RESULTS

DRE

Run Number	1	2	3
1,1,1-Trichloroethane - lbs/hr in fuel	204.0	439.2	443.2
1,1,1-Trichloroethane Emissions - lbs/hr	$<4.51 \times 10^{-5}$	$<6.35 \times 10^{-5}$	$<3.90 \times 10^{-5}$
1,1,1-Trichloroethane DRE - %	>99.9999	>99.9999	>99.9999

SUMMARY OF RESULTS

DRE

Run Number	4	5	6
1,1,1-Trichloroethane - lbs/hr in fuel	415.2	394.0	331.2
1,1,1-Trichloroethane Emissions - lbs/hr	0.012	$<4.63 \times 10^{-5}$	$<3.71 \times 10^{-5}$
1,1,1-Trichloroethane DRE - %	99.997	>99.9999	>99.9999

SUMMARY OF RESULTS

Run Number	1	
Sample	A	B
Total 1,1,1-Trichloroethane - µg	<0.0025	<0.0029
1,1,1-Trichloroethane Emissions - ppm	$<2.20 \times 10^{-5}$	$<3.18 \times 10^{-5}$
Average for Run	$<2.69 \times 10^{-5}$	
1,1,1-Trichloroethane Emissions - lbs/hr	$<3.73 \times 10^{-5}$	$<5.29 \times 10^{-5}$
Average for Run	$<4.51 \times 10^{-5}$	

Run Number	2	
Sample	A	B
Total 1,1,1-Trichloroethane - µg	<0.0035	<0.0032
1,1,1-Trichloroethane Emissions - ppm	$<3.78 \times 10^{-5}$	$<4.05 \times 10^{-5}$
Average for Run	$<3.92 \times 10^{-5}$	
1,1,1-Trichloroethane Emissions - lbs/hr	$<6.13 \times 10^{-5}$	$<6.56 \times 10^{-5}$
Average for Run	$<6.35 \times 10^{-5}$	

SUMMARY OF RESULTS

Run Number	3	
Sample	A	B
Total 1,1,1-Trichloroethane - µg	<0.0024	<0.0025
1,1,1-Trichloroethane Emissions - ppm	$<2.43 \times 10^{-5}$	$<2.30 \times 10^{-5}$
Average for Run	$<2.37 \times 10^{-5}$	
1,1,1-Trichloroethane Emissions - lbs/hr	$<4.00 \times 10^{-5}$	$<3.79 \times 10^{-5}$
Average for Run	$<3.90 \times 10^{-5}$	

Run Number	4	
Sample	A	B
Total 1,1,1-Trichloroethane - µg	1.5017	<0.0041
1,1,1-Trichloroethane Emissions - ppm	0.014	$<3.85 \times 10^{-5}$
Average for Run	0.007	
1,1,1-Trichloroethane Emissions - lbs/hr	0.023	$<6.54 \times 10^{-5}$
Average for Run	0.012	

SUMMARY OF RESULTS

Run Number	5	
Sample	A	B
Total 1,1,1-Trichloroethane - µg	<0.0028	<0.0027
1,1,1-Trichloroethane Emissions - ppm	$<2.60 \times 10^{-5}$	$<3.08 \times 10^{-5}$
Average for Run	$<2.84 \times 10^{-5}$	
1,1,1-Trichloroethane Emissions - lbs/hr	$<4.24 \times 10^{-5}$	$<5.02 \times 10^{-5}$
Average for Run	$<4.63 \times 10^{-5}$	

Run Number	6	
Sample	A	B
Total 1,1,1-Trichloroethane - µg	-------	<0.0025
1,1,1-Trichloroethane Emissions - ppm	-------	$<2.33 \times 10^{-5}$
Average for Run	$<2.33 \times 10^{-5}$	
1,1,1-Trichloroethane Emissions - lbs/hr	-------	$<3.71 \times 10^{-5}$
Average for Run	$<3.71 \times 10^{-5}$	

MULLINS ENVIRONMENTAL TESTING CO., INC.
P.O. Box 598
Addison, Tx 75001
(214) 931-7127

METCO

SOURCE EMISSIONS SURVEY
OF
ASH GROVE CEMENT COMPANY
KILN NUMBER 2 STACK
LOUISVILLE, NEBRASKA

APRIL 1988

FILE NUMBER 88-71

Chloride Analysis

Run Number	1	2	3	4	5	6
Impinger #1 Cl⁻ (mg)	27.9	51.0	50.1	35.1	37.8	49.4
Impinger #2 Cl⁻ (mg)	24.1	23.9	26.4	16.8	20.4	26.1
Total Cl⁻ (mg)	52.0	74.9	76.5	51.9	58.2	75.5
Total HCl (mg)	53.5	77.0	78.7	53.4	59.8	77.6

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June 3, 1988

LABORATORY REPORT

#8712 - Page 3

CORRECTED PAGE

Ash Grove Cement Co.
P.O. Box 609 Hwy. 50 & 66
Interchange
Louisville, NE 68037

Attn: Douglas R. Jaquier

Samples received:
May 12, 1988

[TEI-56204] Sample 6L

Heat Value, BTU/lb	11200.
Total Chlorine, %	2.60
Arsenic, ppm	LT 1
Barium, ppm	4570.
Cadmium, ppm	7.5
Chromium, ppm	294
Lead, ppm	1130.
Mercury, ppm	LT 0.2
Nickel, ppm	20.0
Toluene, %	18.4
1,1,1 Trichloroethane, %	2.3

(9) [TEI-56205] Sample 1

Heat Value, BTU/lb	6400.
Total Chlorine, %	4.83
Arsenic, ppm	LT 1
Barium, ppm	4950.
Cadmium, ppm	93.6
Chromium, ppm	1730.
Lead, ppm	7720.
Mercury, ppm	1.89
Nickel, ppm	4730.
Toluene, %	13
1,1,1 Trichloroethane, %	6.3

Gayle E. Marks SK

Gayle E. Marks, Ph.D.

CC - Jim Ward - Cadence Chemical E-33
Eric Hansen ✓ Ash Grove

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May 25, 1988 **LABORATORY REPORT** #8712 - Page 4

Ash Grove Cement Co
P. O. Box 609
Louisville, NE 68037

Attn: Douglas R. Jaquier

SAMPLE RECEIVED: 05-12-88

TEI NO. 56206
SAMPLE IDENTIFICATION: 2S

Heat Value	6500.	BTU/lb
Sample Preparation		
Total Chlorine	6.84	%
Sample Preparation		
Arsenic	<1	ppm
Barium	5130.	ppm
Cadmium	56.5	ppm
Chromium	1870.	ppm
Lead	7660.	ppm
Mercury	1.07	ppm
Nickel	905	ppm
Toluene	16	%
1,1,1-Trichloroethane	16	%

TEI NO. 56207
SAMPLE IDENTIFICATION: 3S

Heat Value	6000.	BTU/lb
Sample Preparation		
Total Chlorine	5.24	%
Sample Preparation		
Arsenic	<1	ppm
Barium	5520.	ppm
Cadmium	64.3	ppm
Chromium	1850.	ppm
Lead	7570.	ppm
Mercury	0.40	ppm
Nickel	1060.	ppm
Toluene	5.6	%
1,1,1-Trichloroethane	6.1	%

g. e. Marks
Gayle E. Marks, Ph.D.

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May 25, 1988

LABORATORY REPORT

#8712 - Page 5

Ash Grove Cement Co
P. O. Box 609
Louisville, NE 68037

Attn: Douglas R. Jaquier

SAMPLE RECEIVED: 05-12-88

TEI NO. 56208
SAMPLE IDENTIFICATION: 4S

Heat Value	6700.	BTU/lb
Sample Preparation		
Total Chlorine	7.30	%
Sample Preparation		
Arsenic	<1	ppm
Barium	6600.	ppm
Cadmium	33.4	ppm
Chromium	1650.	ppm
Lead	7330.	ppm
Mercury	1.04	ppm
Nickel	678	ppm
Toluene	11	%
1,1,1-Trichloroethane	20	%

TEI NO. 56209
SAMPLE IDENTIFICATION: 8S

Heat Value	6700.	BTU/lb
Sample Preparation		
Total Chlorine	6.43	%
Sample Preparation		
Arsenic	<1	ppm
Barium	6640.	ppm
Cadmium	34.4	ppm
Chromium	1910.	ppm
Lead	8280.	ppm
Mercury	0.92	ppm
Nickel	560	ppm
Toluene	2.0	%
1,1,1-Trichloroethane	3.5	%

Copy: Mr. Jim Ward/Cadence Chem.
Mr. Eric Hansen/Ash Grove/Overland Pk. KS

g. e. Marks
Gayle E. Marks, Ph.D.

Su Table I

H-W STACK TEST APRIL, 1988
CHEM-FUEL AND CHEM-FUEL-S

Operating Conditions	1	2	3	4	5	6
Feed (TPH)	110	110	110	110	113	117
Chem-Fuel (TPH)	-	5.6	5.2	4.8	5.0	7.2
Chem-Fuel-S (TPH)	1.95	1.95	1.95	1.95	1.95	-
Kiln Coal (TPH)	5.4	-	-	-	-	-
P.C. Coal (TPH)	6.4	6.8	6.8	6.8	6.8	6.7
Particulate lb/hr	93.8	16.0	6.4	8.0	11.3	8.2

DRE of 1,1,1 - Trichloroethane

Run Number	1	2	3	4	5	6
Chem-Fuel Feed Rate lbs/hr	0	11,200	10,400	9,600	10,000	14,400
1,1,1-TCE in Chem-Fuel % wt.		2.1	2.3	2.2	1.9	2.3
1,1,1-TCE in Chem-Fuel lbs/hr		235.2	239.2	211.2	190	331.2
Chem-Fuel-S Feed Rate lbs/hr	3900	3900	3900	3900	3900	0
1,1,1-TCE in Chem-Fuel-S % wt.	5.23	5.23	5.23	5.23	5.23	
1,1,1-TCE in Chem-Fuel-S lbs/hr	204.0	204.0	204.0	204.0	204.0	
1,1,1-TCE in Fuel lbs/hr Total	204.0	439.2	443.2	415.2	394.0	331.2
1,1,1-TCE Emissions lbs/hr	4.51×10^{-5}	6.35×10^{-5}	3.9×10^{-5}	0.012	4.63×10^{-5}	3.71×10^{-5}
DRE	99.9999+	99.9999+	99.9999+	99.997	99.9999+	99.9999+
HC, ppm	7	25	9	6	5	22
CO Preheater, ppm	1060	1315	1166	1015	1212	1296
CO Bypass, ppm	78	181	459	271	86	264

H-W STACK TEST APRIL, 1988
CHEM-FUEL AND CHEM-FUEL-S

Run Number	1	2	3	4	5	6
Chem-Fuel Feed Rate	0	11,200	10,400	9,600	10,000	14,400
% Cl in Chem-Fuel		2.76	2.26	3.13	2.83	2.60
lb/hr Cl		309.1	235.0	300.5	283.0	331.2
Chem-Fuel-S Feed Rate	3900	3900	3900	3900	3900	0
% Cl in Chem-Fuel-S	4.83	6.84	5.24	7.30	6.43	
lb/hr Cl	188.4	266.8	204.3	284.7	250.8	
Total Chlorine lb/hr	188.4	575.9	439.3	585.2	533.8	331.2
HCl Emissions lb/hr	14.1	19.3	19.9	13.5	14.3	19.5

REFERENCE 3

SUMMARY OF TESTING AT CEMENT KILNS COFIRING HAZARDOUS WASTE

Marvin Branscome, Wayne Westbrook
Research Triangle Institute
Research Triangle Park, NC 27709

Robert Mournighan
U.S. Environmental Protection Agency
Cincinnati, OH 45268

Jon Bolstad, John Chehaske
Engineering - Science
Fairfax, VA 22030

ABSTRACT

The incineration of chlorinated and other liquid organic wastes was investigated in 6- to 9-day test programs at dry- and wet-process cement kilns. Testing was conducted initially under baseline conditions with no burning of waste fuels. During the waste fuel burn, the waste fuel replaced a portion of the coal and coal/coke used as the primary fuel. Different replacement rates were used for each test day. The test program included monitoring for principal organic hazardous constituents (POHCs), products of incomplete combustion (PICs), particulate matter, SO_2, NO_x, HCl, CO, CO_2 O_2, and total hydrocarbons. The fate and distribution of chlorine and metals were also determined.

Test results for POHCs showed that these cement kilns generally could achieve a destruction and removal efficiency (DRE) of 99.99 percent or greater. Most of the additional chlorine introduced with the waste fuel is removed with the kiln's waste dust. An increase in HCl emissions was observed as the quantity of chlorine entering the kiln with the waste fuel increased. The data indicate that waste combustion changes the distribution of lead so a higher percentage of the lead is removed with the waste dust.

At the wet-process kiln, no significant difference in emission rates of particulate matter and PICs was found between the baseline and waste burn test conditions. Toluene and benzene were found in trace quantities and are attributable to coal combustion. Particulate matter results at the dry-process kiln are inconclusive because of a malfunctioning electrostatic precipitator (ESP).

The burning of waste fuel at the wet-process kiln decreased SO_2 emissions from an average of 636 ppm at the baseline to 265 ppm. SO_2 concentrations at the dry-process kiln remained relatively low with a baseline range of 2 to 12 ppm compared to 5 to 38 ppm during the waste burn.

INTRODUCTION

Preliminary feasibility studies and tests have indicated that the high-temperature combustion process of cement kilns may offer an effective alternative to other disposal methods for hazardous waste. The promising characteristics of cement kilns include:

- Existing high-temperature combustion process at 1,350° to 1,650 °C (2,500° to

3,000 °F) with a gas residence time on the order of seconds.

- Numerous plants scattered through out the country, which could handle large quantities of combustible hazardous waste liquids.
- Large-scale equipment in place, including process control and pollution control; relatively small capital investment required.
- Instantaneous temperature excursions unlikely because of the huge thermal inertia.
- The alkaline environment in a cement kiln absorbs HCl from chlorinated waste combustion.
- Kilns are operated under draft (slight vacuum); therefore, there would be little outward leakage of fumes, mostly inward leakage of air.
- Ash may be incorporated into the product.
- Energy savings from substitution of waste fuel for oil, coal, or gas.

PURPOSE

The purpose of this study was to develop additional data on the destruction of hazardous waste in cement kilns. These data will be used, along with data from other tests, to evaluate the environmental impacts of this method of waste disposal. To this end, the test program was designed to:

- Calculate DREs of principal organic hazardous constituents (POHCs).
- Compare baseline operation (no waste fuel burned) to the operation with waste fuel.
- Determine if products of incomplete combustion (PICs) are formed and, if so, identify them.
- Determine the fate and distribution of metals.
- Measure the effect of fuel burning on HCl emissions, and determine the fate and distribution of chlorine through a material balance.
- Examine the effects of waste fuel burning and process conditions on other pollutants (e.g., particulate matter, NO_x, SO_2, and total hydrocarbons).

APPROACH

The primary focus of the sampling efforts was the kiln's electrostatic precipitator exhaust gas. Volatile organics were collected in Tenax® and Tenax®/charcoal sorbent tubes with the volatile organic sampling train (VOST). The sorbent cartridges were thermally desorbed and analyzed by gas chromatography/mass spectroscopy (GC/MS). Less volatile organic compounds were collected by XAD resin in a Modified Method 5 (MM5) sampling train. Both sorbents were analyzed to determine POHCs identified in the waste fuel and were also examined for products of incomplete combustion. Particulate matter emissions were determined from the MM5 sampling train. Metals emissions were estimated from analysis of the MM5 particle catch.

HCl emissions were sampled through a separate sampling train. The impinger solution was analyzed for HCl by ion chromatography. The exhaust gas was analyzed by continuous emission monitors for O_2, CO, CO_2, NO_x, SO_2, and total hydrocarbons.

Process samples taken included the raw material feed, cement product (clinker), ESP dust, primary fuel, waste fuel, and process water. The major process streams were analyzed for metals and chlorine content to attempt a material balance. In addition, the waste fuel and water were analyzed for organic compounds by GC/MS. Process operating parameters were recorded at 15-minute intervals throughout each test period.

The testing sequence first established baseline operating conditions burning only the primary fuel and no hazardous waste. The hazardous waste was then burned at different fuel replacement rates. This sequence permitted comparisons between the baseline and waste fuel test conditions and also provided information on the impacts of waste combustion in the cement kiln.

PROBLEMS ENCOUNTERED

The major problem encountered was

methylene chloride contamination of blank samples at levels roughly equal to those found from stack gas samples. The result is a bias toward high methylene chloride emission rates and a bias toward low DREs. Blank values were relatively low or nil for the other POHCs and yielded meaningful results. For the dry-process kiln test, one set of samples was invalidated because of lengthy storage time, cracks in sorbent tubes, and contamination. The ESP malfunctioned during the test on the dry-process kiln, and no meaningful data on controlled particulate matter emission rates were obtained for this test.

RESULTS

DREs

The designated POHCs for the two tests were methylene chloride, methyl ethyl ketone (MEK), toluene, 1,1,1-trichloroethane (TCE), and 1,1,2-trichloro-1,2,2-trifluoroethane (Freon 113). The concentration of the POHCs in the waste fuel ranged from 0.3 to 4 percent. The waste fuel was spiked with Freon 113 to determine the DRE of a compound that is difficult to destroy by combustion and that was unique to the waste fuel. The DRE results are summarized in Tables 1 and 2. Results for methylene chloride are environmentally conservative and biased low because sample levels and blank levels were about the same. According to the VOST protocol, blank corrections were not applied because blank levels could not be distinguished from sample levels. No significant blank problems were experienced with the other POHCs. DRE calculations for Freon 113, MEK, and 1,1,1-TCE show 4 to over 5 nines. Toluene was shown to originate from coal combustion. Toluene emission rates were unchanged by the cofiring of waste fuel. Therefore, the DRE for toluene entering only with the waste fuel is likely to be much higher than was measured. Even without subtracting the baseline level of toluene, DREs of 99.99 percent or greater were achieved at the dry-process kiln and one day at the wet-process kiln. The highest DREs for both tests were observed for compounds that had the lowest baseline and blank levels (Freon 113 and 1,1,1-TCE) with DREs on the order of 99.999 percent or greater.

The MM5 results from the dry-process kiln test were also examined to determine the DREs of compounds that were not designated as POHCs. Styrene, ethylbenzene, o-xylene, and benzaldehyde were present in the waste fuel at concentrations of 10 to 20 g/L. Benzaldehyde was detected in the stack gas for both the baseline and waste burn tests and yielded a DRE of 99.998 percent without correction (subtraction) of the baseline level. None of the other three compounds were found in the stack gas, which resulted in DREs greater than 99.999 percent for each based on detection limit values.

A review of kiln tests indicate that the highest DREs and lowest emission rates were observed when baseline or blank levels of the POHC were clearly not a problem. The two tests with apparently the least interference in measurements were at Rockwell Lime (5) and Stora Vika (1,2), where wastes similar to those previously discussed were burned. At Stora Vika, DREs consistently exceeded 4 nines and included 6-7 nines for several compounds. Similarly, at Rockwell Lime the DREs consistently exceeded 4 nines and were as high as 6 nines for several chlorinated compounds. Background and blank interferences were noted at St. Lawrence Cement (9); however, DREs exceeding 4 nines were obtained on a worst-case basis by not subtracting background levels. The results for the test at Los Robles were limited by method detection limits rather than by interferences, but DREs exceeding 4 nines were generally observed (8). A test with PCBs at Peerless Cement (12) found more PCBs entering with slurry feed (river water) in the cooler end of the kiln than was emitted during the PCB burn. However, DREs of 4 to 5 nines were reported without correction for the contribution from the water.

PICs

Organic compounds that were potential PICs from waste combustion were emitted at similar rates during the waste fuel and baseline tests. At the wet-process kiln, compounds such as toluene, benzene, xylene, biphenyl, naphthalene, and methylnaphthalenes were observed in the stack emissions with coal as the only fuel. During both the baseline and waste burn tests, benzene emission rates ranged from 15 to 50 mg/s. Emission rates of the other compounds were on the order of 1 to 10 mg/s. The highest emission rates were observed on a test day with a kiln upset (ring formation) with coal as the only

TABLE 1. DREs[a] AT THE WET-PROCESS KILN

Compound	Percent DRE at Given Replacement Rate 59%	43%	61%	39%	58%	Average
Methylene chloride[b]	99.998	99.995	99.956	99.975	99.993	99.983
Freon 113	------	------	------	>99.999	>99.999	>99.999
Methyl ethyl ketone	99.991	99.978	99.990	99.983	99.997	99.988
1,1,1-Trichloroethane	99.991	99.991	99.996	99.996	99.999	99.995
Toluene[c]	99.952	99.940	99.974	99.951	99.988	99.961

TABLE 2. DREs[a] AT THE DRY-PROCESS KILN

Compound	Percent DRE at Given Replacement Rate 25%	37%	Average
Methylene chloride[b]	99.94	99.99	99.96
Freon 113	99.999	99.999	99.999
Methyl ethyl ketone	99.997	99.999	99.998
1,1,1-Trichloroethane	>99.999	>99.999	>99.999
Toluene[c]	99.992	99.998	99.995

[a] Uncorrected for blanks.

[b] Blank values were comparable to sample values for methylene chloride.

[c] Trace quantities of toluene are produced from coal combustion.

TABLE 3. CHLORINE RESULTS FOR THE WET-PROCESS KILN

Condition	Cl in fuel (kg/hr)	HCl emissions (kg/hr)	Cl in dust (%)	Cl in clinker (ppm)
Baseline	6	0.57	0.2	<200
Day 5	32	0.27	0.7	705
Day 6	21	1.0	0.7	<200
Day 7	41	1.5	0.7	<200
Day 8	72	2.3	1.0	<200
Day 9	128	5.4	1.7	<200

TABLE 4. CHLORINE RESULTS FOR THE DRY-PROCESS KILN

Condition	Cl in fuel (kg/hr)	HCl emissions (kg/hr)	Cl in recycle dust (%)	Cl in waste dust (%)
Baseline	10	1.3	0.73	3.5
Day 3	60	2.2	1.3	5.7
Day 4	71	5.5	1.4	6.1
Day 5	72	27.	1.9	8.1

[a] Clinker results were <125 ppm chlorine.

fuel. No statistically significant increase in emission rates was observed when the waste fuel was burned. No polychlorinated dibenzodioxins or dibenzofurans were found in any samples at a detection limit of less than 1 ppb by weight in the stack gas. Similar results were obtained at the dry-process kiln except that the quantity of these compounds was lower (roughly 10 times the detection limit). The emission rates at this kiln were on the order of 0.3 mg/s.

Particulate Matter Emissions

No statistically significant difference was noted in particulate matter emissions between the baseline and waste fuel burn at the wet-process kiln. The control device was an ESP, and emissions averaged about 0.65 lb/ton. The maximum chlorine loading reached 4.7 kg/Mg of clinker.

A review of particulate matter results from kiln tests conducted to date shows similar results for pairs of tests:

- The testing of two kilns equipped with baghouses (San Juan and Rockwell Lime) showed no increase in particulate matter emissions when chlorinated wastes were burned (5,11). Emissions were 0.65 and 0.25 lb/t for the cement and lime kilns, with chlorine inputs of approximately 5.5 and 2.7 kg Cl/Mg product.
- The testing of two kilns equipped with ESPs (St. Lawrence Cement's dry-process kiln and Alpha Cement) showed a decrease in emissions when wastes were burned that were low in chlorine content (3,10). Baseline emissions of 1.1 lb/t decreased to 0.7 and 0.8 lb/t.
- The testing of two kilns equipped with ESPs (the wet-process kiln we tested and Marquette Cement) showed no change in particulate matter emissions when chlorinated wastes were burned at rates of 1.1-4.7 kg Cl/Mg clinker (7). Emissions were 0.65 and <1 lb/t for these two kilns.
- The testing of two kilns equipped with EPSs (St. Lawrence's wet-process kiln and Stora Vika) yielded results for different wastes and different chlorine loadings. Emissions were positively correlated with chlorine loading; however, the extent of the increase in emissions varied for different compounds and different kilns. Chloride accumulation, as evidenced by ring formation and subsequent release or pluggage, begins to occur in the range of 6-9 kg Cl/Mg clinker (1,2,9).

Although increased chlorine loading at the St. Lawrence and Stora Vika kilns increased particulate matter emissions, there was no known attempt to compensate for changes in the dust's resistivity. However, emissions were still comparable to those observed at other tests. Baseline test results at these two kilns ranged from 0.2 to 0.5 lb/t compared to 0.5 to 1.1 lb/t during the cofiring of waste fuels. The results do not include a kiln upset from a chloride ring formation at St. Lawrence Cement when emissions averaged about 3 lb/t. The tendency for chloride rings to form during high chlorine loading provides an incentive to the kiln's operator to limit the chlorine entering the kiln. Limiting the chlorine input may avoid plugging and process disruptions as well as limit chlorine concentrations in the dust going to the ESP. The test data suggest that particulate matter emissions from chlorinated waste combustion are controllable by a properly operating control device and a reasonable limit on chlorine loading to avoid ring formation and excessive dust loading. Adjustments may be required on a site-by-site basis to optimize ESP performance and thus account for changes in dust resistivity.

Fate of Chlorine

Results for chlorine are summarized in Tables 3 and 4 and show that 90 to 99 percent of the chlorine is retained in the process solids. At the dry-process kiln, the waste fuel contained an average of 2 percent chlorine and was fired at an average rate of about 1.2 kg Cl/Mg clinker. The waste fuel at the wet-process kiln contained 1 to 4 percent chlorine and was fired at an average rate of 2.2 kg Cl/Mg clinker (maximum of 4.7). HCl emissions, percent chlorine in the dust, and percent chlorine in the recycled dust increase as the total chlorine input increases. On the first waste fuel test day (second day of waste fuel burning) at the wet-process kiln, HCl emissions were lower than during the baseline period. Chlorine was detected in the clinker. It is possible that an equilibrium chlorine cycle had not been obtained at this point. On the last day of testing at the dry-process kiln, the chlorine cycle evidently shifted to the cooler end of the kiln. More chlorine exited with the stack gas and waste dust than in previous tests, and the chlorine concentration of the recycled dust appeared to increase although the total chlorine input remained unchanged.

A review of other tests showed that during the combustion of highly chlorinated wastes at St. Lawrence Cement, over 99 percent of the chlorine was retained in the process solids and HCl emissions were <1 lb/hr during both the baseline and waste fuel burns (9). The total chlorine input was up to 6.8 kg Cl/Mg clinker. An increase in HCl emissions from 0.6 to 1.0 lb/hr was observed at Los Robles (8), and an increase from 2.4 to 5.8 lb/hr was observed at Alpha Cement (10). An increase from <0.2 to 0.8 lb/hr was observed at San Juan Cement (11), and at Rockwell Lime the increase was from 0.2 to 0.4 lb/hr (5). During the tests at San Juan Cement, the waste fuel was highly chlorinated (up to 35 percent Cl) and was fired at an average rate of 5.5 kg Cl/Mg clinker. Over 99 percent of the chlorine was retained in the process solids, primarily the clinker. For other tests, most of the chlorine was removed with the waste dust. These tests indicate that HCl emissions can increase from chlorinated waste combustion; however, 90 to over 99 percent of the chlorine is retained in the process solids.

Fate of Lead

The lead content of the waste fuel ranged from roughly 100 to 1,000 ppm for both kiln tests. Lead emissions at the wet-process kiln increased from about 1.5 mg/s at the baseline to about 6.9 mg/s during the waste burn. The malfunctioning ESP prevented useful results at the dry-process kiln test, but a previous test at the same kiln with a similar waste fuel showed an increase in lead emissions from 5 to 9 mg/s. A material balance showed that over 99 percent of the lead was retained in the process solids. The lead concentration in the waste dust increased at both kilns. At the wet-process kiln, the increase was from 395 to 1,530 ppm compared to an increase from 116 to 2,650 ppm for the dry-process kiln.

A review of lead emissions during other kiln tests shows varying results. At St. Lawrence Cement, burning lead-contaminated waste oil with a low chlorine content did not affect lead emissions (3). Similarly, burning chlorinated aliphatics did not increase lead emissions, but burning PCBs resulted in an increase from ~1.5 mg/s at the baseline to ~4.6 mg/s (9). Lead emissions appeared to increase also at Alpha Cement (from ~4 to ~17 mg/s) (10) and Rockwell Lime (from <0.4 to 0.47 mg/s) (5). The lead content in the waste dust also increased in most cases.

For perspective, consider that total lead emissions are relatively small and on the order of emissions from several automobiles burning leaded gas. Also consider that over 99 percent of the lead is retained in the process solids. By comparison, a boiler burning used oil emits 50 to 60 percent of the lead, and may emit a higher percentage because of losses during soot blowing (3,6).

SO_2, NO_x, Total Hydrocarbons, and CO Emissions

At the wet-process kiln, SO_2 concentrations decreased from an average of 636 ppm to 265 ppm when the waste fuel replaced the sulfur-containing coal (4.3 percent sulfur). Approximately 60 percent of the total sulfur was retained in the process solids for both test conditions. At the dry-process kiln, SO_2 concentrations were low, with baseline concentrations of 1.5 to 12 ppm. During the waste burn, SO_2 concentrations ranged from 5 to 38 ppm and were shown to be strongly affected by O_2 input. The kiln exit oxygen increased to 6.7, 7.3, and 7.5 percent on successive test days with corresponding SO_2 concentrations of 38, 13, and 5 ppm. Approximately 99 percent of the sulfur entering with the fuel was retained by the process solids at the dry kiln.

Similar results have been observed at other tests, i.e., a reduction in SO_2 from waste combustion. At Alpha Cement (10), SO_2 concentrations decreased from 78 to 33 ppm, from 93 to 18 ppm at Marquette

Cement (7), and were constant at 27 ppm at Los Robles (8).

NO_x concentrations ranged from 370 to 480 ppm at the wet-process kiln and from 600 to 800 ppm at the dry-process kiln. The NO_x concentrations at the dry-process kiln were strongly affected by kiln oxygen input: an increase in kiln exit O_2 from an increased air rate yielded corresponding increases in NO_x. NO_x emissions are not obviously affected by burning waste fuels. Other investigators have found that NO_x concentrations are primarily affected by oxygen input, primary/secondary air ratio, and temperatures (4).

Concentrations of total hydrocarbon ranged from 6 to 7 ppm during three baseline tests at the wet-process kiln and increased to 21 ppm during a kiln blockage for one baseline test. The overall average was 10 ppm compared to an average of 21 ppm (16 to 28 ppm) during the waste fuel burn. The baseline test at the dry-process kiln revealed concentrations of 2 to 4 ppm compared to daily averages of 1, 5, and 9 ppm for the three waste burn tests. Tests at San Juan Cement, Rockwell Lime, and Stora Vika showed that total hydrocarbon concentrations on the order of 10 ppm or less were attained during both the baseline and waste burn test conditions.

Carbon monoxide concentrations at the wet-process kiln averaged 212 ppm (100 to 400 ppm) during the baseline compared to 190 ppm (130 to 340 ppm) during the waste burn. The baseline tests at the dry-process kiln revealed CO concentrations of 35 to 40 ppm compared to an average of 39 ppm during the waste fuel burn. The difference between CO concentrations during the baseline and waste fuel test conditions is not significant.

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REFERENCE 4

EVALUATION OF HAZARDOUS WASTE INCINERATION IN A DRY PROCESS CEMENT KILN

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ABSTRACT

This report presents the preliminary results of a test program conducted by SYSTECH Corporation at the Marquette Cement Plant in Oglesby, Illinois. The objective of this program was to compare the emissions resulting from co-firing low chlorine, high Btu liquid waste and coal in a dry process cement kiln with the emissions resulting from firing coal only.

The characteristics of the liquid waste burned during the test were examined by performance of standard analytical methods, with particular emphasis on organic composition. Destruction and removal efficiencies (DREs) were calculated for four principal organic hazardous constituents (POHCs) of the fuel: methylene chloride; methyl ethyl ketone; 1,1,1-trichloroethane; and toluene. Additional analyses were conducted on the stack gases to determine particulate loading, SO_2, NO_x, total gaseous nonmethane organics (TGNMO), HCl, and metals emissions. The kiln dust was also sampled and analyzed for metals and Extraction Procedure (EP) toxicity.

The results of these tests indicate that the cement kiln may be an ideal method of disposal for low chlorine, high Btu liquid wastes. The burning of liquid wastes in the kiln did not lead to any significant increase in particulate loading, SO_2, NO_x, TGNMO, or HCl over the levels observed during baseline coal-only test periods. Among the metals examined, only lead was found to significantly increase in emission rate during the liquid waste firing. No significant differences were observed in the EP toxicity of the kiln dusts sampled during the liquid waste and baseline tests, and only the concentration of lead was found to significantly increase in the kiln dust. Within the detection limits of the test method employed, the four POHCs measured were completely destroyed in the kiln.

INTRODUCTION

Marquette Company operates a cement plant in Oglesby, Illinois, which produces approximately 450,000 tons of cement yearly. Pulverized coal has been the primary fuel for this facility. Marquette proposes to construct and operate a liquid waste fuels resource recovery system at the Oglesby plant to facilitate the use of select combustible liquid waste materials such as high Btu (10,000 to 14,000 Btu/lb), low chlorine (2 to 5 percent) waste solvents as supplemental fuel in the kiln. The primary fuel will remain coal with an estimated 25 to 40 percent of the heat required by the manufacturing process supplied by the energy content of liquid waste materials. In order to assess the environmental effects of burning liquid wastes in the kiln, Marquette, in conjunction with the U.S. Environmental Protection Agency (EPA), the Illinois Environmental Protection Agency (IEPA), and SYSTECH Corporation performed a series of tests on the cement kiln at Oglesby on October 26 through 31, 1981.

The liquid waste fuels burned at the Oglesby facility were low chlorine, relatively high Btu waste solvents from ink and paint manufacturing and solvent recovery processes. Wastes of this type are classified as hazardous under the Resource Conservation and Recovery Act (RCRA) regulations primarily because of their ignitability, and have generally been considered unsuitable for recycling or reclaiming. Materials of this type have traditionally been disposed in landfill or incinerated without recovering their useful energy content. Incineration of such wastes in a cement kiln has the potential of minimizing any environmental damage from their disposal by destroying their combustibles while simultaneously recovering their useful energy content. Because of the high temperatures (2700° to 3000°F), long gas retention times (approaching 10 seconds), and high alkalinity in cement kilns, even highly toxic wastes such as PCBs have been demonstrated to be effectively destroyed. Earlier tests have demonstrated destruction and removal efficiencies (DREs) of such compounds exceeding 99.99 percent.[1,2]

The primary objective of the tests conducted in this program was to characterize the baseline emissions from the process when only coal was fired and to compare the results from this situation with those obtained when a combination of liquid waste and coal was being fired in the kiln. Specific emphasis was placed on characterizing the DREs of four principal organic hazardous constituents (POHCs) of the liquid wastes: methylene chloride; methyl ethyl ketone; 1,1,1-trichloroethane; and toluene. The experimental design and test methods used were developed to permit a comparison to be made between these two conditions rather than to accomplish a definitive environmental assessment of the burning of liquid wastes in a cement kiln. Therefore, it should be emphasized that the main purpose of this program was to determine whether co-firing liquid wastes increased the emissions over those normally observed during baseline conditions. The only statistically valid conclusions which can be derived from this test program fall into two categories: either the emissions were significantly increased or else no significant increase was observed. Although the mean values of the data collected may at first glance seem to indicate differences, only by considering the numbers of samples taken and the calculated sample standard deviations can statistically valid conclusions be reached. This summary report focuses on system emissions while the final EPA report will include information regarding any effects that the liquid waste may have had on the characteristics of the cement product. These effects are expected to be negligible and should not impact the environmental considerations regarding this project.

METHODS

The test program conducted at the Oglesby facility was designed to collect 2 days of samples and data during both the baseline and liquid waste burns. Because of difficulties encountered in receiving and delivering a sufficient quantity of liquid waste and periodic unscheduled kiln down times, however, only 1 day of testing was accomplished with liquid waste and only 1 1/2 days during baseline conditions.

Figure 1 shows a schematic flow diagram of the dry process cement kiln tested at Oglesby. Samples and data were collected from the sites labeled A through E. Liquid waste was pumped from a storage tanker into the flame of the kiln through a specially designed delivery nozzle.

The liquid waste burned in the test program was sampled at Site A and analyzed for heating value, chlorine, sulfur, nitrogen, and water content by standard ASTM reference methods. Method 8.01 (SW 846 Test Methods for Evaluating Solid Waste: Physical/Chemical Methods) was employed to identify the concentrations of methylene chloride; methyl ethyl ketone; 1,1,1-trichloroethane; and toluene. Other organics were qualitatively identified by a general scanning procedure employing gas chromatography with flame ionization detection (FID). Metals were identified by inductively coupled plasma emission spectroscopy (ICP). Atomic absorption spectroscopy (AA) was employed for mercury analysis.

Stack emissions were sampled at Site C and examined for total gaseous nonmethane organics (TGNMO) by EPA Method 25. Integrated bag samples of stack gases were analyzed by gas chromatography with FID according to EPA Method 23 for methylene chloride; methyl ethyl ketone; 1,1,1-trichloroethane; and toluene (see Federal Register, June 11, 1980, and EPA 600/4-80-003). Particulate emissions were measured by EPA Method 5, and SO_2 was measured by a modified EPA Method 8 procedure employing 3 percent H_2O_2 in the impingers to collect SO_2 and sulfuric acid mist. Metals emissions were determined from an analysis of the Method 5 filters and the acetone probe rinses by ICP spectroscopy. Mercury emissions were determined by AA spectroscopy. Emission of nitrogen oxides was determined by EPA Method 7. A midget impinger train containing sodium hydroxide was used to collect hydrochloric acid emissions. Analysis of the impinger contents was accomplished by a mercuric nitrate titration.

The kiln dust collected at Site D from the last two banks of the electrostatic precipitator (ESP) was analyzed for metals by ICP spectroscopy. Mercury was analyzed by AA spectroscopy. The potential for leaching of metals from this dust was assessed by conducting EP toxicity tests.

RESULTS AND DISCUSSION

Figure 2 illustrates the testing and process operating log for the test period. It is evident that the kiln experienced several periods of down time during the tests. Three tests, designated Test Nos. 1, 2, and 3, were conducted during the liquid waste burns on October 28, 1981. Test Nos. 4, 5, and 6 were conducted during baseline burns on October 30 and 31, 1981. Each test consisted of approximately 2 hours during which samples and data were collected.

The liquid waste used for this test was typical of that which would be specified for a permanent facility operation. The liquid waste was sampled every hour during the test period, and composites were made of the hourly samples to represent the material fired during each of the three co-firing conditions. The results of these analyses are presented in Table 1. The liquid waste had a mean heating value of 12,350 Btu/lb and a mean chloride content of 4.54 percent. The primary metallic constituent of the waste was lead, with a mean concentration of 1,800 ppm. No PCBs were detected in the waste and the POHCs designated for these tests comprised an average of 24.7 percent of the liquid waste. The other organic constituents listed in Table 1 were qualitatively identified by retention time in the GC analysis.

It is anticipated that in normal operation a substitution rate of 25 to 40 percent liquid waste would be used; however, during the test period a limitation on the quantity of liquid waste available precluded firing the waste at these rates. The substitution rates for the liquid waste expressed as a percent of the total heat input of the combined coal and liquid waste stream were 14.0 percent for Test No. 1, 11.2 percent for Test No. 2, and 12.8 percent for Test No. 3.

Stack emissions measured during the test program are shown in Table 2. None of the POHCs measured were detected in the stack gas samples during either co-firing or coal-only combustion. Table 3 shows the DREs of the kiln for the POHCs measured during the liquid waste tests. Since none of the POHCs were detected at the minimum detection limit of the test method (nominally 0.1 ppm), the DREs expressed can be considered minimum values. The efficiency of combustion of organic compounds is also supported by the results of the Method 25 tests which show no significant increase at a 95 percent confidence level in TGNMO emissions during co-firing when compared with baseline results. These results indicate that there is no measurable contribution to the hydrocarbon emissions from the stack due to the addition of liquid waste to the kiln.

In addition to hydrocarbons, Table 2 also presents the particulate, SO_2, NO_x, and HCl emissions under the co-firing condition for Test Nos. 1, 2, and 3 versus the coal condition during Test Nos. 4, 5, and 6. Although unstable operating conditions contributed considerable variability within the data sets, there was no significant increase at a 95 percent confidence level over baseline conditions in particulate, SO_2, NO_x, or HCl emissions while cofiring liquid waste.

Table 4 shows the results of metals analyses of stack particulates sampled during this test. A slight increase in lead emissions over baseline conditions (from .04 to .072 lb/hr) was observed during the co-firing tests. Other metals examined did not increase significantly at a 95 percent confidence level with the burning of the liquid wastes. Table 4 also shows the results of metals analyses of the kiln dust sampled during this test. An increase in the lead concentration in the kiln dust was observed during the liquid waste firing. This increase was from approximately .02 percent during coal-only conditions to .05 percent during the co-firing conditions. The other metals present in the liquid waste were not observed to significantly increase in concentration at a 95 percent confidence level in the kiln dust when the liquid waste was co-fired in the kiln. Further, the leachability of metals from the kiln dust did not increase significantly and remained orders of magnitude below the allowable limits specified by the EPA.

The inclusion of metals in the liquid waste burned in the cement kiln appears to have had a minimal impact on the discharge of metals from the stack or on the amount occurring in the kiln dust. This may indicate that many metals are deposited in the cement clinker and become incorporated in the crystalline structure of the cement product.

CONCLUSIONS

The general conclusion that can be drawn from this test program regarding the the environmental impacts of firing liquid wastes in a cement kiln is that the liquid waste does not significantly increase the emissions of particles, hydrocarbons, SO_2, NO_x, or HCl from the stack. Within the detection limits of the test methods employed, the four POHCs examined were completely destroyed in the kiln. A slight increase in lead in the particulate and kiln dust was observed, but other metals examined did not show a significant increase either in stack emission or in the process collected kiln dust with the burning of the liquid waste. The kiln dust was determined by the EP toxicity test to be nonhazardous and could be landfilled even when liquid wastes are co-fired. In general, the use of liquid waste in this test produced only minor changes in the emissions from the kiln and revealed that the kiln may provide a promising waste disposal method for high Btu, low chlorine wastes.

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TABLE 1. WASTE FUEL ANALYSIS

	Test 1	Test 2	Test 3
Heat content (Btu/lb)	12,210	13,012	11,823
Ash (%)*	12.13	7.82	6.85
Chloride (%)	3.56	4.28	5.80
Sulfur (%)	.09	.09	.06
Nitrogen (%)	.13	.10	.20
Water (%)	10.70	10.3	11.80
Metals (ppm)			
Cadmium	3	2	1
Chromium	725	565	446
Copper	195	167	177
Lead	2520	1820	1050
Manganese	47	35	42
Mercury	.076	.104	<.032
Nickel	52	42	107
Zinc	1770	1290	905
Quantified organics (%)	23.88	22.01	28.26
Methylene chloride	2.72	2.94	6.27
1,1,1-trichloroethane	1.86	1.63	1.97
Methyl ethyl ketone	7.51	8.90	8.18
Toluene	11.79	8.54	11.84
PCBs†	N.D.	N.D.	N.D.
Other organics (%)§	53.29	59.87	53.09
Methanol			
Ethanol			
2-Propanol			
Acetone			
Methyl acetate			
Ethylene chloride			
2-ethoxy-ethyl acetate			
Methyl isobutyl ketone			
Butyl acetate			
4-hydroxy-4-methyl-2-pentanone			
Benzene			
Ethyl benzene			
Styrene			
C_9 Alkyl benzenes			
Paraffins (C_6-C_{12})			
Xylene			
Unidentified (2 compounds)			

* All (%) are weight percent.

† None detected at a detection limit of .005 percent.

§ Weight percent of other organics = 100 percent - ash - water - quantified organics. Compounds listed in this category were not quantified.

TABLE 2. OGLESBY EMISSION TEST RESULTS

Run No.	Percent substitution of heat input by liquid wastes	Hydrocarbons POHCs*	Hydrocarbons TGNMO† ppm C	Part. gr/scf	Part. lb/hr	SO_2 ppm	SO_2 lb/hr	NOx ppm	NOx lb/hr	HCl ppm	HCl lb/hr
Liquid waste co-firing											
1	14	N.D.§	220	0.125	63.8	41	25.3	388	162.5	405	137
2	11.2	N.D.	800	0.101	58.7	8	5.3	590	280.4	232	89
3	12.8	N.D.	390	0.086	52.7	5	3.9	653	328.0	289	119
Coal-only											
4	—	N.D.	1350	0.075	42.9	42	27.7	864	402.9	522	196
5	—	N.D.	670	0.099	50.1	69	40.5	846	350.2	435	145
6	—	N.D.	1740	0.105	55.7	168	103.2	1052	458.7	654	230

* POHCs tested for were: methylene chloride; toluene; methyl ethyl ketone; and 1,1,1-trichloroethane.

† Method 25 hydrocarbons expressed as ppm carbon.

§ None detected at a nominal detection limit of 0.1 ppm.

TABLE 3. DREs CALCULATED FOR THE CO-FIRING TESTS

	Minimum DREs*			
Test numbers	Methylene chloride	Methyl ethyl ketone	1,1,1-trichloroethane	Toluene
1	99.869	99.960	99.718	99.968
2	99.851	99.959	99.604	99.947
3	99.917	99.961	99.710	99.968
Average	99.879	99.960	99.677	99.961

* The DREs indicated have been adjusted by a sensitivity analysis approach to include the impact of random measurement errors on the DRE calculations. The stated values therefore actually represent the minimum DREs observable in the cement kiln by employing the test methods described in this report.

TABLE 4. METALS TEST RESULTS

Kiln Dust Analysis (ppm)

		Liquid waste				Coal only			
Element	Run No.	1	2	3	Avg.	4	5	6	Avg.
Cd		18	16	15	16	19	22	30	24
Cr		23	24	31	26	23	28	24	25
Cu		26	24	25	25	24	30	30	28
Pb		524	511	488	507	173	186	167	175
Mn		632	656	795	694	681	759	655	698
Ni		25	31	31	29	22	27	29	26
Hg		.22	.30	.40	.31	.40	.22	.26	.29
Zn		71	66	70	69	49	57	75	60

Kiln Dust EP Toxicity Test Results (mg/ℓ)

		Liquid waste				Coal only			
	Run No.	1	2	3	Avg.	4	5	6	Avg.
As		<.003	<.003	<.003	<.003	.006	.004	.003	<.005
Ba		.593	1.020	.685	.766	.753	.649	1.020	.807
Cd		.004	.481	<.003	.167	.073	.017	.897	.329
Cr		<.020	.088	.032	.047	<.020	.020	.035	.025
Pb		<.043	.919	<.043	.335	<.043	<.043	.713	.266
Hg		<.0008	<.0008	<.0008	<.0003	<.0008	<.0008	<.0008	<.0008
Se		.215	.343	.179	.246	.350	.414	.502	.422
Ag		<.007	<.007	<.007	<.007	<.007	.013	<.007	<.009

Metals Emissions On Particulates (lb/hr)

		Liquid waste				Coal only			
	Run No.	1	2	3	Avg.	4	5	6	Avg.
Cd		.003	.001	.001	.002	.002	.003	.002	.002
Cr		.075	.030	.054	.053	.020	—	—	.020
Cu		—	—	—	—	—	—	—	—
Pb		.105	.060	.052	.072	.042	.036	.043	.040
Mn		.007	.004	.003	.005	.003	.002	.003	.003
Hg		.0002	.0002	.0001	.002	.0003	.0003	.0003	.003
Ni		.160	.061	.065	.095	.044	.018	.032	.031
Zn		.049	.005	.001	.018	.002	.002	—	.002

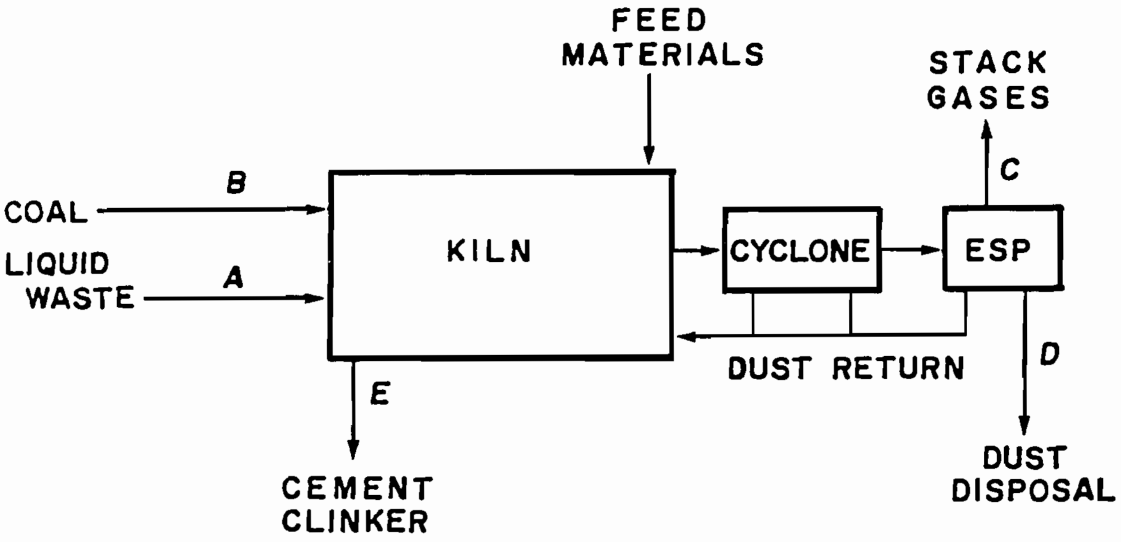

Figure 1. Marquette-Oglesby cement kiln schematic.

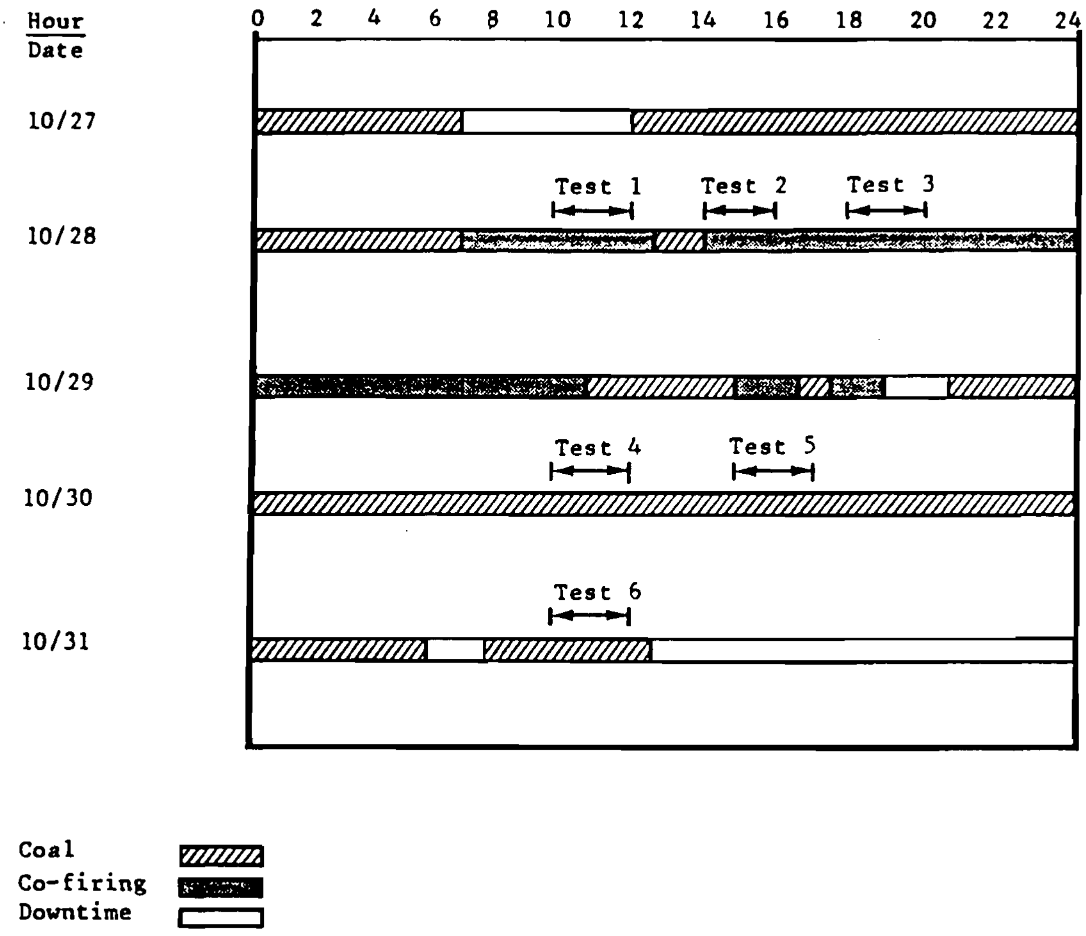

Figure 2. Process operations log.

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REFERENCE 5

THE BEHAVIOR OF METALS IN CEMENT KILNS

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26TH INTERNATIONAL CEMENT SEMINAR

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THE BEHAVIOR OF METALS IN CEMENT KILNS

I. INTRODUCTION AND SUMMARY

It is widely recognized that cement kilns represent significant capacity in the management of hazardous wastes. The capacity exists today and cement kilns can, without any adverse side effects, replace 20% to 30% or more of their fuel requirements with hazardous waste fuels. This represents an environmentally sound technology to recover the energy from hazardous wastes while providing an economic incentive for cement manufacturers.

Companies applying for new permits, or permit modifications, to replace a portion of the fossil fuel in a cement kiln with hazardous waste fuels are typically faced with two concerns voiced by the local residents and the environmental agencies: the potential for emission of hazardous organic compounds and emission of metals. This paper will address both concerns. It will provide evidence that combustion conditions required to manufacture Portland cement clinker in rotary kilns result in destruction and removal of organic hazardous compounds. It will show the results of recent tests indicating the complete destruction and removal of hazardous organic compounds (i.e., DRE >99.996%) when those compounds are fed directly to the feed end housing of a preheater kiln. These findings prove that the emission of organic hazardous compounds from cement kilns is not a valid concern.

This paper will also report on extensive investigations made on six preheater and precalciner kilns to determine the behavior of metals. On the basis of these investigations, which were performed on kilns burning conventional and hazardous waste fuels, accurate predictions of metal emissions may be made. The results of these investigations permit responsible management of the metals input to avoid any potential health or environmental risk.

II. DESTRUCTION OF ORGANIC HAZARDOUS COMPOUNDS IN KILNS

A number of tests have been performed to demonstrate the destruction and removal efficiency (DRE) of cement kilns with respect to organic compounds (1). Most of these tests utilized a variety of different hazardous organic compounds input to the burning zone of long wet kilns, while feeding hazardous wastes as replacement fuels.

A more demanding test series was recently performed. Organic hazardous compounds were fed to the burning zone of a preheater kiln as part of the liquid hazardous waste fuel (liquid HWF) supplement. In a second series, organic hazardous compounds were introduced to the kiln inlet of the same preheater kiln in conjunction with automobile tires being used as replacement fuels. A flow sheet of the kiln system in which the tests were performed is shown in Figure 1. The preheater kiln system tested has a clinker capacity of 2350 short tons per day. It's prime fuel is pulverized coal. Due to the waste streams expected to be used as replacement fuels, carbon tetrachloride and trichlorobenzene were used as organic hazardous constituents (POHCs) for DRE testing. These POHCs are difficult to combust and destroy because of their thermal stability. The POHCs were metered to the kiln system while their concentrations in the stack gases were measured. The results of these tests are shown in Table 1.

During test conditions 1 and 2, both POHCs were added to the liquid HWF. This way, the POHCs have to travel through the sintering zone and through the calcining zone of the rotary kiln and through the entire preheater to survive. The results as shown in Table 1 were therefore, in agreement with previous test data indicating destruction and removal efficiencies for carbon tetrachloride exceeding 99.999%. Measured DRE for trichlorobenzene exceeded 99.99%. During the most severe test condition 3, the POHCs were introduced with automobile tires at the inlet of the rotary kiln. The tire feed device utilizes a specially designed feed chute with a double air lock, which allows the tires to slide down the feed shelf into the rotary kiln. The test results given in Table 1 again, as theoretically expected, clearly shows that the DREs are as high as experienced under test *conditions 1 and 2. For carbon tetrachloride, the DRE was measured to be greater than 99.999%, and for trichlorobenzene, DREs greater than 99.996% were measured. It should be noted that these DREs are a result of the detection limits of these constituents in stack gases rather than the result of actual findings of undestroyed POHCs. In essence, no POHCs were actually detected in the stack gases.*

*These results clearly support the claim that the emission of organics from cement kilns burning HWF as a replacement for part of the fossil fuel, is **not** a valid concern.*

III. METALS RETENTION IN KILNS

Sprung, et al (2,3,4) have extensively investigated the reactions of trace amounts of metals in cement kiln systems. In the course of these investigations, both internal and external circulation of the trace metals were measured. Measurements were made on suspension preheater and traveling grate preheater kiln systems. The results of the measurements revealed that most trace metals in the kiln systems behave in a manner similar to the main elements, i.e. Ca, Si, Al, Fe and Mg. As such, most of the trace metals are bound in the clinker and in the dusts discharged from the kiln system. Since most of the dusts are returned to the kiln feed, external circulations of the main and the trace elements develop. This is typical for cement kiln systems. More than 99.9% of the total main and trace element inputs are bound in the solids of the kiln system (2,3).

It is generally accepted that alkali evaporation from the hot zones of the rotary kiln is increased as the halogen content, specifically the chlorine content, of the preheater feed is increased. Increased volatilization should therefore also occur for most metals in the presence of chlorine. Even for chromium, increased volatilization and partitioning in an incinerator was reported after the chlorine content was increased (5).

In an effort to verify the retention and partitioning of metals in cement kilns, detailed systems analyses were performed. The systems analyzed were 3 precalciner kiln systems, 2 conventional preheater kiln systems (one of which was tested with two chlorine input levels) and one long wet kiln. The systems analyses were performed by sampling all incoming and outgoing mass flows on an hourly basis for a period of at least eight hours. The hourly samples were combined in a composite sample. The composite samples were then analyzed for all metals. During the sampling periods, particulate emissions from the stacks were also measured and the particulate catches were analyzed. Based upon the analytical results and the estimated flow quantities, total input and output of metals were balanced. Since cement kilns typically operate in steady state conditions, such balances are reasonably accurate, i.e., better than ± 5% - 10%. As experienced in previous investigations, when attempting to mathematically balance the total input and output of one trace element in cement kilns (6), the accuracy of the balance is determined by the accuracy of the digestion and analysis of the elements rather than by the system stability.

A typical balance for arsenic (one of the trace metals) is given in Table 2. Table 2 represents the individual results as analyzed and calculated for a 4-stage preheater/precalciner kiln system. Listed are the incoming and outgoing mass flows of the system, the analytical results, and the calculated values in units of milligrams of arsenic per kilogram of clinker. The total input into the kiln system from raw materials and fuels is 12.821 milligrams of arsenic per kilogram of clinker. The bulk of the arsenic input results from the raw material. The total output with clinker and through the stack is 13.912 milligrams of arsenic per kilogram of clinker. This is 8.5% higher than the input. A computer program is used to adjust input and output accordingly. The measured emissions were however not subjected to adjustment. It should be noted that the precalciner kiln system, for which the arsenic balance is given, is not equipped with a bypass. Also, all of the dust collected in the kiln baghouse is returned to the preheater feed.

The arsenic balances, as shown in Table 2, for a preheater/precalciner kiln, were compared for all kiln systems investigated. The comparison focused on the total input and total output and on the portion of arsenic bound in the solids, i.e., clinker and dusts. Included in this comparison were 2 conventional preheater kiln systems which were using liquid HWF to replace some of the fossil fuel. It was found that the percentage of arsenic bound or retained in the solids was similar to all systems; 99.88% with a standard deviation of s = ± .29%. This result permits to consider the retention of arsenic in the solids of all kiln systems as a physical characteristic of the arsenic. The origin of the arsenic has no influence on this physical characteristic: the retention of arsenic in the solids is a function of the physical and chemical behavior of the arsenic input into the kiln systems.

Similar comparisons were made for other metals. The results of these comparisons are shown in Table 3. This table gives the input range of each metal in the various kiln systems burning fossil, and in two cases, liquid HWF fuels. The table also indicates the retention of these metals in the solids of the kiln systems i.e., the percentage of the metal locked up in the solids. Excluded from Table 3 are the highly volatile metals, thallium and mercury, which will be dealt with later. All other trace metals fit well into the scheme found for arsenic. Even with a wide input range over approximately one order of magnitude, the retention of a specific metal in the solids of the kiln system is similar for all kiln systems. The retention of each metal, or the portion of the total input of that metal, which is retained and locked up in the solids seems to be characteristic for each metal. Again, for the metals retainage it obviously is not relevant from where the metals originate: a metal input with raw material behaves in the same characteristic way as a metal input with fuel or with HWF. This finding is of specific importance when considering to burn solid HWF using the Cadence technology (7).

It is to be expected that this characteristic portion of the metal retained in the solids may be correlated with the volatility of the metal. This however, is not obvious from the results presented in Table 3. Chromium, which is not highly volatile, shows a retention in the solids of 99.855% of the total chromium inputs while 99.853% of the more volatile lead *input are retained in the solids.*

The lowest retention in this group of metals was observed for cadmium. With inputs ranging from 0.08 to .39 lbs per hour, 99.555% of the cadmium was retained in the clinker and dusts. This result is in line with the known high volatility of cadmium in the temperature ranges of kiln systems.

The retention of metals in the solids of a kiln system was specifically measured with different chlorine input levels on a 4-stage preheater system. The kiln was not equipped with a bypass. The results for lead and cadmium retention, with 1.8 lbs of chlorine per minute and 3.0 lbs of chlorine per minute input, is shown in Table 4. The table shows that the average retention of these selected metals is, within reasonable accuracy, independent of the chlorine input. Increased chlorine input does not decrease the amount of lead and cadmium bound in the clinker and dust. This result may only be valid within the relatively narrow range of chlorine input levels, but measurements at higher chlorine inputs are not possible. Additional chlorine could not be removed from the kiln system through a bypass. The results, given in Table 4, still support the conclusion that the retention of lead and cadmium in the solids of the kiln system is not decreased with increasing chlorine input, as long as the chlorine input levels do not exceed practical operating levels. This finding is important, since it allows to utilize chlorinated waste streams as replacement fuels for fossil fuel as long as the chlorine tolerance levels of the kiln system are not exceeded.

In addition to metals retention in the solids of cement kiln systems, also the metals emissions must be known for sound metals management.

IV. METALS EMISSIONS

The metals retention in the kiln systems were derived from balancing the metals input and output, the emissions were however measured separately. For emissions measurements, the particulate catches (using EPA Method 5) were analyzed. Metals emissions were also *directly measured (using EPA's Draft Multi-Metals Train). Generally, both methods give similar results which demonstrates that none of the metals discussed are emitted as free metals or vapors. The metals are condensed and have at least partly reacted with the feed stock particulates which pass through the baghouse as particulate emissions. This finding is in agreement with the results reported by Sprung et al (3). The preheater off gases are used to dry the raw materials or they are quenched prior to entering the baghouse. The operating temperature range of the air pollution control device does not permit gas temperatures sufficiently high so as to allow metals to exist in vaporized form.*

As in the case of metals retention in solids, the metals emissions of all tested kiln systems were compared for each metal. The comparison was made on the basis of total metals input. The minute amount of the specific metal emitted was determined as percentage of the total metals input. It should be noted that the metals emission most frequently are below the detection limit. In these cases, the detection limit was used as the metals emission, representing the most conservative approach to present emissions data.

The summary for all metals emissions as percentage of the total metals input is given in Table 5. This table shows the mean values of the emissions from the six kiln systems. As pointed out earlier, some of the kiln systems have totally closed dust return loops and only two of the systems tested were burning HWF as a replacement for a portion of the fossil fuel. As can be expected, no differences in the metals emissions between the kiln systems burning HWF and coal and those burning coal only were identified. This confirms the theory that the origin and point of introduction of metals in the kiln system is irrelevant for the retention and emissions of the metals.

The results given in Table 5 indicate that the emission, in percent of the total metals input, is different for certain groups for metals. While only .004 to .048% of the total metals input is emitted as particulates of metals like vanadium, arsenic and nickel up to .44% of the total cadmium input is emitted as particulate. These results are consistent with those reported for cadmium emissions of a cyclone type preheater kiln system by Kirchner (8).

It may, therefore, be concluded that figures given in Table 5 for the metals emissions in percent of the total metals input are reasonably accurate and representative.

In an effort to group the metals in order of their partitioning, Figure 2 was developed. This figure illustrates metals emissions (in a logarithmic scale) for various metals as a percentage of the total metals input. The metals are arranged in decreasing order with respect to emissions. Figure 2 reinforces the theory that cadmium is the most critical metal followed by selenium, antimony, zinc, lead and silver.

Both Table 5 and Figure 2 indicate that cadmium, selenium, antimony, zinc, lead and silver are the metals which demand the kiln operator's attention regardless of whether HWF are supplementing fossil fuels or not. However, cadmium and lead are generally higher in waste derived fuels than in fossil fuels. It is, therefore, necessary to forecast the emissions of these metals prior to actually burning HWF in a kiln to ensure that these emissions pose no risk to human health nor to the environment.

In Figure 2 and Tables 4 & 5, thallium and mercury were not addressed. These metals are considerably more volatile than the others, and they were of course included in the systems analyses and in the emissions measurements. Most of the balances of the inputs and outputs of these two metals performed on the six kiln systems, close well. This indicates that the mass flows and the emissions were accurately measured. However, a significant data scatter exists from kiln system to kiln system. The scatter of the mercury data is larger than that of the thallium data. This data is shown in Table 6. This table is a summary of the retention and emissions data for these two metals. The thallium retention in the solids of the kiln systems averages 90% with a standard deviation of ± 10.7%. Accordingly, 10% to 20% of the total thallium input is emitted. The data scatter increased primarily due to a long wet kiln, which is included in the data base. The figures for mercury show even a greater scatter; 61% of the total mercury input is retained in the solids with a standard deviation of ± 32%. The measured mercury emissions vary between 10% and 90% of the total mercury input. As previously discussed, the emissions *were assumed to be at the detection limit when the stack testing indeed indicated emissions below the detection limit for thallium and mercury. There is insufficient information to explain the scatter of the thallium and even more so the mercury data. Therefore, until more information is available, the most conservative assumptions must be made.*

V. EMISSIONS FORECASTING

Based upon the results reported under 3 and 4 above, it appears valid to predict metals emissions from cement kilns based upon the total metals input into the kiln and upon the average emissions figures given in Table 5 and in Figure 2. It should be pointed out that these forecasts may be applied to kiln systems of different capacities, as long as the total metals input are not significantly different than the ranges given in Tables 4 & 5. This limitation will effectively limit the extrapolation that may have to be applied.

The forecasting calculations as described above have been used to predict emissions of arsenic, beryllium and cadmium for a 4-stage preheater kiln system with a capacity of 2,000 short tons per day. To put the metal emissions predicted into perspective, they were compared with the extremely conservative Emissions Screening Limits (ESL), as published by EPA (9), taking the specific plant data into account. The result of this comparison is given in Figure 3. This figure gives the predicted metals emissions as percent of the emissions screening limits. The calculation was also performed for chromium. Through site specific testing, it was demonstrated that the content of hexavalent chromium is approximately 2% of the total chromium content.

Figure 3 indicates that all of the metals investigated show emission rates significantly less than 10% of the conservative ESL as published by EPA. The input of the other metals were so low that comparative calculations were only performed, but are not shown in Figure 3. Unfortunately, it is too early to compare these emissions forecasts with tests which are presently under way. However, the emissions forecasts compare very well with emissions measured in previous stack tests. It may, therefore, be assumed that the *methodology described provides reasonably accurate results for metals emissions forecasting.*

IV. LITERATURE

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(9) EPA: Standards For Owners And Operators Of Hazardous Waste Incinerators And Burning Of Hazardous Wastes In Boilers And Industrial Furnaces; Federal Register, Vol. 55, No. 82, April 27, 1990, Pgs. 17862-17921

Attachments:

Figure 1: 4-Stage Preheater Kiln System

Table 1: Destruction And Removal Efficiencies For POHCs Of A 4-Stage Preheater Kiln System

Table 2: Balancing Of Arsenic Preheater/Precalciner Kiln System

Table 3: Metals Retention In Percent Of Input

Table 4: Metals Retentions For Cadmium And Lead With Increased Cl-Input

Table 5: Metals Emissions In Percent Of Input

Figure 2: Metals Emissions

Table 6: Retention And Emissions Of Volatile Metals

Figure 3: Metals Emissions And Emission Screening Limits - 4-Stage Preheater Kiln

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4-Stage Preheater Kiln System

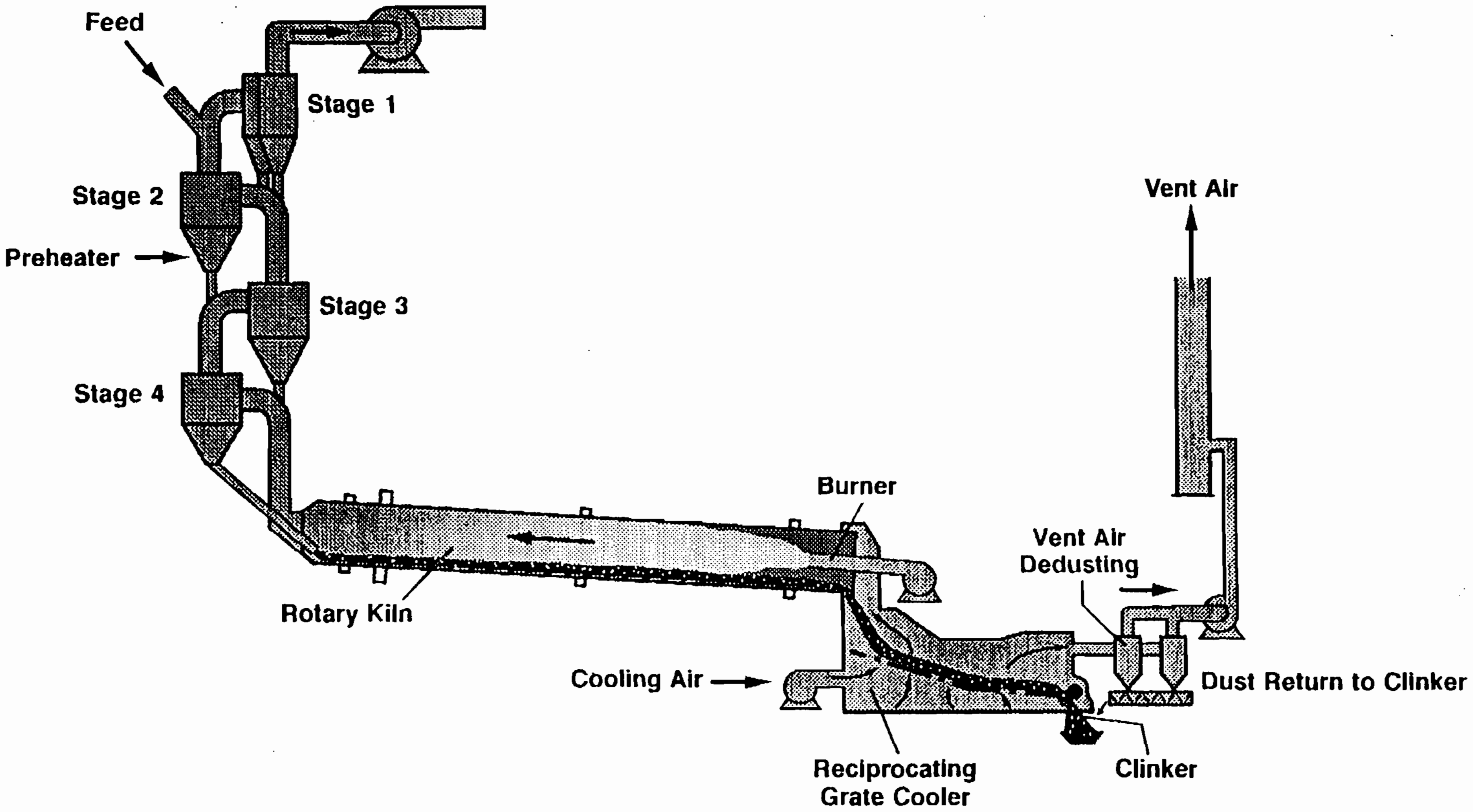

FIGURE 1

TABLE 1

Destruction and Removal Efficiencies For POHCs of a 4-Stage Preheater Kiln System

Principle Organic Hazardous Constituent DRE in %		
Tests of 9/15 - 9/22	Carbontetrachloride	Trichlorobenzene
Condition 1:	POHCs Added with Liquid HWF	
Run 1	99.9996	99.9960
Run 2	99.9996	99.9957
Run 3	99.9996	99.9960
Condition 2:	POHCs Added with Liquid HWF	
Run 1	99.9996	99.9961
Run 2	99.9996	99.9959
Condition 3:	POHCs Added with Tires	
Run 1	99.9996	99.9961
Run 2	99.9996	99.9961
Run 3	99.9996	99.9961

TAB. 2

Balancing of Arsenic Preheater/ Precalciner Kiln System

	Analyzed	Calculated	
	PPM	mg/kg CL	PPM
Raw Materials	8.400	12.689	8.400
Fuels	1.000	0.132	
Preheater Exit		3.379	17.767
Stack Loss	0.012	0.005	
Dust from Baghouse	16.000	3.374	17.743
Preheater Feed	16.064	16.064	9.445
Loss Through Bypass	10.000	0.000	
Kiln Feed	0.000	19.150	14.197
Clinker	14.300		12.816
Total Input	12.821		
Total Output	13.900		

TABLE 3

Metals Retention in Percent of Input

Metal	Input - Lbs/Hr	Retention %
Cr	0.5642 To 10.1974	99.8553 ± 0.3990
Pb	1.5761 To 42.2842	99.8531 ± 0.2008
Ba	33.1177 To 75.9640	99.8781 ± 0.2939
Cd	0.0864 To 0.3945	≥99.5550 ± 0.4418
As	0.0151 To 6.5910	≥99.8868 ± 0.2916
Be	0.0003 To 0.7172	≥99.8681 ± 1.3278
Se	0.0072 To 1.3410	≥95.4002 ± 1.7779
Ag	0.0439 To 0.4975	±99.8420 ± 0.1839
Ni	1.9490 To 5.0261	≥99.9574 ± 0.0108
Sb	0.3532 To 0.6640	≥99.7690 ± 0.0785
Zn	9.1751 To 35.8034	99.7869 ± 0.2598
V	4.9594 To 31.3130	≥99.9922 ± 0.0007

TABLE 4

Metals Retentions for Cadmium and Lead With Increased Cl-Input

Metal	Retention at 100 Lbs of Cl-/Hr	Retention at 180 Lbs Cl-/Hr
Cd	99.55	99.87
Pb	99.85	99.98

TABLE 5

Metals Emissions in Percent of Input

Metal	Input - Lbs/Hr	Emission %
Cr	0.5642 To 10.1974	0.128
Pb	1.5761 To 42.2842	0.167
Ba	33.1177 To 75.9640	0.030
Cd	0.0864 To 0.3945	0.440
As	0.0151 To 6.5910	0.022
Be	0.0003 To 0.7172	0.114
Se	0.0072 To 1.3410	0.298
Ag	0.0439 To 0.4975	0.163
Ni	1.9490 To 5.0261	0.048
Sb	0.3532 To 0.6640	0.266
Zn	9.1751 To 35.8034	0.220
V	4.9594 To 31.3130	0.004

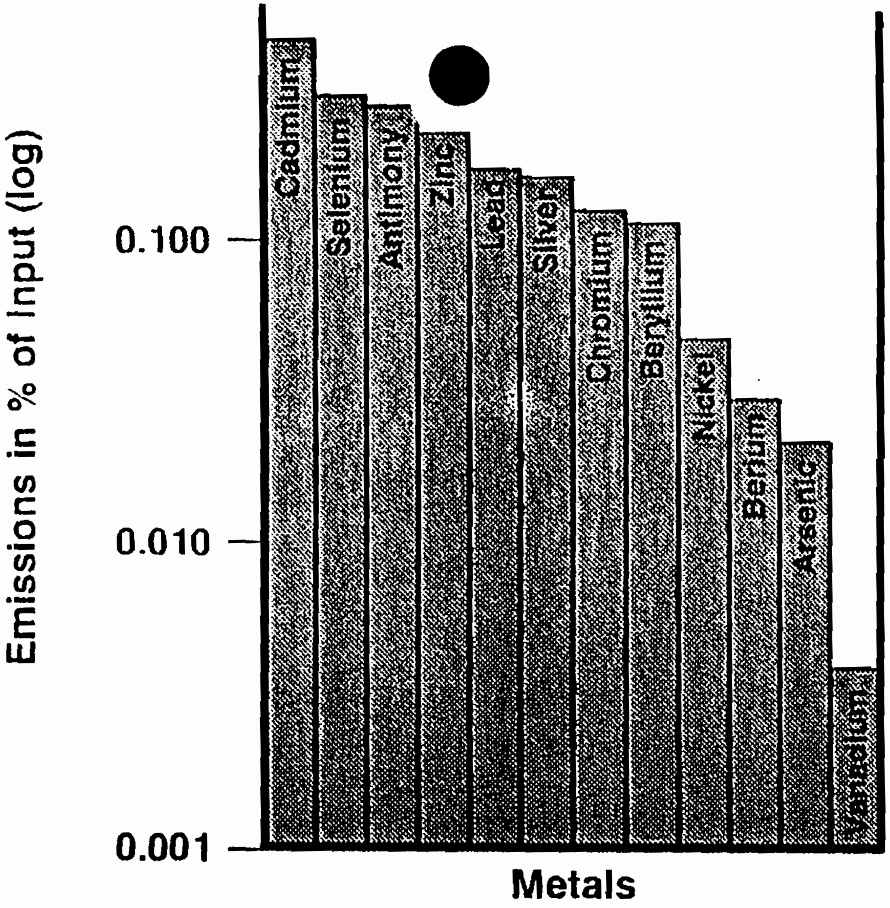
Emissions in % of Input (log)
0.100
0.010
0.001
Cadmium
Selenium
Antimony
Zinc
Lead
Silver
Chromium
Beryllium
Nickel
Barium
Arsenic
Vanadium
Metals

FIGURE 2

Metals Emissions and Emission Screening Limits (ESL)
4-Stage Preheater Kiln

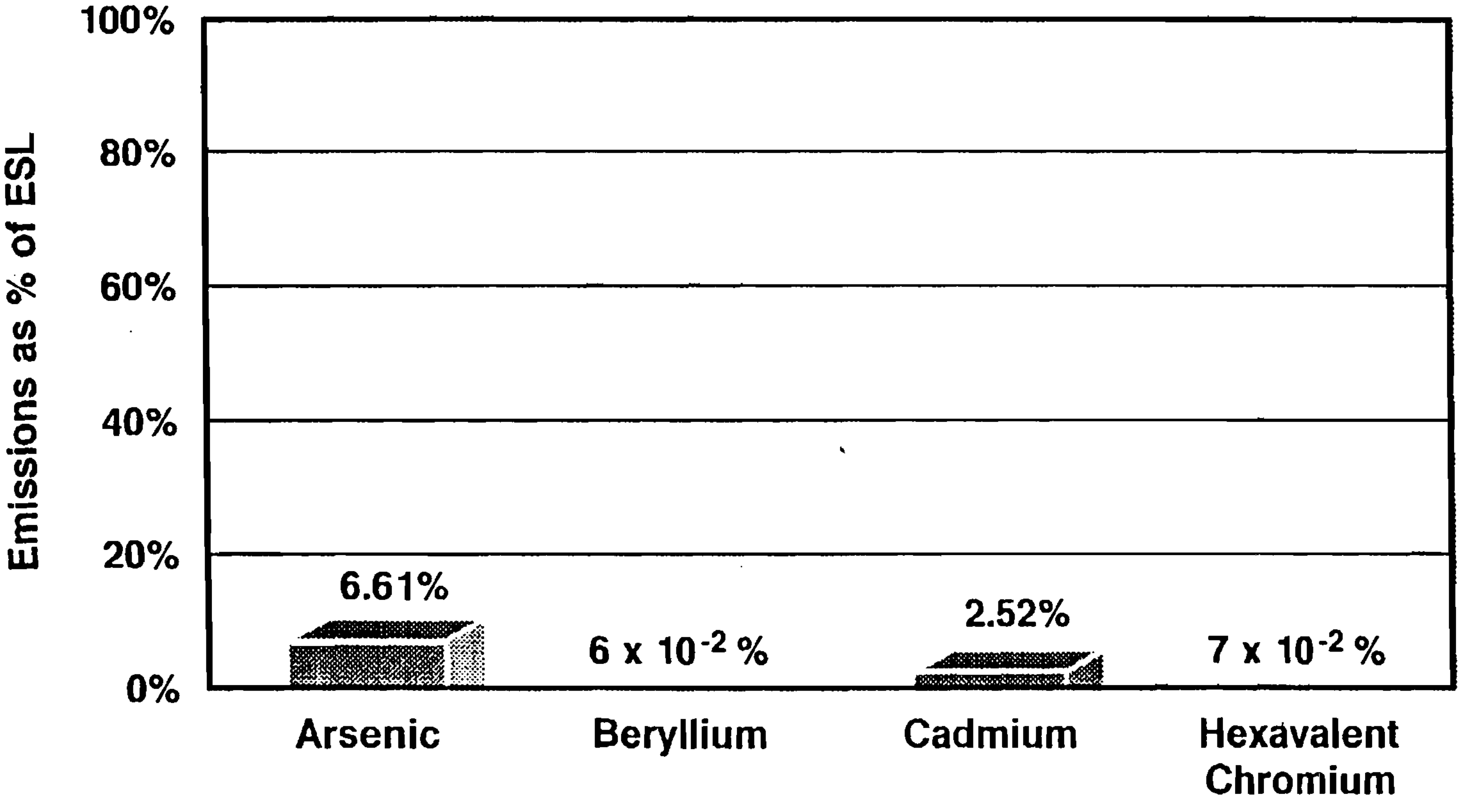

FIGURE 3

REFERENCE 6

METCO
ENVIRONMENTAL
P.O. Box 598
Addison, TX 75001
(214) 931-7127

SOURCE EMISSIONS SURVEY
OF
SOUTHWESTERN
PORTLAND CEMENT COMPANY
KOSMOS CEMENT DIVISION
KILN STACK
KOSMOSDALE, KENTUCKY
VOLUME I

SEPTEMBER 1990

FILE NUMBER 90-111

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SOURCE EMISSIONS SURVEY
SOUTHWESTERN PORTLAND CEMENT COMPANY
KOSMOS CEMENT DIVISION
KILN STACK
KOSMOSDALE, KENTUCKY
FILE NUMBER 90-111

INTRODUCTION

METCO Environmental, Dallas, Texas, conducted a source emissions survey of Southwestern Portland Cement Company, Kosmos Cement Division, located in Kosmosdale, Kentucky, on September 17, 18, 19, 20, 21, 22, 24, and 25, 1990. The purpose of these tests was to determine the concentrations of particulate matter, hydrogen chloride, sulfur dioxide, oxides of nitrogen, carbon monoxide, total hydrocarbons, metals, carbon tetrachloride, and 1,2,4-trichlorobenzene being emitted to the atmosphere via the Kiln Stack.

The sampling followed the procedures set forth in the Appendix to the Code of Federal Regulations, Title 40, Chapter I, Part 60, Methods 1, 2, 3, 3A, 5, 6C, 7E, 9, 10, 23, 25A, and Proposed 26; in "Methodology for the Determination of Metals Emissions in Exhaust Gases From Hazardous Waste Incineration and Similar Combustion Processes;" and in Test Methods for Evaluating Solid Waste, Volume II, Method 0030.

The sampling was observed by Mr. John Bartles and Paul Castagno of the Jefferson County Air Pollution Control District.

SUMMARY OF RESULTS
Kiln Stack

Condition	Particulate Matter Emissions		Hydrogen Chloride Emissions ****		Sulfur Dioxide Emissions		Oxides of Nitrogen Emissions		Carbon Monoxide Emissions		Total Hydrocarbons Emissions		Visible Emissions
	(gr/dscf*)	(lbs/hr)	(ppm)	(lbs/hr)	(ppm)	(lbs/hr)	(ppm)	(lbs/hr)	(ppm)	(lbs/hr)	(ppm)	(lbs/hr)	(% Opacity)
I	0.0025	4.94	3.7	4.90	10	23.7	288	493.5	45	47.2	7	11.8	---**
II	0.0015	3.06	2.0	2.70	23	54.0	383	651.7	131	135.3	6	9.0	0.0
III	0.0012	2.32	2.5	3.36	48	116.6	254	444.7	107	114.4	3	5.6	0.0
IV	0.0013	2.52	2.2	2.89	16	37.4	211	354.6	70	71.2	4	5.7	0.0

Condition	Arsenic Emissions (lbs/hr)	Cadmium Emissions (lbs/hr)	Chromium Emissions (lbs/hr)	Lead Emissions (lbs/hr)	Carbon Tetrachloride Emissions (lbs/hr)	Carbon Tetrachloride DRE (%)	1,2,4-Trichlorobenzene Emissions (lbs/hr)	1,2,4-Trichlorobenzene DRE (%)
I	$<4.48\times10^{-4}$	$<8.95\times10^{-4}$	<0.004	0.002	$<3.15\times10^{-4}$	>99.9993	<0.002	>99.995
II	$<3.81\times10^{-4}$	$<7.62\times10^{-4}$	0.002	0.001	$<3.60\times10^{-4}$	>99.9992	<0.002	>99.995
III	$<3.05\times10^{-4}$	$<6.11\times10^{-4}$	<0.002	3.34×10^{-4}	$<4.09\times10^{-4}$	>99.9992	<0.002	>99.996
IV	$<3.04\times10^{-4}$	$<5.17\times10^{-4}$	<0.002	0.002	------	--------***	------	-------***

* 29.92 "Hg, 68°F (760 mm Hg, 20°C)
** No data, due to poor observation conditions.
*** Condition IV was baseline coal only, not a DRE run.
**** See page 31.

SUMMARY OF RESULTS
Kiln Stack
Condition I

Run Number	1	3	4
Date	9/18/90	9/19/90	9/19/90
Time	1120-1248	1230-1444	1849-2021
Stack Flow Rate - ACFM	360,335	363,356	361,614
Stack Flow Rate - DSCFM*	236,401	229,541	232,345
% Water Vapor - % Vol.	6.31	6.99	5.75
% CO_2 - % Vol.	10.2	7.6	6.1
% O_2 - % Vol.	14.9	14.8	15.0
% Excess Air @ Sampling Point	301	257	254
Stack Temperature - °F	295	310	307
Stack Velocity - FPM	4,685	4,724	4,702
Percent Isokinetic	97.2	100.7	97.1
Particulates Probe, Cyclone & Filter Catch grains/dscf*	0.0027	0.0019	0.0028
grains/cf @ Stack Conditions	0.0017	0.0012	0.0018
lbs/hr	5.38	3.80	5.64
Visible Emissions - % Opacity	----**	----**	----**
Hydrogen Chloride Emissions - ppm***	3.1	3.5	4.5
Hydrogen Chloride Emissions - lbs/hr	4.15	4.57	5.97

* 29.92 "Hg, 68°F (760 mm Hg, 20°C)
** No data due to poor observation conditions.
*** See page 31.

SUMMARY OF RESULTS

Kiln Stack

Condition I

Ion Chromatography Analyses

Run Number	1	3	4
Chloride - Total µg	7,351.2	8,786.6	10,699.4
Chloride ("Back-half") - µg	5,557.2	6,135.6	7,731.4
Ammonia - Total µg	10,655.8	10,563.4	8,152.1
Ammonia ("Back-half") - µg	10,655.8	10,563.4	8,152.1
Calcium - Total µg	457.0	158.2	349.0
Calcium ("Back-half") - µg	0.0	10.2	0.0
Potassium - Total µg	15.0	0.0	0.0
Potassium ("Back-half") - µg	15.0	0.0	0.0
Sodium - Total µg	763.0	1,056.0	411.0
Sodium ("Back-half") - µg	0.0	0.0	0.0

SUMMARY OF RESULTS
Kiln Stack
Metals
Condition I

Run Number	1	3	4
Date	9/18/90	9/19/90	9/19/90
Time	1340-1600	0948-1201	1540-1805
Stack Flow Rate - ACFM	365,040	386,181	376,676
Stack Flow Rate - DSCFM*	238,959	242,814	238,196
% Water Vapor - % Vol.	6.14	6.47	6.67
% CO_2 - % Vol.	9.4	10.4	6.1
% O_2 - % Vol.	14.8	14.4	15.0
% Excess Air @ Sampling Point	280	261	254
Stack Temperature - °F	297	318	312
Stack Velocity - FPM	4,746	5,021	4,898
Percent Isokinetic	99.4	102.8	96.4
Volume of Dry Gas Sampled - DSCF*	71.975	73.204	67.349
Arsenic - total µg	<1.0	<1.0	<1.0
Arsenic Emissions - lbs/hr	$<4.38\text{x}10^{-4}$	$<4.38\text{x}10^{-4}$	$<4.67\text{x}10^{-4}$
Cadmium - total µg	<2.0	<2.0	<2.0
Cadmium Emissions - lbs/hr	$<8.76\text{x}10^{-4}$	$<8.76\text{x}10^{-4}$	$<9.34\text{x}10^{-4}$
Chromium - total µg	11.0	<6.0	5.5
Chromium Emissions - lbs/hr	0.005	<0.003	0.003
Lead - total µg	6.7	1.8	1.7
Lead Emissions - lbs/hr	0.003	$7.88\text{x}10^{-4}$	$7.94\text{x}10^{-4}$

* 29.92 "Hg, 68°F (760 mm Hg, 20°C)

SUMMARY OF RESULTS

Kiln Stack

Method 23

Condition I

Run Number	1	3	4
Date	9/18/90	9/19/90	9/19/90
Time	1120-1500	0956-1358	1534-1928
Stack Flow Rate - ACFM	363,908	367,297	369,876
Stack Flow Rate - DSCFM*	239,621	238,271	239,327
% Water Vapor - % Vol.	5.23	4.38	5.11
% CO_2 - % Vol.	9.8	9.6	6.1
% O_2 - % Vol.	14.9	14.5	15.0
% Excess Air @ Sampling Point	295	258	254
Stack Temperature - °F	301	311	307
Stack Velocity - FPM	4,732	4,776	4,809
Percent Isokinetic	90.8	105.7	98.3
Volume of Dry Gas Sampled - DSCF*	115.739	122.064	113.963
Total 1,2,4-Trichlorobenzene - µg	<7.42	<6.42	<7.38
1,2,4-Trichlorobenzene Emissions - lbs/hr	<0.002	<0.002	<0.002

* 29.92 "Hg, 68°F (760 mm Hg, 20°C)

SUMMARY OF RESULTS

1,2,4-Trichlorobenzene

DRE

Kiln Stack

Condition I

Run Number	1	3	4
Liquid Hazardous Waste Fuel Feed Rate - lbs/hr	4,003	4,003	4,003
1,2,4-Trichlorobenzene in Liquid Feed - ppm	103	<100	<100
1,2,4-Trichlorobenzene in Liquid Feed - lbs/hr	0.41	0.00	0.00
1,2,4-Trichlorobenzene Injected - lbs/hr	50.1	46.9	50.3
Total 1,2,4-Trichlorobenzene - lbs/hr	50.51	46.90	50.30
1,2,4-Trichlorobenzene Emissions - lbs/hr	<0.002	<0.002	<0.002
1,2,4-Trichlorobenzene DRE - %	>99.996	>99.995	>99.996

SUMMARY OF RESULTS

Kiln Stack

Condition I

Run Number	Volume of Dry Gas Sampled (DSCF*)	Carbon Tetrachloride (total μg)	Carbon Tetrachloride (lbs/hr)	Stack Flow Rate (DSCFM*)
1-A	0.658	<0.013	$<6.25\text{x}10^{-4}$	239,621
1-B	0.645	<0.009	$<4.41\text{x}10^{-4}$	
1-C	0.643	<0.008	$<3.93\text{x}10^{-4}$	
Average			$<4.86\text{x}10^{-4}$	
3-A	0.679	<0.007	$<3.24\text{x}10^{-4}$	238,271
3-B	0.673	<0.006	$<2.80\text{x}10^{-4}$	
3-C	0.678	<0.005	$<2.32\text{x}10^{-4}$	
Average			$<2.79\text{x}10^{-4}$	
4-A	0.652	<0.005	$2.42\text{x}10^{-4}$	239,327
4-B	0.631	<0.001	$<5.01\text{x}10^{-5}$	
4-C	0.642	<0.005	$<2.46\text{x}10^{-4}$	
Average			$<1.79\text{x}10^{-4}$	
		Average	$<3.15\text{x}10^{-4}$	

* 29.92 "Hg, 68°F (760 mm Hg, 20°C)

SUMMARY OF RESULTS

Carbon Tetrachloride

DRE

Kiln Stack

Condition I

Run Number	1	3	4
Liquid Hazardous Waste Fuel Feed Rate - lbs/hr	4,003	4,003	4,003
Carbon Tetrachloride in Liquid Feed - ppm	285	<100	<100
Carbon Tetrachloride in Liquid Feed - lbs/hr	1.14	0.0	0.0
Carbon Tetrachloride Injection - lbs/hr	50.0	46.9	50.2
Total Carbon Tetrachloride - lbs/hr	51.14	46.90	50.20
Carbon Tetrachloride Emissions - lbs/hr	$<4.86\text{x}10^{-4}$	$<2.79\text{x}10^{-4}$	$<1.79\text{x}10^{-4}$
Carbon Tetrachloride DRE - %	>99.9990	>99.9994	>99.9996

SUMMARY OF RESULTS
Kiln Stack
Condition II

Run Number	5	6	
Date	9/20/90	9/20/90	
Time	1303-1447	1925-2049	
Stack Flow Rate - ACFM	370,466	361,067	
Stack Flow Rate - DSCFM*	238,514	229,345	
% Water Vapor - % Vol.	6.77	6.18	
% CO_2 - % Vol.	7.5	8.0	
% O_2 - % Vol.	15.6	15.0	
% Excess Air @ Sampling Point	327	278	
Stack Temperature - °F	301	316	
Stack Velocity - FPM	4,817	4,695	
Percent Isokinetic	100.3	97.9	
Particulates Probe, Cyclone & Filter Catch grains/dscf*	0.0019	0.0011	
grains/cf @ Stack Conditions	0.0012	0.0007	
lbs/hr	3.96	2.15	
Visible Emissions 15-minute Average - % Opacity	------	0.0	
Hydrogen Chloride Emissions - ppm**	1.9	2.1	
Hydrogen Chloride Emissions - lbs/hr	2.62	2.77	

* 29.92 "Hg, 68°F (760 mm Hg, 20°C)
** See page 31.

SUMMARY OF RESULTS

Kiln Stack

Condition II

Ion Chromatography Analyses

Run Number	5	6
Chloride - Total µg	5,978.0	7,567.8
Chloride ("Back-half") - µg	3,506.0	5,286.8
Ammonia - Total µg	9,469.0	18,760.2
Ammonia ("Back-half") - µg	9,469.0	18,760.2
Calcium - Total µg	456.8	324.0
Calcium ("Back-half") - µg	0.0	0.0
Potassium - Total µg	271.2	<0.4
Potassium ("Back-half") - µg	0.0	<0.4
Sodium - Total µg	633.2	596.0
Sodium ("Back-half") - µg	0.0	0.0

SUMMARY OF RESULTS
Kiln Stack
Metals
Condition II

Run Number	5	6	
Date	9/20/90	9/20/90	
Time	1010-1218	1622-1844	
Stack Flow Rate - ACFM	361,910	370,961	
Stack Flow Rate - DSCFM*	241,900	236,119	
% Water Vapor - % Vol.	3.66	5.73	
% CO_2 - % Vol.	7.8	8.3	
% O_2 - % Vol.	15.3	15.5	
% Excess Air @ Sampling Point	301	330	
Stack Temperature - °F	297	318	
Stack Velocity - FPM	4,706	4,823	
Percent Isokinetic	98.7	100.7	
Volume of Dry Gas Sampled - DSCF*	70.013	102.018	
Arsenic - total µg	<1.0	<1.0	
Arsenic Emissions - lbs/hr	<4.56x10^{-4}	<3.05x10^{-4}	
Cadmium - total µg	<2.0	<2.0	
Cadmium Emissions - lbs/hr	<9.12x10^{-4}	<6.11x10^{-4}	
Chromium - total µg	4.8	5.3	
Chromium Emissions - lbs/hr	0.002	0.002	
Lead - total µg	4.7	2.0	
Lead Emissions - lbs/hr	0.002	6.11x10^{-4}	

* 29.92 "Hg, 68°F (760 mm Hg, 20°C)

SUMMARY OF RESULTS

Kiln Stack

Method 23

Condition II

Run Number	5	6	
Date	9/20/90	9/20/90	
Time	1006-1333	1622-1953	
Stack Flow Rate - ACFM	368,456	368,028	
Stack Flow Rate - DSCFM*	239,625	235,422	
% Water Vapor - % Vol.	5.64	5.14	
% CO_2 - % Vol.	7.7	8.2	
% O_2 - % Vol.	15.5	15.3	
% Excess Air @ Sampling Point	320	308	
Stack Temperature - °F	302	319	
Stack Velocity - FPM	4,791	4,785	
Percent Isokinetic	101.0	100.4	
Volume of Dry Gas Sampled - DSCF*	117.253	114.508	
Total 1,2,4-Trichlorobenzene - µg	<8.38	<8.64	
1,2,4-Trichlorobenzene Emissions - lbs/hr	<0.002	<0.002	

* 29.92 "Hg, 68°F (760 mm Hg, 20°C)

SUMMARY OF RESULTS

1,2,4-Trichlorobenzene

DRE

Kiln Stack

Condition II

Run Number	5	6
TDF Feed - lbs/hr	2,495	2,640
1,2,4-Trichlorobenzene in TDF - ppm	0	0
1,2,4-Trichlorobenzene in TDF - lbs/hr	0.00	0.00
Liquid Hazardous Waste Fuel Feed Rate - lbs/hr	4,003	4,003
1,2,4-Trichlorobenzene in Liquid Feed - ppm	<350	<350
1,2,4-Trichlorobenzene in Liquid Feed - lbs/hr	0.00	0.00
1,2,4-Trichlorobenzene Injected - lbs/hr	51.9	45.9
Total 1,2,4-Trichlorobenzene - lbs/hr	51.9	45.9
1,2,4-Trichlorobenzene Emissions - lbs/hr	<0.002	<0.002
1,2,4-Trichlorobenzene DRE - %	>99.996	>99.995

SUMMARY OF RESULTS

Kiln Stack

Condition II

Run Number	Volume of Dry Gas Sampled (DSCF*)	Carbon Tetrachloride		Stack Flow Rate (DSCFM*)
		(total µg)	(lbs/hr)	
5-A	0.652	<0.007	$<3.40\text{x}10^{-4}$	239,625
5-B	0.638	<0.006	$<2.97\text{x}10^{-4}$	
5-C	0.648	<0.007	$<3.42\text{x}10^{-4}$	
Average			$<3.26\text{x}10^{-4}$	
6-A	0.618	<0.009	$<4.52\text{x}10^{-4}$	235,422
6-B	0.647	<0.009	$<4.32\text{x}10^{-4}$	
6-C	0.628	<0.006	$<2.97\text{x}10^{-4}$	
Average			$<3.94\text{x}10^{-4}$	
		Average	$<3.60\text{x}10^{-4}$	

* 29.92 "Hg, 68°F (760 mm Hg, 20°C)

SUMMARY OF RESULTS

Carbon Tetrachloride

DRE

Kiln Stack

Condition II

Run Number	5	6
TDF Feed - lbs/hr	2,495	2,640
Carbon Tetrachloride in TDF - ppm	0	0
Carbon Tetrachloride in TDF - lbs/hr	0.00	0.00
Liquid Hazardous Waste Fuel Feed Rate - lbs/hr	4,003	4,003
Carbon Tetrachloride in Liquid Feed - ppm	<350	<350
Carbon Tetrachloride in Liquid Feed - lbs/hr	0.00	0.00
Carbon Tetrachloride Injected - lbs/hr	50.8	48.9
Total Carbon Tetrachloride - lbs/hr	50.8	48.9
Carbon Tetrachloride Emissions - lbs/hr	$<3.26\times10^{-4}$	$<3.94\times10^{-4}$
Carbon Tetrachloride DRE - %	>99.9993	>99.9992

SUMMARY OF RESULTS
Kiln Stack
Condition III

Run Number	7	8	9
Date	9/22/90	9/22/90	9/22/90
Time	1025-1147	1519-1652	2024-2152
Stack Flow Rate - ACFM	373,058	358,079	366,564
Stack Flow Rate - DSCFM*	241,568	231,289	234,384
% Water Vapor - % Vol.	5.12	5.59	5.46
% CO_2 - % Vol.	7.0	7.0	7.5
% O_2 - % Vol.	15.9	15.5	15.7
% Excess Air @ Sampling Point	351	308	338
Stack Temperature - °F	308	304	312
Stack Velocity - FPM	4,851	4,656	4,766
Percent Isokinetic	97.6	99.1	100.7
Particulates Probe, Cyclone & Filter Catch grains/dscf*	0.0014	0.0014	0.0007
grains/cf @ Stack Conditions	0.0009	0.0009	0.0004
lbs/hr	2.84	2.74	1.37
Visible Emissions 15-minute Average - % Opacity	0.0	------	0.0
Hydrogen Chloride Emissions - ppm**	2.7	2.5	2.3
Hydrogen Chloride Emissions - lbs/hr	3.74	3.29	3.05

* 29.92 "Hg, 68°F (760 mm Hg, 20°C)
** See page 31.

SUMMARY OF RESULTS

Kiln Stack

Condition III

Ion Chromatography Analyses

Run Number	7	8	9
Chloride - Total µg	8,285.2	7,531.8	7,783.0
Chloride ("Back-half") - µg	7,112.2	6,356.8	5,991.0
Ammonia - Total µg	12,263.3	14,165.2	16,561.5
Ammonia ("Back-half") - µg	12,263.3	14,165.2	16,561.5
Calcium - Total µg	260.5	171.2	190.4
Calcium ("Back-half") - µg	0.0	5.6	0.0
Potassium - Total µg	0.0	<0.8	0.0
Potassium ("Back-half") - µg	0.0	<0.4	0.0
Sodium - Total µg	2,624.5	210.0	403.6
Sodium ("Back-half") - µg	0.0	0.0	0.0

SUMMARY OF RESULTS
Kiln Stack
Metals
Condition III

Run Number	7	8	9
Date	9/22/90	9/22/90	9/22/90
Time	0730-0940	1223-1432	1727-1941
Stack Flow Rate - ACFM	361,460	372,734	368,850
Stack Flow Rate - DSCFM*	234,356	240,844	237,344
% Water Vapor - % Vol.	5.61	5.06	5.39
% CO_2 - % Vol.	6.5	6.0	7.5
% O_2 - % Vol.	15.5	15.3	15.7
% Excess Air @ Sampling Point	300	275	338
Stack Temperature - °F	302	310	308
Stack Velocity - FPM	4,700	4,846	4,796
Percent Isokinetic	100.7	99.2	102.2
Volume of Dry Gas Sampled - DSCF*	101.308	102.523	104.137
Arsenic - total µg	<1.0	<1.0	<1.0
Arsenic Emissions - lbs/hr	$<3.05\text{x}10^{-4}$	$<3.10\text{x}10^{-4}$	$<3.01\text{x}10^{-4}$
Cadmium - total µg	<2.0	<2.0	<2.0
Cadmium Emissions - lbs/hr	$<6.11\text{x}10^{-4}$	$<6.20\text{x}10^{-4}$	$<6.02\text{x}10^{-4}$
Chromium - total µg	<6.0	3.6	5.4
Chromium Emissions - lbs/hr	<0.002	0.001	0.002
Lead - total µg	0.8	0.7	1.8
Lead Emissions - lbs/hr	$2.44\text{x}10^{-4}$	$2.17\text{x}10^{-4}$	$5.41\text{x}10^{-4}$

* 29.92 "Hg, 68°F (760 mm Hg, 20°C)

SUMMARY OF RESULTS

Kiln Stack

Method 23

Condition III

Run Number	7	8	9
Date	9/22/90	9/22/90	9/22/90
Time	0730-1058	1223-1546	1734-2112
Stack Flow Rate - ACFM	374,725	378,607	373,336
Stack Flow Rate - DSCFM*	244,914	246,593	241,246
% Water Vapor - % Vol.	4.53	4.19	4.43
% CO_2 - % Vol.	6.8	6.5	7.5
% O_2 - % Vol.	15.7	15.4	15.7
% Excess Air @ Sampling Point	325	291	338
Stack Temperature - °F	305	311	313
Stack Velocity - FPM	4,872	4,923	4,854
Percent Isokinetic	98.1	98.2	100.2
Volume of Dry Gas Sampled - DSCF*	116.374	117.327	117.145
Total 1,2,4-Trichlorobenzene - µg	<6.32	<6.94	<8.60
1,2,4-Trichlorobenzene Emissions - lbs/hr	<0.002	<0.002	<0.002

* 29.92 "Hg, 68°F (760 mm Hg, 20°C)

SUMMARY OF RESULTS

1,2,4-Trichlorobenzene

DRE

Kiln Stack

Condition III

Run Number	7	8	9
TDF Feed - lbs/hr	2,640	2,640	2,310
1,2,4-Trichlorobenzene in TDF - ppm	0	0	0
1,2,4-Trichlorobenzene in TDF - lbs/hr	0.00	0.00	0.00
1,2,4-Trichlorobenzene Injected - lbs/hr	51.6	51.6	51.6
Total 1,2,4-Trichlorobenzene - lbs/hr	51.6	51.6	51.6
1,2,4-Trichlorobenzene Emissions - lbs/hr	<0.002	<0.002	<0.002
1,2,4-Trichlorobenzene DRE - %	>99.996	>99.996	>99.996

SUMMARY OF RESULTS

Kiln Stack

Condition III

Run Number	Volume of Dry Gas Sampled (DSCF*)	Carbon Tetrachloride		Stack Flow Rate (DSCFM*)
		(total µg)	(lbs/hr)	
7-A	0.692	<0.008	$<3.74\times10^{-4}$	244,914
7-B	0.677	<0.008	$<3.82\times10^{-4}$	
7-D	0.664	<0.001	$<4.87\times10^{-5}$	
Average			$<2.68\times10^{-4}$	
8-A	0.694	<0.008	$<3.75\times10^{-4}$	246,593
8-B	0.662	<0.011	$<5.41\times10^{-4}$	
8-C	0.671	<0.020	$<9.70\times10^{-4}$	
Average			$<6.29\times10^{-4}$	
9-A	0.671	<0.007	$<3.32\times10^{-4}$	241,246
9-B	0.671	<0.003	$<1.42\times10^{-4}$	
9-C	0.674	<0.011	$<5.20\times10^{-4}$	
Average			$<3.31\times10^{-4}$	
		Average	$<4.09\times10^{-4}$	

* 29.92 "Hg, 68°F (760 mm Hg, 20°C)

SUMMARY OF RESULTS

Carbon Tetrachloride

DRE

Kiln Stack

Condition III

Run Number	7	8	9
TDF Feed - lbs/hr	2,640	2,640	2,310
Carbon Tetrachloride in TDF - ppm	0	0	0
Carbon Tetrachloride in TDF - lbs/hr	0.00	0.00	0.00
Carbon Tetrachloride Injected - lbs/hr	51.6	51.6	51.6
Total Carbon Tetrachloride - lbs/hr	51.6	51.6	51.6
Carbon Tetrachloride Emissions - lbs/hr	$<2.68\times10^{-4}$	$<6.29\times10^{-4}$	$<3.31\times10^{-4}$
Carbon Tetrachloride DRE - %	>99.9994	>99.9987	>99.9993

SUMMARY OF RESULTS
Kiln Stack
Condition IV

Run Number	10	11	12
Date	9/24/90	9/24/90	9/24/90
Time	1020-1144	1756-1952	2306-0034
Stack Flow Rate - ACFM	336,691	362,559	356,222
Stack Flow Rate - DSCFM*	217,442	238,171	233,371
% Water Vapor - % Vol.	5.70	5.37	6.57
% CO_2 - % Vol.	7.5	6.5	5.0
% O_2 - % Vol.	15.8	17.5	16.8
% Excess Air @ Sampling Point	349	663	428
Stack Temperature - °F	311	297	289
Stack Velocity - FPM	4,378	4,714	4,632
Percent Isokinetic	96.4	100.1	100.5
Particulates Probe, Cyclone & Filter Catch grains/dscf*	0.0015	0.0012	0.0011
grains/cf @ Stack Conditions	0.0010	0.0008	0.0007
lbs/hr	2.87	2.51	2.19
Visible Emissions 15-minute Average - % Opacity	0.0	0.0	------
Hydrogen Chloride Emissions - ppm**	2.5	2.2	2.0
Hydrogen Chloride Emissions - lbs/hr	3.11	2.93	2.62

* 29.92 "Hg, 68°F (760 mm Hg, 20°C)
** See page 31.

SUMMARY OF RESULTS

Kiln Stack

Condition IV

Ion Chromatography Analyses

Run Number	10	11	12
Chloride - Total µg	9,315.4	6,901.0	6,815.2
Chloride ("Back-half") - µg	5,848.4	5,727.0	5,142.2
Ammonia - Total µg	14,262.6	12,665.5	11,158.3
Ammonia ("Back-half") - µg	14,262.6	12.665.5	11,158.3
Calcium - Total µg	320.0	321.8	308.4
Calcium ("Back-half") - µg	0.0	0.0	0.0
Potassium - Total µg	<0.2	<0.1	0.0
Potassium ("Back-half") - µg	<0.2	<0.1	0.0
Sodium - Total µg	950.0	344.2	399.6
Sodium ("Back-half") - µg	0.0	0.0	0.0

SUMMARY OF RESULTS
Kiln Stack
Metals
Condition IV

Run Number	10	11	12
Date	9/24/90	9/24/90	9/24/90
Time	0733-0942	1230-1714	2022-2232
Stack Flow Rate - ACFM	336,775	360,046	355,466
Stack Flow Rate - DSCFM*	220,886	235,288	233,576
% Water Vapor - % Vol.	5.78	5.27	5.91
% CO_2 - % Vol.	7.1	6.0	5.2
% O_2 - % Vol.	15.9	17.8	16.5
% Excess Air @ Sampling Point	353	744	388
Stack Temperature - °F	298	303	292
Stack Velocity - FPM	4,379	4,681	4,622
Percent Isokinetic	100.3	101.7	101.4
Volume of Dry Gas Sampled - DSCF*	95.122	102.678	101.670
Arsenic - total µg	<1.0	<1.0	<1.0
Arsenic Emissions - lbs/hr	$<3.06\text{x}10^{-4}$	$<3.02\text{x}10^{-4}$	$<3.03\text{x}10^{-4}$
Cadmium - total µg	<2.0	<2.0	1.1
Cadmium Emissions - lbs/hr	$<6.13\text{x}10^{-4}$	$<6.05\text{x}10^{-4}$	$3.34\text{x}10^{-4}$
Chromium - total µg	<6.0	3.4	5.0
Chromium Emissions - lbs/hr	<0.002	0.001	0.002
Lead - total µg	0.3	9.2	9.2
Lead Emissions - lbs/hr	$9.19\text{x}10^{-5}$	0.003	0.003

* 29.92 "Hg, 68°F (760 mm Hg, 20°C)

SUMMARY OF RESULTS

Kiln Stack

Method 23

Condition IV

Run Number	10	11	12
Date	9/24/90	9/24/90	9/24/90
Time	0732-1054	1230-1838	2028-2358
Stack Flow Rate - ACFM	347,772	361,552	360,257
Stack Flow Rate - DSCFM*	227,787	237,877	238,651
% Water Vapor - % Vol.	5.04	4.51	4.95
% CO_2 - % Vol.	7.3	6.3	5.1
% O_2 - % Vol.	15.9	17.7	16.7
% Excess Air @ Sampling Point	357	725	415
Stack Temperature - °F	305	304	294
Stack Velocity - FPM	4,522	4,701	4,684
Percent Isokinetic	99.5	98.3	99.1
Volume of Dry Gas Sampled - DSCF*	109.859	113.328	114.570
Total 1,2,4-Trichlorobenzene - µg	<7.90	<7.12	<7.83
1,2,4-Trichlorobenzene Emissions - lbs/hr	<0.002	<0.002	<0.002

* 29.92 "Hg, 68°F (760 mm Hg, 20°C)

SUMMARY OF RESULTS

Kiln Stack

Condition IV

Run Number	Volume of Dry Gas Sampled (DSCF*)	Carbon Tetrachloride		Stack Flow Rate (DSCFM*)
		(total µg)	(lbs/hr)	
10-A	0.721	<0.008	<3.34x10^{-4}	227,787
10-B	0.687	<0.009	<3.94x10^{-4}	
10-C	0.680	<0.009	<3.98x10^{-4}	
Average			<3.75x10^{-4}	
11-A	0.669	<0.007	<3.28x10^{-4}	237,877
11-B	0.684	<0.008	<3.67x10^{-4}	
11-C	0.683	<0.005	<2.30x10^{-4}	
Average			<3.08x10^{-4}	
12-A	0.674	<0.001	<4.67x10^{-5}	238,651
12-B	0.672	<0.001	<4.69x10^{-5}	
12-C	0.680	<0.001	<4.63x10^{-5}	
Average			<4.66x10^{-5}	
		Average	<2.43x10^{-4}	

* 29.92 "Hg, 68°F (760 mm Hg, 20°C)

SUMMARY OF RESULTS

Continuous Monitor Data

Run Number	Date	Time	Oxides of Nitrogen Emissions (ppm)	Oxides of Nitrogen Emissions (lbs/hr)	Carbon Monoxide Emissions (ppm)	Carbon Monoxide Emissions (lbs/hr)	Total Hydrocarbons Emissions (ppm)	Total Hydrocarbons Emissions (lbs/hr)	Sulfur Dioxide Emissions (ppm)	Sulfur Dioxide Emissions (lbs/hr)	Oxygen (% Vol.)	Carbon Dioxide (% Vol.)
1	9/18/90	1120-1220	350	600.8	41	42.9	2.0	3.3	7.8	18.6	14.7	11.2
2		1300-1400	475	815.4	50	52.3	5.5	9.0	17.2	41.0	14.8	10.7
3		1455-1555	430	738.2	58	60.6	7.5	12.3	5.0	11.9	14.5	11.1
4	9/19/90	0940-1040	330	564.5	49	51.0	8.0	13.1	8.5	20.2	16.0	10.8
5		1125-1254	155	265.2	41	42.7	9.0	14.7	1.5	3.6	15.4	8.9
6		1300-1400	190	325.0	37	38.5	11.0	18.0	5.0	11.9	15.2	7.9
7		1600-1900	85	145.4	41	42.7	7.5	12.3	24.5	58.4	16.1	5.0
8	9/20/90	1010-1110	280	476.5	98	101.5	5.5	9.0	17.8	42.1	15.4	7.9
9		1212-1312	225	382.9	130	134.7	5.5	9.0	18.8	44.5	15.3	8.0
10		1318-1418	220	374.4	165	171.0	5.5	9.0	42.5	100.5	15.3	8.0
11		1705-1805	490	833.8	150	155.4	6.0	9.8	10.0	23.7	15.0	9.2
12		1902-2002	700	1,191.1	110	114.0	5.0	8.1	25.0	59.1	15.0	9.3
13	9/22/90	0820-0950	205	358.7	168	179.0	1.5	2.5	7.5	18.2	15.4	7.6
14		1040-1140	230	402.5	68	72.5	3.5	5.9	52.5	127.7	15.5	7.2
15		1230-1400	205	358.7	100	106.6	3.5	5.9	95.0	231.1	15.2	6.6
16		1505-1635	265	463.7	125	133.2	3.5	5.9	20.0	48.7	15.4	8.0
17		1735-1905	300	524.9	120	127.9	4.0	6.7	75.0	182.5	15.5	8.3
18		1910-2110	320	559.9	63	67.1	4.0	6.7	37.5	91.2	15.7	7.9
19	9/24/90	0746-0910	275	462.5	75	76.8	4.5	7.2	27.5	64.3	15.5	8.1
20		1020-1120	280	470.9	73	74.8	5.0	8.0	21.0	49.1	15.3	8.2
21		1530-1700	195	328.0	70	71.7	3.0	4.8	10.0	23.4	16.7	5.2
22		1740-1910	190	319.6	65	66.6	3.5	5.6	12.5	29.2	16.6	5.2
23		2036-2206	175	294.3	67	68.6	3.0	4.8	10.0	23.4	16.7	5.0
24		2316-0016	150	252.3	67	68.6	2.5	4.0	15.0	35.1	16.8	4.7

DISCUSSION OF RESULTS

Condition I

The three tests for particulate matter and hydrogen chloride* appeared to be valid representations of the actual emissions during the tests. The indicative parameters calculated from the field data were in close agreement. The moisture percentages for the three tests were within 10.1 percent of the mean value. The measured flow rates (Q_s) for the tests were within 1.6 percent of the mean value. The rates of sampling for the three tests were well within the specified limits, the greatest deviation being 2.9 percent.

* The hydrogen chloride emissions presented in the summary of results for each condition are based on the sampling and analytical protocol specified in EPA Method 26, Determination of Hydrogen Chloride Emissions from Stationary Sources. The EPA has acknowledged the possibility of anomalous results due to cation interference when EPA Method 26 is used to determined hydrogen chloride emissions from cement kilns. Each EPA Method 26 sample was analyzed for specific cations known to exist in cement kilns. The results of the cations analysis can be found in the summary of results for each test condition. Review of this data substantiates the potential of significant cation interference with the EPA Method 26 hydrogen chloride emissions reported.

The calculated emissions (pounds per hour) of particulate matter for the three tests showed a range of -23.1 percent to +14.2 percent variation from the mean value.

The calculated emissions (pounds per hour) of hydrogen chloride for the three tests showed a range of -15.2 percent to +21.9 percent variation from the mean value.

The three tests for metals appeared to be valid representations of the actual emissions during the tests. The indicative parameters calculated from the field data were in close agreement. The moisture percentages for the three tests were within 4.5 percent of the mean value. The measured flow rates (Q_m) for the tests were within 1.2 percent of the mean value. The rates of sampling for the three tests were well within the specified limits, the greatest deviation being 3.6 percent.

The three tests for 1,2,4-trichlorobenzene appeared to be valid representations of the actual emissions during the tests. The indicative parameters calculated from the field data were in close agreement. The moisture percentages for the three tests were within 10.7 percent of the mean value. The measured flow rates (Q_m) for the tests were within 0.3 percent of the mean value. The rates of sampling for the three tests were within the specified limits, the greatest deviation being 9.2 percent.

Condition II

The two tests for particulate matter and hydrogen chloride* appeared to be valid representations of the actual emissions during the tests. The indicative parameters calculated from the field data were in close agreement. The moisture percentages for the two tests were within 4.6 percent of the mean value. The measured flow rates (Q_m) for the tests were within 2.0 percent of the mean value. The rates of sampling for the two tests were well within the specified limits, the greatest deviation being 2.1 percent.

The calculated emissions (pounds per hour) of particulate matter for the two tests showed a range of -29.6 percent to +29.6 percent variation from the mean value.

The calculated emissions (pounds per hour) of hydrogen chloride for the two tests showed a range of -2.8 percent to +2.8 percent variation from the mean value.

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* See page 31.

The two tests for metals appeared to be valid representations of the actual emissions during the tests. The indicative parameters calculated from the field data were in close agreement. The moisture percentages for the two tests were within 22.0 percent of the mean value. The measured flow rates (Q_m) for the tests were within 1.2 percent of the mean value. The rates of sampling for the two tests were well within the specified limits, the greatest deviation being 1.3 percent.

The two tests for 1,2,4-trichlorobenzene appeared to be valid representations of the actual emissions during the tests. The indicative parameters calculated from the field data were in close agreement. The moisture percentages for the two tests were within 4.6 percent of the mean value. The measured flow rates (Q_m) for the tests were within 0.9 percent of the mean value. The rates of sampling for the two tests were well within the specified limits, the greatest deviation being 1.0 percent.

Condition III

The three tests for particulate matter and hydrogen chloride* appeared to be valid representations of the actual emissions during the tests. The indicative parameters calculated from the field data were in close agreement. The moisture percentages for the three tests were within 5.0 percent of the mean value. The measured flow rates (Q_s) for the tests were within 2.5 percent of the mean value. The rates of sampling for the three tests were well within the specified limits, the greatest deviation being 2.4 percent.

The calculated emissions (pounds per hour) of particulate matter for the three tests showed a range of -40.9 percent to +22.6 percent variation from the mean value.

The calculated emissions (pounds per hour) of hydrogen chloride for the three tests showed a range of -9.2 percent to +11.3 percent variation from the mean value.

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* See page 31.

The three tests for metals appeared to be valid representations of the actual emissions during the tests. The indicative parameters calculated from the field data were in close agreement. The moisture percentages for the three tests were within 5.5 percent of the mean value. The measured flow rates (Q_m) for the tests were within 1.4 percent of the mean value. The rates of sampling for the three tests were well within the specified limits, the greatest deviation being 2.2 percent.

The three tests for 1,2,4-trichlorobenzene appeared to be valid representations of the actual emissions during the tests. The indicative parameters calculated from the field data were in close agreement. The moisture percentages for the three tests were within 4.4 percent of the mean value. The measured flow rates (Q_m) for the tests were within 1.2 percent of the mean value. The rates of sampling for the three tests were well within the specified limits, the greatest deviation being 1.9 percent.

Condition IV

The three tests for particulate matter and hydrogen chloride* appeared to be valid representations of the actual emissions during the tests. The indicative parameters calculated from the field data were in close agreement. The moisture percentages for the three tests were within 11.7 percent of the mean value. The measured flow rates (Q_m) for the tests were within 5.3 percent of the mean value. The rates of sampling for the three tests were well within the specified limits, the greatest deviation being 4.6 percent.

The calculated emissions (pounds per hour) of particulate matter for the three tests showed a range of -13.2 percent to +13.7 percent variation from the mean value.

The calculated emissions (pounds per hour) of hydrogen chloride for the three tests showed a range of -9.3 percent to +7.7 percent variation from the mean value.

The three tests for metals appeared to be valid representations of the actual emissions during the tests. The indicative parameters calculated from the field data were in close agreement. The moisture percentages for

* See page 31.

the three tests were within 6.8 percent of the mean value. The measured flow rates (Q_m) for the tests were within 3.9 percent of the mean value. The rates of sampling for the three tests were well within the specified limits, the greatest deviation being 1.7 percent.

The three tests for 1,2,4-trichlorobenzene appeared to be valid representations of the actual emissions during the tests. The indicative parameters calculated from the field data were in close agreement. The moisture percentages for the three tests were within 6.7 percent of the mean value. The measured flow rates (Q_m) for the tests were within 3.0 percent of the mean value. The rates of sampling for the three tests were well within the specified limits, the greatest deviation being 1.7 percent.

Florida Department of Environmental Regulation

Twin Towers Office Bldg. ● 2600 Blair Stone Road ● Tallahassee, Florida 32399-2400

Lawton Chiles, Governor

Carol M. Browner, Secretary

March 12, 1991

Mr. Bill Thomas
Administrator, Air Programs
Southwest District
4520 Oak Fair Blvd.
Tampa, Florida 33610-7347

Dear Mr. Thomas:

Re: Request to Burn Hazardous Waste
Florida Mining and Materials - Cement Kiln No. 2
PSD-FL-124A

The enclosed information is being forwarded to you for completeness review.

Florida Mining and Materials has requested to burn hazardous waste fuel in their No. 2 cement kiln, which was permitted under construction permit No. AC 27-138850 and PSD permit No. PSD-FL-124. Pursuing continuity, the project will be assigned the permit No. PSD-FL-124A.

If you have any questions, please call Bruce Mitchell at (904) 488-1344 or write to me at the above address. All comments, written or oral, should be received by April 4, 1991. If it is convenient to FAX a response to us, the FAX number to use is (904)922-6979.

Sincerely,

Barry D.

for C. H. Fancy, P.E.
Chief
Bureau of Air Regulation

CHF/BM/t

cc: B. Mitchell, BAR
J. Tessitore, C/T & Assoc.

Florida Department of Environmental Regulation

Twin Towers Office Bldg. ● 2600 Blair Stone Road ● Tallahassee, Florida 32399-2400

Lawton Chiles, Governor

Carol M. Browner, Secretary

March 12, 1991

Mr. Satish Kastury
Environmental Administrator
Bureau of Waste Planning
and Regulation
Dept. of Environmental Regulation
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Dear Mr. Kastury:

Re: Request to Burn Hazardous Waste
Florida Mining and Materials - Cement Kiln No. 2
PSD-FL-124A

The enclosed information is being forwarded to you for completeness review.

Florida Mining and Materials has requested to burn hazardous waste fuel in their No. 2 cement kiln, which was permitted under construction permit No. AC 27-138850 and PSD permit No. PSD-FL-124. Pursuing continuity, the project will be assigned the permit No. PSD-FL-124A.

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Sincerely,

Barry D.

for C. H. Fancy, P.E.
Chief
Bureau of Air Regulation

CHF/BM/t

cc: B. Mitchell, BAR
J. Tessitore, C/T & Assoc.

Florida Department of Environmental Regulation

Twin Towers Office Bldg. ● 2600 Blair Stone Road ● Tallahassee, Florida 32399-2400

Lawton Chiles, Governor

Carol M. Browner, Secretary

March 12, 1991

Mrs. Chris Shaver
Chief, Permit Review and Technical
Support Branch
National Park Service
Air Quality Division
P. O. Box 25287
Denver, Colorado 80255

Dear Mrs. Shaver:

Re: Request to Burn Hazardous Waste
Florida Mining and Materials - Cement Kiln No. 2
PSD-FL-124A

The enclosed information is being forwarded to you for completeness review.

Florida Mining and Materials has requested to burn hazardous waste fuel in their No. 2 cement kiln, which was permitted under construction permit No. AC 27-138850 and PSD permit No. PSD-FL-124. Pursuing continuity, the project will be assigned the permit No. PSD-FL-124A.

If you have any questions, please call Bruce Mitchell at (904) 488-1344 or write to me at the above address. All comments, written or oral, should be received by April 4, 1991. If it is convenient to FAX a response to us, the FAX number to use is (904)922-6979.

Sincerely,

Barry D. Andrews

for C. H. Fancy, P.E.
Chief
Bureau of Air Regulation

CHF/BM/t

cc: B. Mitchell, BAR
J. Tessitore, C/T & Assoc.

Florida Department of Environmental Regulation

Twin Towers Office Bldg. ● 2600 Blair Stone Road ● Tallahassee, Florida 32399-2400

Lawton Chiles, Governor
Carol M. Browner, Secretary

March 12, 1991

Mr. Charles B. Hetrick
County Administrator
Hernando County Board of
County Commissioners
Hernando County Governmental
Center/Administration Bldg.
20 North Main Street, Room 461
Brooksville, Florida 34601

Dear Mr. Hetrick:

Re: Request to Burn Hazardous Waste
Florida Mining and Materials - Cement Kiln No. 2
PSD-FL-124A

The enclosed information is being forwarded to you for completeness review.

Florida Mining and Materials has requested to burn hazardous waste fuel in their No. 2 cement kiln, which was permitted under construction permit No. AC 27-138850 and PSD permit No. PSD-FL-124. Pursuing continuity, the project will be assigned the permit No. PSD-FL-124A.

If you have any questions, please call Bruce Mitchell at (904) 488-1344 or write to me at the above address. All comments, written or oral, should be received by April 4, 1991. If it is convenient to FAX a response to us, the FAX number to use is (904)922-6979.

Sincerely,

Barry D. Andrews
for C. H. Fancy, P.E.
Chief
Bureau of Air Regulation

CHF/BM/t

cc: B. Mitchell, BAR
J. Tessitore, C/T & Assoc.

Florida Department of Environmental Regulation

Twin Towers Office Bldg. ● 2600 Blair Stone Road ● Tallahassee, Florida 32399-2400

Lawton Chiles, Governor
Carol M. Browner, Secretary

March 12, 1991

Ms. Jewell A. Harper, Chief
Air Enforcement Branch
Air, Pesticides, & Toxics
  Management Division
U.S. EPA-Region IV
345 Courtland Street, N.E.
Atlanta, Georgia 30365

Dear Ms. Harper:

Re: Request to Burn Hazardous Waste
Florida Mining and Materials - Cement Kiln No. 2
PSD-FL-124A

The enclosed information is being forwarded to you for completeness review.

Florida Mining and Materials has requested to burn hazardous waste fuel in their No. 2 cement kiln, which was permitted under construction permit No. AC 27-138850 and PSD permit No. PSD-FL-124. Pursuing continuity, the project will be assigned the permit No. PSD-FL-124A.

If you have any questions, please call Bruce Mitchell at (904) 488-1344 or write to me at the above address. All comments, written or oral, should be received by April 4, 1991. If it is convenient to FAX a response to us, the FAX number to use is (904)922-6979.

Sincerely,

Barry D. Andrews

for C. H. Fancy, P.E.
Chief
Bureau of Air Regulation

CHF/BM/t

cc: B. Mitchell, BAR
J. Tessitore, C/T & Assoc.

EDGAR J. MARSTON III
EXECUTIVE VICE PRESIDENT
AND GENERAL COUNSEL

February 27, 1991

By Federal Express

RECEIVED
FEB 28 1991
DER - BAQM

Mr. Segundo J. Fernandez
Oertel, Hoffman, Fernandez & Cole, P. A.
2700 Blair Stone Road, Suite C
Tallahassee, FL 32314-6507

Dear Segundo:

During the County Commissioners' meeting in Hernando County yesterday afternoon, we committed to supply certain data to you and the Commissioners. I understand that this data will be reviewed by you and other environmental consultants to Hernando County in connection with your formulation of a recommendation to the Commissioners with respect to our request for the appointment of a citizens committee to evaluate a solid hazardous waste derived fuel test protocol for our Brooksville cement plant. Pursuant to your request, enclosed are the following documents:

(a) Source Emissions Survey for our cement plant in Kosmosdale, Kentucky (September 1990);

(b) Draft of Source Emissions Survey for our cement plant in Knoxville, Tennessee (the final report is expected to be available on March 5, 1991 and will be promptly provided to you and the Commissioners);

(c) Draft of Performance Test Plan for our cement plant in Fairborn, Ohio (test scheduled for Spring 1990);

(d) Draft of Performance Test Plan for our cement plant in Brooksville, Florida [in the form submitted to Florida Department of Environmental Regulation ("DER") in late February 1991];

(e) Source Emissions Surveys of Ash Grove Foreman Cement Company (April 1987, October 1988 and January 1989);

(f) Report of New York State Legislative Commission on Toxic Substances and Hazardous Wastes (December 1987)]; and

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Southdown, Inc.
CITICORP CENTER, 1200 SMITH STREET, SUITE 2400
HOUSTON, TEXAS 77002-4486
TELEPHONE: (713) 650-6200

(g) Summary of EPA's Industrial Boiler and Furnace Regulations ("BIF Rules").

I further reaffirm the following commitments that were made during the meeting yesterday in Hernando County:

(1) As part of a test protocol for the Brooksville facility, Southdown will test for all of the 189 or so hazardous air pollutants listed in Title III to the recent amendments to the Clear Air Act ("Title III Pollutants");

(2) Southdown will use the information gained from the proposed compliance test to conduct a detailed health based risk assessment, including an evaluation of both the potential for the occurrence of cancer as well as other noncancer health impacts for both the EPA regulated hazardous air pollutants and the Title III Pollutants; and

(3) Southdown will request that the DER hold in abeyance Florida Mining's application to burn liquid and solid hazardous waste derived fuels at its Brooksville cement plant except to the extent necessary to process the solid hazardous waste compliance test protocol for the Brooksville facility referred to in item (d) above. This will preserve the status quo until the April 3, 1991 workshop. If the Committee requested in my February 12, 1991 letter is approved at the workshop, the status quo will be extended.

I am also forwarding one copy of items (a) through (f) above and six copies of item (g) above to Robert Bruce Snow. I am requesting that he place one copy of items (a) through (g) in the County library for review by the general public and that he circulate one copy of item (g) to each of the County Commissioners. I have also enclosed a copy of the recently published BIF Rules in Mr. Snow's package and have requested that he place the copy in the County library for the convenience of the general public.

We have asked Ash Grove Cement Company to supply to us copies of the source emission surveys at its plants in Louisville, Nebraska and Chanute, Kansas so that we can forward them to you and Mr. Snow. We will forward copies of these tests as soon as we have received them.

A workshop has been scheduled by the County Commissioners for April 3, 1991. At that meeting the Commissioners have indicated that they will decide whether to create the Committee requested in my February 12, 1991 letter. I think it would be productive to meet prior to April 3, 1991 in your offices in Tallahassee so that we can answer any questions that you and the County's other consultants may have regarding the enclosures. Please let me know when it would be convenient to meet.

Cordially,

Edgar J. Marston III

EJMIII:jap
Enclosures

cc: Mr. Robert Bruce Snow
County Attorney

Mr. Steve Smallwood w/o enclosures ✓
Florida Department of Environmental Regulations

FEDERAL EXPRESS

[redacted]

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Department/Floor No.:
Street Address: 1200 SMITH ST STE 2500
City: HOUSTON
State: TX
ZIP Required: 77002

2 To (Recipient's Name) Please Print: Mr. Steve Smallwood
Recipient's Phone Number (Very Important): (904) 488-4805
Company: Florida Department of Environmental Regulati
Department/Floor No.:
Exact Street Address (We Cannot Deliver to P.O. Boxes or P.O. Zip® Codes.): Two Towers Office Bldg. 2600 Blair Stone Rd
City: Tallahassee
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Edgar J. Marston III
EXECUTIVE VICE PRESIDENT
AND GENERAL COUNSEL

February 12, 1991

RECEIVED
FEB 15 1991
DER - BAQM

Mr. Harold D. Varvel, Chairman
Mr. John Richardson, Vice Chairman
Ms. Virginia Brown-Waite, Second Vice Chairman
Ms. June Ester
Mr. Anthony C. Mosca, Jr.
Board of County Commissioners
Hernando County Government Center
20 North Main Street, Room 460
Brooksville, Florida 34601

Dear Commissioners:

As you probably know, Southdown, Inc. owns the Florida Mining cement plant in northwest Hernando County that can produce over 1.3 million tons of cement per year. Florida Mining's annual payroll for its more than 300 employees in Hernando County exceeds $7 million.

Over the last year or so substantial public attention has focused on whether it is appropriate for Florida Mining to substitute hazardous waste derived fuels for a portion of its fossil fuel requirements at its cement plant. When Florida Mining's cement plant operates at full capacity, it consumes approximately 140,000 tons of coal per year. At a 9% solid hazardous waste fuel substitution rate, Florida Mining would burn approximately 20,000 tons of solid hazardous waste fuel per year and save 15,000 tons of coal or the energy equivalent of 60,000 barrels of oil. This represents less than 4% of the more than 518,000 tons of hazardous waste that were generated in the State of Florida in 1987 according to the Capacity Assurance Plan submitted by the State of Florida to the United States Environmental Protection Agency ("EPA") in October 1989. Furthermore, tests at several cement plants have shown that replacing coal with hazardous waste derived fuels can actually reduce the amount of metals emitted from the stack because of the level of metals naturally occurring in coal.

We are convinced that the burning of hazardous waste derived fuels comprised of spent solvents, paint sludges, used filters and similar industrial residuals in cement kilns will not threaten human health or the environment and, in fact, is the most responsible alternative for the management of hazardous wastes that cannot otherwise be reused or recycled. While we are firmly committed to waste minimization, a certain level of residuals will always exist after industrial waste streams have been recycled or reclaimed to the maximum extent practicable. These residuals of the manufacturing process must be properly treated and disposed of; they should not be buried in the land where they may pose a significant threat to ground water contamination and human health for generations to come.

Southdown, Inc. ■ 1200 SMITH STREET ■ SUITE 2400 ■ HOUSTON, TEXAS 77002 ■ (713) 650-6200

In the case of most organically contaminated residuals, thermal destruction in either incinerators or cement kilns is widely recognized as the best demonstrated available technology for the treatment of such waste streams. We believe that organic residuals should be recycled to the maximum extent practicable and the balance used as a fuel in the manufacture of cement. By burning hazardous waste derived fuels in cement kilns, we not only reduce the rate at which our nation's irreplaceable reserves of fossil fuels are exhausted but also use existing manufacturing facilities for multiple purposes. Cement kilns can both manufacture cement and effectively manage hazardous waste in an environmentally responsible manner without creating new sources of air emissions or materially altering the nature of the air emissions normally associated with the manufacture of cement with fossil fuels.

When burned as a fuel in a cement kiln, the organic constituents of hazardous wastes are thermally destroyed and the minor amounts of metals invariably found in all fossil fuels, hazardous waste fuels and many raw materials are, for the most part, incorporated into the cement in a nonleachable form or captured as particulate matter in air pollution control equipment. Most of the dust captured by the air pollution control equipment is recirculated into the manufacturing process, and the small residual balance is disposed of in an environmentally responsible manner. A substantial amount of test data shows that the percentage of the metals emitted into the air is minute and complies with the stringent standards prescribed by recent EPA regulations.

In May 1990 the County Commissioners of Hernando County concluded that the emissions generated by the burning of hazardous waste fuels in cement kilns were not then regulated by Florida environmental law. While EPA had proposed a detailed framework for the regulation of such emissions, EPA had not yet finalized its rule. Because of public concern relating to the allegedly unregulated burning of hazardous waste as fuel in cement kilns, the County Commissioners adopted an ordinance ("Ordinance") imposing a moratorium upon the burning of hazardous wastes as fuels in cement kilns, pending finalization of EPA's proposed rule.

EPA has now issued a definitive set of regulations and guidance documents relating to the burning of hazardous waste as fuel in boilers and industrial furnaces, including cement kilns. These regulations and interpretative statements are more than 500 pages long and impose stringent limitations upon the permissible levels of emissions from cement kilns, including total hydrocarbons, hydrochloric acid, carbon monoxide and certain metals such as cadmium and lead. Under these final rules, cement kilns must certify by mid 1991 that they are in compliance with the emission standards set forth in the rules. Within the following twelve months, cement kilns desiring to burn hazardous waste derived fuels must conduct extensive test burns in order to demonstrate empirically that they are in compliance with the rules. In short, EPA has provided comprehensive standards for the measurement of the performance of cement kilns that burn hazardous waste derived fuels. While we question the enforceability of the Ordinance, we believe that the purposes for which the

County adopted the Ordinance have been met and request confirmation from the Commissioners that such is the case.

We believe that it is now appropriate to determine whether the Florida Mining cement plant can meet the applicable Federal standards through a compliance test. Since we believe that public familiarity with our plans and public participation in establishing the scope of any compliance test are essential, we suggest that a committee of concerned citizens be appointed to liaison with Florida Mining in establishing the scope of a reasonable compliance test protocol for the burning of hazardous waste derived fuels in its cement plant. The details of our proposal are set forth below for consideration by the County Commissioners of Hernando County:

1. **<u>Applications for membership on Committee</u>**. By publishing suitable notice in the local press, Southdown will invite any interested resident of Hernando County to submit his or her name as a prospective member of a review and advisory committee ("Committee"). Applicants should be prepared to devote substantial time to reviewing data and attending meetings. Anyone wishing to serve on the Committee should write a brief note setting forth his or her name, address, qualifications and reason for desiring to serve on the Committee. These letters should be mailed or delivered to Charles B. Hetrick, County Administrator, Hernando County Government Center, Room 461, 20 North Main Street, Brooksville, Florida 34601 and must be received prior to March 15, 1991.

2. **<u>Composition of Committee</u>**. Southdown requests that the County Commissioners select a chairperson and ten other members of the Committee from among the persons who have applied pursuant to paragraph 1 or who are otherwise qualified and willing to serve on the Committee. We propose that the Commissioners designate an impartial chairperson who has substantial leadership experience in participating in the resolution of complex problems. We also urge that the remaining members be selected by the Commissioners with a view to insuring that the membership reflects a reasonable cross-section of the Hernando County community. The deliberations of and documents generated by the Committee will be subject to Florida's Public Meetings Law and Open Records Law.

3. **<u>Review of compliance test protocol</u>**. The primary function of the Committee will be to review and make recommendations regarding the scope of a proposed compliance test protocol for the burning of solid hazardous waste derived fuel at the Florida Mining facility to ensure that the concerns of the residents of Hernando County are reasonably addressed by the terms and conditions of the protocol. The purpose of the compliance test is to determine whether the Florida Mining facility can meet the applicable requirements of EPA's boiler and industrial furnace regulations under

conditions that satisfy the Florida Department of Environmental Regulation ("DER"). We understand that air toxic experts and other scientists from DER will be available to advise with the Committee regarding the technical aspects of the compliance test protocol. In order to provide the members of the Committee with an additional source of technical expertise, Southdown will pay the reasonable fees and expenses of a professor of recognized standing in a relevant discipline from a major Florida University. This professor will be selected by the Commissioners promptly following the creation of the Committee. If the Committee members desire to tour Southdown's cement plant in Knoxville, Tennessee that currently burns both liquid and solid hazardous waste derived fuels, Southdown will underwrite the expenses of the tour.

4. **Timing of compliance test**. Florida Mining will propose a compliance test protocol for review by the Committee. The test will cover only solid hazardous waste derived fuels. These fuels will be packaged in individual six gallon pails that meet all applicable Department of Transportation regulations for the shipment of hazardous waste. Florida Mining will deliver a draft compliance test protocol to the Committee by the end of March. Florida Mining will work closely with the Committee during the months of April and May and will evaluate all comments received from the Committee through May 31, 1991. Of course, final jurisdiction over the terms and conditions of the compliance test protocol is vested in DER. During the third week in June, Florida Mining will balance the energy requirements of its kiln by burning concurrently coal and solid hazardous waste derived fuels and during the fourth week in June conduct a limited compliance test involving the burning of solid hazardous waste derived fuels. Following completion of the compliance test, Florida Mining will cease burning solid hazardous waste derived fuels until the test results are compiled, submitted to DER and reviewed by the Committee, and all required approvals are received from the DER. In order to avoid any confusion, Florida Mining will promptly request DER to hold in abeyance Florida Mining's permit application to burn liquid hazardous waste derived fuels pending satisfactory completion of the compliance test involving solid hazardous waste derived fuels and satisfaction of the other requirements set forth in paragraph 6 below.

5. **Unsatisfactory compliance test result**. If the results of the compliance test conducted during a one-week trial burn of solid hazardous waste derived fuels fail to meet the applicable requirements of EPA's boiler and industrial furnace regulations under conditions that satisfy DER, Florida Mining will cease its efforts to burn both solid and liquid hazardous waste derived fuels at its plant in Hernando County.

6. **Satisfactory compliance test result**. If the results of the compliance test conducted during the trial burn of solid hazardous waste derived fuels meet the foregoing requirements, Florida Mining will actively pursue the amendment of its air permits to enable it to burn solid hazardous waste derived fuels. Upon the issuance of a notice that DER intends to modify Florida Mining's air permit to enable it to burn solid hazardous waste derived fuels, any substantially affected person would then have an opportunity to request a hearing and present evidence to the DER on why the permit modifications should or should not be granted. If the requisite air permit modifications are issued, Florida Mining may propose a compliance test protocol for the burning of liquid hazardous waste fuels once the infrastructure necessary to receive shipments of liquid hazardous waste fuel by railroad tank cars is in place. Florida Mining will request that the Committee also participate in determining the scope of any applicable compliance test protocol for liquid hazardous waste derived fuels.

7. **Continuing activities of Committee**. Assuming that the results of the compliance test burn of solid hazardous waste derived fuels at Florida Mining are satisfactory and the requisite air permit modifications are issued by the DER, Southdown will continue to look to the Committee as a citizens' advisory committee. Residents of Hernando County should be comforted by the fact that a committee of their peers has unfettered access to the plant. Of course, any resident of Hernando County is welcome to tour the plant at any time. We urge all interested residents to tour the plant during the next few months.

8. **Maintenance of status quo**. If the Commissioners approve the procedures described in this letter, Florida Mining suggests that both it and the County Commissioners maintain the status quo until the compliance test involving solid hazardous waste derived fuels is completed or abandoned by Florida Mining. Florida Mining will refrain from initiating any litigation relating to the enforceability of the Ordinance and the Commissioners will refrain from altering the scope of the Ordinance or contesting the propriety of the compliance test relating to solid hazardous waste derived fuels. Once the test results are compiled and evaluated, Florida Mining will comply with the terms of either paragraph 5 or 6 above. If Florida Mining fails the compliance test, the applicability of the Ordinance to Florida Mining will be mooted because Florida Mining will abandon its efforts to burn both solid and liquid hazardous waste derived fuels. If Florida Mining meets the requirements of the compliance test, Florida Mining, the Commissioners and any substantially affected party can take such action as they think is appropriate under the circumstances.

Some residents of Hernando County have criticized our efforts to burn hazardous waste derived fuels at the Florida Mining facility by asserting that we are exposing the local population to increased air emissions and exporting the profits to Houston. While I do not think this is a fair statement for the reasons noted above, I understand that some people may find it persuasive. There is no doubt that burning hazardous waste derived fuels as a fuel supplement will make Southdown more profitable. It will also make the Florida Mining cement manufacturing operation more competitive in its never ending battle against imported cement that is being dumped by foreign producers along Florida's 1,350-mile coast line. To the extent that Florida Mining can stay competitive and prosper, it can continue to pay substantial taxes to Hernando County and employ over 300 persons in valuable industrial jobs. Since the burning of hazardous waste derived fuels at Florida Mining's cement plant may, in the minds of some citizens, necessitate additional emergency response capabilities on the part of Hernando County, Southdown is prepared to discuss with the Commissioners the underwriting by Southdown's of its fair share of the additional manpower, facility and equipment costs associated with any enhanced emergency response capability that Hernando County may be required to establish.

I would appreciate you placing this proposal on the agenda for your February 26, 1991 meeting. I plan to attend the meeting and will be available to answer any questions that any of you may have.

Cordially,

Edgar J. Marston III

EJM:jap

cc: Ms. Carol Browner, Secretary
Department of Environmental Regulation
B. Mitchell
C. Yancy
B. Andrews
S. Smallwood

CROSS/TESSITORE & ASSOCIATES, P.A.
4763 S. CONWAY ROAD, SUITE F
ORLANDO, FLORIDA 32812
407/851-1484

February 14, 1991

RECEIVED
FEB 19 1991
DER - BAQM

Mr. C.H. Fancy, P.E.
Chief, Bureau of Air Regulation
Florida Department of Environmental Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, FL 32399-2400

SUBJECT: Completeness Review for Application to Modify
AC 27-187498 No. 2 Cement Kiln
C/TA # F03.178

Dear Mr. Fancy:

Please find enclosed two (2) copies of information developed in response to your Completeness Review Letter of November 1, 1990.

With this document, Cross/Tessitore and Associates, along with Florida Mining and Materials has attempted to provide the information you requested as completely as possible.

I would like to clarify that the subject source is the No. 2 Cement Kiln; it is not a lime kiln as referenced in your letter.

I hope the information submitted will fulfill your requirements. Please do not hesitate to contact me should you have any questions or comments.

Sincerely,

Joseph L. Tessitore

Joseph L. Tessitore, P.E.
Vice President

JLT/sr
cc: C.M. Coleman, FM&M
Diane Schenke, Southdown
Peter Cunningham, HBG & S

RECEIVED

FEB 19 1991

DER - BAQM

RESPONSE TO FDER COMPLETENESS REVIEW FOR AN APPLICATION TO MODIFY PERMIT AC27-187498 FLORIDA MINING AND MATERIALS NO. 2 CEMENT KILN

February 14, 1991

Cross/Tessitore & Associates, P.A.
4763 South Conway Road, Suite F.
Orlando, Florida 32812
(407) 851-1484
F03.178/R5147.Doc

Question 1

1. **Please provide in full detail the protocol and procedures that will be used to analyze and determine the type(s) of all hazardous waste fuels prior to accepting and receiving them at the facility.**

   This information has been previously submitted to the Department as part of the Application for a Hazardous Waste Fuels Storage Facility Permit as required by 40 CFR Part 270 and DER 17-730.900.

   Attached is the Waste Analysis Plan included in the Storage Facility Permit Application.

A.6 Waste Analysis Plan

INTRODUCTION

This document describes the chemical and physical nature and characteristics of the hazardous waste derived fuel ("HWF") received, stored and blended at Florida Mining and Materials. FM&M is one of the largest producers of cement in the Southeast. The cement plant, located in Brooksville, Hernando County, proposes to burn HWF as a partial substitute for coal. Many of the substances burned as HWF are either characteristic or listed as hazardous wastes under the Resource Conservation and Recovery Act (RCRA). The primary basis for defining these materials as hazardous is their flash point is below 1400°F, and therefore, these fuels meet the criteria for ignitability.

FUEL CHARACTERIZATION

Hazardous Waste Fuels (HWF)

FM&M proposes to burn industrial waste solvents including those from such industries as paint, coating, ink and solvent recycling (including solids contaminated with those materials), and used oils. Table II.6 presents the current U.S. EPA hazardous waste numbers and descriptions of hazardous waste materials that may be received for use as HWF. Used oil does not appear in Table II.6 inasmuch as the U.S. EPA has specifically excluded it as a hazardous waste. FM&M primarily uses independent suppliers of preblended fuel for this project, however, on-site generated waste solvents, solvent contaminated solids, and used oil are also employed. Suppliers of HWF are RCRA-interim status or permitted hazardous waste TSD installations or RCRA regulated generators which are well equipped to furnish consistent quality and quantity of fuels. These prequalified suppliers provide a manifest and a chemical analysis report with each shipment. The chemical load report will be filed with the manifest's permanent records. FM&M samples all shipments received from RCRA-permitted suppliers (see Table II.10). FM&M utilizes accepted supplemental fuel industry methods for the analysis of these fuels as shown in Table II.7.

Two categories of waste are received consisting of liquid and nonpumpable (solid) fuel from the same industry and waste code types. The liquid fuels have a minimum average heat value of 10,000 Btu per lb. and solid fuels have a minimum average heat value range of 5,000 Btu per lb. Typically, six gallon container packaged fuel modules are used to directly introduce the solid HWF to the cement kiln. Quality checks are run to assure that fuel burning specifications in Table II.8 are satisfied. A preliminary check is run on HWF shipments as specified in Table II.10 prior to off-loading.

FM&M will not accept pesticides, as screened out during the prequalification review. PCB's, metals and other materials are restricted as indicated in the specifications in Table II.8. The limits placed on metals and chlorinated materials in the fuels will provide assurance that only materials meeting precise fuel specifications are accepted at the facility.

Uniform Hazardous Waste Manifest forms (EPA Form 8700-22, current edition) accompany each load of HWF received by FM&M. Any combination of the EPA hazardous waste numbers shown in Table II.6 may appear on a manifest.

Materials not meeting the specification of Table II.8 or not capable of being readily blended to this specification for burning are rejected. The final blended fuel product will meet the specification. Blending will not be conducted to meet the minimum heat content requirement of 5,000 Btu/lb as specified by the EPA Sham Recycling Policy (1983 or as revised).

Liquid HWF System Residues

The solids that accumulate in the liquid HWF system as filtrate, and incidental spill cleanup residues and absorbents, are removed and placed in containers. These containers, which are labeled "Hazardous Waste," are accumulated within a containment area for approximately one month before being introduced to the kiln.

The technical staff will, through their knowledge of the process that generated the waste, for those waste not generated in handling HWF, determine if the waste is restricted from disposal in a landfill and note such in their HWF lab operating file.

QUALITY ASSURANCE PLAN

FM&M will receive all HWF from fuel marketers previously qualified under U.S. EPA/RCRA Authority, from other waste stream generators prequalified by FM&M or from on-site generation. All must have U.S. EPA assigned ID numbers when hazardous waste fuel (HWF) is involved. The following levels of testing HWF are in use:

(1) Prequalification evaluation of all waste streams (Table II.10 , Column A).

(2) Sampling and testing prior to acceptance of fuel shipments is outlined in Table II.10, Columns B and C.

If a shipment is rejected for any reason, FDER will be notified.

A quality assurance/quality control program is used by the laboratory to confirm proper control.

PREQUALIFICATION

The purpose of the preacceptance review (Exhibit II.11) is; (1) to determine whether a preblended waste fuel can be managed at FM&M in accordance with current permits, applicable regulations and company policy; (2) to ensure that all wastes ultimately approved for treatment or storage are handled so as to protect human health and the environment; (3) to confirm the chemical and physical properties of the waste as described by the generator; (4) to provide an information base to assist FM&M in verifying the identity of the incoming waste shipment; and (5) minimize operational problems.

Safety Concerns

FM&M has submitted a detailed employee training program as part of its RCRA storage permit application. That program is premised on our belief that a knowledge of the properties of materials accepted as HWF is necessary to ensure that the materials can be handled safely. Understanding the nature of the industries that supply acceptable materials, and the probable sources of undesirable materials, is essential in ensuring safety in handling candidate wastes. Potential fuels are subjected to exhaustive prequalification evaluation and analysis before they will be accepted into the HWF program. After acceptance, further analysis is conducted on the fuels as shown in Table II.10 before the fuels can be burned in the kiln.

Operational Concerns

In addition to health and safety concerns, FM&M and fuel suppliers such as Cadence Chemical Resource, Inc. have minimized operational problems that could develop through the use of HWF. The prevention of operational or handling problems is effected largely through the comprehensive prequalification evaluation and subsequent representative sampling and testing of each load prior to acceptance. Materials that would interfere with safety or the cement manufacturing process are excluded during the prequalification testing and load receipt testing. Prequalification evaluations assure that only compatible materials are placed in the storage tanks. The material will be checked by fuel suppliers prior to receipt at FM&M. Checks of the individual shipments prior to acceptance will confirm that only compatible materials are received.

SAMPLE PARAMETERS

The Table II.7 lists the sample parameters and referenced test methods used to determine whether health, safety, or operational problems may develop from use of candidate HWF.

To accomplish testing, analytical equipment is employed with procedures that have been jointly developed with the manufacturer of the equipment. Additionally, although standard ASTM or EPA methods are employed at the suppliers and FM&M laboratories during prequalification testing, confirmation of the results will be accomplished through samples of all loads taken at FM&M with analysis taking place in the FM&M laboratory using the above noted methods.

MAJOR LABORATORY EQUIPMENT

FM&M operates an analytical laboratory equipped with modern analyzers. The following discussion elaborates on some important analyzers found in the laboratory: the bomb calorimeter, the gas chromatograph, the atomic absorption spectrophotometer, and the radioactive screening device.

Bomb Calorimeter

The FM&M laboratory is equipped with a Bomb Calorimeter. The bomb calorimeter is capable of measuring the heat value of single samples. The combustion residues in the test bomb are used to determine ash content, sulfur, and halogen content. The sulfur content is determined by using the ash and analyzing for sulfate concentration and back calculating.

Gas Chromatograph

The gas chromatograph is a versatile instrument capable of analyzing a broad range of organic compounds that can be thermally volatilized and passed through the separation column. General gas chromatography uses a wide array of columns, detectors, and temperature profiles. In addition to the above, it will be used for PCB analysis. Samples are diluted with an appropriate solvent and injected directly into the gas chromatograph. Results are reported as an area % of the chromatogram.

Atomic Absorption Spectrophotometer or Inductively Coupled Plasma Arc

The atomic absorption spectrophotometer (AA) and inductively coupled plasma arc are capable of analyzing many elements. The analytical sensitivity for this method of determining metals of concern is 50 ppm and can be made more specific for critical elements.

Radioactive Screening Diffraction Device

A portable unit such as a halogen quenched G.M. tube will be utilized for radioactive screening purposes. Typical energy sensitivities are as follows:

Alpha	2.5 MEV
Beta	50 KEV
Gamma & X-Ray	10 KEV

Any readings above background will be the basis for rejection.

SHIPMENT ANALYSES

In addition to the prequalification evaluation performed by FM&M, each fuel shipment is sampled. Shipments, from fuel marketers that hold U.S. EPA/RCRA authority as hazardous waste fuel suppliers and have fully qualified laboratories, are accompanied by a chemical analysis of batch report and certification as provided in Exhibit II.12A. Shipments from other prequalified waste stream sources and on-site generated materials are tested according to the prequalification requirements to verify that the material meets the HWF specification. A typical batch report and certification form for this requirement is provided in Exhibit II.12B. A portion of each sample analyzed is retained for 90 days for any additional analysis that may be determined to be necessary at a later time.

Liquid HWF

As each HWF shipment is delivered to the FM&M Facility, a core sample of the tank truck or rail car will be taken using the sampler shown in Exhibit II.9. This sampler works on the same basic principle as the composite liquid waste sampler ("COLIWASA") specified for use by EPA to obtain a representative sample of liquid wastes in a large vessel. A positive seal in the sampler used by FM&M will be guaranteed by a ball valve with an extended handle which impacts the bottom of the tank. The handle will be pushed to the closed position which seals the sampled material in a small diameter pipe. The advantage of this sampler is that it will provide a more positive seal and will be more durable than the standard specified unit. However, the difference in the sealing process does not change the basic nature of the sampling mechanism.

Solid HWF

Solid HWF, typically received in six gallon containerized fuel modules, is a preblended fuel delivered to FM&M meeting fuel specifications as shown in Table II.8. Shipments from a fuel supplier normally consist of containers placed on a pallet and wrapped with heat shrink plastic. One pallet typically contains 36 containers with 20 pallets arriving per average truckload. The fuel has been characterized by the supplier who also certifies that the analyses represents a single batch. Typically, one batch is of sufficient quantity (i.e., 720 containers) for one truckload. However, more than one batch can be on a particular shipment. Each batch of solid HWF shipped to FM&M will be accompanied with analysis (Exhibit II.12A or II.12B) and a copy of the manifests from the sources comprising the batch. For example, if four individual generator's waste streams were blended together, then the original manifest from each of the four generators will accompany the shipment of the preblended batch of solid HWF to FM&M.

The contents of a single container can range from semidry sludge-like material, to a combination of physically dissimilar shredded materials such as contaminated rags and filters, elastomeric materials (contaminated gloves, gaskets, etc.), paint solids and cured adhesives. Sampling of the containers is accomplished using a variety of sampling devices such as an auger-type core sampler, long-handled spoon, sampling thief or tongs. Whichever device enables extraction of a representative sample through the vertical cross-section of a container is selected for use. The individual extracting the sample is trained to collect representative samples from each randomly selected container. Exhibit II.9 shows these typical sampling devices. Normally 10 samples are collected and composited as representing the shipment and submitted for shipment analysis. This number of samples is determined in accordance with Table II.9. One container per selected pallet is randomly chosen for sampling. The attached Exhibit II.10 shows the random selection procedure for the containers.

The overall sampling procedure provides the ability to correlate any effects on the process or any environmental emissions with the composition of the HWF fired in the kiln, and allows specific identification should any unique materials be present in HWF streams. Current records containing the results of analysis and quantities of materials inventories will be maintained and readily available for use by the Emergency Coordinator when responding to an emergency.

BLEND/STORAGE TANK ANALYSIS

The hazardous waste fuel received into the blend/storage tanks will also be from authorized fuel blenders. The loads received will meet the specifications as shown on Table II.8 Consequently, there is no need to analyze the contents of the blend/storage tanks.

ASSESSMENT OF HWF SYSTEM RESIDUES

Any residue generated (as discussed above) will be evaluated in accordance with this waste analysis plan for management in the kiln. Waste that cannot be effectively processed on-site will be evaluated, as required, to determine appropriate off-site treatment or disposal options. The technical staff will evaluate the waste based on material flash point and the presence of free liquid to ascertain the appropriate disposal option.

REVISION TO THE ANALYSIS PLAN

This plan will be reviewed by the FM&M Management on an annual basis. The plan will also be reviewed if a change occurs in the applicable regulations, operating procedures, the process or the fuel characteristics. Any necessary revisions to the plan will be forwarded to FDER for its review thirty days before being implemented by FM&M. If FDER objects to a proposed revision in that time period, FM&M will not implement it as proposed.

TABLE II.6

MATERIALS FOR USE AS ALTERNATIVE/HAZARDOUS WASTE FUELS

EPA Hazardous Waste Number	Waste Code	Contaminants
D001	I	Characteristic of Ignitability
D004	T	Arsenic
D005	T	Barium
D006	T	Cadmium
D007	T	Chromium
D008	T	Lead
D009	T	Mercury
D010	T	Selenium
D011	T	Silver
D018	T	Benzene
D021	T	Chlorobenzene
D023	T	o-Cresol
D024	T	m-Cresol
D025	T	p-Cresol
D026	T	Cresol
D027	T	1,4-Dichlorobenzene
D028	T	1,2-Dichloroethane
D029	T	1,1-Dichloroetylene
D030	T	2,4-Dinitrotoluene
D035	T	Methyl Ethyl Ketone
D036	T	Nitrobenzene
D038	T	Pyridine

TABLE II.6 (continued)

MATERIALS FOR USE AS ALTERNATIVE/HAZARDOUS WASTE FUELS

EPA Hazardous Waste Number	Waste Code	Contaminants
F001	T	Tetrachloroethylene, Methylene Chloride, Carbon Tetrachloride, 1,1,1-Trichloroethane, Chlorinated Fluorocarbons, Trichloroethylene
F002	T	Chlorobenzene ,1,1,2 Trichloroethane, 1,2,2 Trifluoroethane, Orthodichlorobenzene, Trichlorofluoromethane, Tetrachloroethylene, Methylene Chloride, Trichloroethylene, 1,1,1-Trichloroethane
F003	I,T	Xylene, Acetone, Ethyl Acetate, Ethyl Benzene, Ethyl Ether, Methyl Isobutyl Ketone, N-Butyl Alcohol, Cyclohexanone, Methanol
F004	T	Cresylic Acid, Nitrobenzene
F005	I,T	Toluene, Methyl Ethyl Ketone, Carbon Disulfide, Isobutanol, Pyridine
F024	T	Chloromethane, Dichloromethane, Trichloromethane, Carbon Tetrachloride, Choroethylene, 1,1-Dichloroethane, 1,2-Dichloroethane, trans-1,2-Dichloroethylene, 1,2-Dichloroethylene, 1,1,1-Trichloroethane, 1,1,2-Trichloroethane, Trichloroethylene, 1,1,1,2-Tetrachloroethane, 1,1,2,2-Tetrachloroethane, Tetrachloroethylene, Pentachloroethane, Hexachloroethane, Allyl Chloride (3-Chloropropene), Dichloropropane, Dichloropropene, 2-Chloro-1,3-butadiene, Hexachloro-1,3-butadiene, Hexachlorocyclopentadiene, Hexachlorocyclohexane, Benzene, Chlorbenzene, Dichlorobenzenes, 1,2,4-Trichlorobenzene, Tetrachlorobenzene, Pentachlorobenzene, Hexachlorobenzene, Toluene, Naphthalene

TABLE II.6 (continued)

MATERIALS FOR USE AS ALTERNATIVE/HAZARDOUS WASTE FUELS

EPA Hazardous Waste Number	Waste Code	Contaminants
K001	T	Pentachlorophenol, Phenol, 2-Chlorophenol, p-Chloro-m-cresol, 2,4-Dimethylphenyl, 2,4-Dinitrophenol, Trichlorophenols, Tetrachlorophenols, 2,4-Dinitrophenol, Creosote, Chrysene, Naphthalene, Fluoranthene, Benzo(b)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-cd)pyrene, Benz(a)anthracene, Dibenz(a)anthracene, Acenaphthalene
K009	T	Chloroform, Formaldehyde, Methylene Chloride, Methyl Chloride, Paraldehyde, Formic Acid
K010	T	Chloroform, Formaldehyde, Methylene Chloride, Methyl Chloride, Paraldehyde, Formic Acid, Chloroacetaldehyde
K022	T	Phenol, Tars (Polycyclic Aromatic Hydrocarbons)
K023	T	Phthalic Anhydride, Maleic Anhydride
K024	T	Phthalic Anhydride, 1,4-Naphthoquinone
K025	T	Meta-dinitrobenzene, 2,4-Dinitrotoluene
K026	T	Paraldehyde, Pyridines, 2-Picoline
K035	T	Creosote, Chrysene, Naphthalene, Fluoranthene, Benzo(b)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-cd)pyrene, Benz(a)anthracene, Dibenz(a)anthracene, Acenaphthalene
K048**	T	Hexavalent Chromium, Lead
K049**	T	Hexavalent Chromium, Lead
K050**	T	Hexavalent Chromium
K051**	T	Hexavalent Chromium, Lead
K052**	T	Lead
K083	T	Anilene, Diphenylamine, Nitrobenzene, Phenylenediamine
K085	T	Benzene, Dichlorobenzenes, Trichlorobenzenes, Tetrachlorobenzenes, Pentachlorobenzene, Hexachlorobenzene, Benzyl Chloride
K086	T	Lead, Hexavalent Chromium
K087	T	Phenol, Naphthalene
K088	T	Cyanide (complexes)
K093	T	Phthalic Anhydride, Maleic Anhydride
K094	T	Phthalic Anhydride
K101	T	Arsenic
K102	T	Arsenic
K103	T	Aniline, Nitrobenzene, Phenylenediamine
K104	T	Aniline, Benzene, Diphenylamine, Nitrobenzene, Phenylenediamine
K111	C,T	2,4-Dinitrotoluene
K112	T	2,4-Toluenediamine, o-Toluidine, p-Toluidine, Aniline

** Wastes from petroleum refining operations.

TABLE II.6 (continued)

MATERIALS FOR USE AS ALTERNATIVE/HAZARDOUS WASTE FUELS

EPA Hazardous Waste Number	Waste Code	Contaminants
K113	T	2,4-Toluenediamine, o-Toluidine, p-Toluidine, Aniline
K114	T	2,4-Toluenediamine, o-Toluidine, p-Toluidine
K115	T	2,4-Toluenediamine
K116	T	Carbon Tetrachloride, Tetrachloroethylene, Chloroform, Phosgene

TABLE II.6 (continued)

MATERIALS FOR USE AS ALTERNATIVE/HAZARDOUS WASTE FUELS

EPA Hazardous Waste Number	Waste Code	Contaminants
U001	I	Acetaldehyde
U002	I	2-Propanone
U003	I,T	Acetonitrile
U004	T	Acetophenone
U005	T	2-Acetylaminefluorene
U006	C,R,T	Acetyl Chloride
U007	T	Acrylamide
U012	I,T	Aniline
U014	T	Auramine
U015	T	Azaserine
U016	T	Benz(c)acridine
U017	T	Benzal Chloride
U018	T	Benz(a)anthracene
U019	I,T	Benzene
U024	T	Dichloromethoxy Ethane
U027	T	Dichloroisopropyl Ether
U031	I	1-Butanol
U034	T	Acetaldehyde, Trichloro
U037	T	Chlorobenzene
U038	T	Chlorobenzilate
U039	T	p-Chloro-m-cresol
U046	T	Chloromethyl Methyl Ether
U048	T	o-Chlorophenol
U051	T	Creosote
U052	T	Cresol (Cresylic Acid)
U053	T	Crotonaldehyde
U055	I	Cumene
U056	I	Cyclohexane
U057	I	Cyclohexanone
U063	T	Dibenz[a,h]anthracene
U064	T	Dibenz[a,i]pyrene
U069	T	Dibutyl Phthalate
U070	T	o-Dichlorobenzene
U071	T	m-Dichlorobenzene
U072	T	p-Dichlorobenzene
U073	T	3,3'-Dichlorobenzidine
U074	I,T	1,4-Dichloro-2-butene
U076	T	Ethylidene Dichloride
U078	T	1,1-Dichloroethylene
U079	T	1,2-Dichloroethylene
U081	T	2,4-Dichlorophenol
U082	T	2,6-Dichlorophenol
U083	T	Propylene Dichloride
U085	I,T	1,2:3,4-Diepoxybutane
U088	T	Diethyl Phthalate

TABLE II.6 (continued)

MATERIALS FOR USE AS ALTERNATIVE/HAZARDOUS WASTE FUELS

EPA Hazardous Waste Number	Waste Code	Contaminants
U101	T	2,4 Dimethylphenol
U102	T	Dimethylphthalate
U107	T	Di-n-octyl Phthalate
U108	T	1,4-Dioxane
U112	I	Ethyl Acetate
U113	I	Ethyl Acrylate
U117	I	Ethyl Ether
U118	T	Ethyl Methacrylate
U122	T	Formaldehyde
U124	I	Furan
U125	I	Furfural
U130	T	Hexachlorocyclopentadiene
U140	I,T	Isobutyl Alcohol
U147	T	Maleic Anhydride
U148	T	Maleic Hydrazide
U152	I,T	Methacrylonitrile
U153	I,T	Thimethanol
U154	I	Methyl Alcohol
U155	T	Methapyrilene
U159	I,T	Methyl Ethyl Ketone
U161	I	Methyl Isobutyl Ketone
U162	I,T	Methyl Methacrylate
U164	T	Methylthiouracil
U165	T	Napthalene
U166	T	1,4-Naphthoquinone
U167	T	alpha-Naphthylamine
U168	T	beta-Naphthylamine
U169	I,T	Nitrobenzene
U170	T	p-Nitrophenol
U171	I,T	2-Nitropropane
U186	I	1,3-Pentadiene
U187	T	Phenacetin
U188	T	Phenol
U190	T	Phthalic Anhydride
U191	T	2-Picoline
U194	I,T	n-Propylamine
U196	T	Pyridine
U201	T	Resorcinol
U202	T	Saccharin, Saccharin Salts
U203	T	Safrole
U213	I	Tetrahydrofuran
U219	T	Thiourea
U220	T	Toluene
U221	T	Toluenediamine
U222	T	o-Toluidine Hydrochloride

TABLE II.6 (continued)

MATERIALS FOR USE AS ALTERNATIVE/HAZARDOUS WASTE FUELS

EPA Hazardous Waste Number	Waste Code	Contaminants
U223	R,T	Toluene Diisocyanate
U226	T	1,1,1-Trichloroethane
U231	T	2,4,6-Trichlorophenol
U238	I	Ethyl Carbamate (urethane)
U239	I	Xylene
U243	T	Hexachloropropene
U248	T	Warfarin (when present at concentrations less than 0.3%)
U328	T	o-Toluidine
U353	T	p-Toluidine
U359	T	Ethylene Glycol Monoethyl Ether

TABLE II.6a

MATERIALS FOR USE AS ALTERNATIVE/HAZARDOUS WASTE FUELS (Expected only on a "Derived From" basis)*

EPA Hazardous Waste Number	Waste Code	Contaminants
D012	T	Endrin
D013	T	Lindane
D014	T	Methoxychlor
D015	T	Toxaphene
D016	T	2,4-D (2,4-Dichlorophenoxyacetic Acid)
D017	T	2,4,5-TP (Silvex)
D019	T	Carbon Tetrachloride
D020	T	Chlordane
D022	T	Chloroform
D031	T	Heptachlor (and its hydroxide)
D032	T	Hexachlorobenzene
D033	T	Hexachloro-1,2-butadiene
D034	T	Hexachloroethane
D037	T	Pentachlorophenol
D039	T	Tetrachloroethylene
D040	T	Trichloroethylene
D041	T	2,4,5-Trichlorophenol
D042	T	2,4,6-Trichlorophenol
D043	T	Vinyl Chloride

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* These listed compounds are expected only on a "Derived From" basis and will be accepted if the characteristics of the waste fuel as generated meet the fuel specification provided in Section II-A.6 of this application. The waste fuel generated by the fuel processors are generated in accordance with the USEPA "Sham Recycling" policy. This is consistent with with USEPA's interpretation of the 1983 guidance (48 CFR 1157-60 (March 16, 1983): letter to Richard G. Stoll from Robert Holloway - Chief, Combustion Section; July 1990).

TABLE II.6a (continued)

MATERIALS FOR USE AS ALTERNATIVE/HAZARDOUS WASTE FUELS (Expected only on a "Derived From" basis)*

EPA Hazardous Waste Number	Waste Code	Contaminants
K011	R,T	Acrylonitrile, Acetonitrile, Hydrocyanic Acid
K013	R,T	Hydrocyanic Acid, Acrylonitrile, Acetonitrile
K014	T	Acetonitrile, Acrylamide
K015	T	Benzyl Chloride, Chlorobenzene, Toluene, Benzotrichloride
K016	T	Hexachlorobenzene, Hexachlorobutadiene, Carbon Tetrachloride, Hexachloroethane, Perchloroethylene
K017	T	Epichlorohydrin, Chloroethers [bis(chloromethyl) ether and bis(2-chloroethyl) ether], Trichloropropane, Dichloropropanols
K018	T	1,2-Dichloroethane, Trichloroethylene, Hexachlorobutadiene, Hexachlorobenzene
K019	T	Ethylene dichloride, 1,1,1-Trichloroethane, 1,1,2-Trichloroethane, Tetrachloroethanes (1,1,2,2-Tetrachloroethane and 1,1,1,2-Tetrachloroethane), Trichloroethylene, Tetrachloroethylene, Carbon Tetrachloride, Chloroform, Vinyl Chloride, Vinylidene Chloride
K020	T	Ethylene dichloride, 1,1,1-Trichloroethane, 1,1,2-Trichloroethane, Tetrachloroethanes (1,1,2,2-Tetrachloroethane and 1,1,1,2-Tetrachloroethane), Trichloroethylene, Tetrachloroethylene, Carbon Tetrachloride, Chloroform, Vinyl Chloride, Vinylidene Chloride
K021	T	Antimony, Carbon Tetrachloride, Chloroform
K027	R,T	Toluene Diisocyanate, Toluene-2,4-diamine
K028	T	1,1,1-Trichloroethane, Vinyl Chloride
K029	T	1,2-Dichloroethane, 1,1,1-Trichloroethane, Vinyl Chloride, Vinylidene Chloride, Chloroform
K030	T	Hexachlorobenzene, Hexachlorobutadiene, Hexachloroethane, 1,1,1,2-Tetrachloroethane, 1,1,2,2-Tetrachloroethane, Ethylene Dichloride
K031	T	Arsenic
K032	T	Hexachlorocyclopentadiene
K033	T	Hexachlorocyclopentadiene
K034	T	Hexachlorocyclopentadiene

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* These listed compounds are expected only on a "Derived From" basis and will be accepted if the characteristics of the waste fuel as generated meet the fuel specification provided in Section II-A.6 of this application. The waste fuel generated by the fuel processors are generated in accordance with the USEPA "Sham Recycling" policy. This is consistent with with USEPA's interpretation of the 1983 guidance (48 CFR 1157-60 (March 16, 1983): letter to Richard G. Stoll from Robert Holloway - Chief, Combustion Section; July 1990).

TABLE II.6a (continued)

MATERIALS FOR USE AS ALTERNATIVE/HAZARDOUS WASTE FUELS (Expected only on a "Derived From" basis)*

EPA Hazardous Waste Number	Waste Code	Contaminants
K036	T	Toluene, Phosphorodithioic and Phosphorothioic Acid Esters
K037	T	Toluene, Phosphorodithioic and Phosphorothioic Acid Esters
K038	T	Phorate, Formaldehydes, Phosphorodithioic and Phosphorothioic Acid Esters
K039	T	Phosphorodithioic and Phosphorothioic Acid Esters
K040	T	Phorate, Formaldehydes, Phosphorodithioic and Phosphorothioic Acid Esters
K041	T	Toxaphene
K042	T	Hexachlorobenzene, Ortho-Dichlorobenzene
K043	T	2,4-Dichlorophenol, 2,6-Dichlorophenol, 2,4,6-Trichlorophenol
K046	T	Lead
K047	R	N.A. (Waste is hazardous because it fails the test for the characteristic of iginitability, corrosivity, or reactivity.)
K060	T	Cyanide, Naphthalene, Phenolic Compounds, Arsenic
K061	T	Hexavalent Chromium, Lead, Cadmium
K062	C,T	Hexavalent Chromium, Lead
K069	T	Hexavalent Chromium, Lead, Cadmium
K073	T	Chloroform, Carbon Tetrachloride, Hexachloroethane, Trichloroethane, Tetrachloroethylene, Dichloroethylene, 1,1,2,2-Tetrachloroethane
K095	T	1,1,1,2-Tetrachloroethane, 1,1,2,2-Tetrachloroethane, 1,1,2-Trichloroethane
K096	T	1,2-Dichloroethane, 1,1,1-Trichlorethane, 1,1,2-Trichloroethane
K097	T	Chlordane, Heptachlor
K098	T	Toxaphene
K099	T	2,4-Dichlorophenol, 2,4,6-Trichlorophenol
K105	T	Benzene, Monochlorobenzene, Dichlorobenzene, 2,4,6-Trichlorophenol
K106	T	Mercury
K117	T	Ethylene Dibromide
K118	T	Ethylene Dibromide
K123	T	Ethylene Thiourea

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* These listed compounds are expected only on a "Derived From" basis and will be accepted if the characteristics of the waste fuel as generated meet the fuel specification provided in Section II-A.6 of this application. The waste fuel generated by the fuel processors are generated in accordance with the USEPA "Sham Recycling" policy. This is consistent with with USEPA's interpretation of the 1983 guidance (48 CFR 1157-60 (March 16, 1983): letter to Richard G. Stoll from Robert Holloway - Chief, Combustion Section; July 1990).

TABLE II.6a (continued)

MATERIALS FOR USE AS ALTERNATIVE/HAZARDOUS WASTE FUELS (Expected only on a "Derived From" basis)*

EPA Hazardous Waste Number	Waste Code	Contaminants
K124	C,T	Ethylene Thiourea
K125	T	Ethylene Thiourea
K126	T	Ethylene Thiourea
K136	T	Ethylene Dibromide

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* These listed compounds are expected only on a "Derived From" basis and will be accepted if the characteristics of the waste fuel as generated meet the fuel specification provided in Section II-A.6 of this application. The waste fuel generated by the fuel processors are generated in accordance with the USEPA "Sham Recycling" policy. This is consistent with with USEPA's interpretation of the 1983 guidance (48 CFR 1157-60 (March 16, 1983): letter to Richard G. Stoll from Robert Holloway - Chief, Combustion Section; July 1990).

TABLE II.6a (continued)

MATERIALS FOR USE AS ALTERNATIVE/HAZARDOUS WASTE FUELS (Expected only on a "Derived From" basis)*

EPA Hazardous Waste Number	Waste Code	Contaminants
U010	T	Mitomycin C
U011	T	Amitrole
U021	T	Benzidene
U022	T	Benz[a]pyrene
U023	C,R,T	Benzotrichloride
U025	T	Dichloroethyl Ether
U026	T	Chlornaphazine
U028	T	Diethylhexyl Phthalate
U029	T	Methyl Bromide
U030	T	4-Bromophenyl Phenyl Ether
U036	T	Chlordane, Chlrodane (alpha & gamma isomers)
U041	T	Epichlorohydrin
U042	T	2-Chloroethyl Vinyl Ether
U043	T	Vinyl Chloride
U044	T	Chloroform
U045	I,T	Methyl Chloride
U047	T	beta-Chloronaphthalene
U050	T	Chrysene
U058	T	Cyclophosphamide
U059	T	Daunomycin
U060	T	DDD, Benzene, 1,1'-(2,2-dichloroethylidene)bis[4-chloro-
U061	T	DDT, Benzene, 1,1'-(2,2-trichloroethylidene)bis[4-chloro-
U062	T	Diallate
U066	T	1,2-Dibromo-3-chloropropane
U067	T	Ethylene Dibromide
U068	T	Methylene Bromide
U075	T	Dichlorodifluoromethane
U077	T	Ethylene Dichloride
U080	T	Methylene Chloride
U084	T	1,3-Dichloropropene
U086	T	N,N'-Diethylhydrazine
U087	T	O,O-Diethyl S-Methyl Dithiophosate
U089	T	Diethylstilbesterol
U090	T	Dihydrosafrole

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* These listed compounds are expected only on a "Derived From" basis and will be accepted if the characteristics of the waste fuel as generated meet the fuel specification provided in Section II-A.6 of this application. The waste fuel generated by the fuel processors are generated in accordance with the USEPA "Sham Recycling" policy. This is consistent with with USEPA's interpretation of the 1983 guidance (48 CFR 1157-60 (March 16, 1983): letter to Richard G. Stoll from Robert Holloway - Chief, Combustion Section; July 1990).

TABLE II.6a (continued)

MATERIALS FOR USE AS ALTERNATIVE/HAZARDOUS WASTE FUELS (Expected only on a "Derived From" basis)*

EPA Hazardous Waste Number	Waste Code	Contaminants
U091	T	3,3'-Dimethoxybenzidine
U093	T	p-Dimethylaminoazobenzene
U094	T	7,12-Dimethylbenz[a]anthracene
U095	T	3,3'-Dimethylbenzidine
U097	T	Dimethylcarbamoyl Chloride
U098	T	1,1-Dimethylhydrazine
U099	T	1,2-Dimethylhydrazine
U103	T	Dimethyl Sulfate
U105	T	2,4-Dinitrotoluene
U106	T	2,6-Dinitrotoluene
U111	T	Di-n-propylnitrosamine
U114	T	Ethylenebisdithiocarbamic Acid, Salts & Esters
U116	T	Ethylenethiourea
U119	T	Ethyl Methanesulfonate
U120	T	Fluoranthene
U121	T	Trichloromonofluoromethane
U123	C,T	Formic Acid
U126	T	Glycidyladehyde
U127	T	Hexachlorobenzene
U128	T	Hexachlorobutadiene
U129	T	Lindane
U131	T	Hexachloroethane
U132	T	Hexachlorophene
U134	C,T	Hydrogen Fluoride
U135	T	Hydrogen Sulfide
U137	T	Indeno[1,2,3-cd]pyrene
U138	T	Methyl Iodide
U139	T	Iron Dextran
U141	T	Isosafrole
U142	T	Kepone
U143	T	Lasiocarpine
U144	T	Lead Acetate
U145	T	Lead Phosphate
U146	T	Lead Subacetate
U149	T	Malononitrile
U150	T	Melphalan

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* These listed compounds are expected only on a "Derived From" basis and will be accepted if the characteristics of the waste fuel as generated meet the fuel specification provided in Section II-A.6 of this application. The waste fuel generated by the fuel processors are generated in accordance with the USEPA "Sham Recycling" policy. This is consistent with with USEPA's interpretation of the 1983 guidance (48 CFR 1157-60 (March 16, 1983): letter to Richard G. Stoll from Robert Holloway - Chief, Combustion Section; July 1990).

TABLE II.6a (continued)

MATERIALS FOR USE AS ALTERNATIVE/HAZARDOUS WASTE FUELS (Expected only on a "Derived From" basis)*

EPA Hazardous Waste Number	Waste Code	Contaminants
U156	I,T	Methylchlorocarbonate
U157	T	3-Methylcholanthrene
U158	T	4,4'-Methylenebis(2-chloroaniline)
U160	R,T	Methyl Ethyl Ketone Peroxide
U163	T	Guanidine, N-Methyl-N'-nitro-N-nitroso
U172	T	N-Nitrosodi-n-butylamine
U173	T	N-Nitrosodiethanolamine
U174	T	N-Nitrosodiethylamine
U176	T	N-Nitroso-N-ethylurea
U177	T	N-Nitroso-N-methylurea
U178	T	N-Nitroso-N-methylurethane
U179	T	N-Nitrosopiperidine
U180	T	N-Nitrosopyrrolidine
U181	T	5-Nitro-o-toluidine
U182	T	Paraldehyde
U183	T	Pentachlorobenzene
U184	T	Pentachloroethane
U185	T	Pentachloronitrobenzene (PCNB)
U192	T	Pronamide
U193	T	1,3-Propane Sultone
U197	T	p-Benzoquinone
U200	T	Reserpinen
U206	T	Streptozotocin
U207	T	1,2,4,5-Tetrachlorobenzene
U208	T	1,1,1,2-Tetrachloroethane
U209	T	1,1,2,2-Tetrachloroethane
U210	T	Tetrachloroethylene
U211	T	Carbon Tetrachloride
U218	T	Thioacetamide
U225	T	Bromoform
U227	T	1,1,2-Trichloroethane
U228	T	Trichloroethylene
U234	R,T	1,3,5-Trinitrobenzene
U235	T	Tris(2,3-dibromopropyl)phosphate
U236	T	Trypan Blue
U237	T	Uracil Mustard

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* These listed compounds are expected only on a "Derived From" basis and will be accepted if the characteristics of the waste fuel as generated meet the fuel specification provided in Section II-A.6 of this application. The waste fuel generated by the fuel processors are generated in accordance with the USEPA "Sham Recycling" policy. This is consistent with with USEPA's interpretation of the 1983 guidance (48 CFR 1157-60 (March 16, 1983): letter to Richard G. Stoll from Robert Holloway - Chief, Combustion Section; July 1990).

TABLE II.6a (continued)

MATERIALS FOR USE AS ALTERNATIVE/HAZARDOUS WASTE FUELS
(Expected only on a "Derived From" basis)*

EPA Hazardous Waste Number	Waste Code	Contaminants
U240	T	Acetic Acid, (2,4-Dichlorophenoxy)-, Salts & Esters
U247	T	Methoxychlor
U248	T	Warfarin Salts (when present at concentrations less than 0.3%)
U249	T	Zinc Phosphide (when present at concentrations of 10% or less)

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* These listed compounds are expected only on a "Derived From" basis and will be accepted if the characteristics of the waste fuel as generated meet the fuel specification provided in Section II-A.6 of this application. The waste fuel generated by the fuel processors are generated in accordance with the USEPA "Sham Recycling" policy. This is consistent with with USEPA's interpretation of the 1983 guidance (48 CFR 1157-60 (March 16, 1983): letter to Richard G. Stoll from Robert Holloway - Chief, Combustion Section; July 1990).

TABLE II.6a (continued)

MATERIALS FOR USE AS ALTERNATIVE/HAZARDOUS WASTE FUELS (Expected only on a "Derived From" basis)*

EPA Hazardous Waste Number	Waste Code	Contaminants
P001	T	Warfarin, Warfarin Salts (when present at concentrations greater then 0.3%)
P002	T	1-Acetyl-2-thiourea
P003	T	Acrolein
P004	T	Aldrin
P005	T	Allyl Alcohol
P007	T	5-(Aminomethyl)-3-isoxazolol
P008	T	4-Aminopyridine
P014	T	Thiophenol
P016	T	Dichloromethyl Ether
P017	T	Bromoacetone
P018	T	Brucine
P020	T	Dinoseb
P022	T	Carbon Disulfide
P023	T	Chloroacetaldehyde
P024	T	p-Chloroaniline
P026	T	1-(o-Chlorophenyl) Thiourea
P027	T	3-Chloropropionitrile
P028	T	Benzyl Chloride
P034	T	2-Cyclohexyl-4,6-dinitrophenol
P037	T	Dieldrin
P039	T	Disulfoton
P040	T	O,O-Diethyl O-Pyrazinyl Phosphorothioate
P041	T	Diethyl-p-nitrophenyl Phosphate
P042	T	Epinephrine
P043	T	Diisopropylfluorophosphate (DFP)
P044	T	Dimethoate
P045	T	Thiofanox
P046	T	alpha, alpha-Dimethylphenethylamine
P047	T	Dinitro-o-cresol, and Salts
P048	T	2,4-Dinitrophenol
P049	T	Dithiobiuret
P050	T	Endosulfan
P051	T	Endrin, Endrin Metabolites
P054	T	Ethyleneimine
P057	T	Fluoroacetamide

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* These listed compounds are expected only on a "Derived From" basis and will be accepted if the characteristics of the waste fuel as generated meet the fuel specification provided in Section II-A.6 of this application. The waste fuel generated by the fuel processors are generated in accordance with the USEPA "Sham Recycling" policy. This is consistent with with USEPA's interpretation of the 1983 guidance (48 CFR 1157-60 (March 16, 1983): letter to Richard G. Stoll from Robert Holloway - Chief, Combustion Section; July 1990).

TABLE II.6a (continued)

MATERIALS FOR USE AS ALTERNATIVE/HAZARDOUS WASTE FUELS (Expected only on a "Derived From" basis)*

EPA Hazardous Waste Number	Waste Code	Contaminants
P058	T	Fluoroacetic Acid, Sodium Salt
P059	T	Heptachlor
P060	T	Isodrin
P062	T	Hexaethyl Tetraphosphate
P064	T	Methyl Isocyanate
P066	T	Methomyl
P067	T	1,2-Propylenimine
P069	T	2-Methyllactonitrile
P070	T	Aldicarb
P071	T	Methyl Parathion
P072	T	alpha-Naphthylthiourea
P075	T	Nicotine, Nicotine Salts
P077	T	p-Nitroaniline
P081	R	Nitroglycerin
P082	T	N-Nitrosodimethylamine
P084	T	N-Nitrosomethylvinylamine
P085	T	Octamethylpyrophosphoramide
P088	T	Endothall
P089	T	Parathion
P092	T	Phenylmercury Acetate
P093	T	Phenylthiourea
P094	T	Phorate
P095	T	Phosgene
P096	T	Phosphine
P097	T	Famphur
P102	T	Propargyl Alcohol
P103	T	Selenourea
P108	T	Strychnine, Strychnine Salts
P109	T	Tetraethyldithiopyrophosphate
P110	T	Tetraethyl Lead
P111	T	Tetraethylpyrophosphate
P112	R	Tetranitromethane
P116	T	Thiosemicarbazide
P118	T	Trichloromethanethiol
P122	R,T	Zinc Phosphide (when present at concentrations of greater then 10%)
P123	T	Toxaphene

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* These listed compounds are expected only on a "Derived From" basis and will be accepted if the characteristics of the waste fuel as generated meet the fuel specification provided in Section II-A.6 of this application. The waste fuel generated by the fuel processors are generated in accordance with the USEPA "Sham Recycling" policy. This is consistent with with USEPA's interpretation of the 1983 guidance (48 CFR 1157-60 (March 16, 1983): letter to Richard G. Stoll from Robert Holloway - Chief, Combustion Section; July 1990).

TABLE II.7

SAMPLE PARAMETERS AND METHODS*

Parameter	Reason for Analysis	Test Method Reference
1. Heat content (Btu/lb)	Determines primary fuel setting to assure continued calcining activity in kiln.	Bomb Calorimeter/ASTM D240.
2. Viscosity *Liquid HWF*	Ensures pumpability and proper atomization of the alternate fuel.	Viscosity meter or zahn cup following manufacturer directions/ASTM D2196.
3. Ash content	Ensures process control as ash content affects clinker quality.	Gravimetric on ash residue remaining in bomb cup. ASTM D3174, D432 or D482.
4. Water *Liquid HWF*	Ensures process control as water quantity affects temperature and calcining activity in kiln. Also affects flow (freezing) in tanks, filters, and other process equipment.	Centrifuge HWF, measure separate phase/ASTM D-1796-83 or E203.
5. Halogens, (CL, BR, F)	Ensures process control as chlorinated materials affect clinker quality and kiln and pre-heater operations.	Ion Chromatography. Selective ion probed or A_gNO_3 titration of bomb washings manufacturers instructions/ASTM D808.
6. Sulfur	Could affect the manufacturing process equipment or environment.	Ion chromatography of bomb washings or leco sulfur analyzer operated per manufacturers instructions/ASTM D129, D3177A, D1551.
7. PCB's	Ensures these materials will not be received above 50 ppm.	Gas chromatography, electron capture detector/ASTM D3534.
8. Extractable pH	Ensures against corrosion or adverse reactions in the receiving tank, handling system, and kiln and accessories.	Meter/ASTM D2110.
9. Metals	Ensures that metals content conforms to the specifications and process control as metals may affect the environment, clinker quality and composition of kiln dust.	Atomic adsorption**, Inductively Coupled Plasma Arc: All methods will conform to manufacturer's specifications/ SW846-7000, SW846-6010.
10. Organic Analysis (Volatile)	Ensures that material conforms to pre-qualification review and the general specifications.	Gas Chromatography/ASTM D260
11. Radioactivity	Ensures that radioactive materials will not be received at the facility.	Radiation monitor G.M. tube/ manufacturer's specifications.

TABLE II.7

SAMPLE PARAMETERS AND METHODS*
(continued)

Parameter	Reason for Analysis	Test Method Reference

NOTE:

* The reason for the selection of an ASTM or other test method in place of SW846 method is given below.

Heat Content - ASTEM Method D240 (modified) was chosen because SD846 does not have a test method for this parameter.

Ash - ASTEM method D2174 - Same as above.

Sulphur - ASTM Method D129 - Same as above.

Fluorine - ASTEM Method D808 - Same as above.

Chlorine - ASTEM Method D808 - Same as above.

Bromine - ASTEM Method D808 - Same as above.

Water (separate phase) ASTEM Method D1796-83.

pH (Extracted) Method D2110. The SW846 method is adequate to test this parameter.
Specific Gravity - ASTM Method D2196 - Same as heat content above.

Metals - The digestion described in SW846 does not completely digest the matrix normally found in HWF consequently not all of the metals are extracted. The variations would be dependent on the matrix and the metal with no consistent patter.

PCB - ASTEM Method D3534. The SW 846 Method was designed to analyze for PCB's in oils not solvents. Because of the differences in polarity of the solvents the PCB's are frequently lost during the extraction process.

Fingerprint Scan (Volatile Organics) - ASTM D260 D2908. SW846 does not have a test method for this parameter.

** The company and our technical consultants are evaluating X-Ray Fusion (XRF) analysis of metals which when operated consistent with manufacturers specifications may be used for metals screening for those metals which require > 50 ppm detection.

TABLE II.8

SPECIFICATION FOR HAZARDOUS WASTE FUELS (HWF)

	Liquid HWF	Solid HWF
Heat Content, minimum	10,000 Btu per lb	5,000 Btu per lb
Suspended Solids, maximum	30 percent	N/A
Sulfur, maximum	1 percent maximum	1 percent maximum
Halogens	5 percent	5 percent
Inorganic Acids and Bases	Extractable pH between 4.0 and 11.0	Extractable pH between 4.0 and 11.0
Water, maximum	1 percent as separate phase	No free standing liquid
Metals, maximum each		
Cadmium	250 ppm	1,000 ppm
Chromium	3,000 ppm	4,000 ppm
Lead	4,000 ppm	8,000 ppm
Barium	4,000 ppm	12,000 ppm
Antimony	See Note	See Note
Arsenic	See Note	See Note
Beryllium	See Note	See Note
Mercury	See Note	See Note
Silver	See Note	See Note
Thallium	See Note	See Note
PCB's	Less than 50 ppm	Less than 50 ppm

NOTE: This specification is subject to FDER Air Quality Section Review and is subject to change.

TABLE II.9

CONTAINER SAMPLING PLAN FOR SHIPMENT

Drums	Solid	Thief (solid), Trier (semi-solid), Zone powder sampler (solid)	See Footnote for number of containers and boxes of the same product to be sampled and composited.	Each Shipment

Footnote	Number of Containers Of Same Waste Stream	Number of Containers Sampled and Composited
ASTM Method D140-70	1	1
	2-8	2
	9-27	3
	28-64	4
	65-125	5
	126-216	6
	217-343	7
	344-512	8
	513-729	9
	730-1000	10

TABLE II.10
WASTE ANALYSIS PLAN - OUTLINE

Parameter Method	A Fuel/Marketer /Generator Qualification	B Truck/Rail Car Receipt for Liquids	C Containerized Solids - Receipt
Heat Content ASTM Method D240	X	X	X
Ash ASTM Method D2174	X	X	X
Sulphur ASTM Method D129	X	X	X
Fluoride ASTM Method D808	X		
Chloride ASTM Method D808	X	X	X
Bromide ASTM Method D808	X		
Water (Separate Phase) ASTM D1796-83	X		
pH (Extracted) ASTM Method D2110	X		
Specific Gravity ASTM Method D2196	X	X	X*
Solids	X		
Metals (As per Specification SW846)	X	X+	X
PCB's ASTM Method D3534	X	X+	X

TABLE II.10
WASTE ANALYSIS PLAN - OUTLINE
(continued)

Parameter Method	A Fuel/Marketer /Generator Qualification	B Truck/Rail Car Receipt for Liquids	C Containerized Solids - Receipt
Volatile Organics Analysis			
Analysis	X		
Fingerprint			
ASTM D260, D2908			
Radioactivity			
Radiation Monitor	X	X	X

Every test noted above is performed at intervals noted:

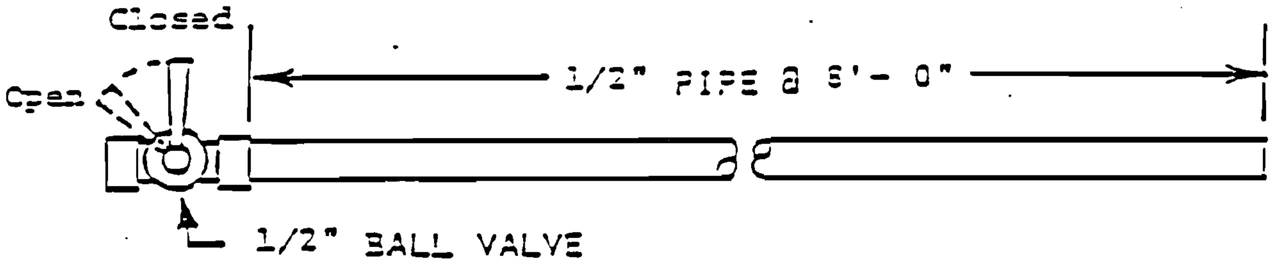
A. Requalification will occur every 6 months or more often if discrepancies occur between material qualified & materials tested at plant. If a generator does not ship on a regular schedule and misses the 6 month requalification the very next shipment will be subjected to requalification analysis.
B. Prior to unloading every truck or rail car.
C. Prior to accepting every truck or rail car. (See Exhibit II.10)

\+ During Phase I Operations, these parameters will be checked for verification on each discrete shipment or shipments of HWF.

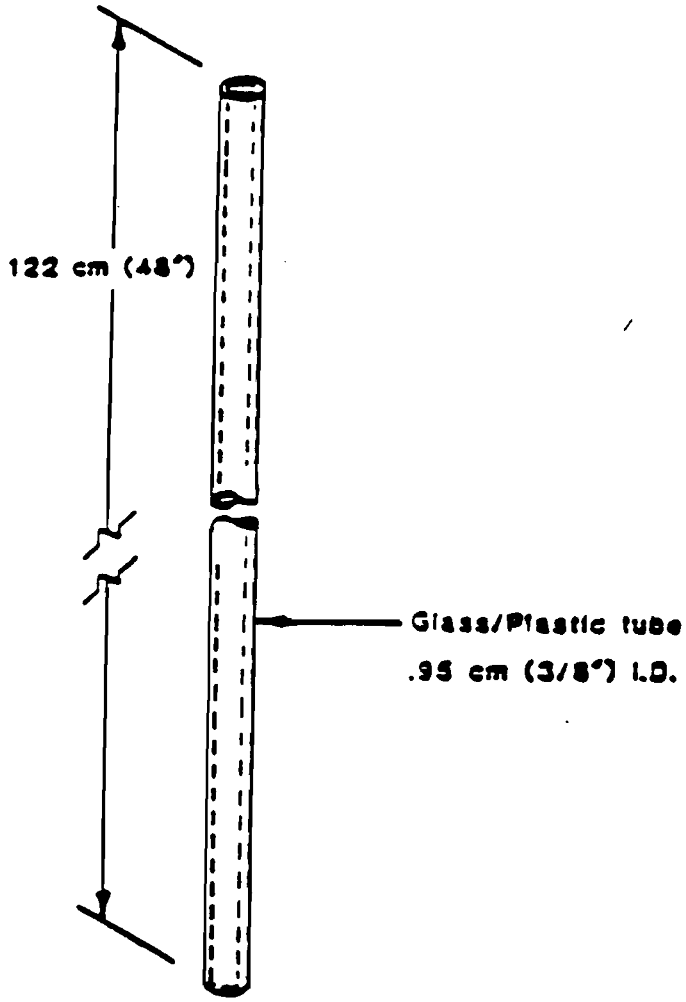
NOTE: If any fuel shipment is rejected, Knox County Department of Air Pollution Control will be notified.

EXHIBIT II.9

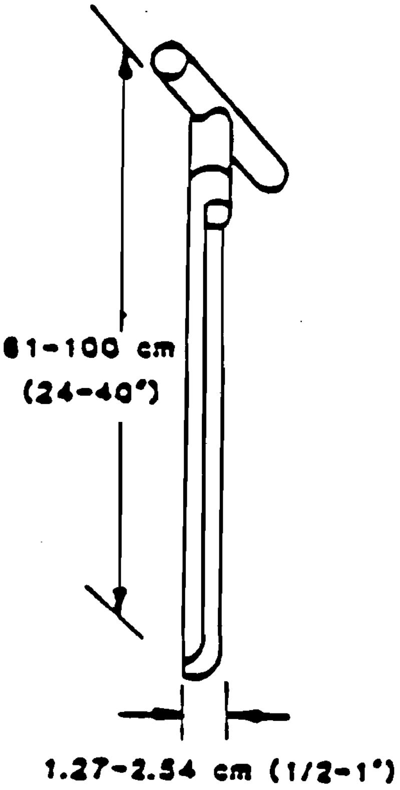
SUPPORTING DATA ON WASTE ANALYSIS



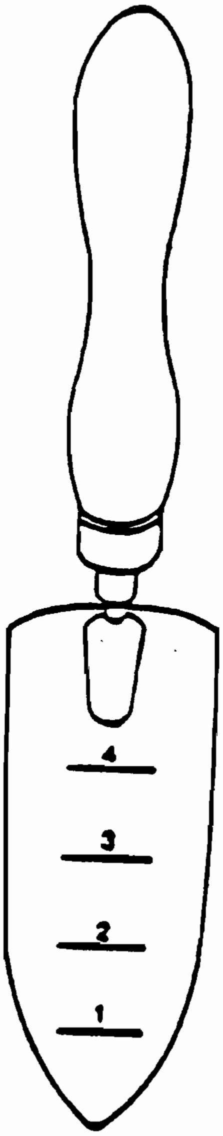
LIQUID FUEL SAMPLE TUBE



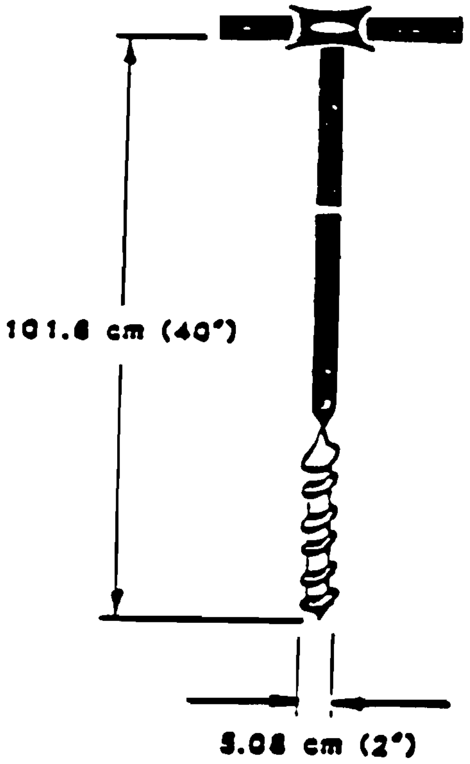
SOLID FUEL SAMPLING DEVICE
THIEF



SOLID FUEL SAMPLING DEVICE
TRIER



SOLID FUEL SAMPLING DEVICE
TROWEL



SOLID FUEL SAMPLING DEVICE
SOIL AUGER

EXHIBIT II.10

SOLID FUEL* SAMPLING PROTOCOL

The following describes the procedure for implementing the Sampling Protocol. The person implementing this protocol (Sampler) must follow the procedure outlined here exactly, in order to ensure that a statistically random sample is obtained. If strict adherence to this procedure is not possible, contact the site laboratory immediately for further instructions.

GENERAL

This procedure requires that each truck load of fuel have an exactly defined group of 10 containers selected for sampling. In order to ensure this, the 10 containers must be selected and removed according to a specific pattern.

This pattern is determined by the use of a computer to generate a random number procedure which randomly identifies the Pallet #, level, and Container # to be sampled. The container numbering procedure is shown at the end of this protocol. The choice of protocol will be determined by an impartial random number generator in order to ensure that it, too, is selected at random.

Each protocol consists of lists of pallet numbers generated from a random number table. The containers to be sampled are described by the protocols in terms of pallet numbers and level (top, middle or bottom). Each protocol requires the identification of the individual pallet specified for a given sample, and the level from which a container is removed.

(RECEIVING) PROCEDURE

1. Inspect and receive the Solid Fuel load.
2. Remove pallets from the truck and stage them in a manner that allows the sampler to gain access to each one. Note that the sampling procedure requires that the sampler be able to remove the stretch wrap on the top two levels of containers if necessary. In addition, the pallets are staged on an impervious surface.

(SAMPLING) PROCEDURE

3. Based upon random number procedure a container will be selected from a pallet.
4. Note the date, processor name, load record number and manifest number on the selected protocol form.
5. Proceed to the load staged to be sampled. Clearly mark each pallet with a number starting with 1 and going until the final pallet is numbered (usually 20 or 22).
6. Note the number of the first pallet to be sampled and identify its location. Also, note the level from which the sample container is to be taken. Remove the necessary stretch wrap and containers to allow proper access.

EXHIBIT II.10

SOLID FUEL SAMPLING PROTOCOL

7. Remove the identified container from the appropriate level and take that container to the sample gathering area. This area will consist of an empty pallet designated for transporting the container to the kiln after they have been sampled.
8. Repeat steps one through seven as outlined above for each of the remaining nine containers. Note that this is a random procedure. Therefore, it is imperative that a high level of accuracy be maintained while identifying the proper pallets, levels and container numbers.
9. During the selection of the containers, be sure and verify each selection with the appropriate notation on the sampling protocol.
10. After all 10 containers are selected, take an 8 ounce sample from each container and deposit it in a sample container suitable for transportation to the laboratory. A suitable sampling device is to be selected based on the nature of the materials in the opened containers.
11. Reseal and rewrap each sampled container for transport to the kiln, along with the rest of the load.
12. Sign the sample protocol form in order to certify that the procedure was properly followed and that the form will be returned with the sample.

EXHIBIT II.10

22 PALLET SAMPLING PROTOCOL 1

Pail Location		Container #
Pallet #	Level*	Sampled
8	B	3
21	M	6
3	T	7
13	T	9
7	B	11
22	B	2
7	M	1
7	B	7
4	B	8
4	B	4

PALLET SAMPLING PROTOCOL 1

Pail Location		Container #
Pallet #	Level*	Sampled
18	B	1
9	T	6
14	M	3
9	B	9
19	M	8
5	M	4
8	T	10
18	M	12
1	T	5
3	T	7

Date	Processor	L.R. #	Manifest #	Sampled By

*Level indicates the tier on the pallet: Top
Middle
Bottom

EXHIBIT II.11

FLORIDA MINING AND MATERIALS
WASTE FUELS QUALIFICATION FORM

GENERAL INFORMATION

Company:____

Generators EPA ID No.:________________________________

Address:____

City:____

State:__________________________________ Zip:________

Contact:____

Title:____________________________ Tele: (   )____________

Waste Description:__________________________________

WASTE INFORMATION:

Metals, ppm	Metals, ppm	Volatile, Relative Area Percent	
PB ______	HG ______	______	______
CR ______	BE ______	______	______
ZN ______	AN ______	______	______
CD ______	BA ______	______	______
AS ______	AG ______	______	______
TH ______		______	______

FUEL VALUE:

Heat Content__________________ Btu/lb.
Total Halogen (Titration)__________ % Wt. as CL
Ash (from Bomb)________________ % Wt.

INORGANICS:

CL________________________ % Wt.
BR________________________ % Wt.
F_________________________ % Wt.
S_________________________ % Wt.
P_________________________ % Wt.

EXHIBIT II.11A

PROCEDURES FOR THE SCREENING OF RADIOACTIVITY IN WASTE FUELS

1. SCOPE AND APPLICATION

1.1 This procedure is to "screen" Hazardous Waste Fuel (HWF) for levels of radioactivity at greater than background.

2. SUMMARY OF METHOD

2.1 A sample is passed within 2-3.0 inches of the detector window of a portable Geiger counter, and the reaction of the meter is noted in the laboratory records.

3. SIGNIFICANCE AND USE

3.1 Hazardous waste fuel blenders do not handle fuels containing radioactive materials. Dixie Cement needs a straightforward, reliable screening procedure for verifying that Hazardous Waste Fuels (HWF) being received are not radioactive above background.

4. INTERFERENCES

4.1 Due to the natural omnidirectional background radiation, occasional background noise (clicks or needle deflections) may be noticed.

4.2 Any person with a pacemaker or other apparatus which uses a low level radioactive source as an energy source ("battery"), including radium watch dials, or energy sources in some forms of smoke detectors, may cause interference. Such interference can usually be tracked to its source using this portable instrument.

5. MATERIALS

5.1 Geiger counter/survey meter including a halogen quenched GM tube detector with a thin mica end window, 1.5-2.0 mg/cm2 in thickness capable of detecting alpha radiation down to 2.5 MeV, beta radiation down to 50 KeV, and gamma radiation down to 10 KeV with a readout down to 0.1 mr/nr (Note 1).

5.2 Low-level radioactive calibration/check source.

6. SAMPLE COLLECTION, PRESERVATION AND HANDLING

6.1 No special sample collection or preservation is necessary. Sample containers used shall be of a standard laboratory glass with a screw top seal. The long-term exposure of any probe to a radioactive sample and/or radioactive check source should be avoided.

6.2 All samples shall be collected in accordance with the current version of the "Quality Assurance Plan" for Dixie Cement Company's HWF program. The current version of the plan calls for an 8 oz. sample of Solid HWF (a liquid HWF sample is typically 1 pint). The radiation screen is the first test run.

7. PROCEDURE

7.1 The collected and sealed sample is taken to the laboratory and placed in the laboratory fume hood.

7.2 The open top of the sample container is placed within two to three (2 - 3) inches of the survey meter. Hold this position for at least 5 seconds, making sure the probe does not contact the sample.

7.3 Note the presence of radiation by the increased frequency of clicks or deflection of the meter needle.

8. CALCULATIONS

8.1 None.

9. QUALITY CONTROL

9.1 Instrument performance is evaluated each day the instrument is used.

9.2 Since there is no aliquot to be removed from the sample container, no other special QC procedures need be performed.

10. PRECISION AND BIAS

Since the results of the test are only intended to give a positive/negative rating to the material being tested, no statement is made about the precision of this method.

(NOTE 1) Meter successfully used: Radiation Alert Monitor 4.

EXHIBIT II.12A *

FLORIDA MINING AND MATERIALS

TYPICAL CHEMICAL ANALYSIS OF BATCH REPORT AND CERTIFICATION

GENERAL INFORMATION

Company:____________________________________

Generators EPA ID No.:______________________________

Address:____________________________________

City:______________________________________

State:______________________________ Zip:________

Contact:____________________________________

Title:________________________ Tele:_(___)____________

Waste Description:________________________________

Is this material or was this material blended with a pesticide product/by-product/off-specification pesticide? ______ Yes ______ No

HWF Test Parameters		Liquid HWF	Solid HWF
Heat content (Btu/lb.)		______	______
Suspended Solids (% Wt.)		______	______
Sulphur (% Wt.)		______	______
Halogens (% Wt.)		______	______
Inorganic Acids and Bases		______	______
Metals (ppm)	Cadmium	______	______
	Chromium	______	______
	Lead	______	______
	Barium	______	______
	Zinc	______	______
	Arsenic	______	______
	Thallium	______	______

	Liquid HWF	Solid HWF
Mercury	______	______
Beryllium	______	______
Antimony	______	______
Silver	______	______
PCBs (ppm)	______	______

The analysis provided herein is representative of a single batch of HWF.

I hereby certify that the above description is complete and accurate to the best of my knowledge and ability to determine and that no deliberate or willful omissions of composition or properties exists. Furthermore, I certify that the HWF supplied satisfies the objectives of the U.S. EPA Sham Recycling Policy (1983 or as revised) as it relates to HWF burned for the purpose of energy recovery.

______________________________ ______________________________

Authorized Signature Date

* This form is to be used for shipments from fuel marketers who hold U.S. EPA/RCRA authority as hazardous waste fuel suppliers and have fully qualified laboraties.

EXHIBIT II.12B *

FLORIDA MINING AND MATERIALS

TYPICAL CHEMICAL ANALYSIS OF BATCH REPORT AND CERTIFICATION

GENERAL INFORMATION

Company:____________________

Generators EPA ID No.:____________________

Address:____________________

City:____________________

State:____________________ Zip:__________

Contact:____________________

Title:____________________ Tele: (   )__________

Waste Description:____________________

Is this material or was this material blended with a pesticide product/by-product/off-specification pesticide? ______ Yes ______ No

WASTE INFORMATION

Metals	Volatile Organics	Relevant Area Percent
PB		
CR		
ZN		
CD		
AS		
TH		
HG		
BE		
AN		
AG		

FUEL VALUE

Heat Content	__________	Btu/lb
Total Halogen (Titration)	__________	% Wt. as CL
Ash (from Bomb)	__________	% Wt.

INORGANICS

CL____________________ % Wt.

BR____________________ % Wt.

F____________________ % Wt.

S____________________ % Wt.

P____________________ % Wt.

The analysis prvided herein is representative of a single batch of HWF.

I hereby certify that the above description is complete and accurate to the best of my knowledge and ability to determine and that no deliberate or willful omissions of composition or properties exists. Furthermore, I certify that the HWF supplied satisfies the objectives of the U.S. EPA Sham Recycling Policy (1983 or as revised) as it relates to HWF burned for the purpose of energy recovery.

________________________ ________________________

Authorized Signature Date

* This form is to be used for shipments from fuel marketers who hold U.S. EPA/RCRA authority as hazardous waste fuel suppliers and have fully qualified laboraties.

Question 2

2. **Please describe in detail the handling, storage, and processing procedures for each type of hazardous waste fuel (i.e., liquid, solid, etc.) that will be required once these fuels arrive at the facility.**

3. **Please describe in detail the handling of the delivery vehicle(s), which should include storage, wash-out, venting, etc.**

   The response to Questions 2 and 3 have been combined. Attachment 1, included in the response to Question 3, provides information which has been previously submitted to the Department as part of the Application for a Hazardous Waste Storage Facility Permit. Attachment 2, which is also included in the response to Question 3, provides supplemental information not included in the Storage Facility Permit Application.

Question 3

2. **Please describe in detail the handling, storage, and processing procedures for each type of hazardous waste fuel (i.e., liquid, solid, etc.) that will be required once these fuels arrive at the facility.**

3. **Please describe in detail the handling of the delivery vehicle(s), which should include storage, wash-out, venting, etc.**

Attachment 1 provides information which has been previously submitted to the Department as part of the Application for a Hazardous Waste Storage Facility Permit. Attachment 2 provides supplemental information not included in the Storage Facility Permit Application.

ATTACHMENT 1

B. Containers

Florida Mining and Materials, in order to operate a supplemental fuels program for its two cement kilns, will construct a hazardous waste storage facility. The facility will consist of five storage areas or units, which may be operated both independently and as integral parts of the total system. Unit 1 will consist of an unloading area designed to accommodate one rail car. Liquid hazardous waste fuels may be pumped from this area either directly to the kiln for burning or to a tank storage area. Unit 2 will consist of an unloading area designed to accommodate two tank trucks. Just as the rail unloading area, liquid hazardous waste fuels may be pumped from this area directly to the kiln or to the tank storage area. This tank farm will comprise Unit 3 of the facility, and will include four tanks with a total capacity of 100,000 gallons. Unit 4 will consist of an area for unloading or prepackaged, nonpumpable hazardous waste fuels. This area will be designed to store the contents of two trucks of 20 to 22 pallets each. The prepackaged fuel containers may be transferred directly to the kiln for burning or to a warehouse storage area. The warehouse will comprise Unit 5. This section provdes details of Units 4 and 5, the container storage areas.

Containers Without Free Liquids

The containers will contain and be compatible with the waste fuels outlined in the Waste Analysis Plan. It is assumed that there will be some phase separation of materials during transit or in storage. Consequently, the storage and handling of containers will be carried out as though the containers contained free liquids.

Basic Design Parameters, Dimensions, and Materials of Construction

The Container Storage Building is designed for container storage and management and secondary containment. Details of the building foundation, structural components, and containment can be found in Figure II.8. The Container Storage Building has been designed in accordance with NFPA 30, Flammable and Combustible Liquids Code, Chapter 4, Section 4-5.7, Liquid Warehouses requirements and other applicable provisions of NFPA 30.

The foundation design will consist of:

- 8 inches of Econocrete with not less than 2000 psi strength.
- A polyethylene film barrier of appropriate strength and weight.
- 8 inches of reinforced concrete slab with a minimum compressive strength of 3000 psi in 28 days. All concrete work to conform to A.C.I. Standard 318.
- 4 inch concrete sill around inside perimeter of building as required by NFPA 30.

In addition, the concrete floor will be coated with a material, such as Chem-Master Corporation's "Dura-Kote 3," or equivalent, that is impervious to solvents. To eliminate potential contamination at joints, all joints will contain waterstops that are nonmetallic such as a flexible Teflon waterstop or similar.

The floor slab in the container storage building has been designed to slope towards a steel lined collection trench that will be situated near the middle of the building. This collection trench will be covered with heavy duty bar grating and will be sloped to drain to an interior, steel-lined concrete sump. The trench and sump will be inspected daily and liquids removed by pumping or other effective methods, such as manual bailing, the use of a vacuum truck, a mop or other absorbent materials. Figures II.9 and II.9A provide design details of the truck unloading area.

Secondary Containment System Design

Figures II.8 through II.8C provide design drawings of the container storage building. The proposed container storage arrangement within the container storage building is illustrated in Figure II.8C. Table II.12 shows the capacity calculations for the containment system associated with the container storage area. The capacity of the containment system exceeds the requirement to contain 10 percent of the total volume of the containers. Given the fact that the facility will be completely enclosed and surrounded by a 4-inch high curb, no adjustments have been made for precipitation volumes.

Ignitable or Reactive Wastes in Containers

Figure I.2 of this application shows the FM&M property and location of HWF storage areas. The ignitable wastes managed in these areas will be well beyond 50 feet of the facility property line. No reactive wastes will be handled.

Description of Containers

The containers used to hold the hazardous waste solids for injection into the kiln for energy recovery will conform to the DOT specification set forth in 49 CFR Part 173.24. Paragraph C.1V of 49 CFR Part 173.24 specifically references 49 CFR Part 178 and 179 (Part 179 is not applicable as it refers to tank cars).

Part 178 is a complete description of all specification containers that could be used. This includes steel, wood paper and plastic containers each with and without liners and various body and head configurations. Subpart H (specifications for Portable tanks) and Sub-part J (specifications for containers for motor vehicle transpiration, tank trucks) would not be applicable. In these specifications, the CFR generally restricts the volume of these containers to less than 110 gallons. FM&M would use containers specified by the 49 CFR Part 178 (with any subsequent amendments made by DOT) and a working size limitation of an average straight side diameter measurement of not more than 13" and a height (head to head) of less than 22". This size limitation is consistent with the physical limitations of the equipment used to insert the containers into the kiln for energy recovery. A container of these dimensions would not have a theoretical volume greater than 13 gallons, with a working volume of approximately 10 gallons. Total storage capacity of the container warehouse would be limited to a volume of 172,800 gallons in containers as described above of what ever container size, rather than a specific number of containers.

Container Management Practices

The shipment of solid waste filled containers will be palletized and wrapped with heat shrink plastic (to facilitate movement with forklifts) when received at the Brooksville facility. Florida Mining and Materials will ensure that incoming containerized wastes are stored in containers that are compatible with the physical and chemical characteristics of the waste. The containers will be handled by plant personnel trained in such and will not be handled or stored in any way which might cause the containers to rupture or leak.

Incoming containers will first be placed in a designated testing area. Each shipment will be tested for compatibility to the waste analysis plan. After testing, if approved, containers will be moved to a permanent storage area for future processing into the cement kiln. The storage area is designed to accommodate first in, first out management of container operations. If the shipment is disapproved, the pallets of containers are immediately removed from the container storage building and placed on the truck that brought them and returned to the supplier.

Each container storage area will be inspected daily. Adequate aisle space will be maintained so that areas can be properly inspected and local fire codes can be satisfied. If a container is identified to be in poor condition, the contents of that container will be transferred to a container which is compatible with the contents and is in good condition. Inspection logs to be used for all the HWF storage areas are provided as Exhibit II.13 in Section C of this application.

C. Tanks

As discussed previously, storage of liquid HWF will involve three areas: Unit 1 providing an unloading area for truck shipments, Unit 2 providing an unloading area for rail shipments, and Unit 3, a tank storage area. This section provides details for each of these storage areas.

Truck/Rail Unloading

Florida Mining and Materials proposes to receive liquid hazardous waste fuels by truck and/or rail car. The waste fuels are those outlined in the Waste Analysis Plan. The waste fuels will either be pumped directly to the cement kiln for energy recovery or pumped to storage tanks for future energy recovery.

Truck Area

Trucks arriving on-site will be directed to the truck unloading area. All testing and unloading of the hazardous waste fuels will occur in this area. The entire truck will be contained within a concrete containment area. The area will be covered with a structure to eliminate the possibility of rain water being collected in the secondary containment. The truck unloading facility has been designed in accordance with NFPA 30. The foundation design consists of:

- 8 inches of Econocrete with not less than 2000 psi strength.

- A polyethylene film barrier of appropriate strength and weight.

- 8 inches of reinforced concrete slab with a minimum compressive strength of 3000 psi in 28 days. All concrete work to conform to A.C.I. Standard 318.

- Concrete curbs around the inside perimeter of the area for containment purposes.

In addition, the floor slab will be coated with a material that is impervious to solvents, such as Chem-Master Corporation's "Dura-Kote 3" or equivalent. All joints will contain waterstops that are nonmetallic such as flexible Teflon waterstop or similar.

The floor slab has been designed to slope towards a steel lined collection trench. This collection trench will be covered with heavy duty bar grating and will be sloped to drain to an interior, steel lined concrete sump. The trench and sump will be inspected daily and liquids removed by pumping as needed. Figures II.9 and II.10 provide design details of the truck unloading area.

Capacity of the Containment System

The maximum anticipated volume of hazardous waste fuels in one truck is 5,000 gallons. The unloading area is designed to accommodate two trucks. The secondary containment area is, therefore, designed to store a minimum of 10,000 gallons of liquid in case of a truck rupture. This is in accordance with requirements specified in NFPA 30.

Table II.13 shows the capacity calculations for the containment area. Given the fact that the facility will be enclosed sufficient to eliminate the possibility of rain water intrusion, no adjustments have been made for precipitation in the volumes.

Rail Area

Rail cars transporting hazardous waste fuels for energy recovery will be directed to the rail unloading facility. The rail facility consists of:

- Steel lined trench under the unloading nozzle of the rail car

- Secondary containment area

- Kiln feed and/or transfer pumps.

Figures II.11, II.11a, II.12, and II.13 show the design of the rail facility. The rail car unloading nozzle will be positioned directly over the concrete trench. The hose from the unloading pumps is located within the trench. The trench is designed to direct any spills to the secondary containment areas. The trench is steel lined and is inspected daily. No fuels will be allowed to pond within the trench.

The trench is covered with a heavy duty grate. Rain that falls directly on the trench will be conveyed to a steel reservoir located within the secondary containment facility. This reservoir is designed to hold the 24 hour, 25 year storm based on the area of the trench that is exposed to the rain. The remaining facility, pumps and secondary containment, are covered with a roof structure.

The secondary containment is designed to collect and hold the volume of one railroad tank car, or 25,000 gallons (see Table II.14). The area is constructed of 8" reinforced concrete slab sitting upon 8" of Econocrete with not less than 2000 psi strength separated by a polyethylene film barrier of appropriate strength and weight. The concrete is coated with a material that is impervious to solvents, such as Chem-Master Corporation's "Dura-Kote 3" or equal. All joints will contain waterstops that are nonmetallic such as a flexible Teflon waterstop or similar.

Hazardous Waste Fuel Management

The shipment of hazardous waste fuel will be tested in accordance with the Waste Analysis Plan. The extraction of samples from the rail/truck will occur within the secondary containment areas. Upon approval of the fuels, an authorized plant employee will begin fuel transfer operations. The waste fuels can either be pumped directly to the kiln or to the storage/blending tanks.

To Kiln

Fuels can be pumped directly to the kiln for energy recovery from the rail/truck. Kiln feed pumps located within the containment areas pump fuels directly out of the rail/truck to the kiln. The feed rate of the pumps are controlled to ensure proper feed rates into the kiln. The pumps are controlled and monitored by pressure and flow sensors. These sensors provided the cement kiln control center necessary information so that the energy recovery process is correctly and safely operated within the confines of the permit.

The pipeline between the containment areas and the kiln are continuously welded steel pipe. For the areas outside of the containment areas, the pipes are enclosed in sealed pipe trays. The trays are sloped such that any leaks can be directed to observation ports. These ports will then be inspected daily for detection of deterioration or leaks. If a leak is detected, the kiln feed is stopped and a thorough investigation is conducted to determine the source of the leak. All leaks will be dealt with and stopped upon detection.

To Storage Tank

Fuels can also be pumped to storage tanks. Transfer pumps located within the containment areas or pumps on the trucks or rail cars, pump fuels directly from the rail/truck into a storage tank. Storage tanks are equipped with level detectors which allow the operator the ability to monitor the level of the fuel in any tank so as to no overfill the tank (see section on Tanks). Piping, pumps, and valves for transferring of fuels are all contained within secondary containment facilities and, therefore, are not in trays. The containment areas are inspected daily for pipe, pump or valve deterioration and/or leaks. If a leak is detected, proper procedures are followed to eliminate the source of the leak.

Tanks

Description of Tanks:

Exhibit II.14 through II.17 provide an assessment of the tank design and P.E. certification. There will be four 25,000 gallon vertical steel tanks with a total holding capacity of 100,000 gallons for storage\blending of liquid HWF. These tanks have been designed to meet or exceed the minimum requirements of API Standard 650, Revision No. 3, Appendix F dated October 15, 1979. All shell design stresses are less than 21 thousand pounds per square inch (KSI) per Appendix "F" with a joint efficiency of 0.7 for vertical joints. Each tank will be hydrostatically tested per API 650.

The four 25,000 gallon above ground tanks are each 12.0 feet in diameter and approximately 35 feet in height. The material of construction will be mild steel throughout all the tanks. The shell thickness will be 1/4" and the bottom of the tanks will be 1/2". The gaskets to be used in the assembly of the pumps and valves will be spiral wound flexitallic Style CG-150 pound pressure or equivalent. Figure II.14 illustrates the storage\blending tank details. Figure II.15 illustrates the general arrangement of the storage tanks.

All the tanks will be used to store/blend HWF. The specific gravity of the HWF will range from 0.77 to 1.25. The maximum liquid level in the tanks will be 1.0 feet below the top.

Daily pressure variations in the tank system will be handled by a nitrogen vapor suppression and control system as illustrated on Figure II.16. The fuels to be used will be within a pH of more than 4 and less than 11, thus the fuels will not be reactive with steel or concrete.

Each tank will be structurally supported on a concrete cylinder slab within the spill containment area, as shown in Figures II.14 and II.15. Each tank will be elevated above the containment area floor. The tank bottom may be observed through observation ports. The tanks will be secured to the slab with anchor bolts.

Tank venting will be accomplished by a nitrogen vapor suppression and control system. Figure II.16 illustrates this system. The low-pressure nitrogen system will have an automatic valving system to keep the manifolded tanks under a positive pressure between 0.5 psig and 2.0 psig in the space above the liquids. Tank vapors will be displaced to a VOC control system only when the tank pressure exceeds 2.0 psig. Under ordinary operating conditions there are no displaced vapors because liquid HWF will be continuously withdrawn from the tank system. Vapor displacement may occur when the fuel delivery rate exceeds the fuel burn rate. The vapors emitted during tank venting required by tank filling or thermal breathing will be conveyed through a welded pipeline directly to the kiln hood and burned in the rotary cement kiln. This pipeline will be fitted with automatic valving and appropriate monitors to ensure that no excess oxygen or heat will be available for combustion. During filling of tanks, displaced vapors will be vented to return to the transportation vessel. The quantity of vapors will be addressed in the air permit applications associated with this project.

The tank foundation will maintain the load of a full tank as shown on Exhibit II.16. Attached calculations show a maximum loading of 388 thousand pounds, including the weight of the tank, the full content of the tank, concrete foundation and 50-year snowfall for each of the 25,000 gallon tanks. Distributing this load over 214 square feet of tank foundation results in a maximum soil bearing load of 1.82 thousand pounds per square feet (KSF). The soil bearing capacity has been conservatively estimated at 2 KSF. Consequently, the soil bearing capacity is more than adequate to support the weight of the tank system.

The steel storage tanks will be constructed on reinforced concrete pads. The concrete and reinforcing have been designed to the following standards:

ACI 211.1-70	Recommended practice for selecting proportions for normal weight concrete.
ACI 301-72	Specifications for structural concrete for buildings.
ACI 302-69	Recommended practice for concrete floor and slab construction.
ACI 315-74	Manual of standard practice for detailing reinforced concrete structures.
ACI 318-77	Building code requirements for reinforced concrete.

In all cases, the steel to concrete ratio is more than adequate to resist all bending forces for both tension and compression, overturning of containment walls, bond between reinforcing steel and concrete, shear stresses and temperature.

The Brooksville, Florida area is not seismically active and consequently not listed in Appendix VI of 40 CFR Part 264. No portion of the facility is located within 200 feet of a fault which has been displaced in holocene time. The tanks will be bolted to the concrete foundation which will be constructed on soil that is not in the saturated zone. The facility is not in the 100-year flood plain. Consequently, the tank system will not float or be dislodged from its foundation and the foundation is stable.

The concrete foundation will be constructed on compacted soil covered with sand to an average depth of six inches. In addition, concrete grade beams will be constructed at a depth of 28" along the perimeter of the concrete foundation. The area below the tank system and below the concrete grade beams will not be subjected to frost conditions and the tank system will not be subjected to frost heave.

The tanks will each have a three-way alarm system that works off of an ultrasound transducer placed in each tank. When the tank level is 3.5 feet from the top, a light will light up on the indicating panel for the particular tank. When the level is 1.0 feet from the top, a siren will sound warning of the possible tank overflow. The liquid level indicating device in each tank will be a remote ultrasound system. Output will be converted to a level indication on the kiln burner floor and at the tank storage area. Audible high level and low level alarms will sound at the storage area and the kiln floor. The overfill alarm will be detected by the person unloading fuel from the transport truck to the tank, allowing immediate stoppage of pumping. Low level alarms will be used by the console operators to prevent running out of fuel. HWF can also be transferred between tanks to aid management of tank levels.

An inventory of feed on hand and a record of the volume of material consumed as fuel will be maintained on a daily basis. The alarm and procedures described are designed to prevent overfilling or running out of fuel. The fuel tank will be situated in a diked area to contain potential spills. The steel-reinforced concrete walls are 8 inches thick and 5 feet tall. Total secondary containment volume is 100,000 gallons.

Tank Corrosion and Erosion

The HWF will be a mixture of common industrial solvents and other organic compounds. These materials are noncorrosive and will be screened so that those materials exhibiting an extractable pH of less than 4 or greater than 11 will not be received. These criteria have been established to ensure that the HWF does not react with the mild steel tank walls. Due to the noncorrosive nature of HWF, no internal coatings or linings will be used. External surfaces will be painted with a 6 mil primer made of Glidden Company epoxy and the finish coat will be Glidden's Gliddthane II at 1.5 to 2 mils thickness or equal. The color will be white. The gaskets used in the assembly of the pumps and valves will be spiral wound Flexitallic Style CG-150 lb. pressure or equivalent solvent resistant material. The tanks will be hydrostatically tested in place after erection to check for leaks. In addition, as means of checking corrosion, all the tanks will be tested for shell thickness using a nondestructive ultrasonic thickness gauge on an annual basis. External inspections of the tanks to detect corrosion and leaks will be conducted daily. The readings will be recorded and updated to develop a corrosion history. The rate of tank corrosion is expected to be less than 0.001 inches per year. The tanks are expected to last a minimum of twenty years.

Tank Management Practices

HWF will be received and pumped into one of the four storage\blending tanks. Each tank can be released to the plant for energy recovery in the rotary cement kiln when tested and approved. A simplified flow diagram is shown in Figure II.17. To ensure that the tanks are operated in accordance with design specifications, the plant will monitor receipts, fuel inventories, HWF use, and fuel characteristics on a daily basis. All materials received will be thoroughly tested as described in the Waste Analysis plan. A record of these analyses will be maintained. Information on the characteristics and quantities of materials moved through the fuel system will ensure that the tanks are operated according to design. The three primary activities involved with tank management (off-loading, storage, and injection into the kiln for energy recovery) are discussed in more detail below.

Off-Loading

The HWF being transported to the Plant will be sampled from the truck or rail car, preliminary tests run, and if okay, then off-loaded. The off-loading system design includes a three inch cam-lock fitting ahead of a filter which will be compatible with fittings on the delivery trucks or rail cars. Facility employees connect the rail cars and trucks to the off-loading system. Off-loading will be done using transport truck pumps and or facility pumps. All connections in the off-loading system will be checked by the plant material handler before off-loading begins.

Storage

Variables influencing tank management practices such as line pressure, flow level, and specific gravity and viscosity will be monitored to aid better management. Fuel temperature will be ambient and thus is of little concern. The HWF will be under a nitrogen blanket in order to maintain the pressure inside the tanks between 0.5 psig and 2.0 psig. The fuel flow level will be continuously measured on the fuel flow indicator in the kiln control room and recorded on a strip chart. The HWF in the storage\blending tanks will be mechanically agitated to ensure homogeneous fuel composition and to prevent settling of solids.

All of the piping outside of the secondary containment areas will be fabricated with welded joints and installed above ground. Secondary containment will consist of the areas around the tanks, concrete containment at rail unloading facility, and floors of existing structures (the Burner-Cooler Building and the Control Room) which house the hazardous waste firing system. All piping, tanks, pumps, filter, gauges, etc. will be inspected daily. The tank system, piping, safety devices, etc., are designed to prevent failures caused by contact, pressure gradients and climatic conditions. This will be accomplished by gauges, relief valves on tanks manufactured with Underwriters Laboratories approval and API Standard 650 design standards.

The piping and ancillary equipment, like the tanks, are designed to prevent failures caused by contact, pressure gradients and climatic conditions in accordance with ANSI B31.3. Valves (1-1/2" and smaller) will have socket weld ends. Hoses to connect to piping will be flexonics type 401M corrugated type 303 SS hose and braid or equal. Pressure gauges will be threaded and have a socket welded valve installed between the HWF line and the gauge that can be closed in the event of leakage in the line or in the gauge. The shift foreman will make the daily, weekly, and monthly inspections. The plant superintendent will oversee this activity, read and follow up on items marked with an X, which will be other than routine.

Injection into the Kiln

Fuel will be delivered to the kiln through a closed loop circulation system utilizing centrifugal pumps and pressure relief valves. Piping for the HWF system is shown in Figure II.17. Exhibit II.11A provides general specifications for the piping system.

In addition to the three primary components of the tank management practices there are two other important components. These two are the tank entry program and the secondary containment system which are discussed below.

Tank Entry Program

Entry into the HWF storage tanks may be necessary to repair the agitators or to remove sludges. Therefore, a program has been developed for tank entry which will prevent employee exposure to dangerous air contamination and/or oxygen deficiency when working inside the tanks.

Tank entry will be by authorization only. The entry authorization provides a checklist of necessary precautions and provides for review of these precautions by supervisory and safety personnel who provide authorization for such entry by their signatures. A copy of the entry authorization is included in Exhibit II.12. The authorization will be issued for the period of one shift only and must be updated for each additional shift. All employee access entrances to the tanks will be posted with the following warning:

DANGER
DANGEROUS AIR CONTAMINATION
AND/OR OXYGEN DEFICIENCY
MAY BE PRESENT. TANK ENTRY
BY AUTHORIZATION ONLY

Table II.15 outlines the procedures to be followed prior to any entry into a fuel storage and/or mixing tank. Table II.16 lists the work procedures to be adhered to when dangerous air contamination and/or an oxygen deficiency may be encountered.

Training for tank entry will be provided before each scheduled tank entry for the following personnel: supervisor of tank entry crew, tank entry crew, standby personnel and rescue personnel. Training will include both instruction, demonstration, and practice in all aspects of tank entry. In addition, general information regarding hazards associated with tank entry will be included in the orientation training of all employees involved in the HWF program.

Liquid Fuels Containment Area

The plans for the containment areas are shown in Figure II.15. The containment area foundation system will consist of one of the following:

- 6-inches of Econocrete with not less than 2500 psi strength.
- A polyethylene film barrier of appropriate strength and weight.
- An 8 inch thick of reinforced concrete slab will be constructed. The concrete surface will be sealed with an epoxy material rated for use with HWF.

The tank farm and containment area will be covered by a roof to prevent precipitation from entering the secondary containment area. Table II.17 shows the calculations for the containment volume.

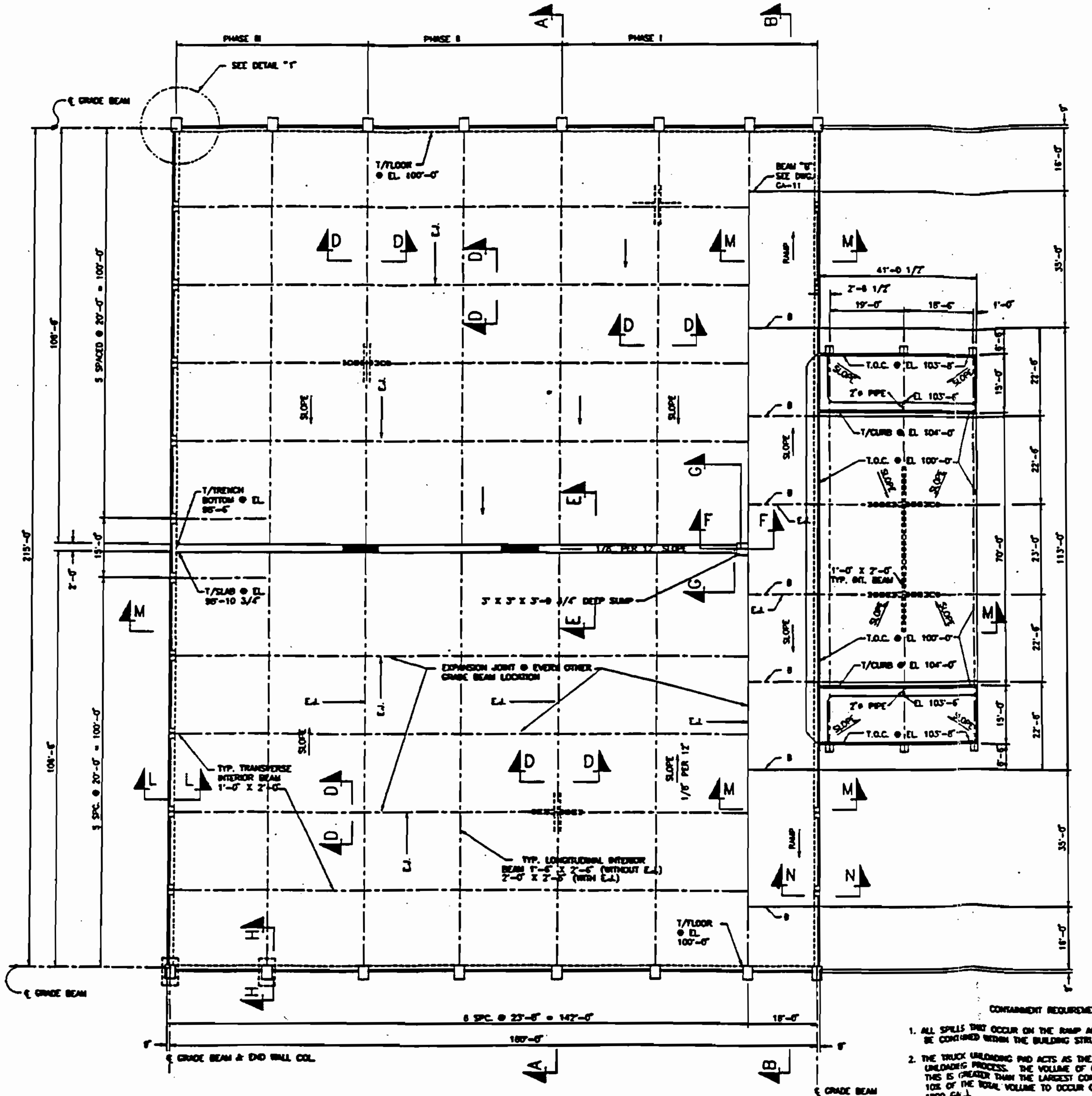
Procedures for prevention of ignition of the materials within the tank and secondary containment areas include:

- Posting the area to prevent open flame.
- Use of nonsparking shovels, scrapers and tools.
- All electrical equipment in the area including motors, wiring, switch gear and instrumentation will be explosion proof.
- Pumps will be equipped with 125 lb. by-pass valves to prohibit pumps overheating due to a plugged line.
- Fuel lines will be equipped with 100 PSI pressure relief to prevent high line pressure.
- Spill clean-up system will be established for leaks, large and small.
- A written tank entry system will be followed.
- Properly trained personnel to handle the loading of tanks and the transfer of tested fuel to the burning tank.

Best Available Copy

FIGURE II.8

THE PHASING REPRESENTS CONSTRUCTION SEQUENCING. PHASE 1 IS A STAND ALONE FACILITY. SUBSEQUENT PHASES WILL BE ADDED AS RECEIPTS DICTATE.

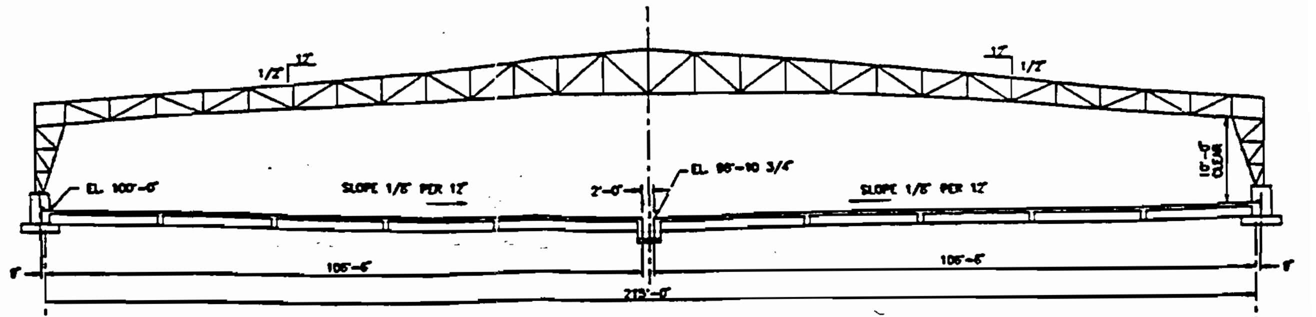


FOUNDATION PLAN

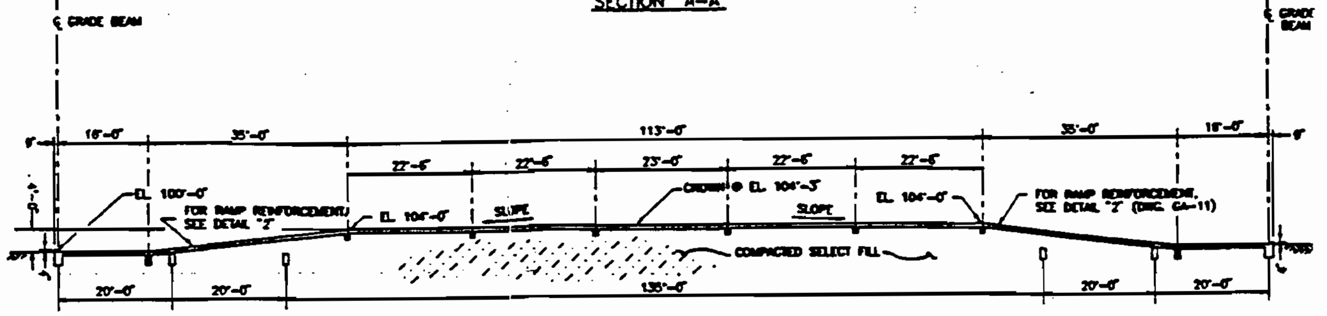
CONTAINMENT REQUIREMENTS

1. ALL SPILLS THAT OCCUR ON THE RAMP AND IN THE CONTAINMENT BUILDING WILL BE CONTAINED WITHIN THE BUILDING STRUCTURE.

2. THE TRUCK UNLOADING PAD ACTS AS THE CONTAINMENT FOR THE TRUCK UNLOADING PROCESS. THE VOLUME OF CONTAINMENT IS APPROXIMATELY 2680 GAL. THIS IS GREATER THAN THE LARGEST CONTAINER (ONE PALLET OR 180 GAL.) AND 10% OF THE TOTAL VOLUME TO OCCUR ON THE PAD DURING IN ONE TIME (5 TRUCKS OR 1800 GAL.)



SECTION "A-A"



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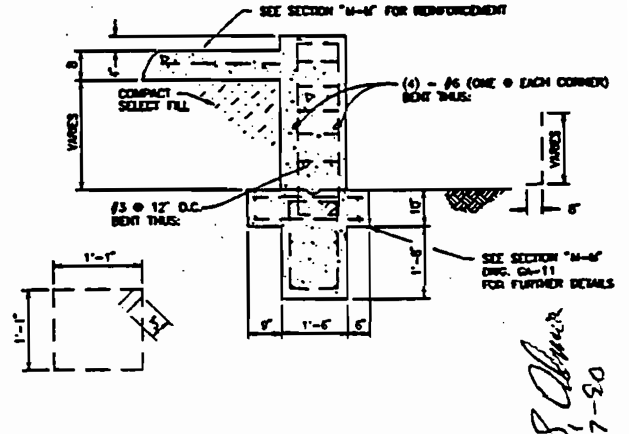
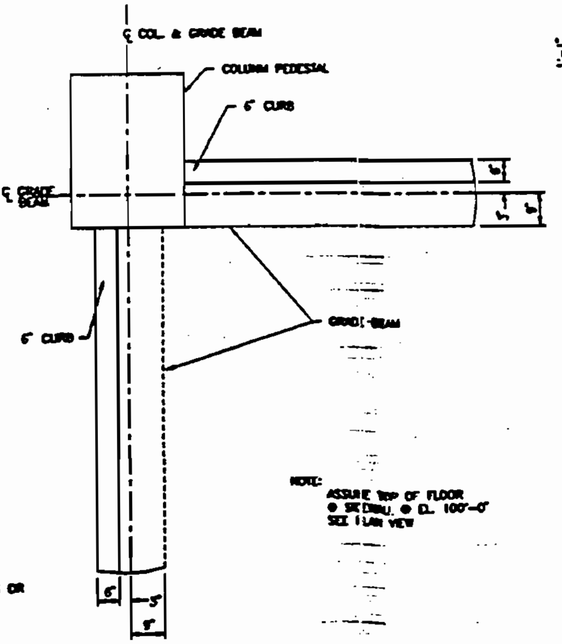


SECTION "N-N" (TYP @ COL. LOCATIONS)
SCALE 1"=1'-0"

8-27-90



DETAIL "1" (TYP)
SCALE 1/2"=1'-0"

GENERAL NOTES

1) ALL CONCRETE WORK SHALL CONFORM WITH CURRENT A.C.I. STANDARD 318.

2) CONCRETE STRENGTH SHALL DEVELOPE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 3,000 p.s.i. IN 28 DAYS.

3) REINFORCING STEEL SHALL BE NEW AMERICAN BILLET A.S.T.M. A615, GRADE 60.

4) CHAMFER ALL EXPOSED CONCRETE EDGES 3/4".

5) FILLS, IF ANY, SHALL BE CONSTRUCTED IN HORIZONTAL LAYERS NOT EXCEEDING 6" IN UNCOMPACTED THICKNESS. EACH LAYER SHALL BE THOROUGHLY COMPACTED TO 95% OF THE MAXIMUM DENSITY AT OPTIMUM MOISTURE CONTENT AS DETERMINED BY A.S.T.M. D698.

6) ANY DISTURBED SUBGRADE MUST BE COMPACTED AS PER NOTE #5.

7) ALL CONCRETE TO BE COATED WITH CHEM-MASTER CORP. " DURA KOTE 3 " OR EQUIVALENT.

8) WORK THIS DWG. WITH DWGS. GA-10 & GA-11.

PERMIT DRAWING

08/10/90

NO.	DATE	REVISION	BY	CH'D	MF'D	W.O.NO.

SOUTHDOWN, INC.

The BenhamGroup
17120 Dallas Parkway
Suite 240
Dallas, Texas 75248
214-248-9901
TBC # 3389-01900

SCALE: 1/16" = 1'-0"
DESIGN:
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ISSUED BY DATE

FLORIDA MINING AND MATERIALS
BROOKSVILLE FLORIDA

WORK ORDER NO.
BROOKSVILLE
PLANT

DEPARTMENT
HAZARDOUS WASTE FUELS SYSTEM
CONCRETE-CONTAINER STORAGE BUILDING
PLAN, SECTIONS AND DETAILS
DRAWING NUMBER
REV

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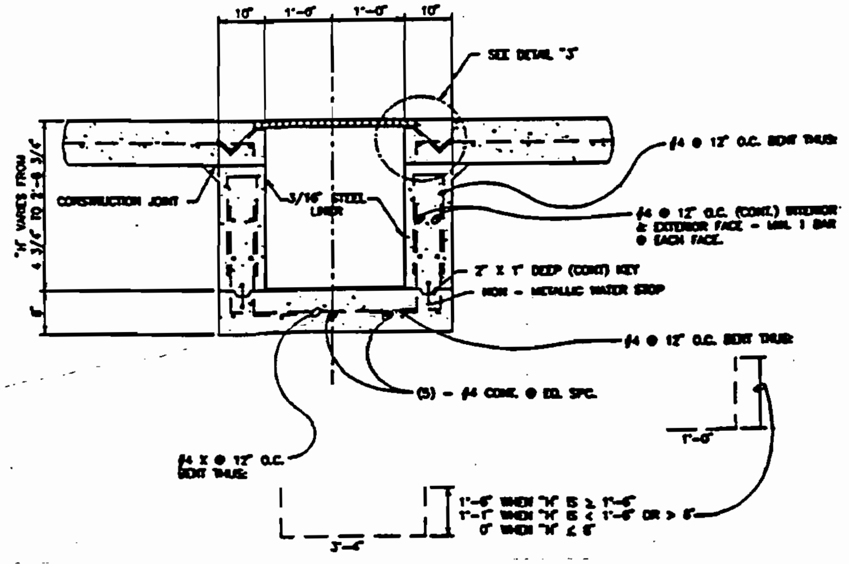
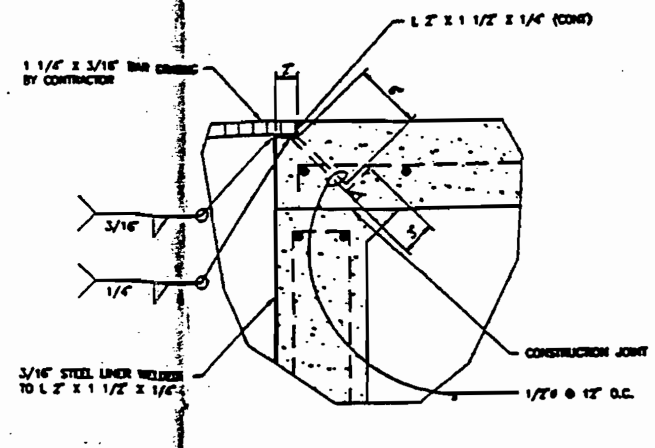
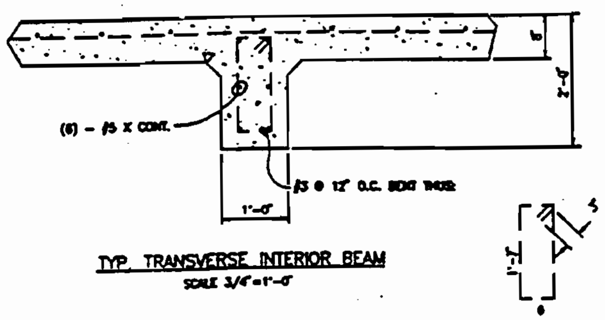
FIGURE II.8A



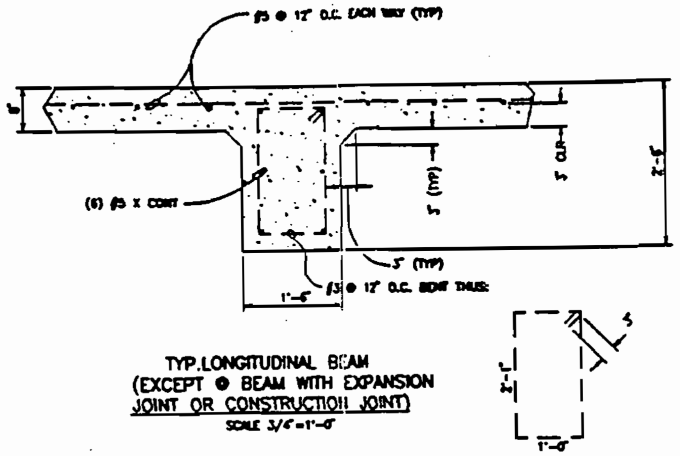
SECTION "E-E"
SCALE 3/4"=1'-0"



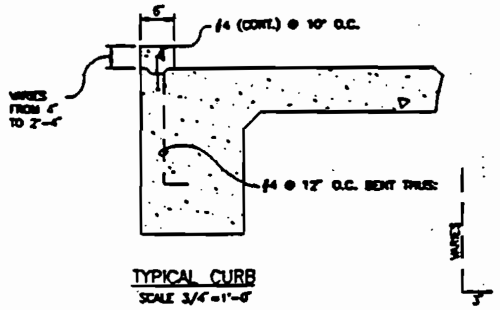
DETAIL "3"
SCALE 1 1/2"=1'-0"



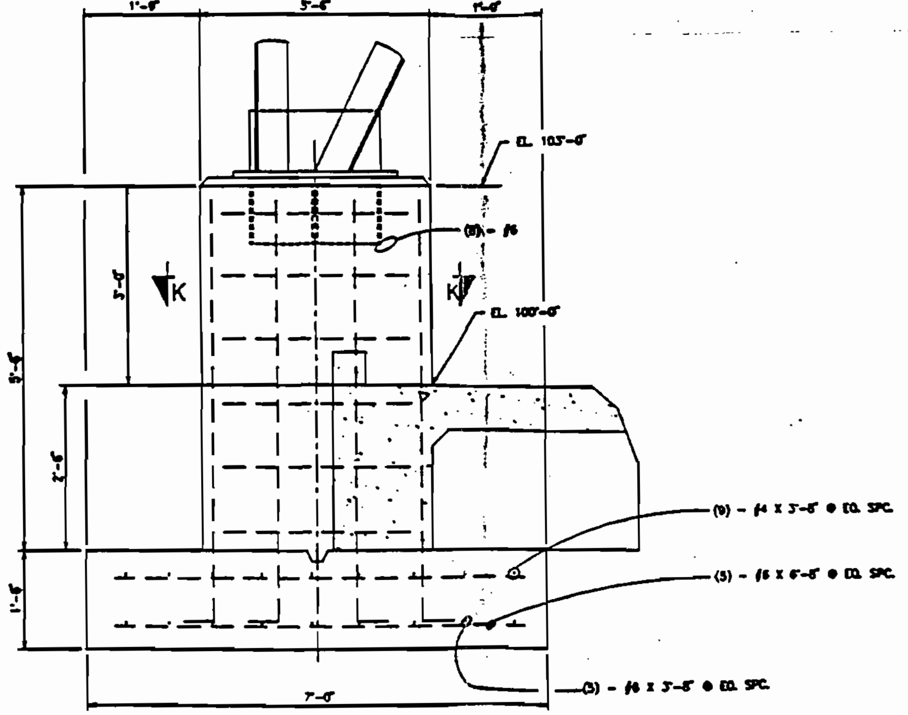
TYP. TRANSVERSE INTERIOR BEAM
SCALE 3/4"=1'-0"



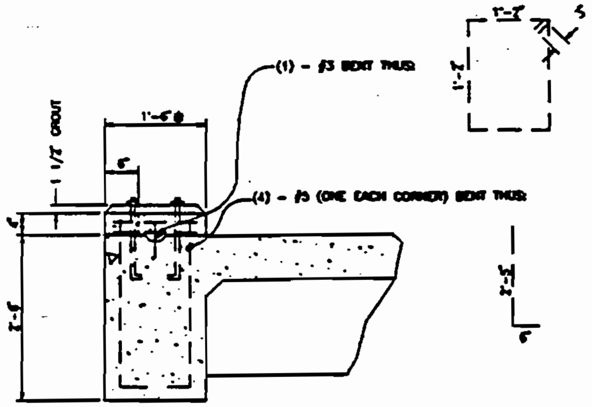
TYP. LONGITUDINAL BEAM
(EXCEPT @ BEAM WITH EXPANSION JOINT OR CONSTRUCTION JOINT)
SCALE 3/4"=1'-0"



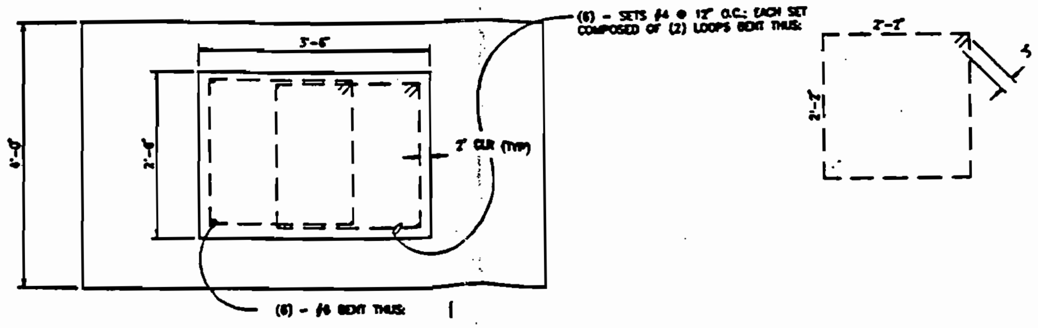
TYPICAL CURB
SCALE 3/4"=1'-0"



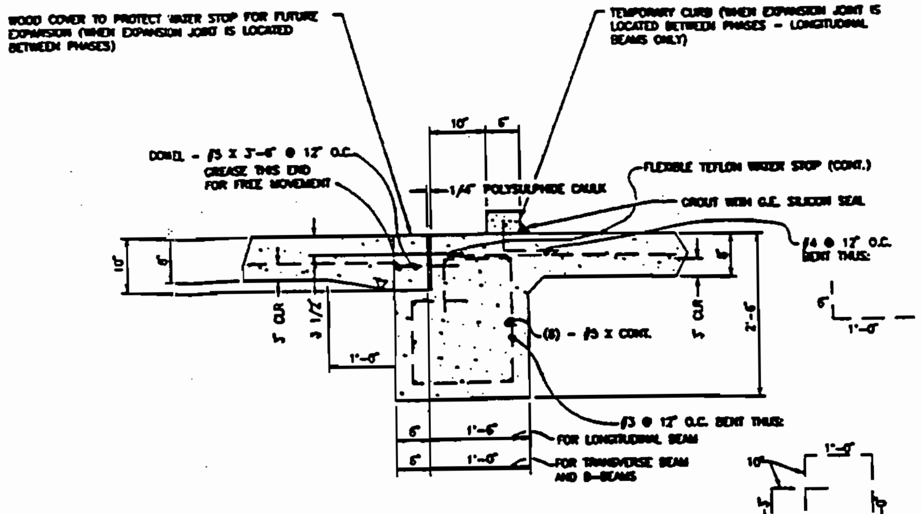
SECTION "H-H"
TYP. R.F. COL. PEDESTAL & FOOTING
SCALE 3/4"=1'-0"



SECTION "I-I" (TYP. @ END WALL COL. PEDESTAL)
SCALE 3/4"=1'-0"



SECTION "K-K"
SCALE 3/4"=1'-0"



SECTION "D-D"
TYP. EXPANSION JOINT
(BEAM "B" WITH EXPANSION JOINT SIMILAR)
SCALE 3/4"=1'-0"

8-22-90

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01/17/90

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SOUTHDOWN, INC.

The BenhamGroup
17120 Dallas Parkway
Suite 240
Dallas, Texas 75248
214-248-0901
TBG # 3380-(1300)

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DESIGN:
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FLORIDA MINING AND MATERIALS
BROOKSVILLE FLORIDA

WORK ORDER NO.
BROOKSVILLE
PLANT

DEPARTMENT
HAZARDOUS WASTE FUELS SYSTEM
CONCRETE-CONTAINER STORAGE BUILDING
SECTIONS AND DETAILS
DRAWING NUMBER
REV

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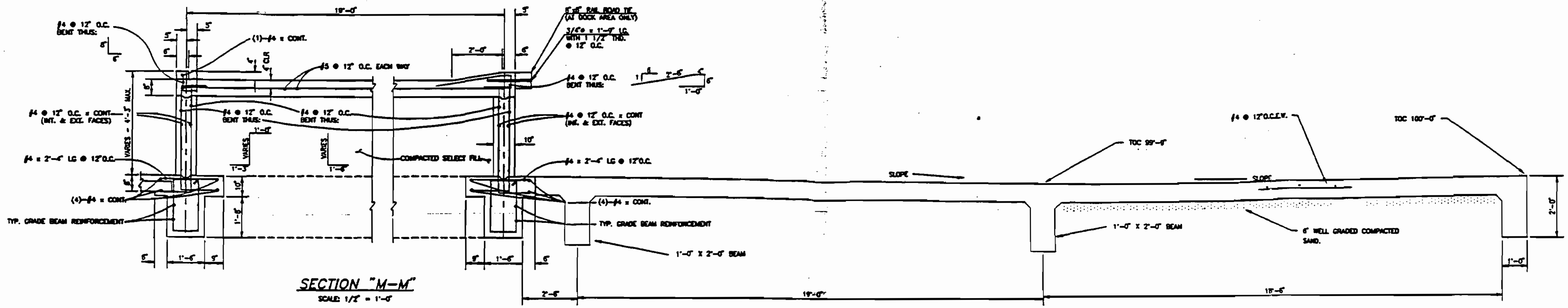
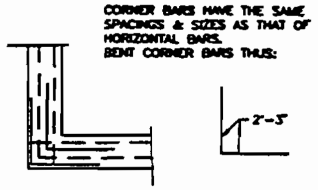
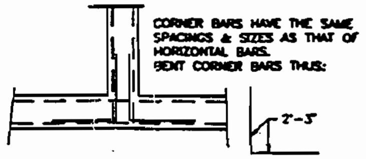
FIGURE II.8B



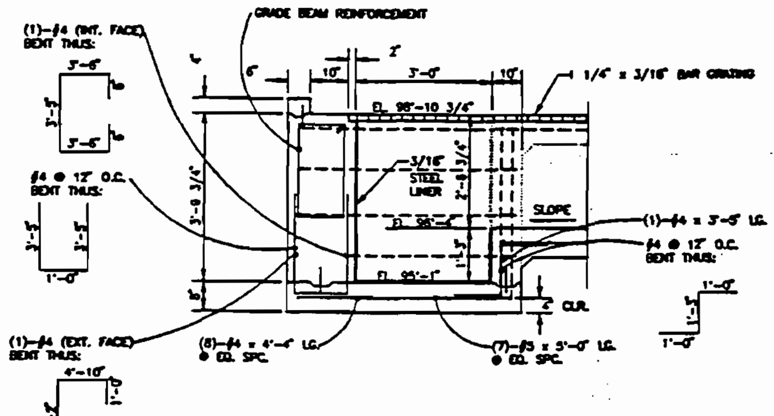
SECTION "M-M"
SCALE: 1/2" = 1'-0"



TYPICAL BAR SPLICE AT CORNER N.T.S.
(FOR BEAMS AND WALL)



TYPICAL BAR SPLICE AT INTERSECTION N.T.S.
(FOR BEAMS)



SECTION "F-F"
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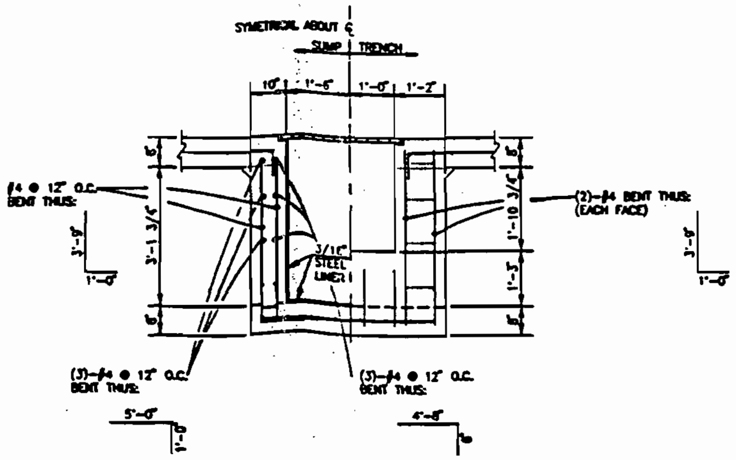

SECTION "G-G"
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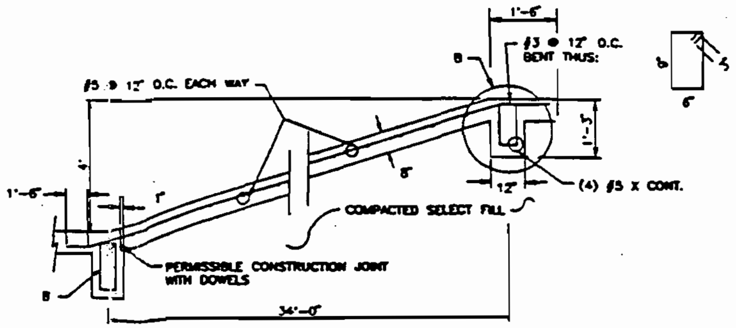

DETAIL "2" AND BEAM "B" DETAIL
N.T.S.

NOTE:
GRADE BEAM AND FOUNDATION DESIGN TO BE CHECKED FOR COMPATIBILITY WITH BUILDING FOUNDATION DESIGN AT TIME OF SELECTION OF PREFABRICATED BUILDING.

8-27-90

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01/17/90

FILE NAME: GA-11

SOUTHDOWN, INC.

The

17120 Dallas Parkway
Suite 240
Dallas, Texas 75248
214-248-0901

TBG # 3329-03900

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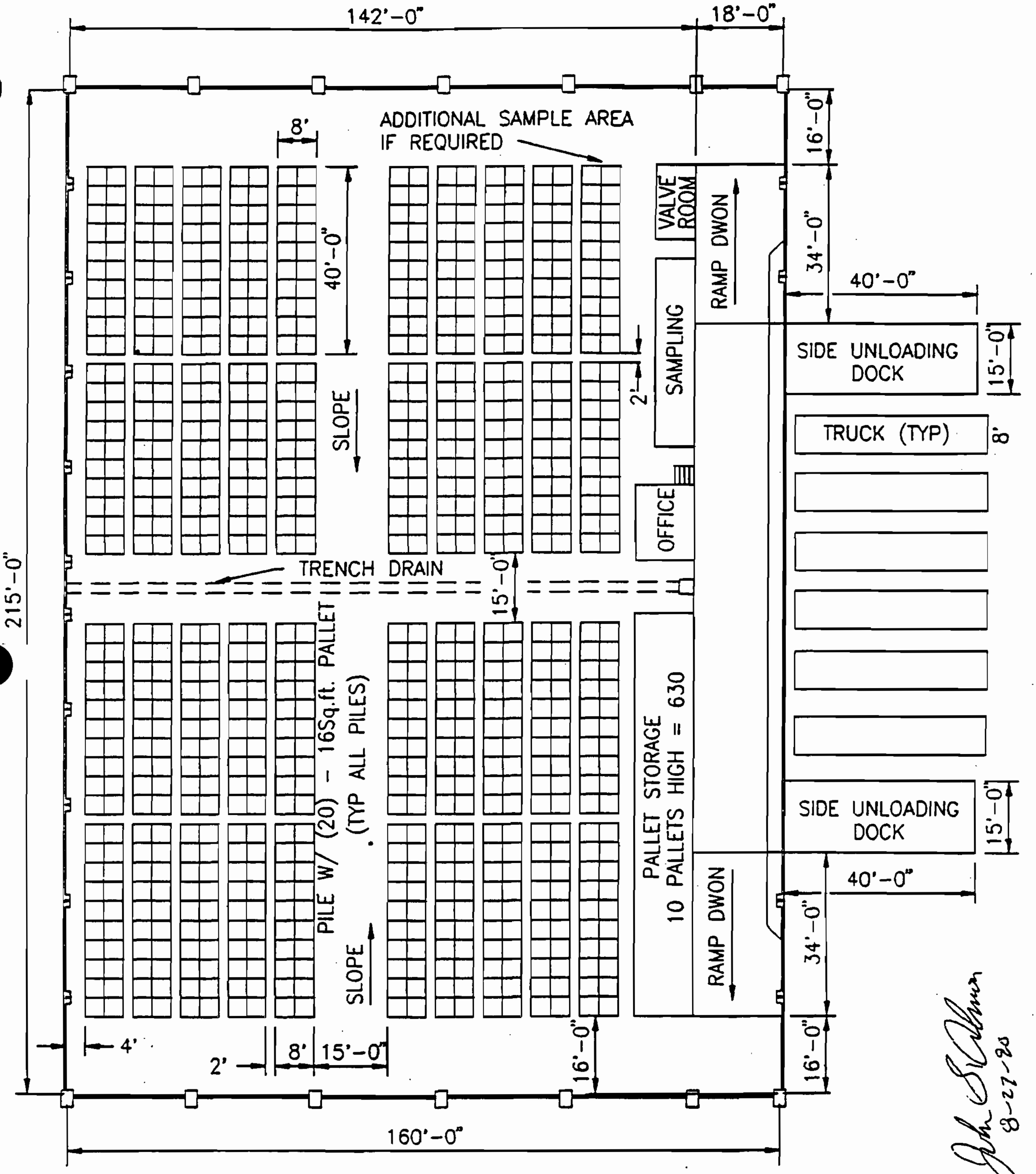
FLORIDA MINING AND MATERIALS

WORK ORDER NO.
BROOKSVILLE

DEPARTMENT
HAZARDOUS WASTE FUELS SYSTEM
CONCRETE-CONTAINER STORAGE BUILDING
SECTIONS AND DETAILS
DRAWING

FIGURE II.8.C



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8/14/90

PRELIMINARY LAYOUT

The BenhamGroup
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Dallas, Texas 75248
214-248-9901
TBG # PROJECT#

FLORIDA MINING AND MATERIALS
BROOKSVILLE FLORIDA

BROOKSVILLE
PLANT

HAZARDOUS WASTE FUEL SYSTEMS
CONTAINER STORAGE ARRANGEMENT

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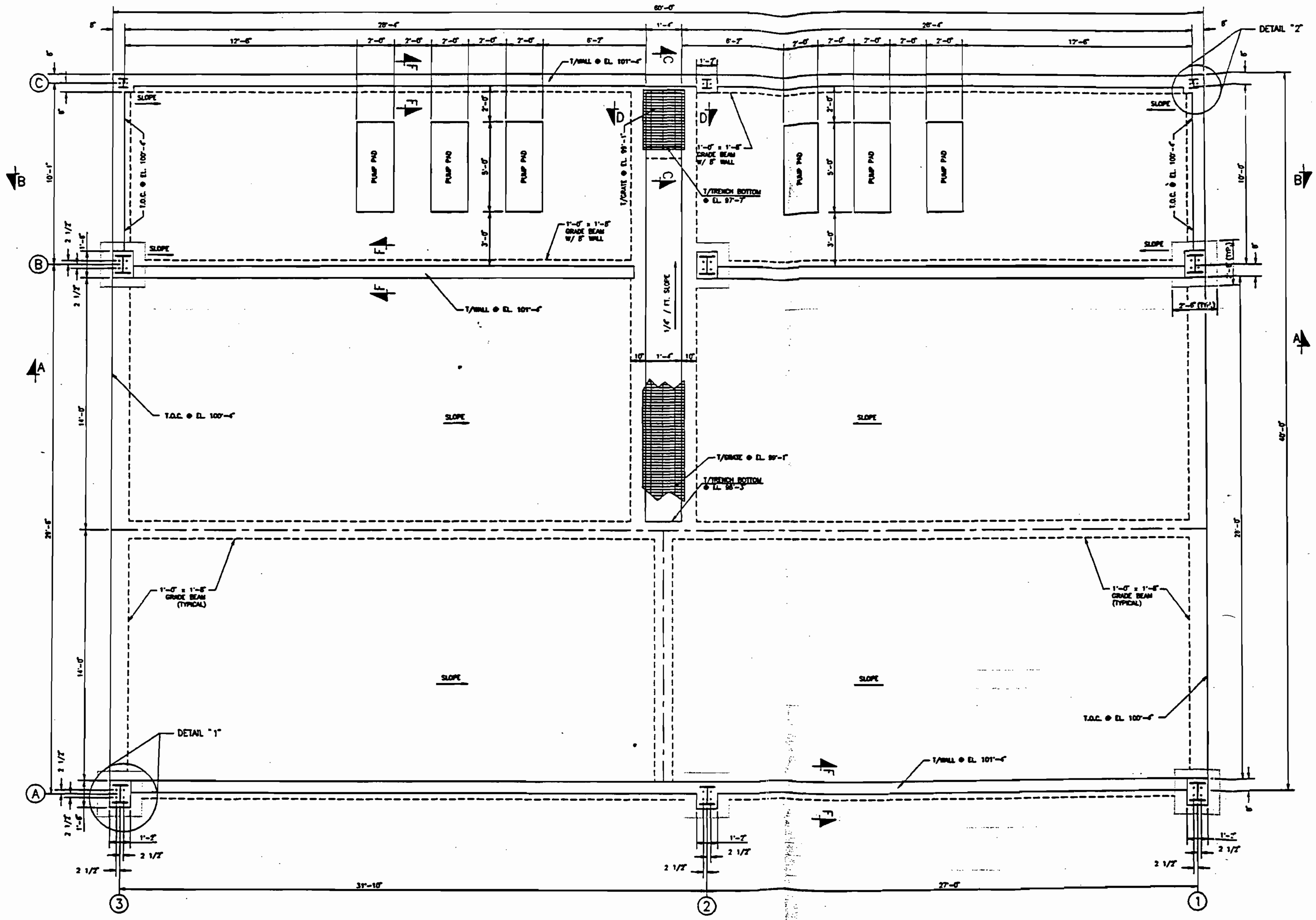
FIGURE II.9



TRUCK UNLOADING CONCRETE PLAN

GENERAL NOTES

1) ALL CONCRETE WORK SHALL CONFORM WITH CURRENT A.C.I. STANDARD 318.

2) CONCRETE STRENGTH SHALL DEVELOPE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 3,000 p.s.i. IN 28 DAYS.

3) REINFORCING STEEL SHALL BE NEW AMERICAN BILLET A.S.T.M. A615, GRADE 60.

4) CHAMFER ALL EXPOSED CONCRETE EDGES 3/4".

5) FILLS, IF ANY, SHALL BE CONSTRUCTED IN HORIZONTAL LIFTS NOT EXCEEDING 6" IN UNCOMPACTED THICKNESS. EACH LAYER SHALL BE THOROUGHLY COMPACTED TO 95% OF THE MAXIMUM DENSITY AT OPTIMUM MOISTURE CONTENT AS DETERMINED BY A.S.T.M. D698.

6) ANY DISTURBED SUBGRADE MUST BE COMPACTED AS PER NOTE #5.

7) ALL CONCRETE TO BE COATED WITH CHEM-MASTER CORP. " DURA KOTE 3 " OR EQUIVALENT.

8-27-90

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08/10/90

FILE NAME: CA-3

NO. DATE REVISION BY CHK'D APP'D W.O.NO.

SOUTHDOWN, INC.

The BenhamGroup
17120 Dallas Parkway
Suite 240
Dallas, Texas 75248
214-248-9901
TBG # 3389-03900

SCALE: 3/8" = 1'-0"
DESIGN:
DRAWN: KAB
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CHECKED:
MICROFILMED DATE:

APPROVED DATE
ISSUED BY DATE

FLORIDA MINING AND MATERIALS
BROOKSVILLE FLORIDA

WORK ORDER NO.
BROOKSVILLE
PLANT

DEPARTMENT
HAZARDOUS WASTE FUELS SYSTEM
CONCRETE-TRUCK UNLOADING
PLAN AND SECTIONS
DRAWING NUMBER
REV

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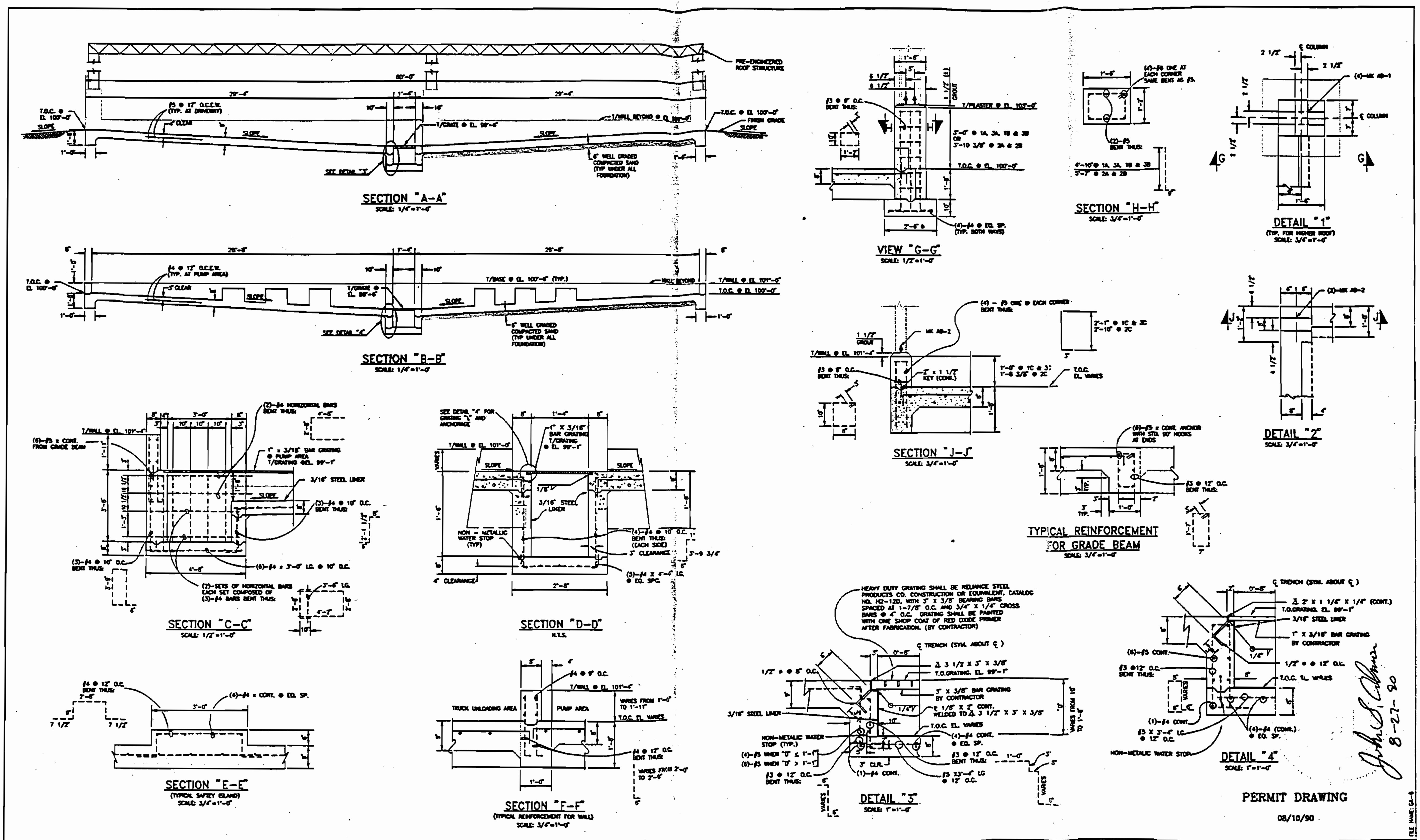
FIGURE II.9A



8-27-90

PERMIT DRAWING

08/10/90

SOUTHDOWN, INC.

17120 Dallas Parkway
Suite 240
Dallas, Texas 75248
214-248-9901

SCALE: AS SHOWN
DESIGN:
DRAWN: KAB
DATE: 01-08-90
APPROVED DATE

FLORIDA MINING AND MATERIALS

WORK ORDER NO.
BROOKSVILLE

DEPARTMENT
HAZARDOUS WASTE FUELS SYSTEM
CONCRETE-TRUCK UNLOADING
SECTIONS AND DETAILS

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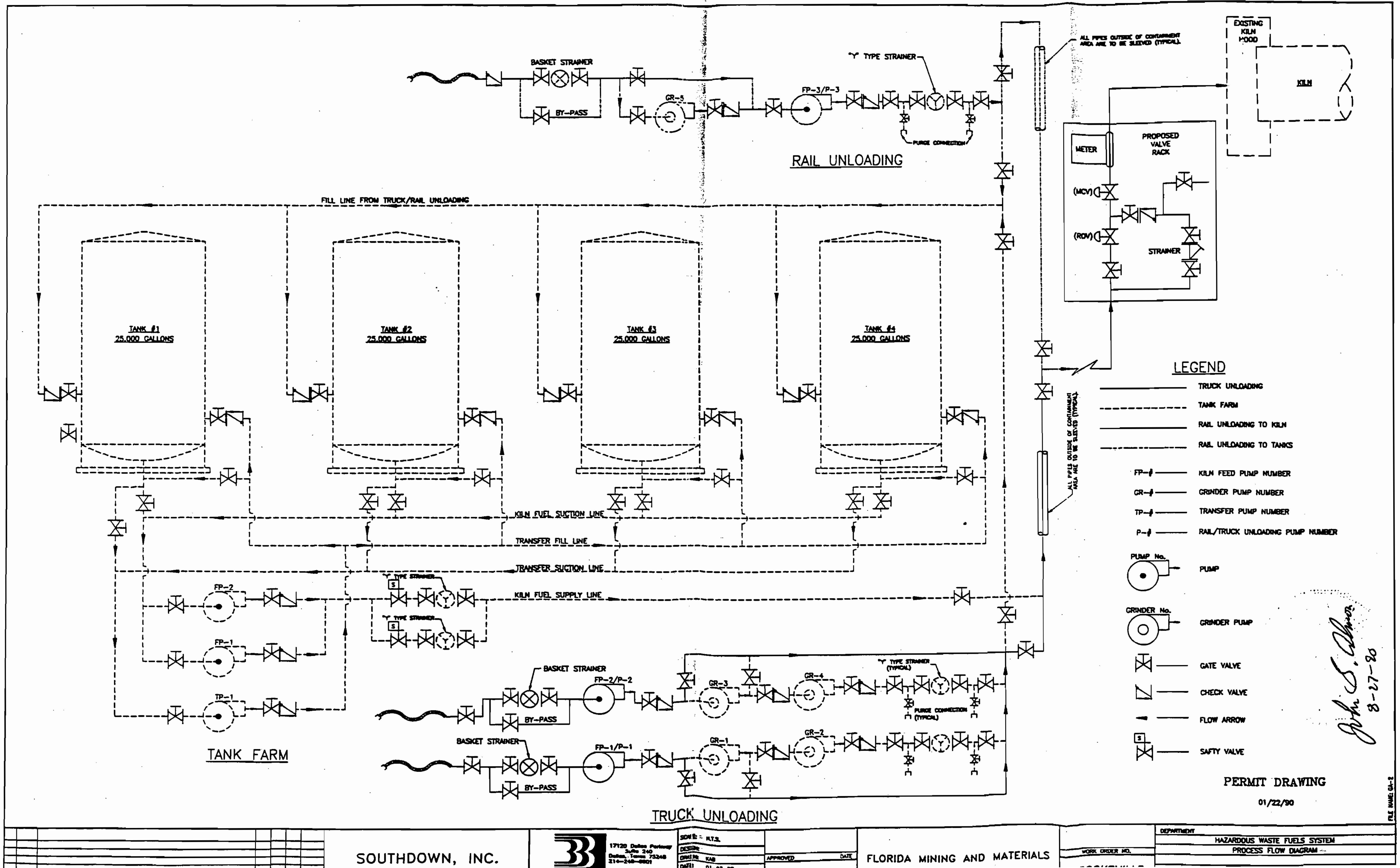
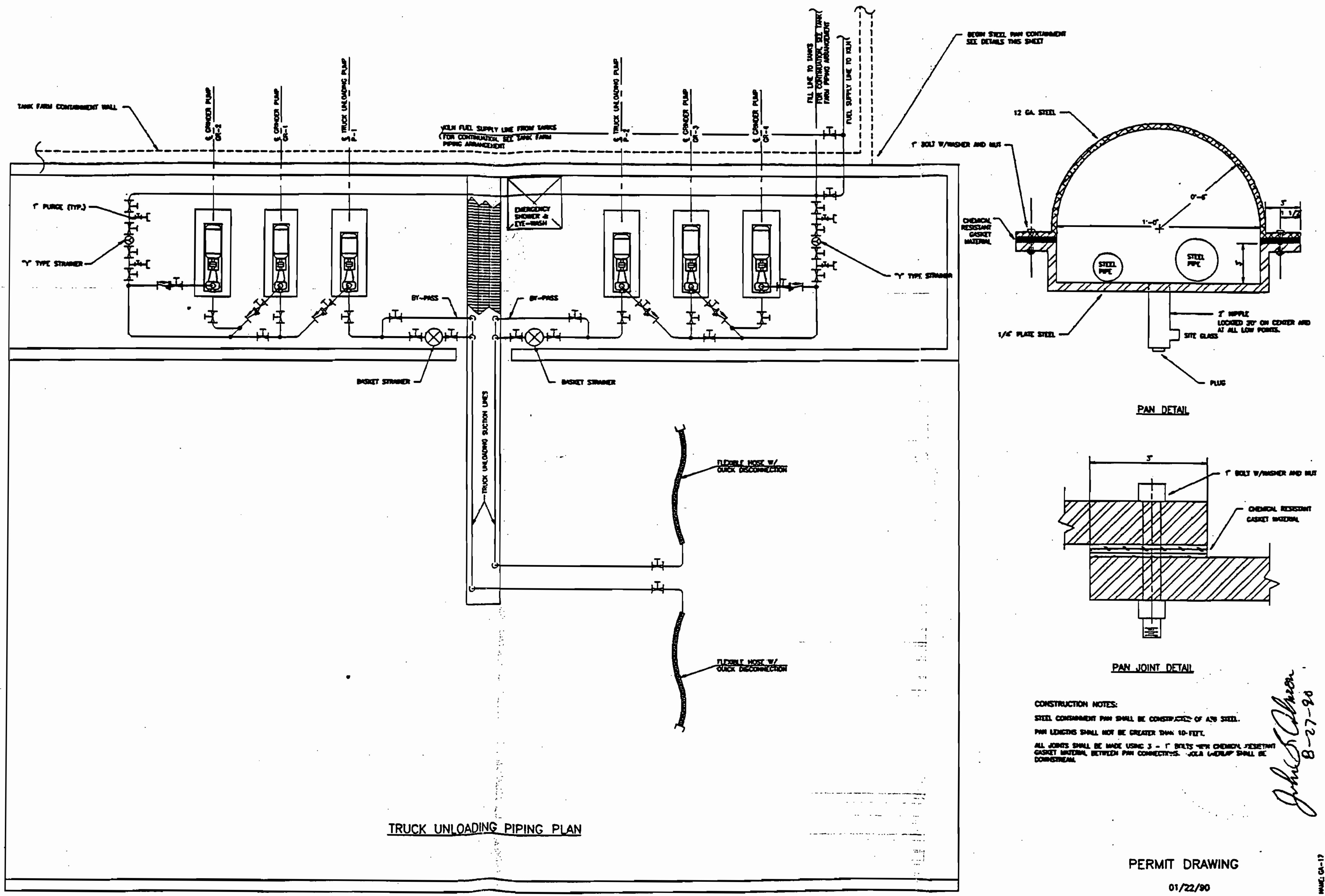
FIGURE II.10



John S. Alnor
8-27-90

FIGURE II.10A



CONSTRUCTION NOTES:

STEEL CONTAINMENT PAN SHALL BE CONSTRUCTED OF A36 STEEL.

PAN LENGTHS SHALL NOT BE GREATER THAN 10-FEET.

ALL JOINTS SHALL BE MADE USING 3 - 1" BOLTS WITH CHEMICAL RESISTANT GASKET MATERIAL BETWEEN PAN CONNECTIONS. [illegible] OVERLAP SHALL BE DOWNSTREAM.

John S. Allerson
8-27-90

PERMIT DRAWING

01/22/90

FILE NAME: GA-17

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SOUTHDOWN, INC.

The BenhamGroup
17120 Dallas Parkway
Suite 240
Dallas, Texas 75248
214-248-0901
TBC # 3389-03800

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FLORIDA MINING AND MATERIALS
BROOKSVILLE FLORIDA

WORK ORDER NO.
BROOKSVILLE
PLANT

DEPARTMENT
HAZARDOUS WASTE FUELS SYSTEM
MECHANICAL-TRUCK UNLOADING
PIPING ARRANGEMENT
DRAWING NUMBER
REV

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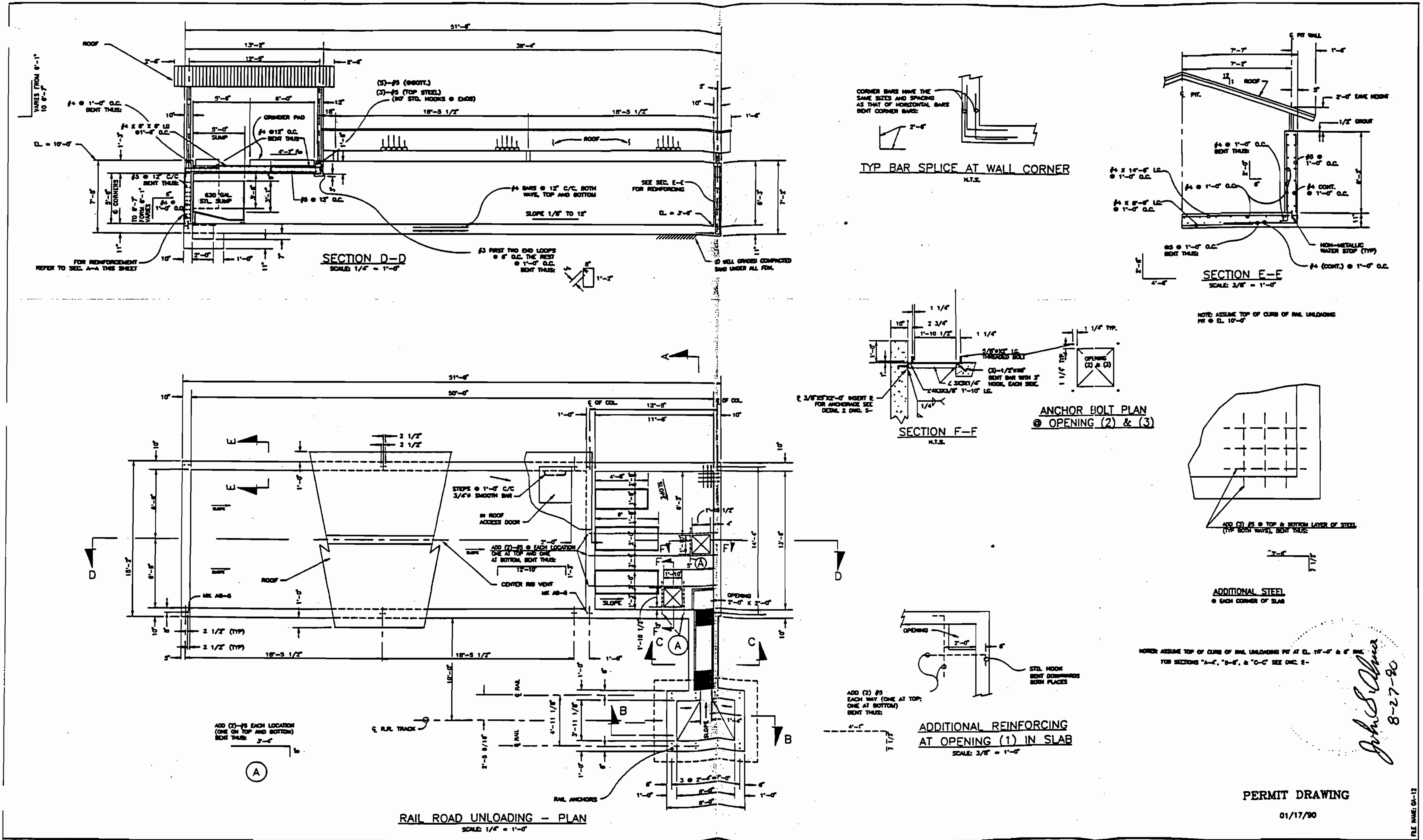
FIGURE II.11



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FLORIDA MINING AND MATERIALS

FLORIDA

WORK ORDER NO.

BROOKSVILLE
PLANT

DEPARTMENT

HAZARDOUS WASTE FUELS SYSTEM
CONCRETE-RAIL UNLOADING FACILITY
PLAN, SECTIONS AND DETAILS

DRAWING NUMBER

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FILE NAME: GA-12

NO. DATE REVISION

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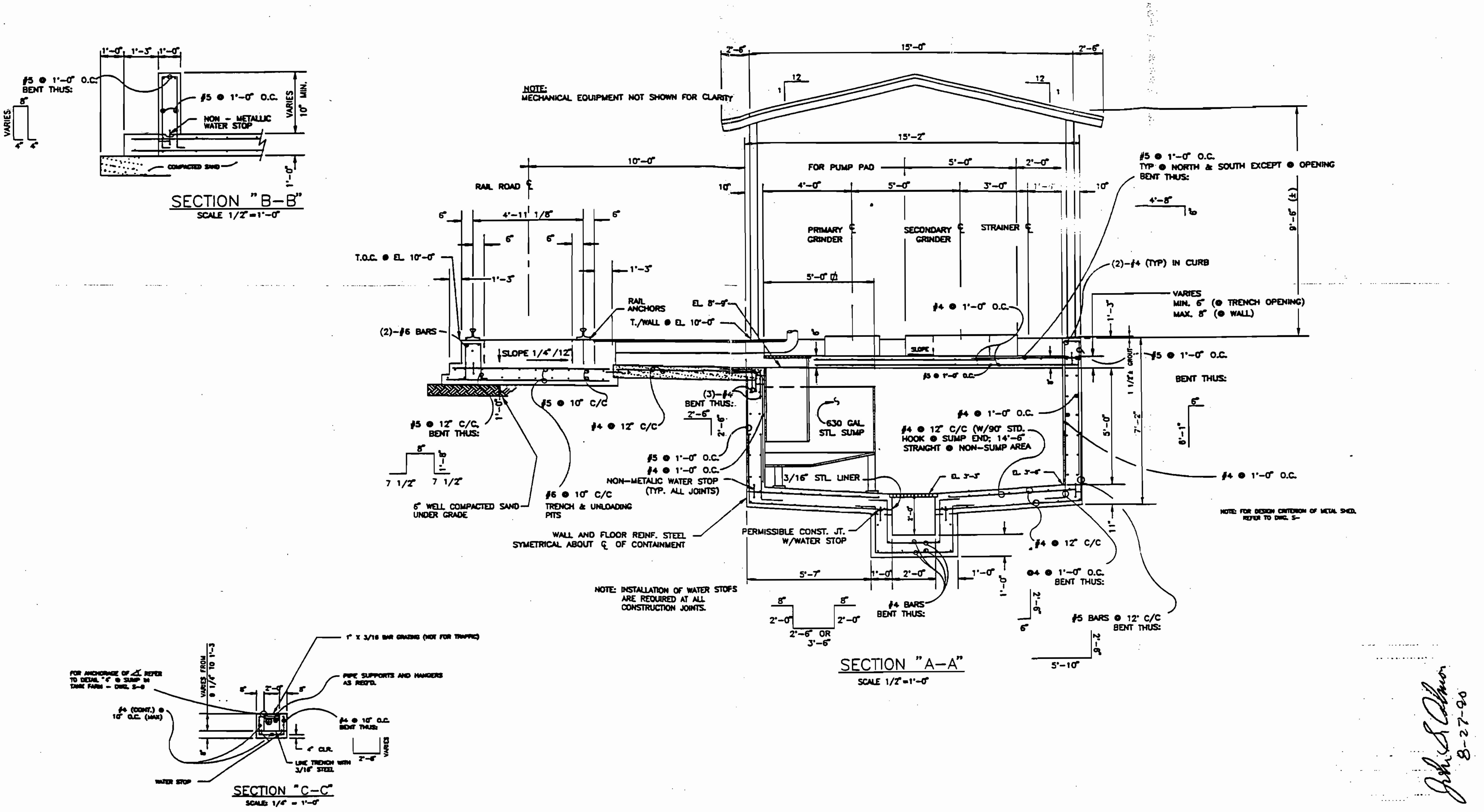
FIGURE II.11A



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FILE NAME: 0A-13

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FLORIDA MINING AND MATERIALS	WORK ORDER NO.	DEPARTMENT	HAZARDOUS WASTE FUELS SYSTEM RAIL UNLOADING FACILITY SECTIONS AND DETAILS

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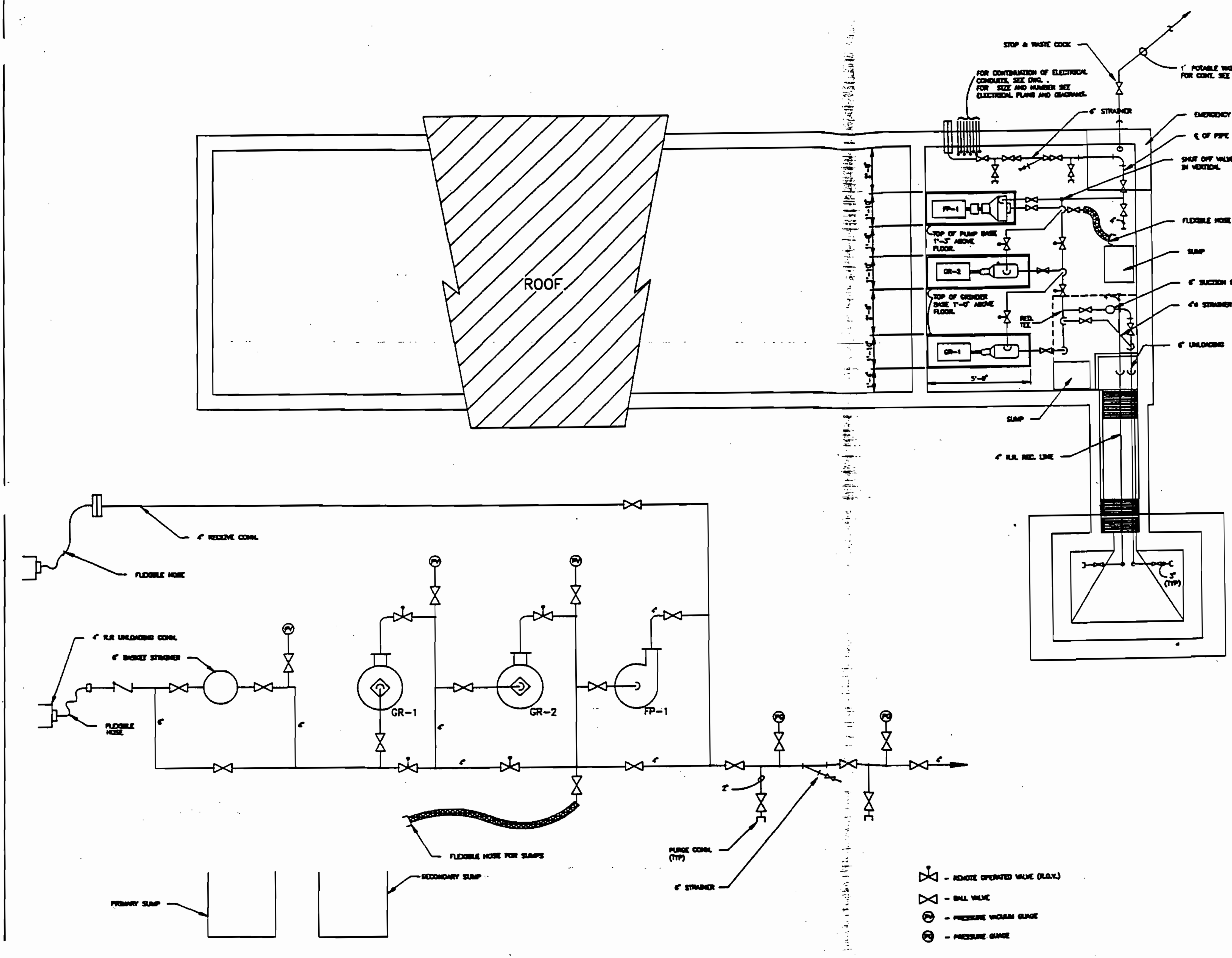
FIGURE II.12



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FLORIDA MINING AND MATERIALS

WORK ORDER NO.
BROOKSVILLE

DEPARTMENT
HAZARDOUS WASTE FUELS SYSTEM
RAIL UNLOADING FACILITY
PIPING PLAN, DETAILS AND SCHEMATIC
DRAWING NUMBER

The BenhamGroup

17120 Dallas Parkway
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214-248-9901

TBG # 3389-03900

FLORIDA MINING
AND MATERIALS

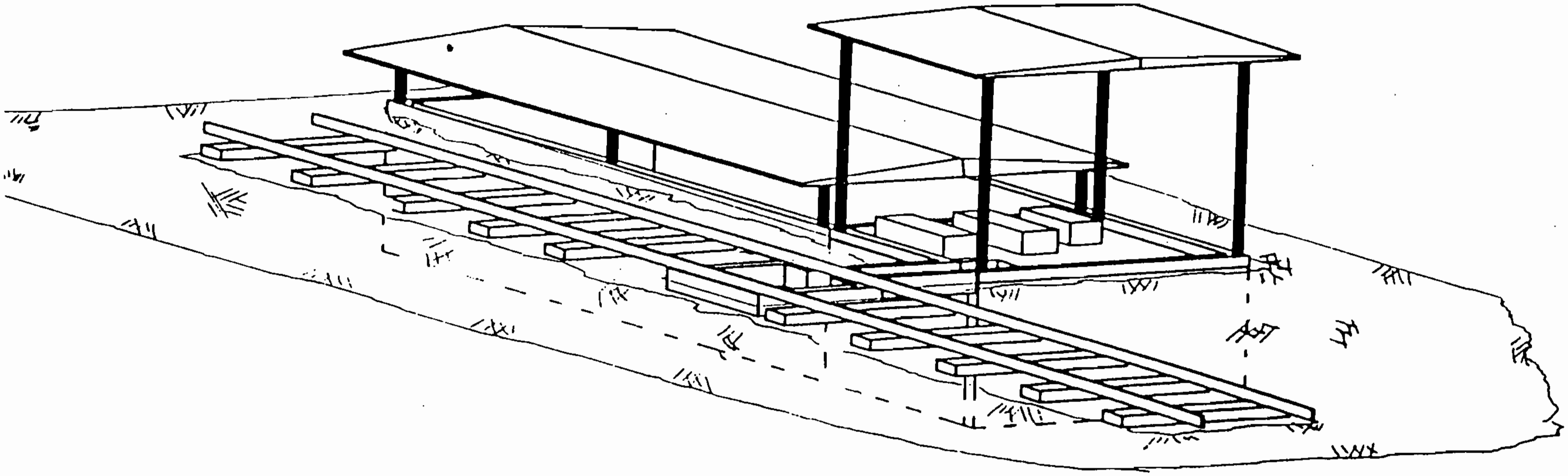
BROOKSVILLE
FLORIDA

BROOKSVILLE
PLANT

HAZARDOUS WASTE FUEL SYSTEMS
ISOMETRIC
BROOKSVILLE, FLORIDA

DRAWING
NUMBER

FIGURE II.13



RAIL UNLOADING FACILITY

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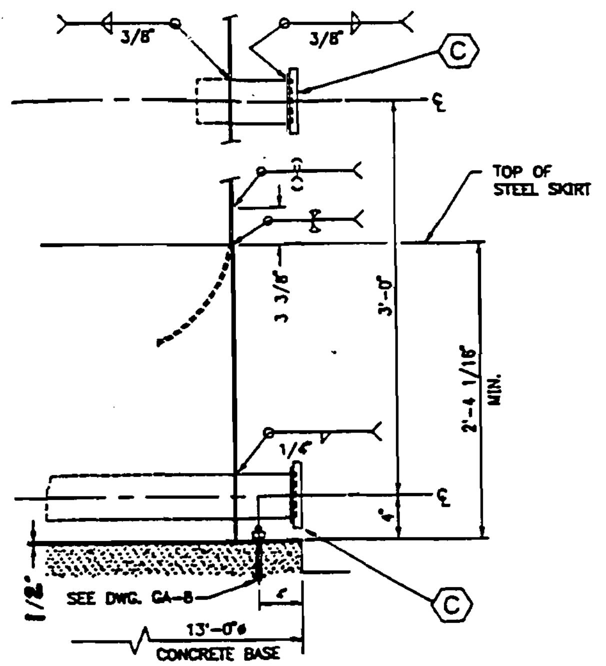
FIGURE II.14

GENERAL NOTES:

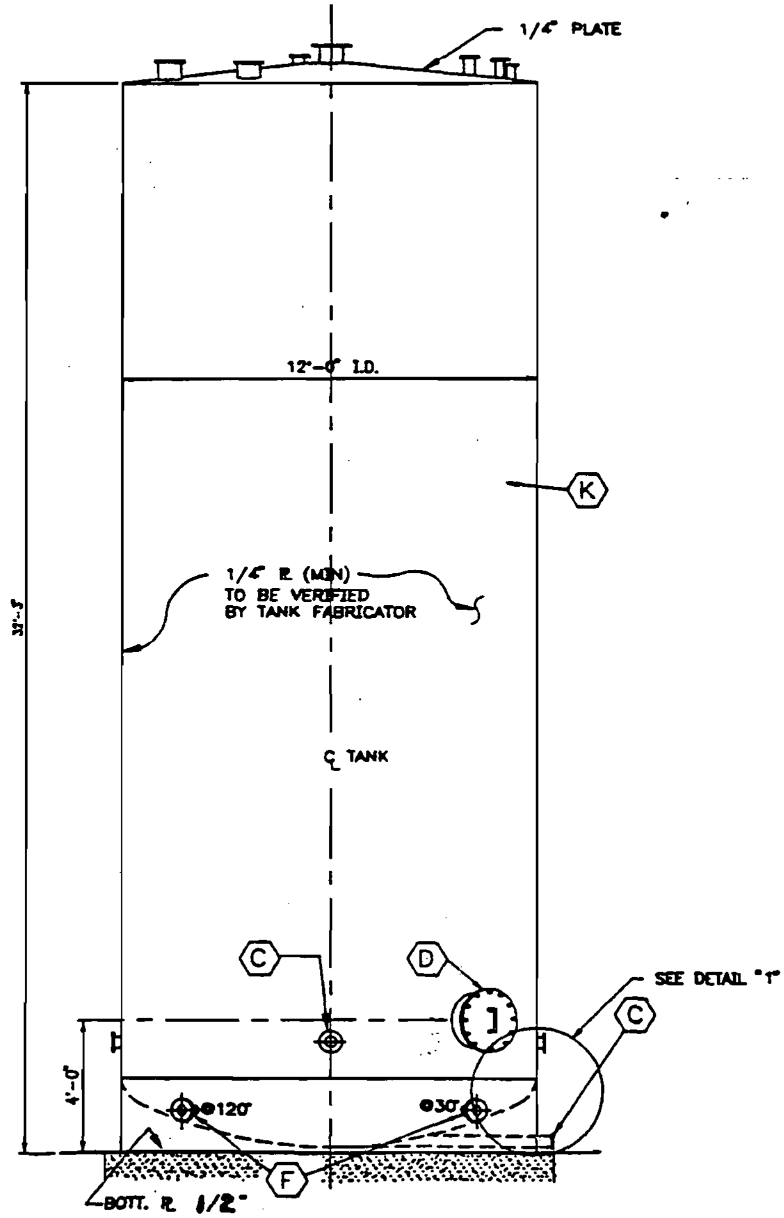
1. TANK NOZZLES SHALL CONFORM WITH API STANDARD 650, INCLUDING APPENDIX F. ALL WELDS TO BE WATERPROOF.
2. NOZZLE LOCATIONS AND ELEVATIONS ARE TYPICAL FOR TANKS T-1 THRU T-4.
3. TANK NOZZLES BY FABRICATOR IN ACCORDANCE WITH API 650 STANDARDS.
4. TANK ROOFS ARE TO BE SLOPED 3/4" PER 12".
5. TANK FABRICATOR TO PROVIDE STRUCTURAL DESIGN FOR TANK. DESIGN TO BE SUBMITTED TO ENGINEER FOR APPROVAL PRIOR TO CONSTRUCTION. MINIMUM DESIGN PARAMETERS: MAXIMUM WORKING PRESSURE = 2.5 PSI. CONFORM TO NFPA 30.
6. INSIDE OF TANK SHALL BE SMOOTH AND FLUSH – NO PROTRUSIONS WILL BE ALLOWED.
7. GASKETS TO BE SPIRAL WOUND FLEXITALLIC STYLE CG OR EQUAL RATING AS REQUIRED.
8. ALL FLANGE BOLT HOLES SHALL STRADDLE THE CENTERLINES.

BILL OF MATERIAL–PER TANK

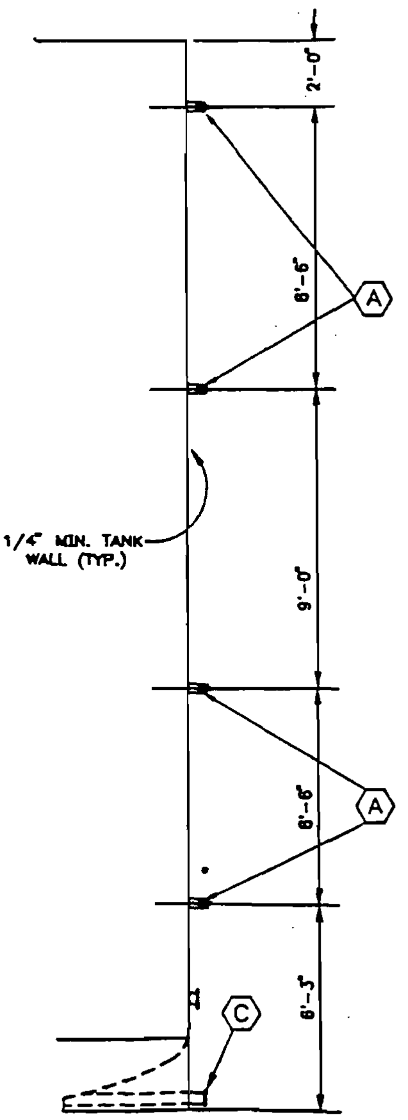
MARK	REQ'D.	DESCRIPTION	REMARKS	FURN. BY
A	4	1"ø 3000# FULL THREADED COUPLING WITH PLUG		TANK FABRICATOR
B	1	10"ø, 150# FLANGE	FOR EMERGENCY PRESSURE VENT	
C	6	4"ø, 150# FLANGE, FUEL INLET/OUTLET		
D	2	20"ø MANWAY WITH COVER PLATE		
E	1	AGITATOR MOUNT	PER AGITATOR SUPPLIER'S INSTRUCTIONS	
F	2	OBSERVATION PORTS		
G	5	4"ø – 150# FLANGE G1 – FOR N2 INLET G2 – FOR PRESSURE SENSING G3 – FOR VAPOR OUTLET G4 – FOR VACUUM RELIEF VALVE G5 – SPARE		
H	1	12-1/2"ø CUTOUT WITH TANK TOP DRILLED FOR 12"ø 150# FLANGE	FOR MICROWAVE LEVEL SENSOR	
I	2	3/4" NPT HALF – COUPLING	FOR HIGH LEVEL SENSORS	
K	1	25,000 GALLON TANK	TANK FABRICATOR TO PROVIDE CERTIFIED DESIGN FOR TANK	



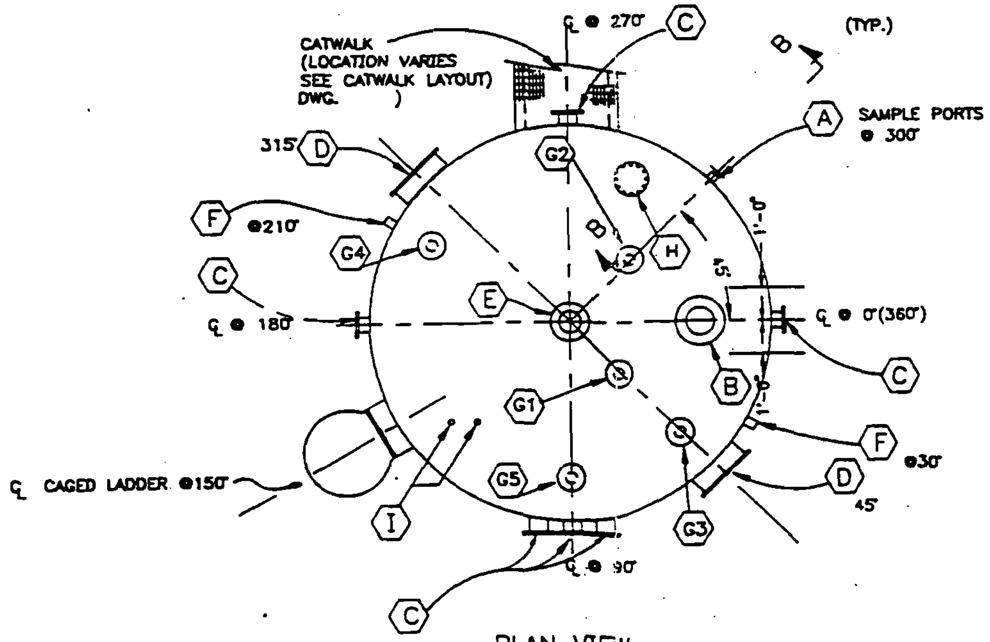
DETAIL "1"
SCALE 1-1/2"=1'



TANK ELEVATION
SCALE 3/8"=1'-0"



SECTION B–B
SCALE 3/8"=1'-0"



PLAN VIEW
SCALE 3/8"=1'-0"

John S. Almon
8-27-90

PERMIT DRAWING

01/17/90

FILE NAME: GA-3

SOUTHDOWN, INC.

The BenhamGroup
17120 Dallas Parkway
Suite 240
Dallas, Texas 75248
214-248-6801
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FLORIDA MINING AND MATERIALS

BROOKSVILLE FLORIDA

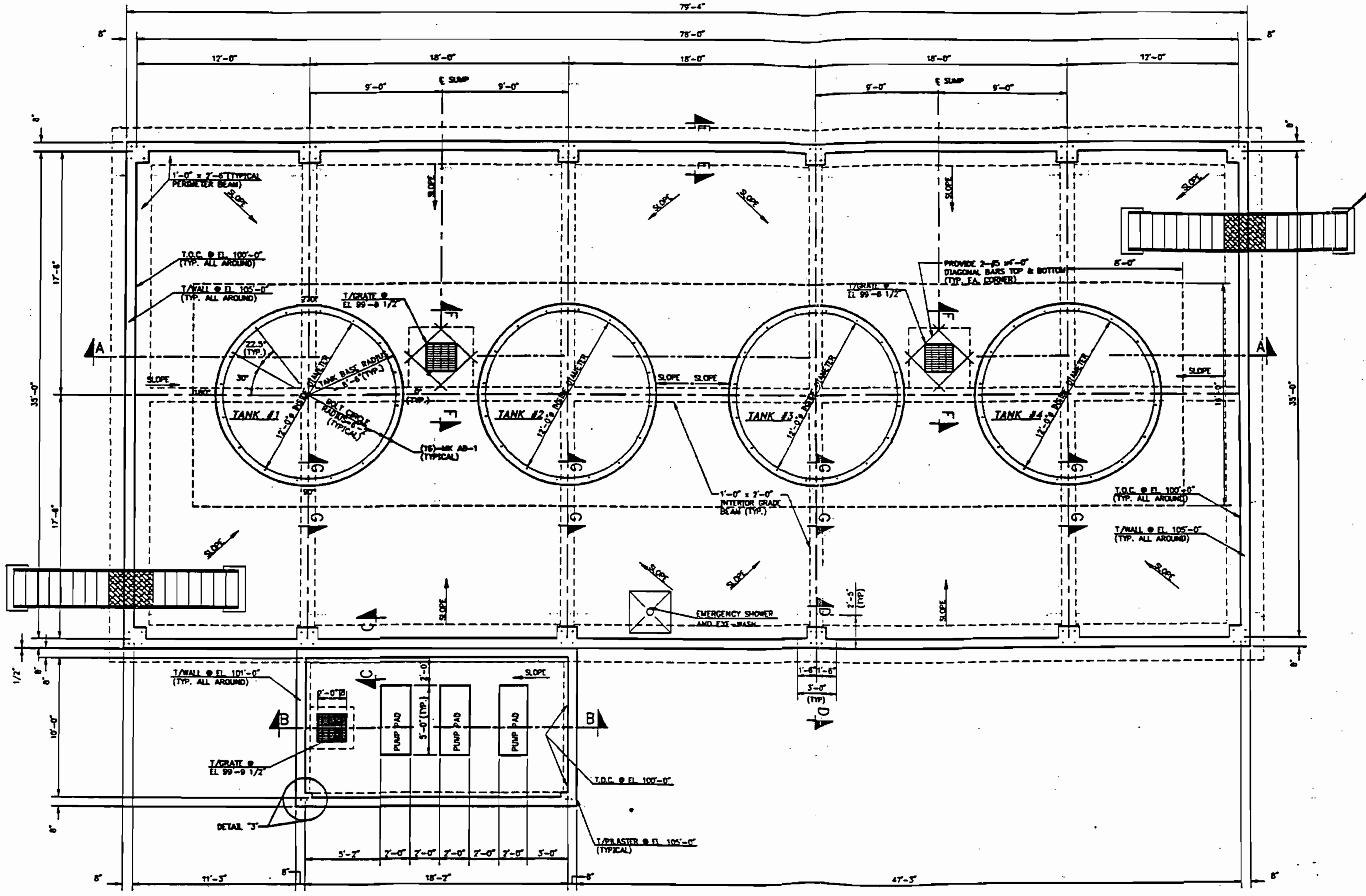
WORK ORDER NO.

BROOKSVILLE
PLANT

DEPARTMENT
HAZARDOUS WASTE FUELS SYSTEM
25,000 GALLON TANK DETAILS
PLAN, ELEVATIONS AND DETAILS

DRAWING NUMBER

REV



CONTRACTOR TO FURNISH STEEL STILE AND CONCRETE PADS FOR ACCESS ACROSS WALL. STILE SHALL BE 2'-6" WIDE WITH 8" RISERS AND 10" TREADS. HANDRAILS SHALL CONSIST OF 2 RAILS, 1 1/2"ø STD. PIPE WITH VERTICAL POST SPACED A MAXIMUM OF 6'-0" CENTER TO CENTER. STILE STRINGER SHALL BE C8 x 11.5. CONTRACTOR TO VERIFY LOCATION WITH PLANT ENGINEER PRIOR TO CONSTRUCTION. (TYPICAL 2 (TWO) PLACES

GENERAL NOTES

1) ALL CONCRETE WORK SHALL CONFORM WITH CURRENT A.C.I. STANDARD 318.
2) CONCRETE STRENGTH SHALL DEVELOPE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 3,000 p.s.i. IN 28 DAYS.
3) REINFORCING STEEL SHALL BE NEW AMERICAN BILLET A.S.T.M. A615, GRADE 60.
4) CHAMFER ALL EXPOSED CONCRETE EDGES 3/4".
5) FILLS, IF ANY, SHALL BE CONSTRUCTED IN HORIZONTAL LIFTS NOT EXCEEDING 6" IN UNCOMPACTED THICKNESS. EACH LAYER SHALL BE THOROUGHLY COMPACTED TO 95% OF THE MAXIMUM DENSITY AT OPTIMUM MOISTURE CONTENT AS DETERMINED BY A.S.T.M. D698.
6) ANY DISTURBED SUBGRADE MUST BE COMPACTED AS PER NOTE #5.
7) ALL CONCRETE TO BE COATED WITH CHEM-MASTER CORP. " DURA KOTE 3 " OR EQUIVALENT.
8) STRUCTURE DESIGNED FOR AIR BLAST OVERPRESSURE OF .5PSI

LEGEND

T.O.C. —— TOP OF CONCRETE
T/WALL —— TOP OF WALL
T/GRATE —— TOP OF GRATE

8-27-90

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08/22/90

FILE NAME: CA-4

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SOUTHDOWN, INC.

The BenhamGroup
17120 Dallas Parkway
Suite 240
Dallas, Texas 75248
214-248-6901
TBG # 3389-03900

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FLORIDA MINING AND MATERIALS
BROOKSVILLE FLORIDA

WORK ORDER NO
BROOKSVILLE
PLANT

DEPARTMENT
HAZARDOUS WASTE FUELS SYSTEM
CONCRETE TANK FARM
PLAN AND SECTIONS
DRAWING NUMBER
REV

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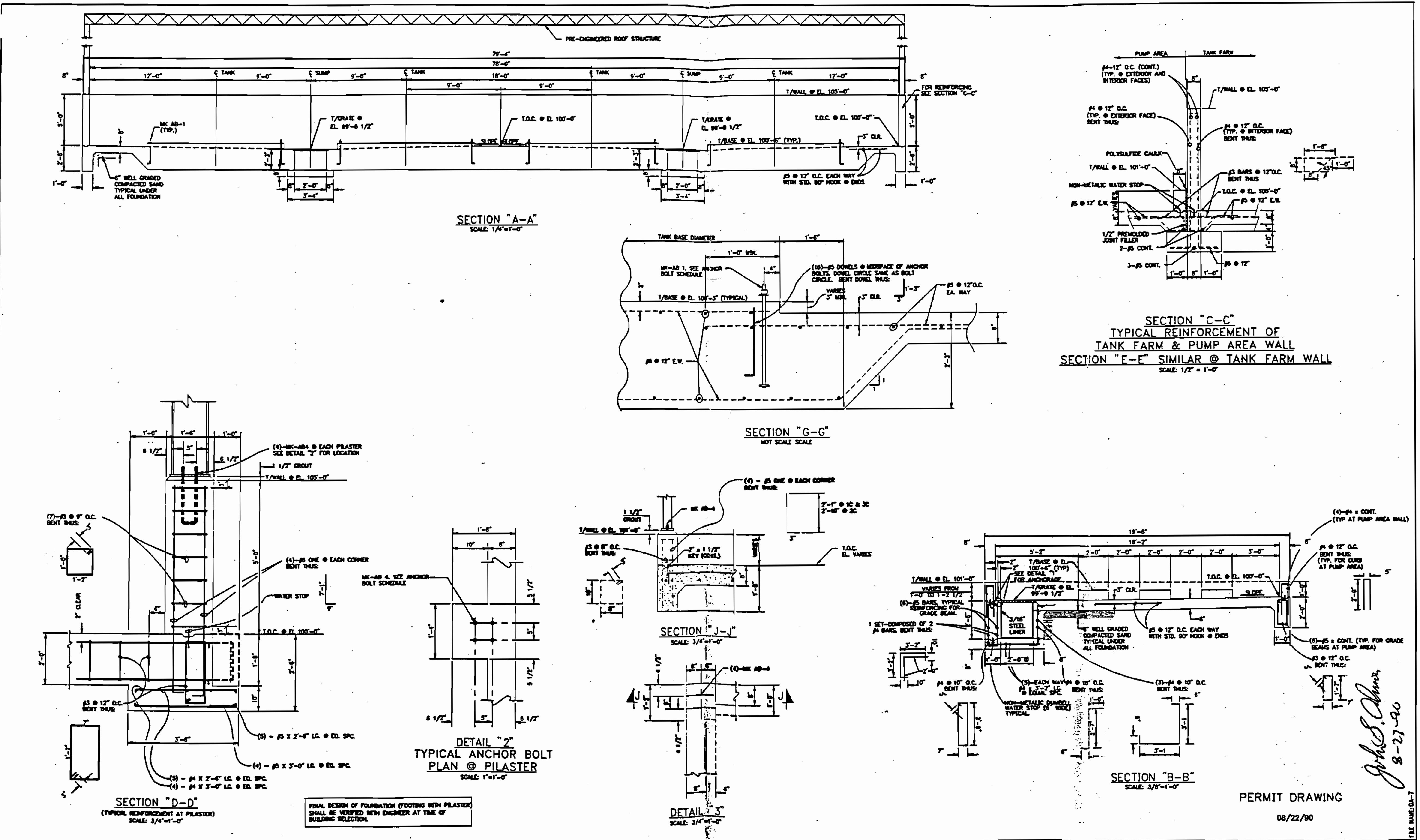
FIGURE II.15A



SECTION "A-A"
SCALE: 1/4"=1'-0"

SECTION "C-C"
TYPICAL REINFORCEMENT OF
TANK FARM & PUMP AREA WALL
SECTION "E-E" SIMILAR @ TANK FARM WALL
SCALE: 1/2" = 1'-0"

SECTION "G-G"
NOT SCALE SCALE

SECTION "D-D"
(TYPICAL REINFORCEMENT AT PILASTER)
SCALE: 3/4"=1'-0"

DETAIL "2"
TYPICAL ANCHOR BOLT
PLAN @ PILASTER
SCALE: 1"=1'-0"

SECTION "J-J"
SCALE: 3/4"=1'-0"

DETAIL "3"
SCALE: 3/4"=1'-0"

SECTION "B-B"
SCALE: 3/8"=1'-0"

FINAL DESIGN OF FOUNDATION (FOOTING WITH PILASTER) SHALL BE VERIFIED WITH ENGINEER AT TIME OF BUILDING SELECTION.

PERMIT DRAWING

08/22/90

John S. [illegible]
8-27-90

SOUTHDOWN, INC.

17120 Dallas Parkway
Suite 240
Dallas, Texas 75248
214-248-8801

SCALE: AS SHOWN
DESIGN:
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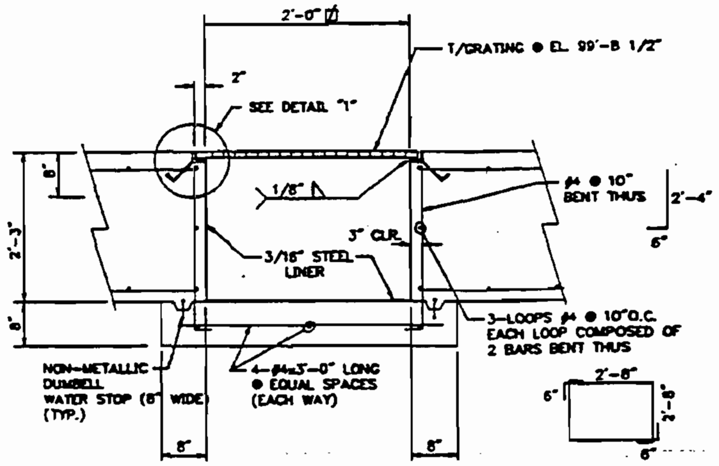
DATE

FLORIDA MINING AND MATERIALS

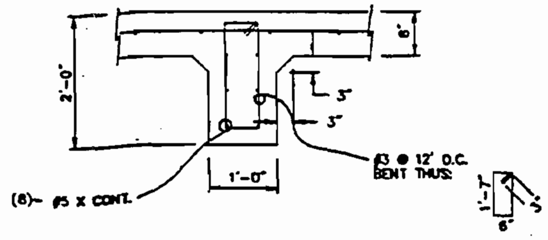
WORK ORDER NO.

DEPARTMENT
HAZARDOUS WASTE FUELS SYSTEM
CONCRETE-TANK FARM
SECTIONS AND DETAILS

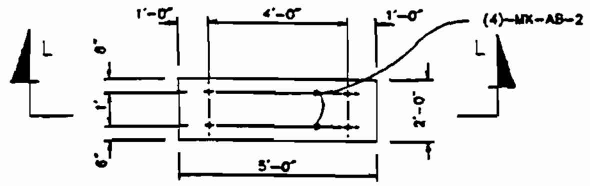
FIGURE II.15B



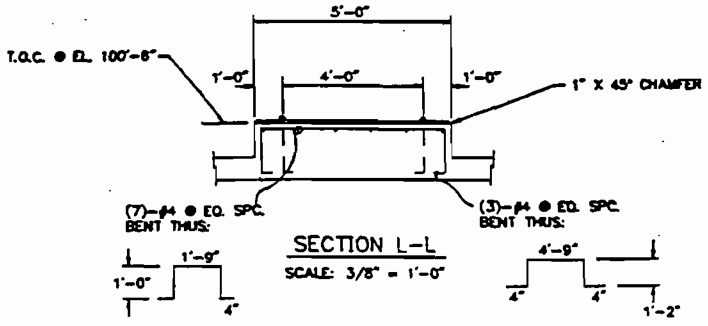
SECTION "F-F"
SIMILAR IN TANK AREA
SCALE 3/4"=1'



TYPICAL INTERIOR BEAM
SCALE: 3/4" = 1'-0"

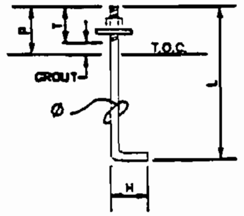


PUMP BASE
PLAN VIEW
SCALE: 3/8" = 1'-0"

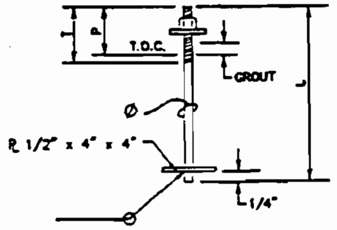


SECTION L-L
SCALE: 3/8" = 1'-0"

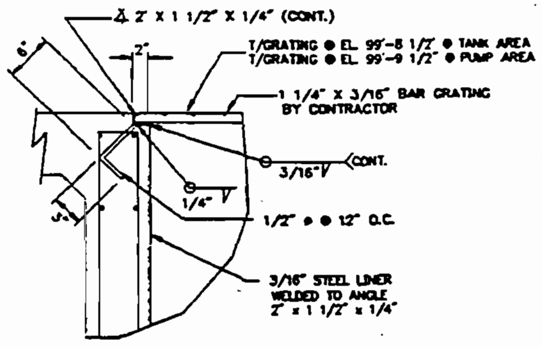
8-27-90



TYPE I
N.T.S.



TYPE II
N.T.S.



DETAIL "1"
SCALE: 1" =1'-0"

ANCHOR BOLT SCHEDULE

MARK	Ø DIA.	REQ'D	TYPE	L LENGTH	P PROJ.	T THREAD	GROUT	H HOOK	REMARKS
AB-1	3/4"	64	II	2'-0"	2"	2"	----	----	FOR TANKS
AB-2	5/8"	20	I	1'-7"	5 3/4"	3"	1"	3"	FOR KILN FEED AND TRANSFER PUMPS
AB-3	5/8"	16	I	1'-7"	5 3/4"	3"	1"	3"	FOR GRINDER PUMPS
AB-4	3/4"	32	I	2'-0"	4"	4"	1 1/2"	3"	FOR TANK FARM ROOF

NOTE:
ALL ANCHOR BOLT INFORMATION IS PRELIMINARY PENDING RECEIPT OF CERTIFIED DRAWINGS FROM MANUFACTURERS.

PERMIT DRAWING

08/22/90

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SOUTHDOWN, INC.

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Dallas, Texas 75248
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FLORIDA MINING AND MATERIALS
BROOKSVILLE FLORIDA

WORK ORDER NO.
BROOKSVILLE
PLANT

DEPARTMENT
HAZARDOUS WASTE FUELS SYSTEM
CONCRETE-TANK FARM
SECTIONS AND DETAILS
DRAWING NUMBER
REV

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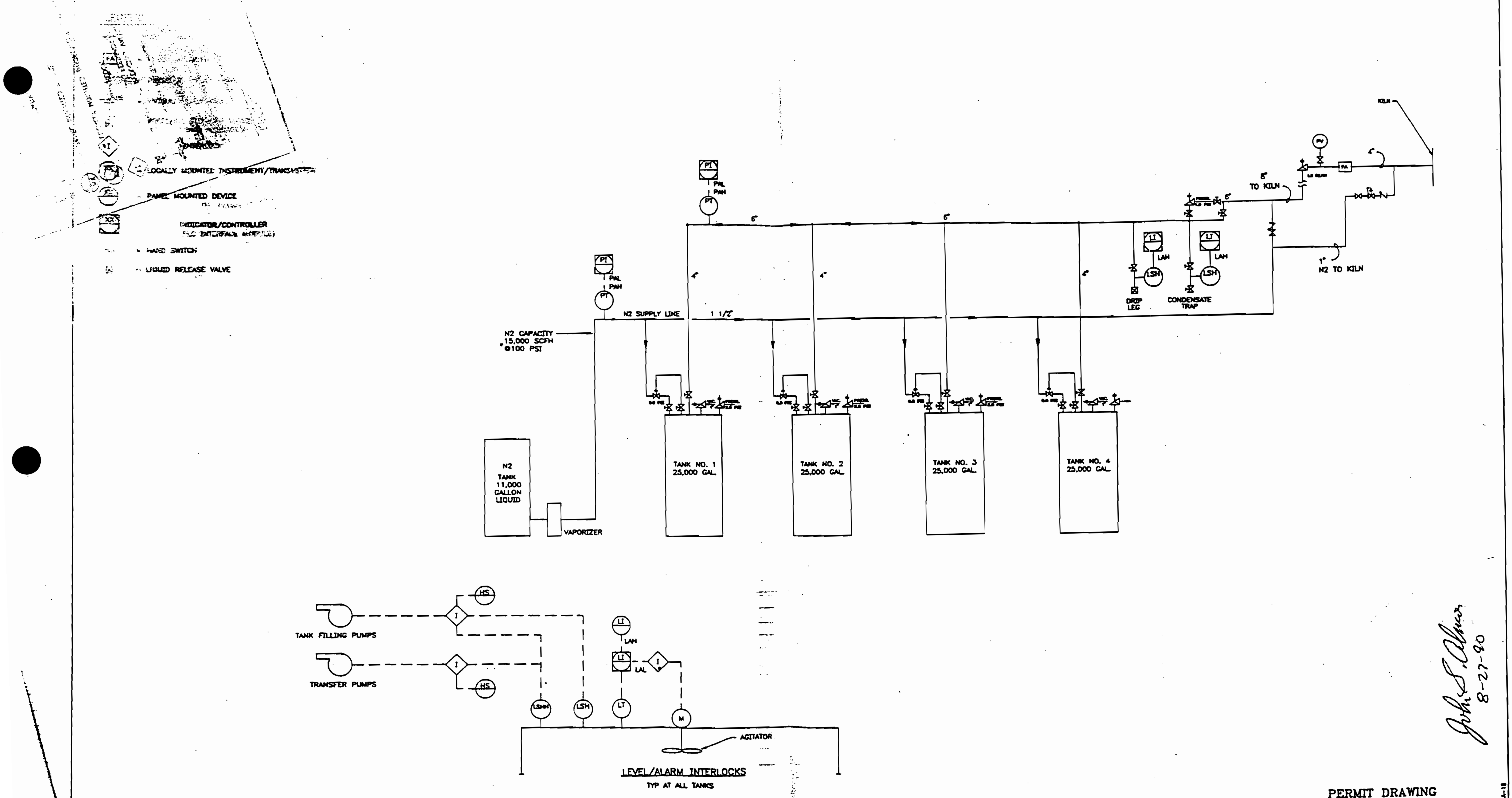
FIGURE II.16



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FILE NAME: CA-18

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FLORIDA MINING AND MATERIALS
BROOKSVILLE FLORIDA

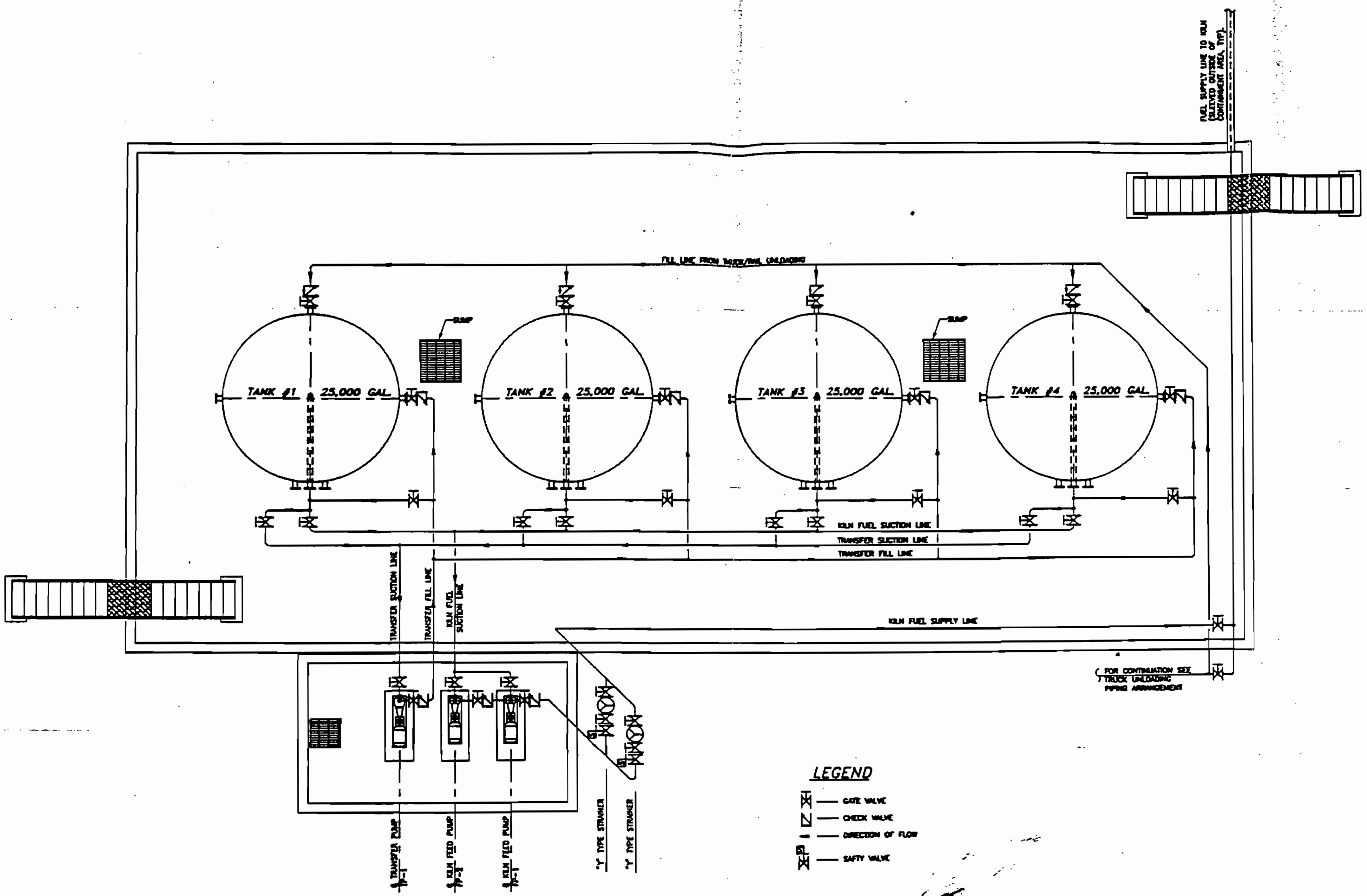
WORK ORDER NO.

BROOKSVILLE
PLANT

DEPARTMENT
HAZARDOUS WASTE FUELS SYSTEM
MECHANICAL PIPING
NITROGEN VENT SYSTEM

DRAWING NUMBER

REV



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FILE NAME: OA-18

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The BenhamGroup
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214-248-6801
TBG # 3389-03800

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FLORIDA MINING AND MATERIALS
BROOKSVILLE FLORIDA

WORK ORDER NO.
BROOKSVILLE
PLANT

DEPARTMENT
HAZARDOUS WASTE FUELS SYSTEM
MECHANICAL–TANK FARM
PIPING ARRANGEMENT
DRAWING NUMBER:
REV

TABLE II.12

CONTAINER STORAGE FACILITY CONTAINMENT CALCULATIONS:

Storage Description: The container storage building will be a pre-engineered building with the floor depressed in order to contain 10% of the total volume of the containers stored within the facility, The ramps are designed to convey and spills into the container building to the floor trench system. The truck unloading pad is designed to contain any spills resulting from the unloading of the trucks. This will be covered with a pre-engineered building in order to keep rain out of the containment area.

Total Building Containment Requirements:

Total Designed Storage Capacity: 172,800 gallons

Required Storage Volume Equals 10% of total volume or

172,800 gal x10% = 17,280 gallons
17,280 gal/7.48 gal/CF. = 2304 CF

Storage Provided:

Total Floor Area: 142'0" x 215'0" = 30,530 SF

Area Occupied by One Pallet: 4 ft. x 4 ft. = 16 SF

Total Number of Pallets: 800

Total Sq. Footage Occupied by Pallets: 800 x 16 SF = 12,800 SF

Total Area for Containment: 30, 530 SF - 12,800 SF = 17,730 SF

Storage Provided: Area x Average Depth

17,730 SF x (1.104'/2) = 9787 CF

9787 CF > 2304 CF OK for Container Building

Truck Unloading Pad at Container Building

Required Storage Volume Equals One Pallet or 196 Gallons.

Storage Provided: Width x Length x Depth

41'0" x 70'0" x .125' = 359 CF
or 359 CF x 7.48 Gal/CF = 2685 Gal

2685 Gal > 196 Gal OK for Truck Unloading Area

TABLE II.13

TRUCK UNLOADING PAD CONTAINMENT

Storage Description: The truck unloading pad will be covered with a pre-engineered roof structure in order to direct rain water away from the concrete containment area. The concrete pad is designed to contian any spills resulting in the unloading of trucks.

Total Containment Required: 10,000 gallons

Required Storage Volume: 10,000 Gal. /7.48 Gal/CF = 1337 CF

Storage Provided:

Total Volume:

Pad	38'8" x 60'0' x (1'3"/2)	= 1425 CF
Collection Area	24'8" x 1'4" x 1'	= 1458 CF

Subtract Areas Not Availbe for Storage:

Curb	8" x 58'8" x (1'3'/2)	= 25 CF
Pump Pad	2' x 5' x 6" x 6	= 30 CF
Truck Wheels	2' x 8" x (1'3"/2) x 36	= 60 CF
	Total	= 115 CF

Total Storage Provided:

1458 CF - 115 CF = 1343 CF

1343 CF > 1337 CF OK

TABLE II.14

RAIL UNLOADING FACILITY CONTAINMENT CALCULATIONS

Storage Required:

Total Number of Railroad Cars: 2

Capacity Per Railroad Car: 25,000 Gal.

Total Capacity: 50,000 Gal.

10% of Total Capacity: 5,000 Gal.

Required containment is the larger capacity of one railroad car:

25,000 (Gal.)/7.5 (Gal/Cf.) = <u>3,334</u>

Rainwater:[3.92′ x 6′ x 2 + 2′ x 17.63′] 5.5" Rainfall = 38 Cf.

<u>TOTAL CONTAINMENT REQUIRED: 3372 CU. FT.</u>

Storage Provided (Covered):

Total Floor Area: 13.5′ x 50′ = 675 Sf.

Total Volume: 675′ x 6′-3" High = 4218 Cf.

- 12.42′ x 13.5′ x 1.25 h. = -210 Cf.

+ Sumps @ 2′ x 2′ x 2′ = 8 Cf.

Transverse Slope + 13′ x 50′ x .25′ = 169 Cf.

Slope to Center + 13′ x 50′ x .5 = <u>84 Cf.</u>

<u>Total Containment Provided = 4269 Cf.</u>

TABLE II.15

TANK PRE-ENTRY PRECAUTIONS

The following precautions are to be implemented before any entry into a fuel storage or mixing tank is allowed:

1. Assure valves on all lines which convey fuel materials into the tank are closed and locked.
2. All mechanical devices which could cause injury to persons inside tanks will be made inoperative through standard lockout/tagout procedures.
3. Fuel and sludge are to be removed from the tank and rinse solvents are to be used to clean the tank further.
4. Blowers will be used to purge fuel vapors from the tanks.
5. Depending on the reason for tank entry and the duration of tank work, it may be necessary to steam clean the tank prior to entry.
6. Vehicular and foot traffic in the tank area are to be restricted.
7. The air inside the tank is to be tested to determine oxygen content, concentrations of major fuel constituents, and flammable/explosive concentrations. A record is to be kept of these monitoring results and will be available for inspection.
8. If these tests show the absence of any dangerous air contamination and/or oxygen deficiency, entry will be permitted and air tests will be repeated at least once each shift. If air tests show the presence of any dangerous air contamination and/or oxygen deficiency, additional precautions, as described in Table II.13 are to be followed.

TABLE II.16

ENTRY AND WORK PROCEDURES WHEN DANGEROUS AIR CONTAMINATION AND/OR OXYGEN DEFICIENCY MAY BE PRESENT

When the absence of dangerous air contamination and/or oxygen deficiency cannot be ensured, the following precautions will be implemented:

1. NIOSH/MSHA-approved self-contained breathing apparatus and full-body protective clothing will be worn.
2. An approved safety belt with attached line will be worn. The line is to be secured outside the tank entrance.
3. A second employee, provided with a readily accessible, NIOSH/MSHA-approved self-contained breathing apparatus, will be stationed outside the tank entrance. A third employee will be required to be within sight and call of the standby employee at all times. The standby employee will enter the tank only in event of emergency and only after notifying at least one other employee of the emergency and plans to enter the tank.
4. When tank entry is made through the top opening, the safety belt will be replaced with a safety harness, and a hoisting device will be used.
5. No work involving a source of ignition (flame, spark, etc.) will be permitted if air testing shows that a flammable/explosive atmosphere is present or could develop.
6. Only lighting and electrical equipment approved in accordance with the Low-Voltage Electrical Safety Orders will be used.
7. An employee trained in first aid and cardiopulmonary resuscitation (CPR) will be immediately available at all times. That self-contained breathing apparatus is in use for tank entry.
8. Visual or radio communication will be maintained at all times between employee working inside tanks and the standby employee.

TABLE II.17

STORAGE TANK AREA CONTAINMENT CALCULATIONS

REQUIRED STORAGE VOLUME:

= 100,000 Gallons on 13,370 Cf.

STORAGE PROVIDED:

Available storage due to slope of Tank Farm = Vs
Using inverse frustrum of a pyramid (per sump):

$V1 = 1/3(A_1 + A_2 + (A_1 * A_2)^{5})h$

$V_1 = {}^{1}/_{3}(1365 + 9 + (1365 \text{ x } 9).^{5})(0.2917)$

$V_1 = 144.38$ cf.
$V_1 = 144.38 * 2 = 288.76$ cf.--- Subtract tank bases

$V_{TB} = 0.25 * 3.14 * D^2 *$ Avg. height = Volume of one tank base

$V_{TB} = .025 * 3.14(13)^2 * ({}^{2}/_{12}) = 22.12$ cf.

Volume of four tank bases = $4 * V_{TB} = 88.51$ cf.

$Vss = V_1 - (4 * V_{TB}) = 288.76 - 88.51 = 200.25$ cf.

Available Storage to Top of Containment above the sloping base portion = V_C

$V_2 = 78' \text{ x } 35' \text{ x } 5' = 13,650$ cf.

TOTAL STORAGE PROVIDED:

$= V_S + V_C = 13,650 + 200.25 = 13,850.25$c.f.
$= 13,850.25 \text{ x } 7.48 = 103,600$ gal.

Storage Provided exceeds Required Storage.

EXHIBIT II.11A

PIPING MATERIAL SPECIFICATION

PART 1 - GENERAL

A. DESCRIPTION: This specification identifies the material requirements for the lr construction and installation of piping for the transportation of liquid hazardous waste fuels.

B. MATERIALS: All piping and equipment associated with the piping shall meet the following minimum requirements.

PIPING: Hydrocarbon piping, butt-welded, schedule 40, using socket-weld connections (150 lb. flanges only as required at pumps and valves) for any piping over one inch. Piping under one inch may have threaded connections. All piping outside of the containment area shall be protected by one of two methods:

METHOD 1 - Enclosed in a schedule 10 pipe jacket 2 sizes larger than the hydrocarbon pipe with a spacer between them. The spacer shall consist of the inner portion (spider) of a standard pipe guide located at each pipe support and similar to tri-state industries standard pipe guide.

METHOD 2 - Placed in a formed steel pan made of 1/8" thick A36 steel plate. Pan will have 1/8" steel plate cover, gasketed and bolted in placed. More than one pipe may be placed in metal pan.

VALVES: Ball valves, ANSI 150 pound class, carbon steel body with 316 stainless steel ball and stem, reinforced PTFE gaskets and seats. Under one inch - threaded connections; over one inch - flanged connections. Test at 50 PSI, after installation but before operation, to assure that all valves are bubble tight and show no visible leaks. Watts, Contromatis, or equal.

BASKET STRAINERS: Basket strainers, steel body, stainless basket with 3/8" size openings, 150 pound ANSI, Mueller, or equal.

HOSE CONNECTIONS: Hose connections for liquid shall be Kam Valok, or equal, dry disconnect couplings (Dover Corporation).

Y-STRAINERS: Y-strainers, steel body, stainless steel basket W/3/8" size openings, 150 pound ANSI, Sarco, or equal.

GASKETS: Gaskets for 1-1/2" to 6" flanges will be flexitallic type gasket (spiral-wound gasket), gasket material for 8" or larger flanges will be 1/8" garlock or equal, gasket materials for tank manways will be Gore-Tex Teflon rope packing.

EXHIBIT II.12

TANK ENTRY AUTHORIZATION FORM

Date:____________ **Time From**______ **a.m. p.m.** **to**______ **a.m. p.m.**

Tank Identification:____________________

Work to be Performed:____________________

Employees assigned to work:____________________

Work Performed by:____________________

TANK PREPARATION

Drained to floor level of ____________ inches.

Purged with air for ____________ hours.

ATMOSPHERIC TESTS

Date	Time	Test	Location	Reading
______	______	oxygen	______	______
______	______	flammability	______	______
______	______	hydrocarbons	______	______

Tests performed by:____________________

CHECKLIST

1.	Are valves on all lines closed and locked?	Y	N	N/A
2.	Is electrical equipment properly locked out and tagged?	Y	N	N/A
3.	Is area roped off?	Y	N	N/A
4.	Are caution signs posted?	Y	N	N/A

EXHIBIT II.12

TANK ENTRY AUTHORIZATION FORM

HAZARD CHECKLIST

Y N Flammable/explosive atmosphere

Y N Toxic vapor concentration

Y N Oxygen deficiency

Y N Toxic residues

Y N Other (specify)____________________

____

EQUIPMENT CHECKLIST

Blower

SCBA

Chemical-Resistant Suits, Gloves, Boots

Communications Radio (intrinsically safe)

Approved Lighting and Electrical Equipment

Special Tools (specify)____________________

PROCEDURES IMPLEMENTATION CHECKLIST

Y N Tank entry procedures reviewed by all personnel

Y N Stand-by person assigned

Y N Contact person assigned

AUTHORIZATIONS

Emergency Coordinator____________________

Cognizant Supervisor____________________

NOTES:____________________

____

EXHIBIT II.13

GENERAL SPECIFICATIONS

PART 1 - GENERAL

1.1 Description

Furnish and install PVC flexible membrane lining in the areas shown on the drawings. All work shall be done in strict accordance with the project drawings, these specifications and the membrane lining Supplier's approved shop drawings.

Sufficient lining material shall be furnished to cover all lined areas shown on the plans including panel overlaps at field seams. One percent shall be added to the length of each panel to allow for shrink and wrinkles.

The liner shall be installed in a relaxed condition and shall be free of tension or stress upon completion of the installation. Stretching of the line to fit will not be allowed.

It is the intent of these specifications to ensure a quality finish product. It shall be the responsibility of the Contractor to ensure that this requirement is met.

PART 2 - PRODUCTS

2.1 Materials

The lining material shall be a Polyvinyl Chloride (PVC) Membrane and shall be manufactured by the calendering process. The lining material shall be uniform in color, thickness, size and surface texture. The finished liner shall be free from pinholes, blisters, and contaminants.

The PVC liner shall have smooth or matte finishes on both sides and shall not be embossed.

The membrane shall be manufactured for a composition of high quality ingredients specifically compounded for use in hydraulic structures. Only domestic materials shall be used. Reprocessed or reground materials will not be acceptable.

The lining material must have the minimum property values shown in Table A.

PART 3 - EXECUTION

3.1 Subgrade Preparation

Lining installation shall not begin until a proper base has been prepared to accept the membrane lining. Base material shall be free from angular rocks, roots, grass and vegetation. Foreign materials and protrusions shall be removed and all cracks and voids shall be filled and the surface made level or uniformly sloping as indicated on the drawings. The prepared surface shall be free from loose earth, rocks, rubble and other foreign matter. The subgrade shall be uniformly compacted to ensure against settlement and shall be steel wheel rolled prior to liner installation.

The surface on which the lining is to be placed shall be maintained in a form, clean, dry and smooth condition during lining installation. If groundwater is present within 12 inches below the surface to be lined, the General Contractor shall dewater the area prior to and during installation of the liner.

3.2 Lining Installation

The PVC lining shall be placed over the prepared surface in such a manner as to assure minimum handling. Anchor trench excavation and any structure seal preparation should be completed before lining installation begins. The sheets shall be of such lengths and widths and shall be placed in such a manner as to minimize field seaming. Horizontal field seams on the slopes shall be kept to a minimum. Only those sheets of lining material which can be anchored and sealed together that same day shall be unpackaged and placed in position.

In areas where wind is prevalent, lining installation should be started at the upwind side of the project and proceed downwind. The leading edge of the liner shall be secured at all times with sandbags or other means sufficient to hold it down during high winds.

Sandbags or rubber tires may be used, as required, to hold the lining in position during installation. Tires shall not have exposed steel cords or other sharp edges which may snag or cut the lining. Materials, equipment or other items shall not be dragged across the surface of the liner or be allowed to slide down slopes on the lining. All parties walking or working upon the lining material shall wear soft-sole shoes.

Lining sheets shall be closely fit and sealed around inlets, outlets, and other projects through the lining. Lining to concrete seals shall be made with a mechanical anchor or as shown on the drawings. All piping, structures and other projections through the lining shall be sealed with approved sealing methods.

The liner shall be installed in a relaxed condition and shall be free of tension or stress upon completion of the installation. Stretching of the liner to fit will not be allowed.

3.3 Field Seams

All seaming adhesives, caulking and mastics shall be of a type or types recommended and supplied by the Manufacturer or Fabricator of the PVC panels and shall be delivered in original one gallon containers each with an indelible label bearing the brand name and complete directions as to proper storage and use.

Field lap joints shall be formed by lapping the edge of panels a minimum of six (6) inches. The contact surfaces of panels to be seamed shall be wiped clean to remove all dirt, dust, moisture and other foreign materials. Sufficient liner to liner bonding adhesive shall be applied to the joint area so as to form a continuous solvent weld approximately 2 - 3 inches wide. In applying adhesive, care must be taken to tie-in to the end of the previously completed seamed area so that leak paths or weak points in the seam do not occur. The surfaces should be pressed together immediately and a roller or flat wooden paddle used to squeeze the adhesive toward the leading edge of the panel. Any wrinkles shall be smoothed out. A small amount of adhesive should extrude and appear at the edge of the seam to indicate that sufficient adhesive has been applied. Excess adhesive should be wiped off with a clean rag. Seams shall be inspected after the initial seal and any loose edges shall be resealed, using the same procedure, to eliminate all free edges.

Extreme care shall be taken to avoid fishmouths in the field seams. Where fishmouths do occur, they shall be slit out far enough from the seam to dissipate them, lapped, seamed together in the lapped area and patched. Any portion of the lining damaged during installation, by any cause, shall be removed or repaired by using an additional piece of PVC lining, as specified hereinafter.

3.4 Patching

Any repairs to the PVC lining shall be patched with the lining material and liner-to-liner bonding adhesive. The patch material shall have rounded corners and shall extend a minimum of four (4) inches in each direction from the damaged area.

3.5 Earth Cover

Earth cover shall be placed over the PVC lining as shown on the drawings. Cover material shall be approved by the Engineer prior to placement. Soil containing sharp, jagged rock, roots, debris or any other material which may be abrasive to or may puncture the membrane, shall not be used as cover material.

The Contractor must satisfactorily demonstrate to the Engineer that the use of chosen cover material will not have any detrimental effects on the liner. Onsite materials approved by the Engineer shall be stockpiled as excavated for backfill over the liner.

The cover material shall be placed over the lining as soon after liner placement as possible. The cover soil shall be placed over the lining in such a manner and with such equipment as the Contractor may choose, provided it is satisfactorily demonstrated to the Engineer that such manner and such equipment does not damage the lining. In general, low ground pressure (LGP) equipment shall be used to spread the earth cover.

END OF SECTION

TABLE A

MINIMUM MATERIAL PROPERTIES

Property	Test Method	Test Value 20 mils
Gauge (Nominal) Thickness, minimum	ASTM D792 Par. 9.1.3	19 mils
Specific Gravity	ASTM D792 MTD A-1	1.24 to 1.30
Minimum Tensile Properties (each direction)	ASTM D882	
1. Breaking Factor	MTD A or B	46 lbs/in width
2. Elongation at Break	MTD A or B	300%
3. Modulus (Force) @ 100% Elongation	MTD A or B	18 lbs/in width
Tear Resistance (minimum average pounds)	ASTM D1004 Die C	6 lbs (300 lbs/in)
Low Temperature Impact (50% pass)	ASTM D1790	-15°F
Dimensional Stability (each direction, percent change maximum)	ASTM D1204 212°F 15 min.	+5%
Water Extraction (maximum % wt loss)	ASTM D3083 (as modified by NSF)	0.35%
Volatile Loss (maximum % wt loss)	ASTM D1203 MTF A	0.9%
Resistance to Soil Burial (% change maximum in original value)	ASTM D3083 (as modified by NSF)	
1. Breaking Factor		5%
2. Elongation at Break		20%
3. Modulus @ 100% Elongation		20%
Hydrostatic Resistance (pounds/sq in minimum)	ASTM D751 MTD A	60 psi

STEEL PIPE

PART 1 - GENERAL

1.1 Description

This section covers the requirements for schedule 40 and schedule 80 steel pipe and fittings.

PART 2 - PRODUCTS

2.1 Materials

A. Pipe

1. Steel pipe shall conform to the provisions of NFPA 30, Chapter 3 and ANSI B31.4.

B. Fittings

1. Flanges shall be used at all connections to equipment for dismantling of the piping. Flanges shall be standard class 125 lb. ANSI 31.4 for 125 psi service.
2. All flanged joints shall have ring gaskets conforming to ANSI B31.4. Gaskets shall be made of materials which are not injuriously affected by the fluid in the piping system and shall be capable of withstanding the pressures and temperatures to which they will be subjected.
3. Welding fittings shall conform to ANSI Standard B31.4. Shaped nipples or fishmouth fittings will not be permitted.
4. Valves shall be flanged and conform to ANSI Standard B31.4.

PART 3 - EXECUTION

3.1 Installation

A. Steel pipe shall be installed as shown on the drawings.

B. All pipe fittings and joints shall be welded in accordance with API Standard 1104.

C. All external piping shall be painted with a material suitable to eliminate corrosion.

D. All pipe shall be hydrostatically tested in accordance with API Standard RP1110.

MISCELLANEOUS ITEMS

PART 1 - GENERAL

1.1 Description

This section covers the requirements for waterstops and concrete sealer.

PART 2 - PRODUCTS

2.1 Materials

A. Waterstops

1. Waterstops shall be PVC and comply with Corps of Engineer CRD-C572. Waterstops shall be Greenstreak dumbbell of labyrinth of equal.

B. Concrete Sealer

1. Concrete shall be a two-part epoxy resin rated for use on interior masonry wall. Sealer shall resist chemicals to be stored. Sealer shall be ChemMaster, "Durakote 3" or equal.

PART 3 - EXECUTION

3.1 Installation

A. Waterstops shall be installed at all construction joints and other joint types and sizes shown on the plans.

B. Concrete sealer shall be installed on all interior concrete surfaces.

END OF SECTION

EXHIBIT II.14

TANK REPORT AND ASSESSMENT

Florida Mining and Materials
Brooksville, Florida

Introduction

This assessment of the structural integrity and adequacy of the tank system designed by Florida Mining and Materials and The Benham Group for installation at the Brooksville, Florida cement plan has been prepared to satisfy the requirements of 40 CFR 264.192. The assessment shows that the foundation structural support, seams and connections are sufficient to ensure that the tank system should not collapse, rupture or fail. The tank system is compatible with the wastes and adequately protected against corrosion. The foundation is adequate to support the weight of full tanks and to resist the effect of frost heave, flotation or seismic activity for the location proposed.

1. Design standards for Tanks

   The tank design meets or exceeds the minimum requirement of API 650 Appendix "F". All shell design stresses are less than 21 KSI per Appendix "F" with joint efficiency of 0.7 for the vertical joints. The tank will be hydro tested per API 650.

2. Hazardous Characteristics of Wastes to be Handled

   The wastes stored in the tank system are primarily common industrial solvents from the paint, coatings, ink and chemical manufacturing industries. Xylenes, toluene, mixed aliphatic and aeromatic compounds and acetone, make up most of the waste mixtures. In addition, small quantities of alcohols, ketones, ether-alcohols and halogenated solvents are present. The waste mixtures also contain solid residues including resins and paint pigments. These waste characteristics are described in greater detail in Section II.7 of this Permit Application.

   All of the blended waste materials stored in the tank system exhibit the hazardous waste characteristic of ignitability. The materials have a pH between 4 and 11 and do not exhibit the characteristic of corrosivity. In addition, these wastes do not have any of the properties characteristic of reactive wastes. Some of the wastes stored in these tanks will exhibit the characteristics of EP toxicity. The wastes are all compatible with the mild steel materials of construction and no special coatings or other corrosion protection are required.

3. External Corrosion

   The tank system is designed so that no external metal will be in contact with the soil or in water. Standards and recommended practices for control of external corrosion on buried or submerged storage systems prescribed by the National Association of Corrosion Engineers are not applicable. Corrosion protection in the form of coatings, special alloys, cathodic protection of electrical isolation are not needed to insure that the tank system will not collapse, rupture or otherwise fail.

4. Underground Components and Vehicular Traffic

There are no buried components in the tank system which could be adversely affected by vehicular traffic.

5. Foundation Design and Climatic Considerations

The tank foundation will maintain the load of a full tank. Attached calculations how a maximum loading of 239 thousand pounds, including the weight of the tank, the full content of the tank, concrete foundation and 50-year snowfall for each of the 25,000 gallon tanks. Distributing this load over the tank foundation results in a maximum soil bearing load of 1.55 thousand pounds per square feet (KSF). The soil bearing capacity has been conservatively estimated at 4 KSF. consequently,, the soil bearing capacity is more than adequate to support the weight of the tank system.

The steel storage tanks will be constructed on a concrete foundation reinforced with 1/2" and 5/8" steel bar. The concrete and reinforcing have been designed to the following standards.

ACI 211.1-70	Recommended practice for selecting proportion of normal weight concrete.
ACI 301-72	Specifications for structural concrete for buildings.
ACI 302-69	Recommended practice for concrete floor and slab construction.
ACI 315-74	Manual of standard practice for detailing reinforced concrete structures.
ACI 318-77	Building code requirements for reinforced concrete.
Order No. 78-6	Hernando County Mining Ordinance for air blast over pressure.

In all cases, the steel to concrete ratio is more than adequate to resist all bending forces or both tension and compression, overturning of containment walls, bond between reinforcing steel and concrete, shear stresses and temperature.

The Brooksville, Florida area is not seismicly active and consequently not listed in Appendix VI of 40 CFR Part 264. No portion of the facility is located with 200 feet of a fault which has been displaced in holocene time. The tanks will be bolted to the concrete foundation which will be constructed on soil which is not in the saturated zone. The facility is not in the 100-year flood plain. consequently, the tank system will not float or be dislodged from its foundation and the foundation is stable.

The concrete foundation will be constructed on compacted soil covered with sand to an average depth of six inches. In addition, concrete grade beams will be constructed at a depth of 2 - 6 inches along the perimeter of the concrete foundation. The area below the tank system and below the concrete grade beams will not be subject to frost conditions and the tank system will not be subjected to frost heave.

The concrete foundation for the tank and containment structure has been designed to comply with Hernando County Ordinance No. 78-6 concerning blast resistance due to mining activities. Tank overturning was checked based on an air blast overpressure of 0.5 lbs/sf, which is the ordinance design criteria. The tank foundation exceeds this design parameter. The containment structure and tank foundation design was also check to determine if the structures could withstand a blast with a particle velocity of 1.0 in/sec. Based on the united States Department of the Interior publication RI 8507 and the Corp of Engineers, Engineer manual EM 1110-2-3800, both dealing with minimum design criteria for blasting, the foundations as designed will meet the County requirement concerning particle speed.

(EXAMPLE)

EXHIBIT II.15

TANK INSTALLATION CERTIFICATION

This is to certify that the new above-ground storage tank system located at the Florida Mining and Materials, Brooksville, Florida Cement Plant, has been inspected by me under requirements of 40 CFR 262.192(b). This installation was inspected for the following items:

1. Weld breaks
2 Punctures
3. Scrapes of protective coatings
4. Cracks
5. Corrosion
6. Other structural damage or inadequate construction and/or installation

My inspection determined that there were no construction deficiencies detected prior to placing this tank system in service.

This tank system was also tested for tightness and there were no leaks in the tanks or auxiliary equipment prior to being placed in service.

I have also reviewed the installation of the auxiliary equipment and it is properly supported and protected against physical damage and excessive stress due to factors such as settlement, vibration, expansion, or contraction.

Signed

____
Professional Engineer

State of Florida No. _________

EXHIBIT II.16

Florida Mining and Materials
Brooksville, Florida

ASSESSMENT OF HAZARDOUS WASTE STORAGE TANK SYSTEM
25,000 GALLON TANK

Weight of Tank:

Roof	1/4" plate	$10.2 \times 1/4 \times 3.14 \times 12^2$	=	1,153	lbs
Wall	3/16" plate	$7.65 \times 3.14 \times 12 \times 30$	=	8,648	lbs
Base	1/2" plate	$20.4 \times 1/4 \times 3.14 \times 13.25^2$	=	2,811	lbs
Summation:			=	12,612	lbs

Weight of Snow:

Estimated ground snow load from the Climate Atlas of the United States", U.S. Dept. of Commerce, page 54

Roof (Snow) 1.0×10.0 psf = 10 psf < 20 psf

$3.14 \times 6^2 \times 20$ = 2,261 lbs

Fuel $V = 1/4(3.14) \times 12^2 \times 28.5 = 3{,}222 \text{ ft}^3$

$62.4 \times 3{,}222$ = <u>201,053</u> lbs

Summation: = 203,314 lbs

Weight of Foundation:

$150 \times 12/12 \times 3.14 \times 7$ = 23,079 lbs

Total Weight = 12.61 + 203.1 + 23.08 = 239.0 k

$$\text{Bearing Load} = \frac{239.0}{3.14 \times 7^2} = 1.55 \text{ SF} < 4 \text{ KSF}$$ - estimated bearing capacity of soil

Per: "Structural Engineering Handbook", by Gaylord and Gaylord, page 5-2.

The depth of frost penetration at the Brooksville plant is about 10 inches.

EXHIBIT II.17

Assessment of Hazardous Waste Storage Tank System

CERTIFICATION

This certification applies only to the assessment of the hazardous waste storage tank system document and pertinent drawings for the 25,000 gallon tank which I have signed and sealed as a registered professional engineer.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to be the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signed:

8-27-90

Professional Engineer
State of Florida
License No. 31420

EXHIBIT II.18

INSPECTION SCHEDULE

Area/Equipment	Specific Item	Type of Problem	Inspection Frequency
Monitoring Equipment	Ultrasonic tank level & overfill devices	Proper function, calibration	Daily
	Fuel flow indicator	Proper function, calibration	Daily
	Torch pressure gauge	Proper function, calibration	Daily
	Pump pressure gauge	Proper function, calibration	Daily
	Tank level gauge differential press.	Proper function, calibration	Daily
	Containment ultrasound leak detection system	Proper function, cleanliness	Daily
Safety & Emergency Equipment	Protective clothing (impermeable full body coveralls, gloves, boots)	Adequate supply, clean condition	Weekly/after use
	Half & full-face piece respirators	Seals, air delivery system	Weekly/after use
	Mechanical spark-resistant tools	Stored properly, damaged	Weekly/after use
	Emergency shower & eyewash (4)	Water pressure, leaking, drainage	Weekly
	Organic vapor sensor	Vapor levels	Monthly/investigation
	Self-contained breathing apparatus (SCBA)	Located at supplier (Sheridan Supply 278-4845)	Monthly
	Absorbent material (kiln dust)	Adequate supply	Monthly/after use
	55-gallon drums	Corrosion, adequate supply, covers	Monthly
	First aid equipment & supplies	Adequate supply	Monthly/after use
	Decontamination facility	Upkeep	Monthly/after use
	Telephone system	Power failure	Annually
	Emergency lighting system (aux.)	Battery failure, lights	Annually
	Fire extinguishers	Needs recharging	Monthly/after use
	Foam fire fighting system	Not enough water pressure, frozen foam, dirty nozzles	Semiannually
	Fire control water	Lubrication, struck valve, freeze	Monthly
	Emergency alarm	Power failure, damaged	Monthly/after use
	Emergency vehicle	Proper function	Monthly
	Face shield and extra protective equipment	Broken or dirty equipment	Monthly
		Overfilled, dump mechanism	Weekly

EXHIBIT II.18

INSPECTION SCHEDULE
(Cont.)

Area/Equipment	Specific Item	Type of Problem	Inspection Frequency
Security Device	Television camera	Dirt buildup	Weekly
	Waring signs	Readability, obstruction	Weekly
Operating and Structural Equipment	Dikes	Cracks, deterioration	Daily
	Bases	Erosion, uneven settlement, cracks in base, deterioration of water seal between tank bottom and foundation, wet spots, dead vegetation	
	Protective coating on tanks	Rust spots, blisters	Daily
	Tank (external)	Corrosion, discoloration, cracks, buckles, bulges, malfunction of seals	Daily
	Tank (internal)	Corrosion - ultrasonic inspection	Annually
	Tank ladder	Damaged, structural stability	Daily
	Tank structural supports	Concrete deterioration and cracking, corrosion of pipe supports	Daily
	Pipes	Loss of metal thickness, leaks, corrosion or deterioration, crack	Daily
	Fuel storage area	Leaks, spills, wet spots	Daily
	Off-loading area	Leaks, spills, wet spots	Daily
	Fuel pumps	Power, pressure drop, leaks	Daily
	Filters	Pressure increase, cleanout	Daily
	Valves	Corrosion, deterioration, leaks	Daily
	Agitators	Leaks, lubrication	Daily
	Fittings	Corrosion, deterioration, leaks	Daily
	Overfill control and level indicator	Proper function	Daily
	Nozzles - fire-fighting	Deterioration, deformation	Monthly
	Sump pumps	Power, clogging, air supply	Daily
	Containers	Leaks, spills, cleanliness	Daily
	Epoxy coating - containment area floor	Wear out, leaks	Daily

EXHI II.19

DAILY INSPECTION LOG

Inspector's Name/Title: ______________________

Date of Inspection: ______________________(Inspect on 1st shift)

Time of Inspection: ______________________

Area/Equipment: MONITORING EQUIPMENT		Status	Observation	Date & Nature of Repair/ Remedial Action
Specific Item	Type of Problems	(A) Acceptable (U) Unacceptable		
Ultrasonic tank level and overfill devices				
Fuel flow indicator	Proper function, calibration			
Torch pressure gauge	Proper function, calibration			
Pump pressure gauge	Proper function, calibration			
Tank level gauge differential press.	Proper function, calibration			
Containment ultrasound leak detection system	Proper funciton, cleanliness			

Area/Equipment: OPERATING & STRUCTURAL EQUIPMENT		Status	Observation	Date & Nature of Repair/ Remedial Action
Specific Item	Type of Problems	(A) Acceptable (U) Unacceptable		
Dikes	Cracks, deterioration			
Bases	Erosion, uneven settlement, cracks in base, deterioration of water seal between tank bottom & foundation, wet spots, dead vegetation			
Protective coating on tanks	Rust spots, blister			
Tank (external)	Corrosion, discoloration, cracks, buckles, bulges, malfunction of seals			
Tank ladder	Damaged, structural stability			
Tank structural supports	Concrete deterioration, Cracking, corrosion of pipe supports			

Inspector's Name/Title: ______________________

Date of Inspection: ______________________(Inspect on 1st shift)

Time of Inspection: ______________________

Area/Equipment: OPERATING & STRUCTURAL EQUIPMENT Specific Item	Type of Problems	Status (A) Acceptable (U) Unacceptable	Observation	Date & Nature of Repair/ Remedial Action
Pipes	Loss of metal thickness, leaks, corrosion, deterioration, cracks			
Fuel storage Area	Leaks, spills, wet spots			
Off-loading area	Leaks, spills, wet spots			
Fuel pumps	Power, pressure drop			
Filters	Pressure increase			
Valves	Corrosion, deterioration, leaks			
Agitators	Leaks, lubrication			
Fittings	Corrosion, deterioration, leaks			
Overfill control & level indicator	Proper function			
Sump pumps	Power, clogging, air supply			
Containers	Leaks, spills, cleanliness			
Epoxy coating - containment area floor	Wear out, leaks			

EXHI II.20

WEEKLY INSPECTION LOG

Inspector's Name/Title: ______________________

Date of Inspection: ______________________(Inspect on 2nd shift on Tuesday)

Time of Inspection: ______________________

Area/Equipment: SAFETY & EMERGENCY EQUIPMENT

Specific Item	Type of Problems	Status (A) Acceptable (U) Unacceptable	Observation	Date & Nature of Repair/ Remedial Action
Protective clothing (impermeable full body, coveralls, gloves, boots)	Adequate supply, clean condition			
Half & full-face respirators	Seals, air delivery system			
Mechanical spark-resistant tools	Stored properly, damaged			
Emergency shower, eye wash	Water pressure, leaking drainage			
	Overfilled,			

Area/Equipment: SAFETY & EMERGENCY EQUIPMENT

Specific Item	Type of Problems	Status (A) Acceptable (U) Unacceptable	Observation	Date & Nature of Repair/ Remedial Action
Television Camera	Dirt buildup			
Warning Signs	Readability, obstruction			

EXHIBIT II.21

MONTHLY INSPECTION LOG

Area/Equipment: SAFETY & EMERGENCY EQUIPMENT		Status (A) Acceptable (U) Unacceptable	Observation	Date & Nature of Repair/ Remedial Action
Specific Item	Type of Problems			
Organic vapor sensor	Vapor levels			
Self-contained breathing apparatus (SCBA)	Seals, air delivery system			
Absorbent material (kiln dust)	Adequate supply			
55-gallon containers	Corrosion, adequate supply			
First aid equipment and supplies	Adequate supply or inoperative			
Decontamination facility	Upkeep			
Fire extinguishers	Need recharging			
Foaming eductor & foam concentrate	Not fuctioning, adequate supply			
Fire control water	Lubrication, stuck valve			
Emergency alarm	Power failure, damaged			
Face shields & extra protective equipment	Broken or dirty eqipment			

EXHIBIT II.22

SEMI-ANNUAL AND ANNUAL INSPECTION LOG

Area/Equipment: SAFETY & EMERGENCY EQUIPMENT		Status (A) Acceptable (U) Unacceptable	Observation	Date & Nature of Repair/ Remedial Action
Specific Item	Type of Problems			
Telephone system	Power failure			
Emergency lighting system (auxiliary)	Battery failure, lights			
*Foam Fighting System	Not enough water pressure frozen foam, dirty nozzles			

* Inspect 1st Tuesday in April and October, day shift

Area/Equipment: OPERATING & STRUCTURAL EQUIPMENT		Status (A) Acceptable (U) Unacceptable	Observation	Date & Nature of Repair/ Remedial Action
Specific Item	Type of Problems			
Tanks (internal)	Corrosion (ultrasonic inspection)			

EXHIBIT II.23

WEEKLY RAIL INSPCTION CHECHLIST

ITEM	CONDITIONS			ACTION REQUIRED
	NEEDS REPAIRS	FAIR	GOOD	
VERTICAL ALIGNMENT				
HORIZONTAL ALIGNMENT				
GAGE				
DAMAGED TIES				
BALLAST CONDITION				
LOOSE JOINT				
GREASED SWITCH POINTS				
GREASED JOINTS				
CROSSING STRUCTURES				
CROSSING MARKINGS				
RAIL SIDE				
ROAD SIDE				
SIGNALS				
WEED CONTROL				

ATTACHMENT 2

Prequalification and Scheduling of HWF

As described in the waste analysis plan in the Part "B" application, each HWF supplier submits a completed prequalification form (see subattachement A) and a sample of the HWF for analysis. A comparison of this analysis to the prequalification form and the acceptance criteria is performed, as well as an examination of the waste codes of the proposed HWF in comparison to the approved list of waste codes. All of this is described in detail in the waste analysis plan.

Receipt on-site

The HWF transport vehicle arrived on-site on or about its scheduled time. If the vehicle is unable to be immediately sent to a sampling/unloading area, it is directed to a designated parking area. The alternative to this is to send the vehicle off-site. Generally, these delays in receipt are due to early arrival or problems with the preceding receipt and are of short duration.

The manifest, a land ban certification and a chemical analysis of land report, are given to an individual trained in receipt inspection and documentation. If the documents conform to the parameters in the waste analysis plan and applicable regulations, the vehicle is examined. If the seals are undamaged and their numbers match the numbers listed on the manifest, the vehicle will be moved to a sampling/unload station. In most cases the examination of the documents and vehicle will occur at this station.

Sampling HWF

There are two types of HWF, Liquid (LHWF) and Solid (SHWF). LHWF is received in truck transports or railroad tank cars. SHWF is received in DOT containers of various descriptions delivered by a truck transport.

Sampling of the SHWF conforms to the method described in the WAP. Briefly the transport is backed onto a concrete apron up to an unloading dock. The doors are opened and the condition of the load examined. The containers must be in a fit condition to contain the SHWF and be properly labeled. The containers are unlocked from the transport using a forklift or other mechanical device suitable for the task by an operator trained in the proper and safe operation of the equipment and the proper and safe handling of hazardous waste. The containers are set down in a hazardous waste containment area. Following the sampling plan in the WAP the containers are sampled. The containers are then set aside in a contained storage area. No washout of the HWF transports is done on the site. When the analysis is complete and compared to the acceptance criteria and determined that it does conform, the SHWF containers are scheduled for processing in the kiln for energy recovery. If the analysis does not conform, the containers are loaded back onto the transport and the load rejected. The manifest is not signed as accepted until the analysis is complete and determined to conform to the acceptance criteria.

Sampling of LHWF in tank trucks and tank cars conforms to the WAP as well. The vehicles are moved onto a sampling/unloading area and secured (i.e., wheels chock-blocked, brakes set and transport grounded). Garbed in the appropriate protective equipment an operator will connect the vent connection of the vehicle to the vapor vent system. The valve on the vent line is opened and any pressure in the vehicle is vented into the system. (This vent system is intended to transport VOC vapors from tank to tank, or tank to transport, during transfers. Additionally, any excess vapors or any tank breathing losses will vent to the kiln hood into the combustion air. In the event the kiln is not operating, these vapors would vent through a VOC control device such as an activated carbon bed.) After it is determined that the vehicle is free of pressure, the manway is opened. Sampling will proceed as detailed in the WAP. The operator will secure the manway when his sampling is complete and take the sample to the laboratory for analysis. The analytical procedures are detailed in the WAP. Comparisons to the acceptance criteria and acceptance or rejection of the LHWF loads is performed. If rejected, the transport is reinspected to be sure it is fit as a transport. The vent closed, the vent line disconnected, the ground disconnected and the chock blocks removed preparatory to the movement of the transport. If accepted, the transfer of the LHWF from the transport to the storage tanks is initiated. When complete, the transfer is documented, the transport vehicle is secured, all liquid and vapor lines disconnected, the ground disconnected and chock blocks removed and the vehicle released to the transporter. No wash out of the HVF transports is done.

All handling of hazardous waste fuel is done by individuals trained in the proper and safe handling procedures. These procedures include but are not limited to: Selection and use of the proper personal protective equipment; the selection and use of the proper equipment to open, sample, and close the containers; acceptable container management practices; proper spill containment and cleanup practices; emergency procedures; and other HWF facility operating procedures and practices.

SOUTHDOWN, INC.

PREQUALIFICATION PROCEDURES

SOLVENT DERIVED FUEL

I. HWF APPROVAL PROCESS
What Suppliers must do to qualify HWF stream

II. WHO MUST APPROVE THE HWF SUPPLIER
Waste Stream must go through approval process

III. RECEIVING FACILITIES RESPONSIBILITIES
Approving Waste Stream

IV. ANALYTICAL DATA
Who is responsible for analytical data for waste stream

V. FINGERPRINT ANALYSIS
What happens if fingerprinting analysis does not meet prequalification

VI. REQUALIFICATION
When must a waste stream be requalified

EXHIBIT 1. Generator or Supplier Notification of Fuel Derived from Hazardous Waste

REGULATION: 40 CFR 266.34
Section: B

EXHIBIT 2. Cement Kiln (Industrial Furnace) Notification

REGULATION: 40 CFR 260.10
40 CFR 266.35
Section: B

EXHIBIT 3. Hazardous Waste Fuel Checklist

EXHIBIT 4. Waste Fuels Qualification

REGULATION: 40 CFR 264.13
Section: A1
Figure: 2

I. HWF APPROVAL PROCESS

Before any Southdown kiln will accept hazardous waste fuel for burning in one of its cement kiln, the waste stream must be prequalified by the generator or supplier. At a minimum, this analysis must contain all the information that is known by the supplier in order to burn the waste safely to ensure that Southdown stays in compliance with state and federal regulations.

Before hazardous waste fuel is initially accepted by one of Southdown's cement kilns, a sample of the hazardous waste fuel must be sent to an outside lab for complete analysis. In the event the analysis is done by Southdown, or contracted to an outside laboratory by Southdown, the results of the analysis will be sent to the Director of Resource Recovery Operations and will be forwarded to the generator for inclusion in the prequalification. When the analysis is complete, the supplier must complete (Exhibit 1) Waste Fuels Qualification, sign off the certification statement, and send to Southdown for approval.

II. WHO MUST APPROVE WASTE STREAM FOR BURNING

Upon receipt of the completed Waste Fuel Qualification, the approval process begins. The waste profile and all other analytical data will be checked against the receiving facility's acceptance criteria for waste fuel. If all analytical data on the Qualification meets all the standards set forth by Southdown's Waste Analysis Plan for the receiving facility, the waste will be approved for acceptance. If for some reason, there is a problem with any of the analytical results, Southdown will not approve the HWF supplier until further clarification is provided. Southdown has the option to require a requalification of HWF that we believe or have reason to believe that the process or operation at the suppliers or fuel blender has changed.

In addition, Southdown can require additional analysis of incoming loads, if for some reason, the waste that is received does not match the waste designated on the manifest.

III. RECEIVING FACILITIES RESPONSIBILITY

The Waste Fuel Qualification will be reviewed by the Corporate Resource Recovery Compliance Manager, with the sign off by the Hazardous Waste Fuel Coordinator at the receiving facility. Final approvals will be given by the Director of Resource Recovery Operations.

IV. ANALYTICAL DATA

The Waste Fuel Qualification along with all other supporting documentation such as the outside lab analytical will be kept at the receiving facility by the Chief Chemist with copies of such to be kept in the RCRA operating files for back-up.

V. FINGERPRINTING ANALYSIS

When a load of waste fuel is accepted at one of Southdown's facilities, there will be a fingerprint analysis done on the load to ensure that it meets the original Waste Fuel Qualification. In doing this, it will ensure that all requirements are met for Interim Status, Part B permits, and appropriate air permits. This will help ensure that Southdown's facilities stay in compliance.

If for some reason the fingerprint does not match the prequalification, the load of waste will be assessed for rejection.

VI REQUALIFICATION

On an annual basis, the supplier must requalify his Hazardous Waste Fuel Stream. This must be done to ensure that Southdown's facilities are not accepting a waste stream that will jeopardize the health and safety of its employees and that all operations are not harmed in any way.

The requalification process will be exactly the same as the original qualification process (see Section II).

All paperwork, analytical data, and waste profile must be on file for the requalification before a load of Hazardous Waste Fuel is accepted.

Southdown will notify all suppliers or generators one month before their annual requalification date, to ensure their waste stream is requalified and that all necessary paperwork is in place at all Southdown facilities, so that no operations will be affected.

If a load must be cancelled from Cadence Chemical Resources, the contacts at Cadence are as follows:

Jim Ward	-	Work	(219) 879-0371
		Home	(219) 874-4591
Ken Derksen	-	Work	(219) 879-0371
		Home	(219) 256-3074
		Beeper	(219) 256-4784

Also, in the event of a load being cancelled or rejected, please notify the following:

Dave Constans	-	Work	(713) 653-6868
		Home	(713) 292-9469
		Pager	1-800-759-7354 Pin # 18718
Brenda Parfitt	-	Work (Kosmos)	(502) 935-7331
		(Fairborn)	(513) 878-8651
		Home	(502) 845-2717

FLORIDA MINING & MATERIALS

WASTE FUELS QUALIFICATION

GENERAL INFORMATION
COMPANY ____________________ GENERATORS EPA ID NO. __________
ADDRESS ____________________ CITY __________ STATE ______ ZIP ______
CONTACT ____________________ TEL ( ) __________ TITLE __________
WASTE DESCRIPTION (INCLUDE DOT DESCRIPTION) ____________________
PROCESS GENERATING WASTE ____________________

MAJOR VOLATILE ORGANICS (RELATIVE AREA PERCENT)
____________________ ______
____________________ ______
____________________ ______
____________________ ______

METALS, PPM
PB ______
CR ______
CD ______
AS ______
HG ______
BE ______

HEAT CONTENT __________ BTU/LB.
ASH (FROM BOMB) __________ %WT.
TOTAL HALOGEN (TITRATION) ____ %WT. AS CL
S __________ %WT.
PH (DIRECT/EXTRACTED) __________ / __________
LIQUID HWF SOLIDS (CENTRIFUGE) ______ %VOL.
WATER (TOTAL) __________ %WT.
VISCOSITY __________ CP
ECIFIC GRAVITY __________
S __________ PPM
FLASH POINT (CLOSED CUP) __________ F

EPA WASTE CODE NUMBER(S) ____________________
____

SAMPLE
______ COMPOSITE
______ GRAB
______ BASED ON KNOWLEDGE OF PROCESS
______ BASED ON ACTUAL ANALYTICALS

DETERMINATIONS REPORTED ABOVE WERE CHOSEN BASED ON THE SAMPLE MATRIX. THE COMPOSITION OF THE WASTE FUEL WILL NOT CHANGE SO AS TO RENDER THIS SURVEY AND THE SAMPLE SUBMITTED NON-REPRESENTATIVE WHEN ASSESSED AGAINST THE RECEIVING FACILITY'S FUEL SPECIFICATION. THE GENERATOR SUBMITTING THIS WASTE FUELS QUALIFICATION FURTHER WARRANTS THAT HWF SUPPLIED TO FM&M CEMENT WILL SATISFY THE OBJECTIVES OF THE U.S. EPA SHAM RECYCLING POLICY (1983, OR AS REVISED) AS IT RELATES TO HWF BURNED FOR THE PURPOSE OF ENERGY RECOVERY.

____________________ AUTHORIZED SIGNATURE
__________ DATE

__________ HEREBY WARRANTS THE WASTE STREAM REPRESENTED BY THE SURVEY AND SAMPLE SUBMITTED IS ACCEPTABLE AT THIS FACILITY AND THAT SAID FACILITY HAS/HAVE THE APPROPRIATE PERMITS AND CAN ACCEPT THIS WASTE AS LONG AS ALL HAZARDS ASSOCIATED WITH THE WASTE HAVE BEEN FAIRLY DISCLOSED ON THE SURVEY.

____________________ FLORIDA MINING AND MATERIALS REVIEW
____________________ CEMENT PLANT APPROVAL
__________ DATE

Question 4

4. **Provide a listing and description of all waste materials/fuels that this facility will not accept or receive for this proposal. The description should include, but not be limited to, the chemical name and CASR (Chemical Abstract Services Registry) numbers, their state (i.e., < 50 ppm, > 760 mm Hg V.P., etc.), and any other screening criteria.**

Table III-5, "Specification for Hazardous Waste Fuels (HWF)" included in the application, provides for a maximum concentration for PCB's of 50 ppm in any waste materials/fuels accepted at the facility.

As part of the Application for a Hazardous Waste Fuels Storage Facility Permit previously submitted to the Department, the list of hazardous wastes and corresponding RCRA waste code numbers, which may be accepted at the facility has been defined. This list excludes both dioxin containing materials and pesticides, and is attached as part of the response for Item 7 in this submission. No material will be accepted at FM&M which is contaminated with dioxins or pesticides. No material will be accepted which contains PCB's in excess of 50 ppm.

TABLE III-5

SPECIFICATION FOR HAZARDOUS WASTE FUELS (HWF)

	Liquid HWF	Solid HWF
Heat Content, minimum	10,000 Btu per lb	5,000 Btu per lb
Suspended Solids, maximum	30 percent	N/A
Sulfur, maximum	1 percent maximum	1 percent maximum
Halogens	5 percent	5 percent
Inorganic Acids and Bases	Extractable pH between 4.0 and 11.0	Extractable pH between 4.0 and 11.0
Water, maximum	1 percent as separate phase	No free standing liquid
Metals, maximum each		
Cadmium	250 ppm	1,000 ppm
Chromium	3,000 ppm	4,000 ppm
Lead	4,000 ppm	8,000 ppm
Barium	4,000 ppm	12,000 ppm
Antimony	See Note	See Note
Arsenic	See Note	See Note
Beryllium	See Note	See Note
Mercury	See Note	See Note
Silver	See Note	See Note
Thallium	See Note	See Note
PCB's	Less than 50 ppm	Less than 50 ppm

NOTE: This specification is subject to FDER Air Quality Section Review and is subject to change.

Question 5

5. **Since PSD does evaluate and compare the emissions of "actuals to proposed potentials" for all pollutants, please provide the synopsis page of the most recent compliance tests performed on the No. 2 lime kiln for each pollutant tested.**

Table V-5 included in the Application provided current actual emissions for eight PSD compounds. For carbon monoxide, nitrogen dioxide (NO_x), sulfur dioxide, ozone (VOC) and particulate, the actual emissions listed have been established through the past two years of available test data and have been accepted by the Department under current Permit AC27-173474. Since these values were established, no further testing has been conducted on the No. 2 Kiln.

TABLE V-5

PSD REGULATED EMISSIONS SUMMARY

Compound	Current Actual Emissions (lb/hr)	Current Actual Emissions (T/yr)	Proposed Potential Emissions (lb/hr)	Proposed Potential Emissions (T/yr)	Net Emissions Increase (T/yr)	Significant* Emissions Increase (T/yr)
Carbon Monoxide	41.1	162.3	64.0	262.2	99.9	100
Nitrogen Dioxide (NO_X)	158.4	625.4	162.3	665.3	39.9	40
Sulfur Dioxide	1.8	7.1	11.5	47.0	39.9	40
Ozone (VOC)	5.4	21.3	7.4	31.2	9.9	40
Particulate	7.7	30.4	13.5	55.3	24.9	25
Lead	0.00003	0.00014	0.04305	0.17650	0.17636	0.6
Mercury	0.0	0.0	0.02182	0.08947	0.08947	0.1
Beryllium	0.00006	0.0002459	0.000157	0.0006456	0.0003997	0.0004

* From Table 500-2 DER 17-2.500 (2)(e)2

Question 6

6. **From Table II-1, which of these kilns listed have afterburners?**

None of the facilities listed in Table II-1 have afterburners operating with a cement kiln. It should be noted that cement kilns burning HWF do not have afterburners since they achieve satisfactory destruction of the HWF compounds due to their high operating temperatures and long, hot gas retention times.

When HWF is fed to the main burner at the discharge end of a cement kiln, the organic compounds are exposed to gas temperatures exceeding 3,500°F as the material temperatures in this part of the kiln exceed 2,450°F. Gas retention time in the temperature range above 1,800°F is five to six seconds. These conditions provide complete destruction/removal efficiencies (DRE's) greater than 99.99%, as shown in Figure 1 for various difficult to destroy organic compounds.

Also, when HWF is fed to the feed end of the rotary kiln, as containerized HWF through the feed shelf, the organic compounds are exposed to gas temperatures of 1,950 to 2,000°F for more than 1.5 to 2.0 seconds. Again, these conditions provide complete DRE's of greater than 99.99%. As demonstrated in the attached Figure V-1 showing the temperature and retention time profile for the FM&M No. 2 Kiln, the proposed environment for the solid and liquid HWF meets or exceeds the RCRA requirement and, therefore, all of the organic compounds which are included in the HWF will be destroyed with 99.99% or greater efficiency.

A significant amount of testing of cement kilns firing hazardous waste fuel has established the level of destruction for various organic compounds. The attached table summarizes the results of the testing data in Reference 1 through 6. This summary shows that cement kilns have demonstrated high levels of destruction efficiency for thermally stable compounds without the use of an afterburner. For example, Reference 5 shows destruction efficiencies of greater than 99.99% for Trichlorobenzene which is classified by EPA as a Class 1 Stable Compound (EPA/625/6-89/019). This POHC was added to fuel fed to the feed shelf of a kiln similar to FM&M's Kiln No. 2.

FIGURE 1

COMPARISON OF THERMAL STABILITY OF TYPICAL PCB ISOMERS TO TYPICAL HEXACHLOROBENZENE DIOXIN, FURAN AND BIPHENYL COMPOUNDS

(DUVALL AND RUBEY, 1977)

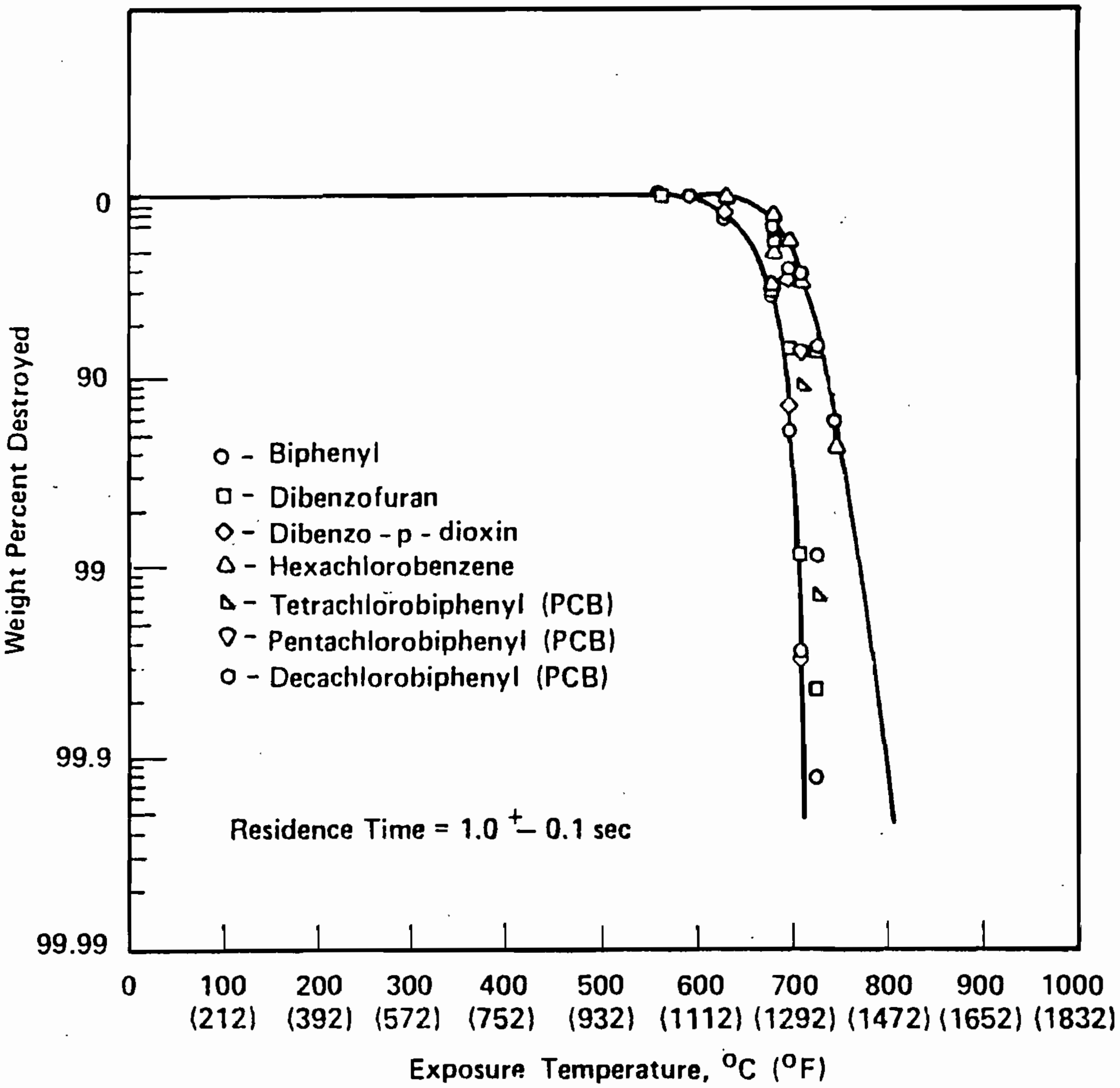

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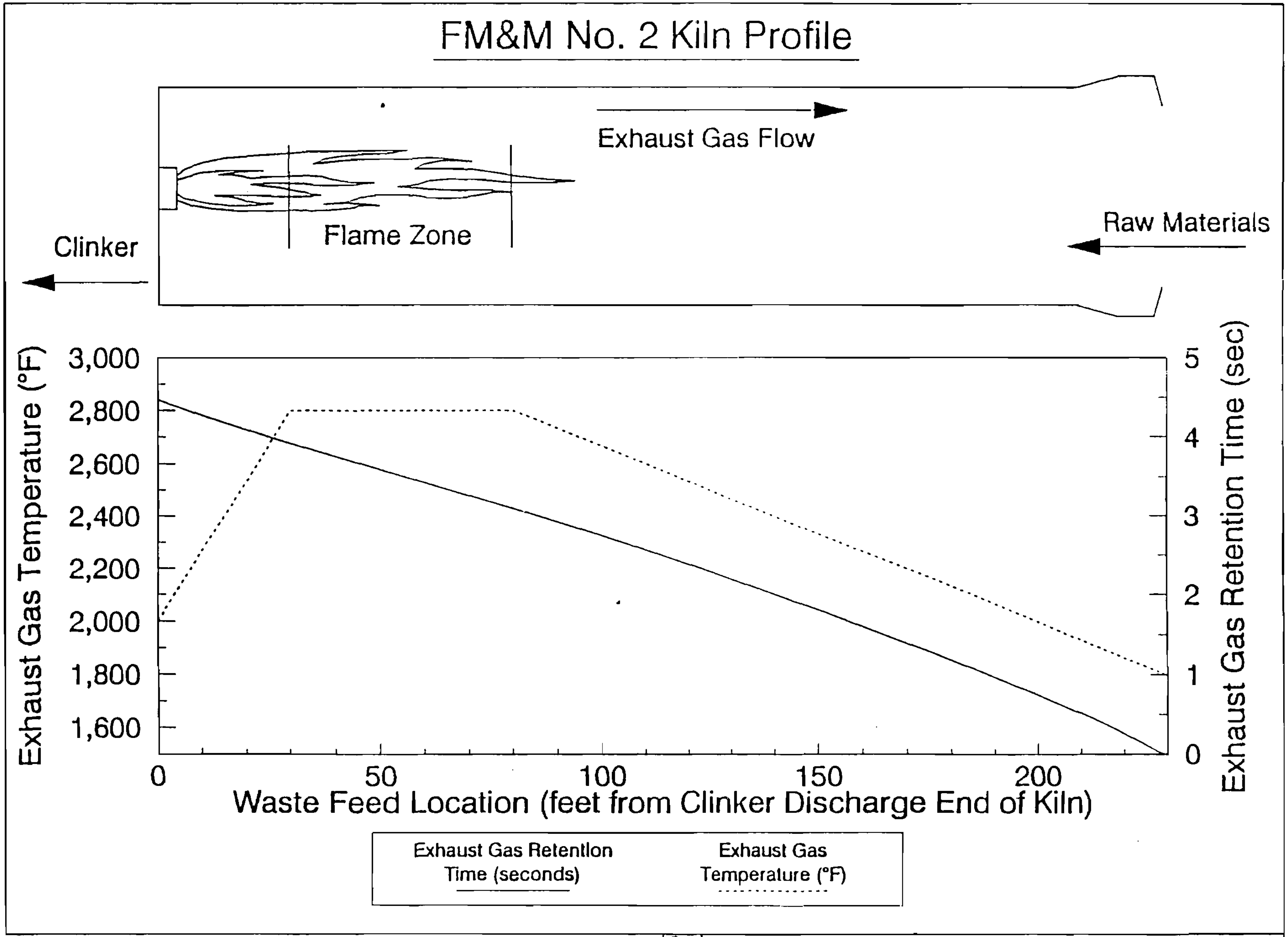
FIGURE V-1



DATA SUMMARY
(References 1 through 6)

DESTRUCTION REMOVAL EFFICIENCIES
(For Cement Kilns Burning HWF)

Reference	Carbon Tetrachloride	Trichlorobenzene	Methylene Chloride	Methylethyl Ketone	1,1,1 - Trichloroethane	Toluene
1	----	----	----	----	>99.999	----
2	----	>99.999	----	----	----	----
3	----	----	99.96	99.998	>99.999	99.995
4*	----	----	99.879	99.96	99.677	99.61
5						
A**	99.9959	----	----	----	----	
B***	99.9961	----	----	----	----	
6	> 99.9992	> 99.995				

---

* The DRE's indicated have been adjusted by a sensitivity analysis approach to include the impact of random measurement errors on the DRE calculations. The stated values therefore actually represent the minimum DRE's observable in the cement kiln by employing the test methods described in this report.

** POHC's introduced to kiln system at burner location thereby maximizing retention time.

*** POHC's introduced to kiln system along with waste tires at raw materials feed shelf thereby minimizing retention time.

Question 7

7. **Please list all waste fuel constituents and their CASR numbers that you intend to receive and process at this facility. Also, provide the maximum ambient off-property concentrations (i.e., 1-hr, 3-hr, 8-hr, 24-hr, and annual) of the individual pollutants that will be expected from the combustion of the various constituents.**

As part of the Application for a Hazardous Waste Fuels Storage Facility Permit previously submitted to the Department, the list of hazardous wastes which may be accepted at the facility has been defined. This list is included in the response to Question 1 as Table II.6 and II.6A.

Tables VII-2 and VII-3, included in the subject Air Permit Application, provide maximum ambient off-property concentrations (8-hr, 24-hr, and annual) for typical organic compounds and all metal compounds expected in the waste fuels accepted at the facility. As requested, maximum 1-hr and 3-hr concentrations have been calculated and are provided as attached Tables VII-2A and VII-3A. These tables provide a comparison of the projected concentrations with the Florida Air Toxics Permitting Strategy No Threat Levels. While the No Threat Levels are not specified for 1-hr and 3-hr averaging times, it can be assumed that each would be higher than the 8-hr level for any given compound. A review of Tables VII-2 and VII-3 shows that the calculated 1-hr and 3-hr concentrations are conservatively estimated to be below the 8-hr No Threat Level.

The maximum ambient off-property concentrations are based on the assumptions presented in Table A-1. Additionally, the maximum ambient off-property concentrations are considered conservative, since the emission rates for each compound were assumed to be substantially higher than the typical concentration of the compound in the hazardous waste fuel. For example, Benzene is assumed to exist in the hazardous waste fuel at 500,000 ppm when in actuality the typical expected concentration is 34.7 ppm.

TABLE A-1

DISPERSION MODELING PROTOCOL
INDUSTRIAL SOURCE COMPLEX - SHORT TERM

---

1) Highest and Second Highest Groundlevel Concentrations were calculated for the following averaging times: 1-hour, 3-hour, 8-hour and 24-hour.

2) Annual Concentrations were obtained from ISCST's N-day Average Concentration.

3) Receptor Grid: Rectangular coordinate system, receptors spaced every 100 meters, and grid extends far enough beyond property boundary to determine off-site maximums.

4) Discrete Receptors: Rectangular coordinate system with receptors placed every 500 meters along the eastern edge of the Chassahowitzka Wilderness Area to determine Class I Area maximum concentrations.

5) Terrain is assumed to be flat (no terrain elevations input).

6) Meteorological Data: 5 years of hourly preprocessed data from Tampa (NWS 12842), 1985 through 1989.

7) Rural Dispersion Mode.

8) Regulatory Default Option was used:

   * Final plume rise used at all down wind receptors;
   * Stack-tip downwash effects included;
   * Buoyancy-induced dispersion effects are parameterized;
   * Default wind profile coefficients are used;
   * Default vertical potential temperature gradients are used;
   * Calm processing routine used to handle concentrations during calm periods;
   * Revised building wake effects procedure is selected, either Huber-Snyder or Schulman-Scire depending on stack height and building dimensions;
   * No decay assigned to SO_2 in the rural dispersion mode.

9) Source Data:

   * Emission Rate = 1.0 gram/sec (to determine dispersion coefficients);
   * Stack Height = 90 ft;
   * Stack Diameter = 14 ft;
   * Stack Gas Exit Flow Rate = 300,000 ACFM @ 386°F.

10) Wind Direction Specific Building Dimensions for downwash and building wake effects calculations were calculated using the model BREEZE WAKE by Trinity Consultants, Inc. BREEZE WAKE produces the direction-specific, building wake effect calculations required by ISCST.

11) No gravitational settling was considered for particulate emissions.

TABLE VII-2

EVALUATION OF NO-THREAT LEVELS - ORGANIC COMPOUNDS

Compound	HWF Concentration (ppm)		Assumed(1) Emission Rate (lb/hr)	Maximum Groundlevel Concentration (µg/cu.m.)			No-Threat Level(2) (µg/cu.m.)		
	Typical	Assumed		8-hour	24-hour	Annual	8-hour	24-hour	Annual
Acrolein	100	500000	0.3751531	0.3615992	0.1500680	0.0156458	2.5	0.6	N/D
Acrylonitrile	100	500000	0.3751531	0.3615992	0.1500680	0.0156458	45	11	0.015
Benzene	34.7	500000	0.3751531	0.3615992	0.1500680	0.0156458	30	7.1	0.12
Bromoform	10	500000	0.3751531	0.3615992	0.1500680	0.0156458	50	12	N/D
Carbon Tetrachloride	10	500000	0.3751531	0.3615992	0.1500680	0.0156458	126	30	0.07
Chlorobenzene	185	500000	0.3751531	0.3615992	0.1500680	0.0156458	460	110	N/D
Chloroethane	10	500000	0.3751531	0.3615992	0.1500680	0.0156458	52000	12381	N/D
Chloroform	47.1	500000	0.3751531	0.3615992	0.1500680	0.0156458	98	23	0.04
1,2-Dichlorobenzene	55.2	500000	0.3751531	0.3615992	0.1500680	0.0156458	N/D	N/D	10
1,4-Dichlorobenzene	10	500000	0.3751531	0.3615992	0.1500680	0.0156458	4020	1071	10
Dichlorobromonethane	10	500000	0.3751531	0.3615992	0.1500680	0.0156458	N/D	N/D	N/D
Dichlorodifluoromethane	10	500000	0.3751531	0.3615992	0.1500680	0.0156458	94000	73571	200

---

(1) Destruction Removal Efficiency = 99.99%

(2) As specified in the "Florida Air Toxics Permitting Strategy - Appendix A".
N/D = Not Defined for this averaging time in the "Florida Air Toxics Permitting Strategy - Appendix A"

TABLE VII-2

EVALUATION OF NO-THREAT LEVELS - ORGANIC COMPOUNDS
(continued)

Compound	HWF Concentration (ppm)		Assumed(1) Emission Rate (lb/hr)	Maximum Groundlevel Concentration (μg/cu.m.)			No-Threat Level(2) (μg/cu.m.)		
	Typical	Assumed		8-hour	24-hour	Annual	8-hour	24-hour	Annual
1,1-Dichloroethane	10	500000	0.3751531	0.3615992	0.1500680	0.0156458	4000	952	0.04
1,2-Dichloroethane	10.2	500000	0.3751531	0.3615992	0.1500680	0.0156458	40	9.5	0.04
1,1-Dichloroethylene	10	500000	0.3751531	0.3615992	0.1500680	0.0156458	40	9.5	0.02
1,2-Dichloroethylene	10	500000	0.3751531	0.3615992	0.1500680	0.0156458	7400	1881	N/D
1,2-Dichloropropane	10	500000	0.3751531	0.3615992	0.1500680	0.0156458	3500	833	N/D
1,3-Dichloropropylene(3)	10	95	0.0000712	0.0000687	0.0000285	0.0000029	50	12	0.000003
Ethylbenzene	3560	500000	0.3751531	0.3615992	0.1500680	0.0156458	4350	1036	N/D
Methyl Bromide	10	500000	0.3751531	0.3615992	0.1500680	0.0156458	200	48	N/D
Methyl Chloride	10	500000	0.3751531	0.3615992	0.1500680	0.0156458	1050	250	N/D
Methylene Chloride	171	500000	0.3751531	0.3615992	0.1500680	0.0156458	1750	417	3

---

(1) Destruction Removal Efficiency = 99.99%

(2) As specified in the "Florida Air Toxics Permitting Strategy - Appendix A".
N/D = Not Defined for this averaging time in the "Florida Air Toxics Permitting Strategy - Appendix A"

(3) 1,3-Dichloropropylene will be controlled through prequalification review
at the processing location to ensure that it is not inappropiately blended into the fuel.

TABLE VII-2

EVALUATION OF NO-THREAT LEVELS - ORGANIC COMPOUNDS (continued)

Compound	HWF Concentration (ppm) Typical	HWF Concentration (ppm) Assumed	Assumed(1) Emission Rate (lb/hr)	Maximum Groundlevel Concentration (µg/cu.m.) 8-hour	Maximum Groundlevel Concentration (µg/cu.m.) 24-hour	Maximum Groundlevel Concentration (µg/cu.m.) Annual	No-Threat Level(2) (µg/cu.m.) 8-hour	No-Threat Level(2) (µg/cu.m.) 24-hour	No-Threat Level(2) (µg/cu.m.) Annual
1,1,2,2-Tetrachloroethane	10	500000	0.3751531	0.3615992	0.1500680	0.0156458	70	17	0.02
Tetrachloroethylene	225	500000	0.3751531	0.3615992	0.1500680	0.0156458	3350	798	N/D
Toluene	9500	500000	0.3751531	0.3615992	0.1500680	0.0156458	2000	N/D	N/D
1,1,1-Trichloroethane	512	500000	0.3751531	0.3615992	0.1500680	0.0156458	N/D	N/D	0.02
1,1,2-Trichloroethane	10	500000	0.3751531	0.3615992	0.1500680	0.0156458	450	107	N/D
Trichloroethylene	50.9	500000	0.3751531	0.3615992	0.1500680	0.0156458	2700	643	0.77
Trichlorofluoromethane	10	500000	0.3751531	0.3615992	0.1500680	0.0156458	N/D	N/D	300
Vinyl Chloride	10	500000	0.3751531	0.3615992	0.1500680	0.0156458	100	24	0.14

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(1) Destruction Removal Efficiency = 99.99%

(2) As specified in the "Florida Air Toxics Permitting Strategy - Appendix A".
N/D = Not Defined for this averaging time in the "Florida Air Toxics Permitting Strategy - Appendix A"

TABLE VII-2A

EVALUATION OF NO-THREAT LEVELS - ORGANIC COMPOUNDS

	HWF Concentration (ppm)		Assumed(1) Emission Rate	Maximum Groundlevel Concentration (µg/cu.m.)		No-Threat Level(2) (µg/cu.m.)	
Compound	**Typical**	**Assumed**	**(lb/hr)**	**1-hour**	**3-hour**	**1-hour**	**3-hour**
Acrolein	100	500000	0.3751531	0.8730189	0.539063	N/D	N/D
Acrylonitrile	100	500000	0.3751531	0.8730189	0.539063	N/D	N/D
Benzene	34.7	500000	0.3751531	0.8730189	0.539063	N/D	N/D
Bromoform	10	500000	0.3751531	0.8730189	0.539063	N/D	N/D
Carbon Tetrachloride	10	500000	0.3751531	0.8730189	0.539063	N/D	N/D
Chlorobenzene	185	500000	0.3751531	0.8730189	0.539063	N/D	N/D
Chloroethane	10	500000	0.3751531	0.8730189	0.539063	N/D	N/D
Chloroform	47.1	500000	0.3751531	0.8730189	0.539063	N/D	N/D
1,2-Dichlorobenzene	55.2	500000	0.3751531	0.8730189	0.539063	N/D	N/D
1,4-Dichlorobenzene	10	500000	0.3751531	0.8730189	0.539063	N/D	N/D
Dichlorobromonethane	10	500000	0.3751531	0.8730189	0.539063	N/D	N/D
Dichlorodifluoromethane	10	500000	0.3751531	0.8730189	0.539063	N/D	N/D

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(1) Destruction Removal Efficiency = 99.99%

(2) As specified in the "Florida Air Toxics Permitting Strategy - Appendix A".
N/D = Not Defined for this averaging time in the "Florida Air Toxics Permitting Strategy - Appendix A"

TABLE VII-2A

EVALUATION OF NO-THREAT LEVELS - ORGANIC COMPOUNDS (continued)

Compound	HWF Concentration (ppm) Typical	HWF Concentration (ppm) Assumed	Assumed[1] Emission Rate (lb/hr)	Maximum Groundlevel Concentration (μg/cu.m.) 1-hour	Maximum Groundlevel Concentration (μg/cu.m.) 3-hour	No-Threat Level[2] (μg/cu.m.) 1-hour	No-Threat Level[2] (μg/cu.m.) 3-hour
1,1-Dichloroethane	10	500000	0.3751531	0.8730189	0.539063	N/D	N/D
1,2-Dichloroethane	10.2	500000	0.3751531	0.8730189	0.539063	N/D	N/D
1,1-Dichloroethylene	10	500000	0.3751531	0.8730189	0.539063	N/D	N/D
1,2-Dichloroethylene	10	500000	0.3751531	0.8730189	0.539063	N/D	N/D
1,2-Dichloropropane	10	500000	0.3751531	0.8730189	0.539063	N/D	N/D
1,3-Dichloropropylene[3]	10	95	0.0000712	0.000167	0.0001023	N/D	N/D
Ethylbenzene	3560	500000	0.3751531	0.8730189	0.539063	N/D	N/D
Methyl Bromide	10	500000	0.3751531	0.8730189	0.539063	N/D	N/D
Methyl Chloride	10	500000	0.3751531	0.8730189	0.539063	N/D	N/D
Methylene Chloride	171	500000	0.3751531	0.8730189	0.539063	N/D	N/D

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(1) Destruction Removal Efficiency = 99.99%

(2) As specified in the "Florida Air Toxics Permitting Strategy - Appendix A".
N/D = Not Defined for this averaging time in the "Florida Air Toxics Permitting Strategy - Appendix A"

(3) 1,3-Dichloropropylene will be controlled through prequalification review
at the processing location to ensure that it is not inappropiately blended into the fuel.

TABLE VII-2A

EVALUATION OF NO-THREAT LEVELS - ORGANIC COMPOUNDS (continued)

Compound	HWF Concentration (ppm) Typical	HWF Concentration (ppm) Assumed	Assumed[(1)] Emission Rate (lb/hr)	Maximum Groundlevel Concentration (μg/cu.m.) 1-hour	Maximum Groundlevel Concentration (μg/cu.m.) 3-hour	No-Threat Level[(2)] (μg/cu.m.) 1-hour	No-Threat Level[(2)] (μg/cu.m.) 3-hour
1,1,2,2-Tetrachloroethane	10	500000	0.3751531	0.8730189	0.539063	N/D	N/D
Tetrachloroethylene	225	500000	0.3751531	0.8730189	0.539063	N/D	N/D
Toluene	9500	500000	0.3751531	0.8730189	0.539063	N/D	N/D
1,1,1-Trichloroethane	512	500000	0.3751531	0.8730189	0.539063	N/D	N/D
1,1,2-Trichloroethane	10	500000	0.3751531	0.8730189	0.539063	N/D	N/D
Trichloroethylene	50.9	500000	0.3751531	0.8730189	0.539063	N/D	N/D
Trichlorofluoromethane	10	500000	0.3751531	0.8730189	0.539063	N/D	N/D
Vinyl Chloride	10	500000	0.3751531	0.8730189	0.539063	N/D	N/D

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(1) Destruction Removal Efficiency = 99.99%

(2) As specified in the "Florida Air Toxics Permitting Strategy - Appendix A".
N/D = Not Defined for this averaging time in the "Florida Air Toxics Permitting Strategy - Appendix A"

TABLE VII-3

EVALUATION OF NO-THREAT LEVELS - METAL COMPOUNDS

	Fuel Concentration (ppm)			Emission(1)	Maximum Groundlevel Concentration (μg/cu.m.)			No-Threat Level(2) (μg/cu.m.)		
Compound	**Liquid HWF**	**Non-Pumpable HWF**	**Coal**	**Rate (lb/hr)**	**8-hour**	**24-hour**	**Annual**	**8-hour**	**24-hour**	**Annual**
Antimony	100	200	0.0	0.00411	0.0039652	0.0016456	0.0001715	5.0	1.2	N/D
Barium	4000	12000	136.3333	0.00853	0.0082181	0.0034106	0.0003555	5.0	1.2	N/D
Lead	4000	10000	1.7	0.04305	0.0414933	0.0172202	0.0017953	1.5	0.36	0.09
Mercury	5	7.5	0.0	0.02182	0.0210332	0.0087290	0.0009100	0.1	0.024	N/D
Silver	300	600	0.0	0.01791	0.0172631	0.0071644	0.0007469	N/D	N/D	3.0
Thallium	50	100	0.0	0.00355	0.0034254	0.0014215	0.0001482	N/D	N/D	0.3
Arsenic	5	7.5	5.8233	0.00002	0.0000161	0.0000067	0.0000007	2.0	0.5	0.0002
Cadmium	250	500	0.0	0.01166	0.0112341	0.0046623	0.0004860	0.5	0.12	0.0006
Chromium	3000	6000	16.5333	0.00966	0.0093114	0.0038643	0.0004028	0.5	0.12	N/D
Beryllium	8	10	1.3333	0.000157	0.0001517	0.0000629	0.0000065	0.02	0.005	0.0004

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(1) As determined in Section V of the application.

(2) As specified in the "Florida Air Toxics Permitting Strategy - Appendix A".
N/D = Not Defined for this averaging time in the "Florida Air Toxics Permitting Strategy - Appendix A"

TABLE VII-3A

EVALUATION OF NO-THREAT LEVELS - METAL COMPOUNDS

	Fuel Concentration (ppm)				Maximum Groundlevel Concentration (μg/cu.m.)		No-Threat Level(2) (μg/cu.m.)	
Compound	**Liquid HWF**	**Non-Pumpable HWF**	**Coal**	**Emission(1) Rate (lb/hr)**	**1-hour**	**3-hour**	**1-hour**	**3-hour**
Antimony	100	200	0.0	0.00411	0.009564	0.005906	N/D	N/D
Barium	4000	12000	136.3333	0.00853	0.019850	0.012257	N/D	N/D
Lead	4000	10000	1.7	0.04305	0.100182	0.061859	N/D	N/D
Mercury	5	7.5	0.0	0.02182	0.050777	0.031354	N/D	N/D
Silver	300	600	0.0	0.01791	0.061678	0.025735	N/D	N/D
Thallium	50	100	0.0	0.00355	0.008261	0.005101	N/D	N/D
Arsenic	5	7.5	5.8233	0.00002	0.000047	0.000029	N/D	N/D
Cadmium	250	500	0.0	0.01166	0.027134	0.016754	N/D	N/D
Chromium	3000	6000	16.5333	0.00966	0.011480	0.013881	N/D	N/D
Beryllium	8	10	1.3333	0.000157	0.000365	0.000226	N/D	N/D

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(1) As determined in Section V of the application.

(2) As specified in the "Florida Air Toxics Permitting Strategy - Appendix A".
N/D = Not Defined for this averaging time in the "Florida Air Toxics Permitting Strategy - Appendix A"

Question 8

8. **Since the net emissions increase per pollutant in Table V-5 are so close to the PSD significant levels contained in F.A.C. Chapter 17-2, Table 500-2, what reasonable assurances can you provide the Department that these levels will not be exceeded? Please explain in detail.**

Calculations provided in the Application and used to estimate potential emissions were conducted based on maximum levels of contaminants required by the fuel specification (Table III-5). All calculations were conducted in order to limit the fuel specification to comply with the Florida Air Toxics Permitting Strategy as well as PSD and NAAQS requirements.

No significant increase in the levels for the pollutants listed in Table V-5 are expected. This conclusion is based on the following:

(1) For the case of Sulfur Dioxide, Lead, Mercury and Beryllium, the hazardous waste fuel limitations were based on a "mass balance" approach to meet the PSD Significant Emissions Increase Criteria.

(2) For the case of Carbon Monoxide, Nitrogen Dioxide, VOC, and Particulates, the proposed potential emissions are based on testing conducted by EPA and other cement kiln/hazardous waste fuel facilities.

A more detailed discussion on the justification for the proposed potential emissions are presented below for each pollutant:

(a) CARBON MONOXIDE (CO)

CO emissions from dry-process cement kilns are strongly based on the oxygen availability in the kiln and the combustion efficiency in the process which includes the time/temperature requirements for the conversion of CO to CO_2. EPA data in Reference 3 states that baseline testing (no hazardous waste fuel) on dry-process kilns achieved CO levels of 35 to 40 ppm, while hazardous waste fuel burning results showed CO levels of 39 ppm. Further, they state "The difference between CO concentrations during the baseline and waste fuel test conditions is not significant."

(b) NITROGEN DIOXIDE (NO_x)

The NO_x concentrations in dry-process cement kilns is strongly dependent on excess air availability during the combustion process. In general, increases in excess air (O_2) yield corresponding increases in NO_x emissions. It is anticipated during the burning of hazardous waste fuel that NO_x emissions will decrease due to better distribution of heat release and less fixation of atmospheric nitrogen. EPA (Reference 3) states that "NO_x emissions are not obviously affected by burning waste fuels." Testing data in Reference 4 shows a reduction in NO_x emissions when firing liquid waste fuels when compared to firing coal only.

TABLE III-5

SPECIFICATION FOR HAZARDOUS WASTE FUELS (HWF)

	Liquid HWF	Solid HWF
Heat Content, minimum	10,000 Btu per lb	5,000 Btu per lb
Suspended Solids, maximum	30 percent	N/A
Sulfur, maximum	1 percent maximum	1 percent maximum
Halogens	5 percent	5 percent
Inorganic Acids and Bases	Extractable pH between 4.0 and 11.0	Extractable pH between 4.0 and 11.0
Water, maximum	1 percent as separate phase	No free standing liquid
Metals, maximum each		
Cadmium	250 ppm	1,000 ppm
Chromium	3,000 ppm	4,000 ppm
Lead	4,000 ppm	8,000 ppm
Barium	4,000 ppm	12,000 ppm
Antimony	See Note	See Note
Arsenic	See Note	See Note
Beryllium	See Note	See Note
Mercury	See Note	See Note
Silver	See Note	See Note
Thallium	See Note	See Note
PCB's	Less than 50 ppm	Less than 50 ppm

NOTE: This specification is subject to FDER Air Quality Section Review and is subject to change.

(c) SULFUR DIOXIDE (SO_2)

SO_2 emissions should not increase since the fuel specification limits the Sulfur content of the hazardous waste fuel based in terms of "lb of $S/10^6$ Btu" which is consistent with the existing coal input. This approach limits the Sulfur mass input (lb/hr) to the kiln to the existing rate and, therefore, no significant increase in SO_2 emissions are expected.

(d) OZONE (VOC)

VOC emissions for this process are dependent on the process combustion efficiency. Due to the high temperatures and long retention time, VOC emissions are not expected to increase.

EPA (Reference 3) states that total hydrocarbon testing results showed average results of 2 to 4 ppm for a dry-process kiln during baseline operation compared to an average of 5 ppm for three waste fuel burn cases.

Also, testing results in Reference 4 (Table II) showed a significant decrease in hydrocarbons (as measured by Method 25) when burning liquid waste fuels as compared to coal burning in the baseline case.

(e) LEAD, MERCURY AND BERYLLIUM

The proposed metal increases, as presented in Table V-5, are based on; (1) hazardous waste fuel concentration limits, and (2) metal removal efficiencies, as stated in Table V-4 (which has been attached for convenience). These metal removal efficiencies are based on testing results from Southdown, Inc. A summary of Southdown, Inc. test results for metal removal and organic compound destruction are presented in Reference 5.

TABLE V-4

EVALUATION OF METAL EMISSIONS

	Antimony	Barium	Lead	Mercury	Silver	Thallium	Arsenic	Cadmium	Chromium	Beryllium
Liquid HWF Concentration (ppm)	100	4000	4000	5	300	50	5	250	3000	8
Non-Pumpable HWF Concentration (ppm)	200	12000	10000	7.5	600	100	7.5	500	6000	10
Maximum HWF Input (ton/yr)	4.20933	252.56000	210.46667	0.16091	12.62800	2.10467	0.15785	10.52333	126.28000	0.23642
Maximum HWF Input (lb/hr)	1.02667	61.60000	51.33333	0.03925	3.08000	0.51333	0.03850	2.56667	30.80000	0.05766
Coal Concentration (ppm)	0.0	136.33333	1.7	0.0	0.0	0.0	5.8233333	0.0	16.533333	1.3333333
Coal Input (ton/yr)	0.0	12.26746	0.15297	0.00000	0.0	0.0	0.52399	0.0	1.48769	0.10810
Coal Input (lb/hr)	0.0	2.99206	0.03731	0.00000	0.0	0.0	0.12780	0.0	0.36285	0.02636
System Removal Efficiency	99.5993%	99.9868%	99.9162%	44.4000%	99.4185%	99.3077%	99.9899%	99.5459%	99.9690%	99.8126%
HWF Emissions (lb/hr)	0.00411	0.00813	0.04302	0.02182	0.01791	0.00355	0.00000	0.01166	0.00955	0.00011
HWF Emissions (lb/yr)	33.73360	66.67584	352.74213	178.93720	146.86364	29.14121	0.03189	95.57291	78.29360	0.88609
Coal Emissions (lb/hr)	0.0	0.00039	0.00003	0.00000	0.0	0.0	0.00001	0.0	0.00011	0.00005
Coal Emissions (lb/yr)	0.0	3.23861	0.25637	0.00000	0.0	0.0	0.10585	0.0	0.92237	0.40515
Estimated Potential Emissions (lb/hr)	0.00411	0.00853	0.04305	0.02182	0.01791	0.00355	0.00002	0.01166	0.00966	0.000157
Estimated Potential Emissions (lb/yr)	33.73360	69.91445	352.99851	178.93720	146.86364	29.14121	0.13773	95.57291	79.21597	1.29124
Estimated Potential Emissions (ton/yr)	0.01687	0.03496	0.17650	0.08947	0.07343	0.01457	0.00007	0.04779	0.03961	0.0006456

TABLE V-5

PSD REGULATED EMISSIONS SUMMARY

Compound	Current Actual Emissions		Proposed Potential Emissions		Net Emissions Increase	Significant* Emissions Increase
	(lb/hr)	(T/yr)	(lb/hr)	(T/yr)	(T/yr)	(T/yr)
Carbon Monoxide	41.1	162.3	64.0	262.2	99.9	100
Nitrogen Dioxide (NO_X)	158.4	625.4	162.3	665.3	39.9	40
Sulfur Dioxide	1.8	7.1	11.5	47.0	39.9	40
Ozone (VOC)	5.4	21.3	7.4	31.2	9.9	40
Particulate	7.7	30.4	13.5	55.3	24.9	25
Lead	0.00003	0.00014	0.04305	0.17650	0.17636	0.6
Mercury	0.0	0.0	0.02182	0.08947	0.08947	0.1
Beryllium	0.00006	0.0002459	0.000157	0.0006456	0.0003997	0.0004

* From Table 500-2 DER 17-2.500 (2)(e)2

Question 9

9. **Please explain in detail the facility's procedures for an emergency shutdown of the No. 2 Lime Kiln (i.e., burn out, fan loss, etc.) for each type of the hazardous waste fuels (i.e., liquid, solid, etc.).**

10. **Will there be a system electrical interlock utilized in an emergency shutdown of the No. 2 Lime Kiln? Please explain in detail.**

The response to Questions 9 and 10 have been combined since both emergency conditions and system interlock would be involved in the kiln system shutdown.

Kiln shutdown during the burning of HWF can occur for the following reasons:

1) System interlock shutdown due to process parameters.

2) System interlock shutdown due to emission monitoring parameters.

3) Emergency shutdown due to process equipment malfunction.

4) Emergency shutdown due to other factors such as power interruption or lightening.

In general, it should be stated that during any emergency or interlock, shutdown will result in HWF feed cut-off and will be implemented in full compliance with the BIF Regulations which the EPA adopted on December 31, 1990. These regulations require the installation of Continuous Emission Monitors (CEM's) for CO, HC, SO_2, NO_x and O_2. In the event that combustion conditions in the kiln deteriorate, for example the hourly rolling average of HC exceeds 20 ppm (corrected to 7% O_2), HWF feed shutoff will occur. Also, if the gas temperature at the feed end of the kiln falls below 1,800°F for more than 5 minutes, the HWF feed will be shut off.

In conjunction with the above, an "operating window" for the FM&M No. 2 Kiln, which defines the kiln operating conditions during HWF burning, will be defined during a series of test burns, as stipulated in the BIF regulations. Should the kiln system drift outside of this "operating window," the HWF feed will be shut off and operations would proceed as required by BIF regulations.

A more detailed description and discussion of the FM&M No. 2 Kiln emergency shutdown procedure and electrical interlock system, are presented in Attachment 1 and Attachment 2, respectively. These attachments are included in the response to Question 10.

In conclusion, it should be stated that regardless of the reasons for shutdown, HWF feed (solid or liquid) will be cut-off, and in most cases the kiln combustion process will continue as long as possible to destroy any feed residuals. In the worst case, where solid feed is terminated but the kiln combustion process ceases, the "thermal inertia" of the kiln will continue to maintain temperature (> 1,800°F) for at least one hour after shutdown (Attachment 1, Figure 1). This will ensure thermal destruction of any feed residuals under the worst case conditions.

Question 10

9. **Please explain in detail the facility's procedures for an emergency shutdown of the No. 2 Lime Kiln (i.e., burn out, fan loss, etc.) for each type of the hazardous waste fuels (i.e., liquid, solid, etc.).**

10. **Will there be a system electrical interlock utilized in an emergency shutdown of the No. 2 Lime Kiln? Please explain in detail.**

The response to Questions 9 and 10 have been combined since both emergency conditions and system interlock would be involved in the kiln system shutdown.

Kiln shutdown during the burning of HWF can occur for the following reasons:

1) System interlock shutdown due to process parameters.

2) System interlock shutdown due to emission monitoring parameters.

3) Emergency shutdown due to process equipment malfunction.

4) Emergency shutdown due to other factors such as power interruption or lightening.

In general, it should be stated that during any emergency or interlock, shutdown will result in HWF feed cut-off and will be implemented in full compliance with the BIF Regulations which the EPA adopted on December 31, 1990. These regulations require the installation of Continuous Emission Monitors (CEM's) for CO, HC, SO_2, NO_x and O_2. In the event that combustion conditions in the kiln deteriorate, for example the hourly rolling average of HC exceeds 20 ppm (corrected to 7% O_2), HWF feed shutoff will occur. Also, if the gas temperature at the feed end of the kiln falls below 1,800°F for more than 5 minutes, the HWF feed will be shut off.

In conjunction with the above, an "operating window" for the FM&M No. 2 Kiln, which defines the kiln operating conditions during HWF burning, will be defined during a series of test burns, as stipulated in the BIF regulations. Should the kiln system drift outside of this "operating window," the HWF feed will be shut off and operations would proceed as required by BIF regulations.

A more detailed description and discussion of the FM&M No. 2 Kiln emergency shutdown procedure and electrical interlock system, are presented in Attachment 1 and Attachment 2, respectively.

In conclusion, it should be stated that regardless of the reasons for shutdown, HWF feed (solid or liquid) will be cut-off, and in most cases the kiln combustion process will continue as long as possible to destroy any feed residuals. In the worst case, where solid feed is terminated but the kiln combustion process ceases, the "thermal inertia" of the kiln will continue to maintain temperature (> 1,800°F) for at least one hour after shutdown (Attachment 1, Figure 1). This will ensure thermal destruction of any feed residuals under the worst case conditions.

ATTACHMENT 1

KILN NO. 2 EMERGENCY SHUTDOWN PROCEDURES

While there normally are occasional interruptions in the operation of the kiln over the course of a year, very few would be classified as emergencies. In most cases, there exists prior knowledge of conditions which lead to these shutdowns and several hours are available to plan the exact time to take the kiln down. This allows sufficient time to stop introducing waste fuels into the system and to maintain full operating temperatures until they are destroyed before shutting down the process.

The attached #2 KILN SHUTDOWN SUMMARY shows that we had 42 interruptions of this process in 1990. Of these, only the nine Florida Power interruptions would have come with no warning and would be classified as emergency shutdowns. This is a fairly common occurrence in the summer months due to severe electrical storms which are typical of this climate. These interruptions are usually brief and the kiln is back on line in a matter of minutes.

Procedures will be in place and conditions will ensure that in the event of a nonemergency shutdown of the #2 kiln system the feed of both solid and liquid hazardous waste fuels will be shut off for a sufficient length of time prior to taking the process down to allow for complete purging of the system. On the infrequent occasions when this is not possible, the attached temperature charts and heat profiles show that the thermal inertia of the kiln system will provide sufficient heat to destroy all waste fuels that are in the system at the time.

Since it is impossible to measure temperature directly in the burning zone of the kiln, a correlation must be made to temperatures which are measurable to derive burning zone temperature during a shutdown period. For this purpose we will use a temperature which is measured in the lower stage of the preheater. This temperature averages approximately 1650°F when the kiln is in full production. It is a fact that the burning zone material temperature must be in excess of 2450°F to produce clinker for Portland cement. The attached graph titled KILN TEMPERATURE PROFILE shows the correlation between these two temperatures during a typical cool-down period. It clearly shows that we would maintain burning zone temperatures in excess of 1800°F for one hour after the fire is taken out of the kiln and in excess of 1200°F after two hours. This would be more than sufficient time and temperature for destruction of any waste fuels in the system.

The attached strip charts show the typical drop in the lower preheater temperature during several kiln shutdowns. The green, highlighted line on each of the charts is the recorded temperature. The scale on the strip charts is from 0 to 2200°F horizontally and one hour per inch vertically. The burning zone temperature can then be derived from the KILN TEMPERATURE PROFILE graph.

The following list of procedures details steps that are taken immediately following emergency shutdowns of #2 kiln system when there is no prior knowledge or time to prepare.

#2 KILN EMERGENCY SHUTDOWN PROCEDURES

1. STOP FEEDING OF ALL SOLID AND LIQUID HAZARDOUS WASTE FUELS IMMEDIATELY IF NOT PREVIOUSLY STOPPED BY INTERLOCKS.

2. STOP THE KILN DRIVE MOTOR AND CONNECT AUXILIARY DRIVE ENGINE FOR ROTATING KILN DURING THE SHUTDOWN.

3. REDUCE THE DRAFT ON THE KILN BY CLOSING THE DAMPER (M-2604) ON THE PREHEATER I.D. FAN (M-2602) TO MINIMUM OPENING REQUIRED TO MAINTAIN NEGATIVE PRESSURE.

4. REDUCE AIR FLOW ON CLINKER COOLER UNDERGRATE FANS TO MINIMUM TO MINIMIZE THERMAL SHOCK AND HEAT LOSS IN THE KILN.

5. KEEP A FIRE IN THE KILN AND MAINTAIN OPERATING TEMPERATURES IN THE BURNING ZONE UNTIL REPAIRS ARE MADE UNLESS THE NATURE OF THE SHUTDOWN MAKES THIS IMPOSSIBLE OR UNLESS IT HAS BEEN DETERMINED THAT A FULL COOL-DOWN WILL BE REQUIRED.

6. TURN THE KILN 1/3 OF A ROTATION EVERY 10 MINUTES WITH AUXILIARY DRIVE ENGINE UNTIL READY TO START BACK UP.

7. IF FULL COOL-DOWN IS REQUIRED THEN THE FREQUENCY OF KILN TURNS IS INCREASED BY FIVE MINUTES EVERY HOUR UP TO A MAXIMUM OF 30 MINUTES BETWEEN TURNS FOR FIRST 24 HOURS.

NOTE: Hazardous waste fuels will be utilized only in full production operation. Interlock system described in response to question 10 will insure that they will not be used for kiln warmups or in standby firing modes.

SUMMARY OF ALL #2 KILN SHUTDOWNS FOR 1990

DATE	REASON FOR SHUTDOWN	HOURS
16-Jan-90	VORTEX PLUGGED	5.7
17-Jan-90	M-2907 COOLER FAN (REPLACE WHEEL)	2.5
29-Jan-90	REFRACTORY REPAIRS	212.4
08-Feb-90	M-2864 COAL FAN DAMPER CHANGE-OUT	1.4
13-Feb-90	COAL MILL BEARING TEMP. (7.69.1)	0.1
15-Feb-90	STIFFENER RING BOLTS	0.5
01-Mar-90	COOLER GRATE OUT	4.5
02-Mar-90	MCC-13 TRANSFORMER OUT	2.4
12-Mar-90	REFRACTORY REPAIRS	52.4
16-Mar-90	FLORIDA POWER	0.1
03-Apr-90	LOST POWER ON MCC-13	0.2
08-Apr-90	M-2514 AEROPOL BLOWER	3.9
09-Apr-90	M-2514 AEROPOL BLOWER	2.7
12-Apr-90	COOLER GRATE OUT	4.1
29-Apr-90	MCC-9 TRANSFORMER JOB (ELECTRICAL DEPT.)	0.4
	NO DOWN TIME FOR MAY	
03-Jun-90	FLORIDA POWER INTERRUPTION	0.1
06-Jun-90	COOLER GRATE OUT	6.4
16-Jun-90	CLINKER COOLER (HYDRAULIC OIL COOLER LEAKING)	2.5
22-Jun-90	CLINKER COOLER (BAD DRIVE CYLINDER)	4.3
24-Jun-90	REFRACTORY REPAIRS	108.8
08-Jul-90	FLORIDA POWER INTERRUPTION	0.1
10-Jul-90	FLORIDA POWER INTERRUPTION	0.1
11-Jul-90	FLORIDA POWER INTERRUPTION	0.2
13-Jul-90	M-2925 CLINKER BREAKER CHUTE PLUGGED	5.4
15-Jul-90	REFRACTORY REPLACEMENT	90.6
18-Aug-90	FLORIDA POWER	0.1
23-Aug-90	FLORIDA POWER	1.5
02-Sep-90	FLORIDA POWER INTERRUPTION	0.2
26-Sep-90	REPLACE STIFFENER RING BOLT	0.5
02-Oct-90	REPLACE STIFFENER RING BOLT	0.4
06-Oct-90	REFRACTORY REPLACEMENT	144.6
18-Oct-90	COOLER GRATE REPLACEMENT	3.1
21-Oct-90	FLORIDA POWER INTERRUPTION	0.1
06-Nov-90	PLUG BOLT HOLE IN COAL MILL	0.1
08-Nov-90	TIGHTEN STIFFENER BOLT RING	0.3
09-Nov-90	M-2925 CLINKER BREAKER	3.0
14-Nov-90	REPLACE COOLER GRATE	4.0
21-Nov-90	REPLACE COOLER GRATE	4.0
30-Nov-90	DOWN WHEN #2 RAW MILL STARTED (CROSS TIE WAS IN)	0.3
03-Dec-90	M-2701 DRIVE MOTOR	10.5
07-Dec-90	M-2701 DRIVE MOTOR	4.8
20-Dec-90	REFRACTORY REPAIRS	270.5

FIGURE 1

KILN TEMPERATURE PROFILES

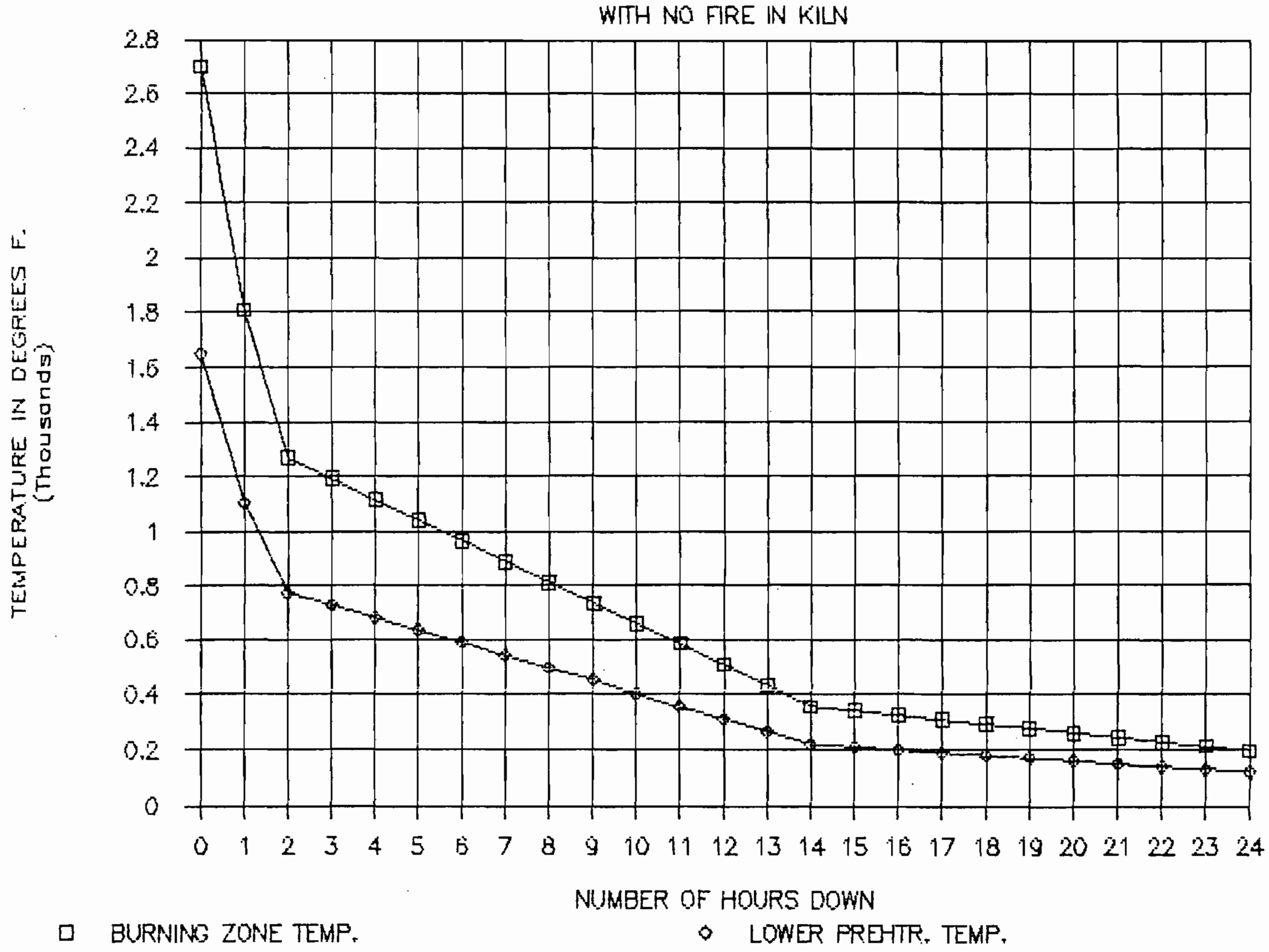


FIGURE 2

LOWER STAGE PREHEATER TEMPERATURE (TEMPERATURE IN °F)

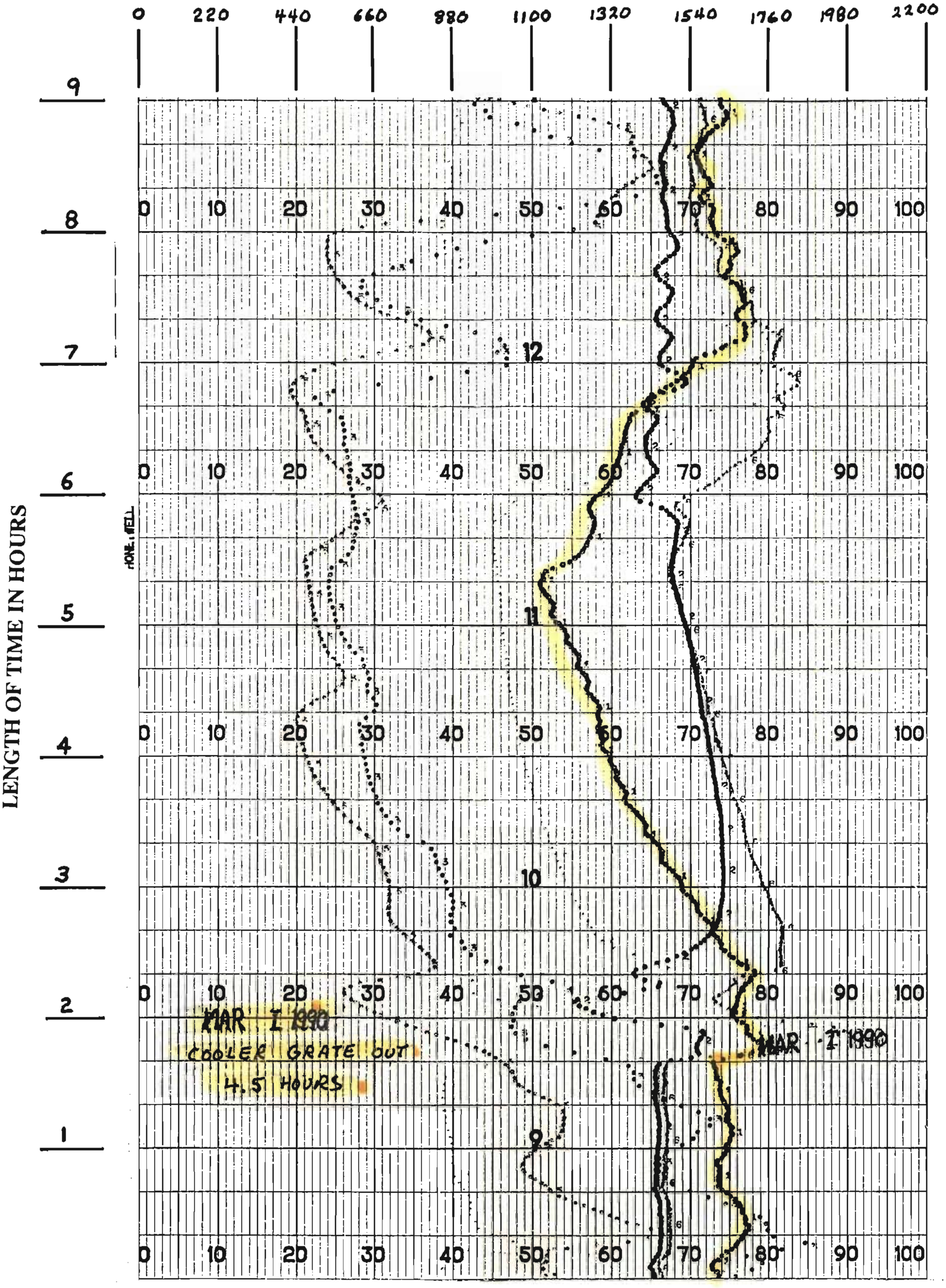
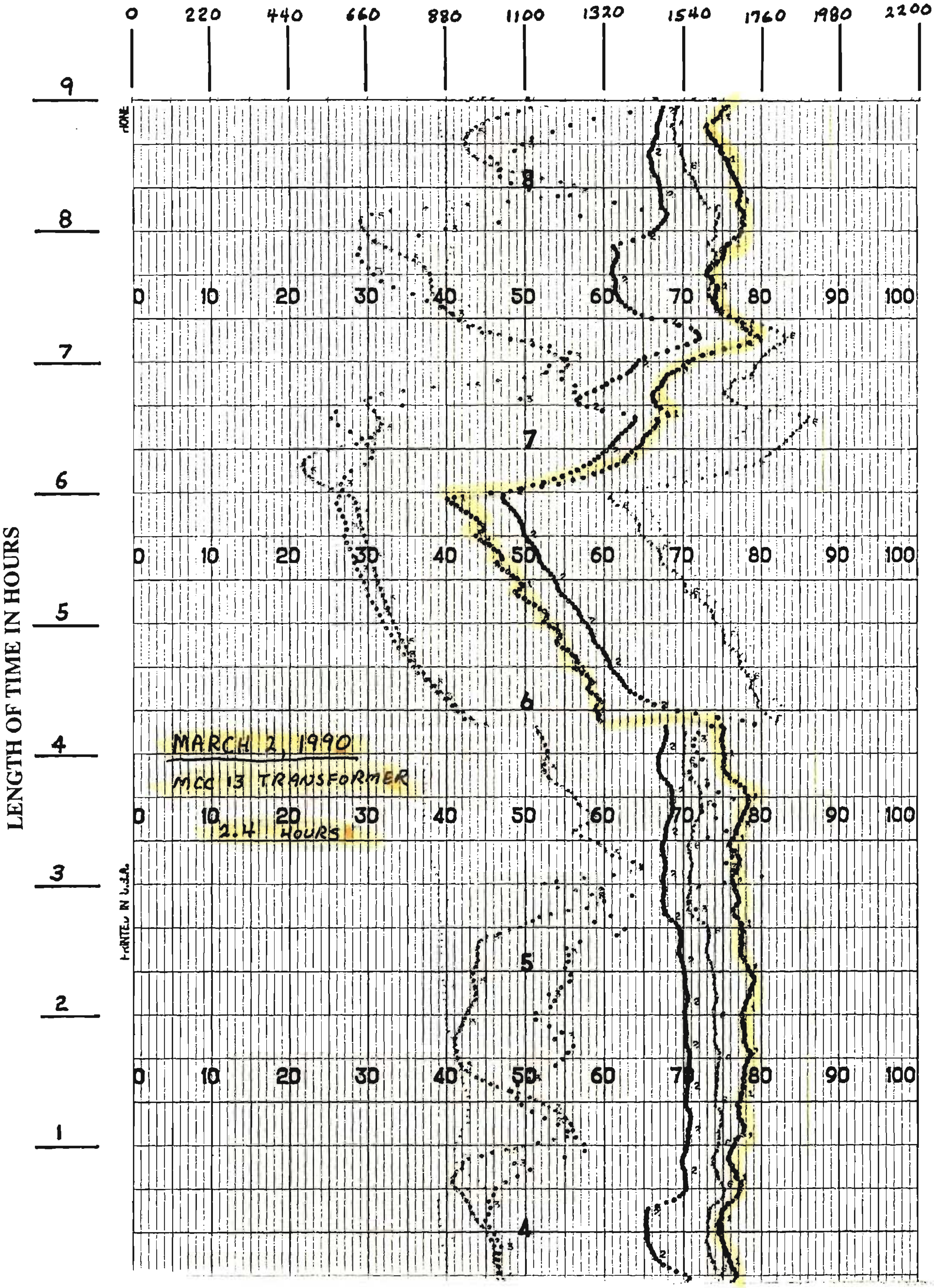


FIGURE 3

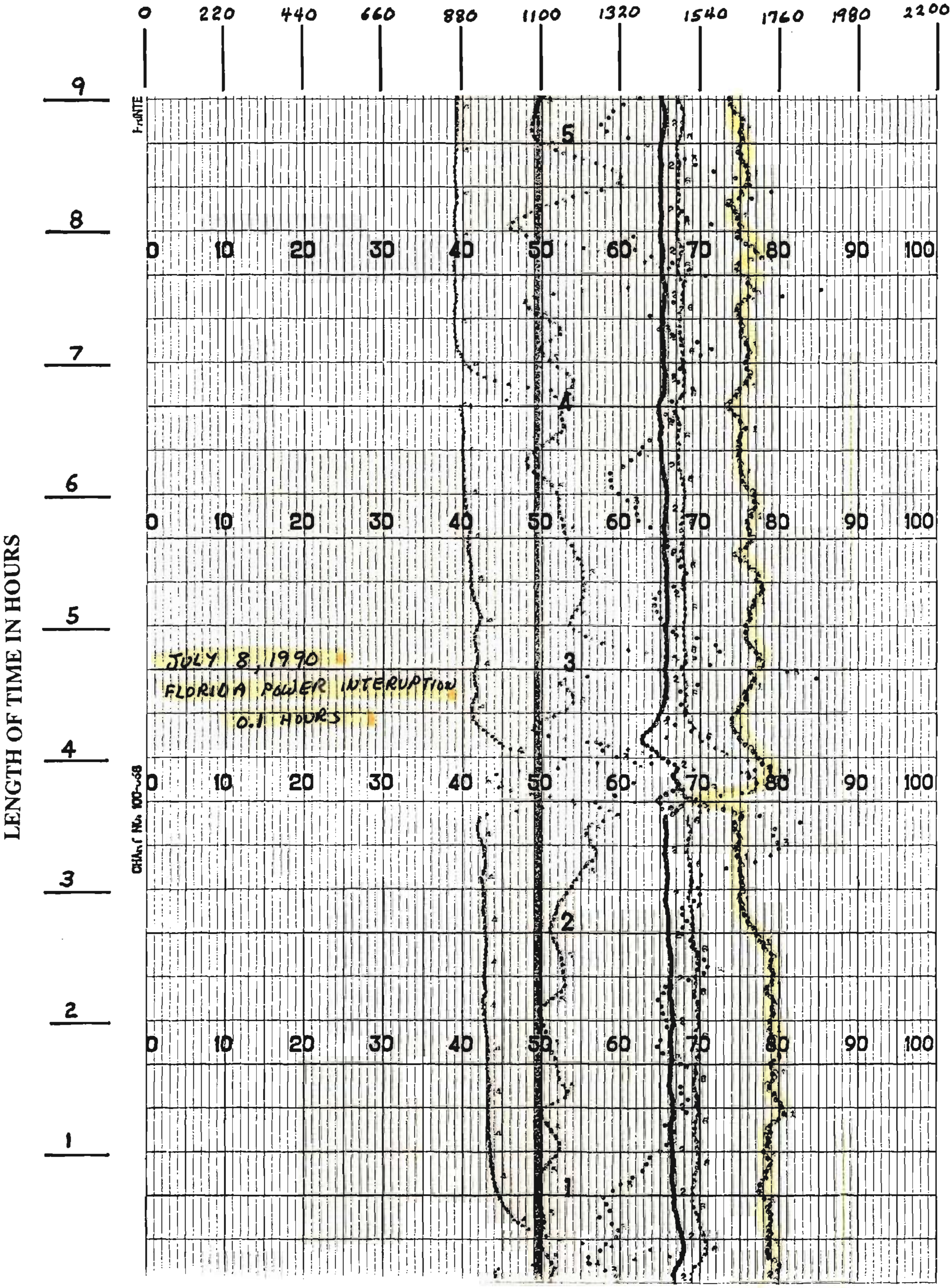
LOWER STAGE PREHEATER TEMPERATURE
(TEMPERATURE IN °F)



MARCH 2, 1990
MCC 13 TRANSFORMER
2.4 HOURS

FIGURE 4

LOWER STAGE PREHEATER TEMPERATURE
(TEMPERATURE IN °F)



JULY 8, 1990
FLORIDA POWER INTERUPTION
0.1 HOURS

ATTACHMENT 2

KILN NO. 2 ELECTRICAL INTERLOCKS SYSTEM

System electrical interlocks are now and will continue to be utilized in emergency shutdown situations as well as during normal operating conditions on #2 kiln. The following is a detailed explanation of each of the interlocks in the present system as well as those which will be added specifically for firing with hazardous waste fuels.

1. Kiln/Mill Baghouse Inlet Temperature

This interlock already exists in the present #2 kiln system and is intended to prevent damage to the baghouse filter bags due to exposure to extremely high temperatures. This temperature is monitored with two thermocouples, each serving as a backup to the other. An audible alarm is sounded in the control room as the baghouse temperature approaches a threatening level. The Process Supervisor must then take immediate action to get the situation under control. If he is unable to do so and the temperature continues to rise then the firing system is shut down automatically to prevent equipment damage. The low temperature shutdown is designed to cause the system to "fail safe" if either thermocouple fails due to an open circuit giving a falsely low temperature reading. This insures that the system cannot be operated without properly functioning monitoring devices.

2. Clinker Cooler Baghouse Inlet Temperature

This interlock is also in use in the present system and is designed identical to the one described above and serves the same purpose of protecting the filter bags from damage due to exposure to extremely high temperatures.

3. Preheater I.D. Fan Inlet Temperature

This interlock also exists in the present system and is intended to prevent damage to the preheater fan due to exposure to extremely high temperatures. An audible alarm is sounded in the control room when the fan temperature reaches the initial alarm point. The Process Supervisor must then take immediate action to get the situation under control. If he is unable to do so and the temperature continues to rise then the firing system is shut down automatically to prevent fan damage.

4. Preheater I.D. Fan Exit Pressure

This interlock already exists and is designed to shut the system down if the kiln/mill baghouse shows signs of inability to handle the volume of gas currently being used in the process. The baghouse should be able to maintain safely negative pressures at the fan exhaust duct. If not, it shuts down firing systems so that excessive air volume can be reduced.

5. <u>Combustibles</u>

This is an existing interlock and is designed to assure that a sufficient amount of combustion air is available for complete combustion of fuels which are being fired in the kiln. Any deficiencies in oxygen will cause formation of carbon monoxide which is a highly combustible compound. If CO is detected at levels of 1% or more then the firing systems are shut down.

6. <u>Coal Mill I.D. Fan Shutdown</u>
7. <u>Preheater I.D. Fan Shutdown</u>
8. <u>Kiln/Mill Baghouse Exhaust Fan Shutdown</u>

All three of these fans are vital to kiln firing system and firing systems cannot be operated unless they are running.

9. <u>Waste Fuel Atomizing Air Pressure Low</u>

Waste fuels will be air atomized as they are introduced into the kiln to sustain rapid and complete combustion. If the required pressure is not indicated then the waste fuels will be shut off.

10. <u>Kiln Exit Gas Temperature Low</u>

Because it is our intention to introduce hazardous waste fuels into the process only when we have sufficient temperatures for rapid and complete combustion, we will install interlocks which will shut down waste fuel firing if we drop below minimum temperature requirements in this area.

11. <u>Coal Mill Drive Motor Shutdown</u>

Because it is our intention to use waste fuels only when operating at normal production rates and not during warmup and standby firing modes, we will install interlocks that allow for waste fuel firing only if the coal mill is running. Since the coal mill runs only during normal operating conditions this would assure the same for waste fuels.

12. <u>Manual-Only Restart</u>

Initial start-up of waste fuel firing system and any subsequent restart of the system would require the conscious action of the Process Supervisor. The system will not restart automatically following interruptions due to interlock systems, etc.

#2 KILN ELECTRICAL INTERLOCK SUMMARY

	INTERLOCK	ALARM	ACTION TAKEN
1	PREHEATER I.D.FAN INLET TEMPERATURE	800 °F	AUDIBLE ALARM ON C.O.P. IN CONTROL ROOM
		840 °F	COAL AND WASTE FUELS SHUT OFF
2	KILN/MILL BAGHOUSE INLET TEMPERATURE	520 °F	AUDIBLE ALARM ON C.O.P. IN CONTROL ROOM
		540 °F	COAL AND WASTE FUELS SHUT OFF
		30 °F	COAL AND WASTE FUELS SHUT OFF (FAIL SAFE)
3	CLINKER COOLER BAGHOUSE INLET TEMPERATURE	400 °F	AUDIBLE ALARM ON C.O.P. IN CONTROL ROOM
		440 °F	COAL AND WASTE FUELS SHUT OFF
		30 °F	COAL AND WASTE FUELS SHUT OFF (FAIL SAFE)
4	PREHEATER I.D. FAN EXIT PRESSURE	+5"WC	FAN MOTOR, COAL AND WASTE FUELS SHUT OFF
5	COMBUSTIBLES	1%	COAL MILL FEEDER AND WASTE FUELS SHUT OFF
6	COAL MILL I.D. FAN SHUTDOWN	MOTOR STOPS	COAL AND WASTE FUELS SHUT OFF
7	PREHEATER I.D. FAN SHUTDOWN	MOTOR STOPS	COAL AND WASTE FUELS SHUT OFF
8	KILN-MILL BAGHOUSE EXHAUST FAN SHUTDOWN	MOTOR STOPS	COAL AND WASTE FUELS SHUT OFF
9	LOW ATOMIZING AIR PRESSURE	UNKNOWN	WASTE FUELS SHUT OFF
10	KILN EXIT GAS TEMPERATURE LOW	1200F	WASTE FUELS SHUT OFF
11	COAL MILL DRIVE MOTOR	MOTOR STOPS	WASTE FUELS SHUT OFF
12	MANUAL RE-START	N/A	FIRING OF WASTE FUELS NOT AUTOMATIC WHEN ALARM CLEARS

Question 11

11. **Please provide a detailed cost analysis for an afterburner/incinerator, or an equivalent, that meets the criteria of 40 CFR 264.343 (July, 1988 version) and could be retrofitted to the No. 2 Lime Kiln.**

    Attached is a cost analysis conducted using the <u>EAB Control Cost Manual</u> EPA 450/5-87-001A, February, 1987. Design criteria of 2,000°F @ 2.0 seconds retention time would require three parallel thermal oxidizer chambers approximately 22 feet in diameter and 60 feet long to provide additional secondary combustion of kiln exhaust gases. This analysis demonstrates that the estimated total capital investment for a three-component thermal oxidizer system sized to operate with the No. 2 kiln would be $1,532,582.00. Operating costs would exceed $60,000,000.00 annually.

FLORIDA MINING AND MATERIALS
AFTERBURNER DESIGN CALCULATIONS

Flow Conditions @ Baghouse Exit:

Total Flow Rate = 300,000 acfm @ 380°F

H_2O = 10%

= 30,000 acfm @ 380°F

Specific Volume of H_2O @ 380°F = 34.08 cf/lb

H_2O Mass Flow = (30,000 cf/min) x (50 min/hr) ÷ (34.08 cf/lb)

= 52,817 lb/hr

Dry Gas Flow Rate = 199,000 dscfm

Specific Volume Dry Gas = 13.3 cf/lb

Dry Gas Mass Flow = (199,000 cf/min) x (60 min/hr) ÷ (13.3 cf/lb)

= 897,744 lb/hr

Enthalpy H_2O @ 380°F = 1202.38 Btu/lb

Enthalpy Dry Gas @ 380°F = 77.31 Btu/lb

Total Exhaust Gas Heat Content = [(897,744 lb/hr) x (77.31 Btu/lb)]

\+ [(52,817 lb/hr) x (1202.38 Btu/lb)]

= 132.91 x 10^6 Btu/hr

Afterburner Mass and Energy Balance

Assumptions:

Heat Loss = 5%

Operating Temperature = 2000°F

Combustion Air Inlet Temperature = 70°F

FLORIDA MINING AND MATERIALS
AFTERBURNER DESIGN CALCULATIONS

Results:

Total Flow Rate = 2,037,705 acfm @ 2000°F

Dry Gas Mass Flow = 1,709,950 lb/hr

H_2O Mass Flow = 164,658 lb/hr

Total Auxiliary Fuel Required = 1086 mmBtu/hr

Design Conditions:

Retention Time = 2 sec.

Velocity = 30 fps

Geometry = Vertical Cylinder

Case A - 2 Components
Case B - 3 Components

Total Volume Required = (2,037,705 cf/min) ÷ (60 min/sec) x (2 sec)

= 67,923.5 cf

<u>CASE A (2 Components)</u>

Component Volume = 67,923.5 cf ÷ 2

= 33,962 cf

Component Flow Rate = 2,037,705 acfm ÷ 2

= 1,018,852.5 acfm @ 2000°F

Cross Sectional Area = $\pi \dfrac{D^2}{4}$

= Flow Rate ÷ Velocity

D = (Flow Rate x 4 ÷ π ÷ Velocity) $^{1/2}$

= (1,018,852.5 cf/min x 4 ÷ π ÷ 60 s/min ÷ 30 fps) $^{1/2}$

= 26.8 ft.

L = Velocity x Retention Time

= 30 fps x 2 s

= 60 ft.

FLORIDA MINING AND MATERIALS
AFTERBURNER DESIGN CALCULATIONS

CASE B (3 Components)

Component Volume = 67,923.5 cf ÷ 3

= 22641 cf

Component Flow Rate = 2,037,705 acfm ÷ 3

= 679,235 acfm @ 2000°F

$$\text{Cross Sectional Area} = \pi \frac{D^2}{4}$$

Flow Rate ÷ Velocity

$$D = (679{,}235 \text{ cf/min} \times 4 \div \pi \div 60 \text{ s/min} \div 30 \text{ fps})^{1/2}$$

= 21.9 ft.

L = Velocity x Retention Time

= 30 fps x 2 s

= 60 ft.

EQUIPMENT COST CALCULATIONS

CASE A:

Component Flow Rate = 1,018,853 acfm @ 2000°F

= 1,018,853 x (460 + 70) / (460 + 2000)

= 219,509 scfm

From Table 3-1. Equations for Incinerator Equipment Costs

EAB Control Cost Manual EPA 450/5-87-001A, February, 1987:

$$\ln Eq = [14{,}402 - 992(\ln Q) + 70\,(\ln Q)^2]\ (10^{-3})$$

Where Eq = Equipment Cost (Each Component)

Q = Flow Rate (scfm)

FLORIDA MINING AND MATERIALS
AFTERBURNER DESIGN CALCULATIONS

$\ln Eq = [14{,}402 - 992\ (12.3) + 70\ (151.3)\}\ (10^{-3})$

$= [14{,}402 - 12201.6 + 10591]\ (10^{-3})$

$= 12.8$

$Eq = \$359{,}116$ per component

Total Capital Equipment Cost = $718,232

Total Capital Investment = 1.9 (Total Equipment Cost)

= $1,364,641

<u>CASE B</u>:

Component Flow Rate = 679,235 acfm @ 2000°F

= 679,235 x (460 + 70) / (460 + 2000)

= 146,339 scfm

$\ln Eq = [14{,}402 - 992\ (\ln Q) + 70\ (\ln Q)^2]\ (10^{-3})$

$= [14{,}402 - 992\ (11.9) + 70\ (141.5)]\ (10^{-3})$

$= [14{,}402 - 11805 + 9905]\ (10^{-3})$

$= 12.5$

$Eq = \$268{,}874$ per Component

Total Capital Equipment Cost = $806,622

Total Capital Investment = $1,532,582

FLORIDA MINING AND MATERIALS
AFTERBURNER DESIGN CALCULATIONS

ANNUAL OPERATING COSTS

Direct Operating Costs (From Table 3-3)

Operating Labor = 0.5 hr/shift
3 shifts/day
365 days/yr
= (0.5) (3) (365)
= 547.5 hr/yr @ 12.50 $/hr
= $6,843.75

Supervisory Labor = 15% of operating labor
= 82 hr/yr @ 12.50 $/hr
= $1,025.00

Maintenance Labor = 0.5 hr/shift
= 547.5 hr/yr @ 12.50 $/hr
= $6,843.75

Maintenance Materials = 100% of maintenance labor
= 6843.75

Utilities = 1086 mmBtu/hr
(Fuel oil - 144,800 Btu/gal @ 1 $/gal)
8200 hr/yr
= (7337.8 gal/hr) (8200 hr/yr)
= $60,170,270 /yr

TOTAL = $60,191,826.25

TABLE 3-3. SUGGESTED FACTORS FOR ESTIMATING INCINERATOR ANNUAL COSTS

Item	Suggested Factor
Direct Operating Costs	
Operating labor[a]	0.5 hr/shift
Supervisory labor[a]	15% of operating labor
Maintenance labor	0.5 hr/shift
Maintenance materials[a]	100% of maintenance labor
Replacement parts	Thermal incinerators: None Catalytic incinerators: (See eq. 3-12)
Utilities:	
Fuel	The amount of fuel required is calculated from Step 5 (Q_3) of Section 3.2.
Electricity[b,c]	Use the following ΔP values in estimating electricity requirements: Thermal incinerators = 4 in. water Catalytic incinerators = 6 in. water Heat exchange of 35% = 4 in. water 50% = 8 in. water 70% = 15 in. water Ductwork and stack = As required
Indirect Operating Costs	
Overhead	60% of sum of operating, supervisory, and maintenance labor and maintenance materials
Administrative charges	2% X TCI[d]
Property tax	1% X TCI[d]
Insurance	1% X TCI[d]
Capital recovery cost[e]	CRFs X [TCI - 1.08 x C_{cat}]

[a] Reference 11.

[b] The total ΔP of an incinerator system is the sum of base (i.e., incinerator) ΔP + heat exchanger ΔP.

[c] An equation to calculate electricity requirements (kWh per hour) is given in Item 3 of Section 3.2.2.

[d] TCI = Total capital investment.

[e] The CRFs (system capital recovery factor) is a function of the equipment life (10 years, typically) and the opportunity cost of the capital (i.e., interest rate). For instance, for a 10-year life and a 10% interest rate, CRF_s = 0.1628.

Question 12

12. **Will the facility, under this proposal, be receiving and processing any TSCA substances, such as PCB's for example, that would require U.S. EPA approval? If so, please describe in detail and provide the approval from the U.S. EPA.**

The facility will not accept any TSCA substances. Table III-5, "Specification for Hazardous Waste Fuels" provides for limiting PCB content of waste fuels to a maximum of 50 ppm.

TABLE III-5

SPECIFICATION FOR HAZARDOUS WASTE FUELS (HWF)

	Liquid HWF	Solid HWF
Heat Content, minimum	10,000 Btu per lb	5,000 Btu per lb
Suspended Solids, maximum	30 percent	N/A
Sulfur, maximum	1 percent maximum	1 percent maximum
Halogens	5 percent	5 percent
Inorganic Acids and Bases	Extractable pH between 4.0 and 11.0	Extractable pH between 4.0 and 11.0
Water, maximum	1 percent as separate phase	No free standing liquid
Metals, maximum each		
Cadmium	250 ppm	1,000 ppm
Chromium	3,000 ppm	4,000 ppm
Lead	4,000 ppm	8,000 ppm
Barium	4,000 ppm	12,000 ppm
Antimony	See Note	See Note
Arsenic	See Note	See Note
Beryllium	See Note	See Note
Mercury	See Note	See Note
Silver	See Note	See Note
Thallium	See Note	See Note
PCB's	Less than 50 ppm	Less than 50 ppm

NOTE: This specification is subject to FDER Air Quality Section Review and is subject to change.

Question 13

13. **If available, please provide us with all pollutant stack test data from like and similar sources (i.e., raw material processed, size, etc.) burning similar type fuels that are proposed for the No. 2 Lime Kiln.**

Attached as References 1 through 6, are test reports from the following facilities burning hazardous waste fuels:

Reference 1) Ash Grove Foreman Cement Company
Kiln Number 2
Foreman, Arkansas

Reference 2) Ash Grove Cement Company
Kiln Number 2
Louisville, Nebraska

Also provided are the following technical references:

Reference 3) Summary of Testing at Cement Kilns Cofiring Hazardous Waste
Marvin Branscome, Wayne Westbrook
Research Triangle Institute
Research Triangle Park, North Carolina

Reference 4) Evaluation of Hazardous Waste Incineration in a Dry Process Cement Kiln
Gregory M. Higgins and Arthur J. Helmstetter, P.E.
SYSTECH Corporation
Xenia, Ohio

Reference 5) The Behavior of Metals in Cement Kilns
Michael Von Seebach and J. Bruce Tompkins
Presented at: Rock Product's
26th International Cement Seminar
New Orleans, Louisiana

Reference 6) Source Emission Survey of Southwestern Portland Cement Company
Kosmos Cement Division
Kiln Stack
Kosmosdale, Kentucky
Volume 1, September, 1990

A summary of the DRE data included in each of these references is provided in the response to Question 6.

REFERENCE 1

ENVIROME
P.O. Box 59
Addison, TX 7
(214) 931-71

SOURCE EMISSIONS SURVEY
OF
ASH GROVE FOREMAN CEMENT COMPANY
KILN NUMBER 2
NORTH AND SOUTH STACKS
FOREMAN, ARKANSAS

OCTOBER 1988

FILE NUMBER 88-170

88-170

11/[illegible]

Cr 0.021
0.051
0.017
0.0[illegible]
0.026
0.0[illegible]
0.061
0.017

X̄ = 0.03275

σ = 0.01[illegible]

Pb 0.035
0.069
0.[illegible]9
0.077
0.1[illegible]
0.07[illegible]
0.021
0.012

Ȳ = 0.0791

σ 0.077

SUMMARY OF RESULTS

Kiln Number 2

Run Number	Kiln Fuel Firing Rates Coal (tons/hr)	Kiln Fuel Firing Rates K Blend (tons/hr)	Kiln Fuel Firing Rates SWDF (lbs/hr)	Kiln Feed Rate (tons/hr)	Particulate Matter Emissions (lbs/hr)	Particulate Matter Emissions (lbs/ton Kiln Feed)	Hydrogen Chloride Emissions (ppm)	Hydrogen Chloride Emissions (lbs/hr)	Volatile Organic Compounds Emissions (ppm)	Volatile Organic Compounds Emissions (lbs/hr)	Carbon Monoxide Emissions (ppm)	Carbon Monoxide Emissions (lbs/hr)	Trichlorobenzene DRE (%)
1	7.5	0	60.0	45.0	6.88	0.153	114.2	19.8	7	1.47	46	6.14	>99.9999
2	7.3	0	60.0	45.0	7.12	0.158	178.0	28.4	12	2.31	40	4.90	>99.9999
3	6.9	0	60.0	45.0	4.67	0.104	96.7	16.4	22	4.52	33	4.31	>99.9999
Average	7.2	0	60.0	45.0	6.22	0.138	129.6	21.5	14	2.77	40	5.12	>99.9999
4	2.0	5.9	62.4	46.7	19.40	- 0.415 -	112.4	17.2	6	1.11	42	4.93	>99.9999
5	2.0	7.4	74.1	53.7	12.14	0.226	115.4	21.5	12	2.70	282	40.42	>99.9999
6	2.0	6.5	80.0	53.0	26.76	0.505	106.4	19.7	7	1.56	51	7.25	>99.9999
Average	2.0	6.6	72.2	51.1	19.43	0.382	111.4	19.5	8	1.79	125	17.53	>99.9999
7	3.5	5.0	75.1	53.0	5.39	0.102	116.4	20.2	7	1.47	61	8.16	>99.9999
8	3.1	5.0	80.0	53.0	23.63	0.446	122.0	22.2	9	1.98	44	6.16	>99.9999
Average	3.3	5.0	77.6	53.0	14.51	0.274	119.2	21.2	8	1.73	53	7.16	>99.9999

BEST AVAILABLE COPY

SUMMARY OF RESULTS

Kiln Number 2

Firing Coal and Solid Waste Derived Fuel

Stack	South	South	North
Run Number	1	2	3
Stack Flow Rate - ACFM	78,345	75,442	78,503
Stack Flow Rate - DSCFM*	30,612	28,106	29,959
% Water Vapor - % Vol.	32.35	34.04	31.52
% CO_2 - % Vol.	16.6	17.3	17.3
% O_2 - % Vol.	8.2	7.2	7.2
% Excess Air @ Sampling Point	70	56	56
Particulates **Probe, Cyclone & Filter Catch** grains/dscf*	0.0262	0.0295	0.0182
grains/cf @ Stack Conditions	0.0102	0.0110	0.0069
lbs/hr	6.88	7.12	4.67
Kiln Feed - tons/hr	45.0	45.0	45.0
Particulate Emissions - lbs/ton kiln feed	0.153	0.158	0.104
Hydrogen Chloride Emissions - ppm	114.2	178.0	96.7
Hydrogen Chloride Emissions - lbs/hr	19.8	28.4	16.4

* 29.92 "Hg, 68°F (760 mm Hg, 20°C)

SUMMARY OF RESULTS

Volatile Organic Compounds

Kiln Number 2

Firing Coal and Solid Waste Derived Fuel

Run Number	1	2	3	Ambient
Methane Concentration - ppm	1	1	1	3
Methane Emissions - lbs/hr	0.08	0.07	0.07	----
Ethane Concentration - ppm	1	1	1	0
Ethane Emissions - lbs/hr	0.14	0.13	0.14	----
Propane Concentration - ppm	----	----	----	----
Propane Emissions - lbs/hr	----	----	----	----
Non-Methane, Non-Ethane VOC Concentration as Propane - ppm	7	12	22	8
Non-Methane, Non-Ethane VOC Emissions as Propane - lbs/hr	1.47	2.31	4.52	----
Total Hydrocarbons Concentration as Propane - ppm	----	----	----	----
Total Hydrocarbons Emissions as Propane - lbs/hr	----	----	----	----

*29.92 "Hg, 69°F (760 mm Hg, 20°C)

SUMMARY OF RESULTS

Kiln Number 2

Firing Coal and Solid Waste Derived Fuel

Run Number		1	2	3
Carbon Monoxide - parts per million	Chart	55	48	40
	Actual	46	40	33
Carbon Monoxide Emissions -	lbs/hr	6.14	4.90	4.31

$$\text{Actual ppm CO} = \text{ppm CO (chart)} \times \left[1 - \frac{\%\ CO_2}{100}\right]$$

$$\text{CO (lbs/hr)} = \frac{\text{ppm CO} \times 28 \times 60 \times \text{DSCFM}^*}{385.1 \times 10^6}$$

* 29.92 "Hg, 68°F (760 mm Hg, 20°C)

SUMMARY OF RESULTS

Kiln Number 2

Metals Emissions

Firing Coal and Solid Waste Derived Fuel

	Run Number 1		Run Number 2		Run Number 3	
	Total µgs	lbs/hr	Total µgs	lbs/hr	Total µgs	lbs/hr
Arsenic	<1.0	$<9.89\text{x}10^{-5}$	<1.0	$<9.58\text{x}10^{-5}$	1.1	$1.08\text{x}10^{-4}$
Beryllium	<4.0	$<3.96\text{x}10^{-4}$	<4.0	$<3.83\text{x}10^{-4}$	<4.0	$<3.94\text{x}10^{-4}$
Cadmium	4.7	$4.65\text{x}10^{-4}$	4.9	$4.69\text{x}10^{-4}$	2.6	$2.56\text{x}10^{-4}$
Chromium	506.0	0.050	638.0	0.061	194	0.019
Lead	228.0	0.023	220.0	0.021	118	0.012
Mercury	0.3	$2.97\text{x}10^{-5}$	0.3	$2.87\text{x}10^{-5}$	0.1	$9.84\text{x}10^{-6}$
Silver	<1.0	$<9.89\text{x}10^{-5}$	<1.0	$<9.58\text{x}10^{-5}$	<1.0	$<9.85\text{x}10^{-5}$
Selenium	5.5	$5.44\text{x}10^{-4}$	3.5	$3.35\text{x}10^{-4}$	3.2	$3.15\text{x}10^{-4}$
Thallium	<100.0	$<9.89\text{x}10^{-3}$	<100.0	$<9.58\text{x}10^{-3}$	<100.0	$<9.85\text{x}10^{-3}$

SUMMARY OF RESULTS

Kiln Number 2

DRE

Firing Coal and Solid Waste Derived Fuel

Stack	North	North	South
Run Number	1	2	3
Stack Flow Rate - ACFM	77,993	81,034	77,717
Stack Flow Rate - DSCFM*	31,058	30,562	29,247
% Water Vapor - % Vol.	31.27	33.24	32.02
% CO_2 - % Vol.	16.6	17.3	17.3
% O_2 - % Vol.	8.2	7.2	7.2
% Excess Air @ Sampling Point	70	56	56
Total Trichlorobenzene - µg	<1.151	<2.333	<1.275
Trichlorobenzene Emissions - lbs/hr	$<4.05\text{x}10^{-5}$	$<8.36\text{x}10^{-5}$	$<4.38\text{x}10^{-5}$
Waste Feed Rate - lbs/hr	3,600.0	3,600.0	3,600.0
Trichlorobenzene in Waste Feed - %	5.4	5.4	5.4
Trichlorobenzene - lbs/hr in feed	194.4	194.4	194.4
Trichlorobenzene DRE - %	>99.9999	>99.9999	>99.9999

* 29.92 "Hg, 68°F (760 mm Hg, 20°C)

SUMMARY OF RESULTS

Kiln Number 2

Firing Coal, Liquid Waste Derived Fuel,
and Solid Waste Derived Fuel

Stack	North	North	South
Run Number	4	5	6
Stack Flow Rate - ACFM	71,716	95,668	97,671
Stack Flow Rate - DSCFM*	26,927	32,854	32,602
% Water Vapor - % Vol.	31.25	35.79	34.69
% CO_2 - % Vol.	16.5	17.6	15.5
% O_2 - % Vol.	7.5	6.6	8.0
% Excess Air @ Sampling Point	59	49	65
Particulates **Probe, Cyclone & Filter Catch** grains/dscf*	0.0841	0.0431	0.0958
grains/cf @ Stack Conditions	0.0314	0.0147	0.0319
lbs/hr	19.40	12.14	26.76
Kiln Feed - tons/hr	46.7	53.7	53.0
Particulate Emissions - lbs/ton kiln feed	0.415	0.226	0.505
Hydrogen Chloride Emissions - ppm	112.4	115.4	106.4
Hydrogen Chloride Emissions - lbs/hr	17.2	21.5	19.7

* 29.92 "Hg, 68°F (760 mm Hg, 20°C)

SUMMARY OF RESULTS

Volatile Organic Compounds

Kiln Number 2

Firing Coal, Liquid Waste Derived Fuel, and Solid Waste Derived Fuel

Run Number	4	5	6	Ambient
Methane Concentration - ppm	3	10	3	3
Methane Emissions - lbs/hr	0.20	0.82	0.24	----
Ethane Concentration - ppm	2	2	2	2
Ethane Emissions - lbs/hr	0.25	0.31	0.30	0
Propane Concentration - ppm	----	----	----	----
Propane Emissions - lbs/hr	----	----	----	----
Non-Methane, Non-Ethane VOC Concentration as Propane - ppm	6	12	7	7
Non-Methane, Non-Ethane VOC Emissions as Propane - lbs/hr	1.11	2.70	1.56	----
Total Hydrocarbons Concentration as Propane - ppm	----	----	----	----
Total Hydrocarbons Emissions as Propane - lbs/hr	----	----	----	----

*29.92 "Hg, 69°F (760 mm Hg, 20°C)

SUMMARY OF RESULTS

Kiln Number 2

Firing Coal, Liquid Waste Derived Fuel, and Solid Waste Derived Fuel

Run Number		4	5	6
Carbon Monoxide - parts per million	Chart	50	342	60
	Actual	42	282	51
Carbon Monoxide Emissions -	lbs/hr	4.93	40.42	7.25

$$\text{Actual ppm CO} = \text{ppm CO (chart)} \times \left[1 - \frac{\%\ CO_2}{100}\right]$$

$$\text{CO (lbs/hr)} = \frac{\text{ppm CO} \times 28 \times 60 \times \text{DSCFM}^{*}}{385.1 \times 10^{6}}$$

* 29.92 "Hg, 68°F (760 mm Hg, 20°C)

SUMMARY OF RESULTS

Kiln Number 2

Metals Emissions

Firing Coal, Liquid Waste Derived Fuel, and Solid Waste Derived Fuel

	Run Number 4		Run Number 5		Run Number 6	
	Total µgs	lbs/hr	Total µgs	lbs/hr	Total µgs	lbs/hr
Arsenic	2.3	1.97×10^{-4}	1.5	1.21×10^{-4}	2.3	2.25×10^{-4}
Beryllium	<4.0	$<3.43 \times 10^{-4}$	<4.0	$<3.22 \times 10^{-4}$	<4.0	$<3.92 \times 10^{-4}$
Cadmium	47.8	4.10×10^{-3}	13.3	1.07×10^{-3}	26.9	2.64×10^{-3}
Chromium	226.0	0.019	423.0	0.034	267.0	0.026
Lead	2,180.0	0.187	957.0	0.077	2,130.0	0.209
Mercury	1.4	1.20×10^{-4}	0.3	2.42×10^{-5}	0.5	4.90×10^{-5}
Silver	<1.0	$<8.58 \times 10^{-5}$	<1.0	$<8.05 \times 10^{-5}$	<1.0	$<9.80 \times 10^{-5}$
Selenium	7.7	6.61×10^{-4}	2.7	2.17×10^{-4}	2.2	2.16×10^{-4}
Thallium	<100.0	$<8.58 \times 10^{-3}$	<100.0	$<8.05 \times 10^{-3}$	<100.0	$<9.80 \times 10^{-3}$

SUMMARY OF RESULTS

Kiln Number 2

DRE

Firing Coal, Liquid Waste Derived Fuel, and Solid Waste Derived Fuel

Stack	South	South	North
Run Number	4	5	6
Stack Flow Rate - ACFM	78,781	101,060	98,962
Stack Flow Rate - DSCFM*	28,427	34,540	33,262
% Water Vapor - % Vol.	33.46	34.94	34.17
% CO_2 - % Vol.	16.5	17.6	15.5
% O_2 - % Vol.	7.5	6.6	8.0
% Excess Air @ Sampling Point	59	49	65
Total Trichlorobenzene - µg	<1.226	<1.770	<1.100
Trichlorobenzene Emissions - lbs/hr	$<4.32\times10^{-5}$	$<6.13\times10^{-5}$	$<4.55\times10^{-5}$
Waste Feed Rate - lbs/hr	3,744.0	4,446.0	4,800.0
Trichlorobenzene in Waste Feed - %	5.4	5.4	5.4
Trichlorobenzene - lbs/hr in feed	202.2	240.1	259.2
Trichlorobenzene DRE - %	>99.9999	>99.9999	>99.9999

* 29.92 "Hg, 68°F (760 mm Hg, 20°C)

SUMMARY OF RESULTS

Kiln Number 2

Firing Coal, Liquid Waste Derived Fuel, and Solid Waste Derived Fuel

Stack	South	South	
Run Number	7	8	
Stack Flow Rate - ACFM	92,681	98,560	
Stack Flow Rate - DSCFM*	30,661	32,107	
% Water Vapor - % Vol.	35.10	34.65	
% CO_2 - % Vol.	18.1	15.1	
% O_2 - % Vol.	6.7	7.9	
% Excess Air @ Sampling Point	**51**	**63**	
Particulates **Probe, Cyclone & Filter Catch** grains/dscf*	0.0205	0.0859	
grains/cf @ Stack Conditions	0.0068	0.0279	
lbs/hr	5.39	23.63	
Kiln Feed - tons/hr	53.0	53.0	
Particulate Emissions - lbs/ton kiln feed	0.102	0.446	
Hydrogen Chloride Emissions - ppm	116.4	122.0	
Hydrogen Chloride Emissions - lbs/hr	20.2	22.2	

* 29.92 "Hg, 68°F (760 mm Hg, 20°C)

SUMMARY OF RESULTS

Volatile Organic Compounds

Kiln Number 2

Firing Coal, Liquid Waste Derived Fuel, and Solid Waste Derived Fuel

Run Number	7	8	Ambient	
Methane Concentration - ppm	3	3	4	
Methane Emissions - lbs/hr	0.23	0.24	----	
Ethane Concentration - ppm	2	2	<1	
Ethane Emissions - lbs/hr	0.29	0.30	----	
Propane Concentration - ppm	2	3	2	
Propane Emissions - lbs/hr	0.42	0.66	----	
Non-Methane, Non-Ethane VOC Concentration as Propane - ppm	7	9	6	
Non-Methane, Non-Ethane VOC Emissions as Propane - lbs/hr	1.47	1.98	----	
Total Hydrocarbons Concentration as Propane - ppm	----	----	----	
Total Hydrocarbons Emissions as Propane - lbs/hr	----	----	----	

*29.92 "Hg, 69°F (760 mm Hg, 20°C)

SUMMARY OF RESULTS

Kiln Number 2

Firing Coal, Liquid Waste Derived Fuel,
and Solid Waste Derived Fuel

Run Number		7	8	
Carbon Monoxide - parts per million	Chart	75	52	
	Actual	61	44	
Carbon Monoxide Emissions -	lbs/hr	8.16	6.16	

$$\text{Actual ppm CO} = \text{ppm CO (chart)} \times \left[1 - \frac{\%\ CO_2}{100}\right]$$

$$\text{CO (lbs/hr)} = \frac{\text{ppm CO} \times 28 \times 60 \times \text{DSCFM}^{*}}{385.1 \times 10^{6}}$$

* 29.92 "Hg, 68°F (760 mm Hg, 20°C)

SUMMARY OF RESULTS

Kiln Number 2

Metals Emissions

Firing Coal, Liquid Waste Derived Fuel, and Solid Waste Derived Fuel

	Run Number 7		Run Number 8	
	Total µgs	lbs/hr	Total µgs	lbs/hr
Arsenic	<1.0	$<9.35\times10^{-5}$	3.3	3.13×10^{-4}
Beryllium	<4.0	$<3.74\times10^{-4}$	<8.0	$<7.59\times10^{-4}$
Cadmium	5.5	5.14×10^{-4}	10.5	9.96×10^{-4}
Chromium	221.0	0.021	325.0	0.031
Lead	372.0	0.035	732.0	0.069
Mercury	0.3	2.80×10^{-5}	0.3	2.84×10^{-5}
Silver	<1.0	$<9.35\times10^{-5}$	<3.0	$<2.84\times10^{-4}$
Selenium	3.6	3.37×10^{-4}	0.9	8.53×10^{-5}
Thallium	<100.0	$<9.35\times10^{-3}$	<100.0	$<9.48\times10^{-3}$

SUMMARY OF RESULTS

Kiln Number 2

DRE

Firing Coal, Liquid Waste Derived Fuel, and Solid Waste Derived Fuel

Stack	North	North	
Run Number	7	8	
Stack Flow Rate - ACFM	97,964	99,635	
Stack Flow Rate - DSCFM*	32,539	32,875	
% Water Vapor - % Vol.	34.31	33.77	
% CO_2 - % Vol.	18.1	15.1	
% O_2 - % Vol.	6.7	7.9	
% Excess Air @ Sampling Point	51	63	
Total Trichlorobenzene - µg	<1.086	<0.854	
Trichlorobenzene Emissions - lbs/hr	$<4.34x10^{-5}$	$<3.55x10^{-5}$	
Waste Feed Rate - lbs/hr	4,506.0	4,800.0	
Trichlorobenzene in Waste Feed - %	5.4	5.4	
Trichlorobenzene - lbs/hr in feed	243.3	259.2	
Trichlorobenzene DRE - %	>99.9999	>99.9999	

* 29.92 "Hg, 68°F (760 mm Hg, 20°C)

DISCUSSION OF RESULTS

It should be noted that the emissions represent one stack from the source which has two stacks.

Runs Number 1, 2, and 3

The three tests for particulate matter and hydrogen chloride appeared to be valid representations of the actual emissions during the tests. The indicative parameters calculated from the field data were in close agreement. The moisture percentages for the three tests were within 4.3 percent of the mean value. The measured flow rates (Q_s) for the tests were within 4.9 percent of the mean value. The rates of sampling for the three tests were well within the specified limits, the greatest deviation being 2.5 percent.

The calculated emissions (pounds per ton of kiln feed) of particulate matter for the three tests showed a range of -24.8 percent to +14.2 percent variation from the mean value.

The three tests for hydrogen chloride appeared to be valid representations of the actual emissions during the tests. The calculated emissions (pounds per hour) of hydrogen chloride for the three tests showed a range of -23.8 percent to +31.9 percent variation from the mean value.

The three tests for volatile organic compounds appeared to be valid representations of the actual emissions during the tests. The calculated emissions (pounds per hour) of volatile organic compounds for the three tests showed a range of -46.9 percent to +63.4 percent variation from the mean value.

The three tests for carbon monoxide appeared to be valid representations of the actual emissions during the tests. The calculated emissions (pounds per hour) of carbon monoxide for the three tests showed a range of -15.8 percent to +20.0 percent variation from the mean value.

The three tests for trichlorobenzene and semivolatile compounds appeared to be valid representations of the actual emissions during the tests. The indicative parameters calculated from the field data were in close agreement. The moisture percentages for the three tests were within 3.3 percent of the mean value. The measured flow rates (Q_s) for the tests were within 3.4 percent of the mean value. The rates of sampling for the three tests were within the specified limits, the greatest deviation being 5.0 percent.

<u>Runs Number 4, 5, and 6</u>

The three tests for particulate matter and hydrogen chloride appeared to be valid representations of the actual emissions during the tests. The indicative parameters calculated from the field data were in close agreement. The moisture percentages for the three tests were within 7.8 percent of the mean value. The measured flow rates (Q_s) for the tests were within 12.6 percent of the mean value. The rates of sampling for the three tests were well within the specified limits, the greatest deviation being 3.9 percent.

The calculated emissions (pounds per ton of kiln feed) of particulate matter for the three tests showed a range of -40.8 percent to +32.2 percent variation from the mean value.

The three tests for hydrogen chloride appeared to be valid representations of the actual emissions during the tests. The calculated emissions (pounds per hour) of hydrogen chloride for the three tests showed a range of -11.6 percent to +10.4 percent variation from the mean value.

The three tests for volatile organic compounds appeared to be valid representations of the actual emissions during the tests. The calculated emissions (pounds per hour) of volatile organic compounds for the three tests showed a range of -38.0 percent to +50.8 percent variation from the mean value.

The three tests for carbon monoxide appeared to be valid representations of the actual emissions during the tests. The calculated emissions (pounds per hour) of carbon monoxide for the three tests showed a range of -71.9 percent to +130.5 percent variation from the mean value. The large variation is due to the much higher concentration of carbon monoxide measured during Run Number 5.

The three tests for trichlorobenzene and semivolatile compounds appeared to be valid representations of the actual emissions during the tests. The indicative parameters calculated from the field data were in close agreement. The moisture percentages for the three tests were within 2.2 percent of the mean value. The measured flow rates (Q_s) for the tests were within 11.4 percent of the mean value. The rates of sampling for the three tests were within the specified limits, the greatest deviation being 4.1 percent.

Runs Number 7 and 8

The two tests for particulate matter and hydrogen chloride appeared to be valid representations of the actual emissions during the tests. The indicative parameters calculated from the field data were in close agreement. The moisture percentages for the two tests were within 0.6 percent of the mean value. The measured flow rates (Q_s) for the tests were within 2.3 percent of the mean value. The rates of sampling for the two tests were well within the specified limits, the greatest deviation being 3.1 percent.

The calculated emissions (pounds per ton of kiln feed) of particulate matter for the two tests showed a range of -62.8 percent to +62.8 percent variation from the mean value.

The two tests for hydrogen chloride appeared to be valid representations of the actual emissions during the tests. The calculated emissions (pounds per hour) of hydrogen chloride for the two tests showed a range of -4.7 percent to +4.7 percent variation from the mean value.

The two tests for volatile organic compounds appeared to be valid representations of the actual emissions during the tests. The calculated emissions (pounds per hour) of volatile organic compounds for the two tests showed a range of -14.8 percent to +14.8 percent variation from the mean value.

The two tests for carbon monoxide appeared to be valid representations of the actual emissions during the tests. The calculated emissions (pounds per hour) of carbon monoxide for the two tests showed a range of -14.0 percent to +14.0 percent variation from the mean value.

The two tests for trichlorobenzene and semivolatile compounds appeared to be valid representations of the actual emissions during the tests. The indicative parameters calculated from the field data were in close agreement. The moisture percentages for the two tests were within 0.8 percent of the mean value. The measured flow rates (Q_s) for the tests were within 0.5 percent of the mean value. The rates of sampling for the two tests were within the specified limits, the greatest deviation being 4.7 percent.

METCO
ENVIRONMENTAL
P.O. Box 598
Addison, TX 7500
(214) 931-7127

SOURCE EMISSIONS SURVEY
OF
ASH GROVE FOREMAN CEMENT COMPANY
KILN NUMBER 2
NORTH AND SOUTH STACKS
FOREMAN, ARKANSAS

OCTOBER 1988

FILE NUMBER 88-170

CHLORIDE ANALYSIS

Run Number	1	2	3	4
Impinger #1 mg Cl^-	154.000	239.317	131.300	168.270
Impinger #2 mg Cl^-	40.878	48.601	30.895	26.208
Total mg Cl^-	194.878	287.918	162.195	194.478
Total mg HCl^-	200.375	296.040	166.770	199.964
ppm HCl	114.2	178.0	96.74	112.4
lbs/hr HCl	19.82	28.36	16.42	17.16

Run Number	5	6	7	8
Impinger #1 mg Cl^-	179.233	144.450	155.873	170.940
Impinger #2 mg Cl^-	80.264	50.625	54.530	56.887
Total mg Cl^-	259.497	195.075	210.403	227.827
Total mg HCl	266.817	200.578	216.338	234.254
ppm HCl	115.39	106.4	116.4	122.0
lbs/hr HCl	21.49	19.66	20.2	22.21

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88-170

Ashgrove Cement
#2 Kiln

CHLORIDE ANALYSIS

SAMPLE NO.	SAMPLE VOL.	SAMPLE IDENTITY RUN	IMP	DILUTION	DIL'N FACTOR	ALIQUOT (ML)	ABSORBANCE @ 360 nm	ug Cl⁻ PER ML	TOTAL ug Cl⁻ ✓
1	440	1	1	10/100	10	3	.263	21.0	154000.0
2	415	2	1			3	.457	34.6	239,316.7
2′	"	"	1			3	.445	33.9	234,475.0
3	404	3	1			3	.242	19.5	131,300.0
4	426	4	1			3	.302	23.7	168,270.0
5	380	5	1			3	.369	28.3	179,233.3
6	405	6	1			3	.269	21.4	144,450.0
7	412	7	1			3	.287	22.7	155,873.3
8	407	8	1			3	.323	25.2	170,940.0
9	415	1	2	–	–	1	.245	19.7	40,877.5
[illegible]	262	2		–	–	1	.492	37.1	48,601.0
11	334	3		–	–	1	.227	18.5	30,895.0
12	273	4		–	–	1	.237	19.2	26,208.0
13	508	5		10/100	10	5	.188	15.8	80,264.0
14	375	6		–	–	1	.349	27.0	50,625.0
15	380	7		–	–	1	.374	28.7	54,530.0
16	326	8		–	–	1	.461	34.9	56,887.0

STANDARDS

ug Cl⁻ per ml	ABSORBANCE		
5	.033		
10	.105		
20	.244		
30	.395		
40	.531		

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88-170

CHLORIDE ANALYSIS

SAMPLE NO.	SAMPLE VOL.	SAMPLE IDENTITY	DILUTION	DIL'N FACTOR	ALIQUOT (ML)	ABSORBANCE @ 360 nm	ug Cl⁻ PER ML	TOTAL ug Cl⁻
SPIKE A		3 ml #1 2 ml STD 40	—	—	5	.455	36.6	% Recovery 97.5
SPIKE B		3 ml #4 2 ml STD 30	—	—	5	.460	34.8	% Recovery 92.5
1=	440	duplicate RUN 1 Imp 1	10/100	10	5	.442	33.5	147,400.0

STANDARDS

ug Cl⁻ per ml	ABSORBANCE		
5			
10			
20			
30			
40			

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TEI ANALYTICAL, INC.
7177 NORTH AUSTIN • NILES, ILLINOIS • 60648 • 312/647-1345

December 16, 1988

LABORATORY REPORT

#9704
Page 1 of 13 pa

Cadence Chemical
P.O. Box 770
Michigan City, IN 46360

Attn: Jim Ward

SAMPLE RECEIVED: 11-04-88

TEI NO. 60316
SAMPLE IDENTIFICATION: S Blend #1 10/25/88

1,2,4-Trichlorobenzene	9.0	%
1,2,3 Trichlorobenzene	5.3	%

TEI NO. 60317
SAMPLE IDENTIFICATION: S Blend #2 10/25/88

1,2,4-Trichlorobenzene	7.5	%
1,2,3 Trichlorobenzene	2.5	%

TEI NO. 60318
SAMPLE IDENTIFICATION: S Blend #3 10/25/88

1,2,4-Trichlorobenzene	4.4	%
1,2,3 Trichlorobenzene	2.5	%

TEI NO. 60319
SAMPLE IDENTIFICATION: S Blend #4 10/26/88

1,2,4-Trichlorobenzene	4.0	%
1,2,3 Trichlorobenzene	2.5	%

TEI NO. 60320
SAMPLE IDENTIFICATION: S Blend #5 10/26/88

1,2,4-Trichlorobenzene	3.6	%
1,2,3 Trichlorobenzene	2.2	%

TEI NO. 60321
SAMPLE IDENTIFICATION: S Blend #6 10/26/88

1,2,4-Trichlorobenzene	3.3	%
1,2,3 Trichlorobenzene	2.1	%

CC - Bill Mullins ✓
METCO

Chem-Fuel Ash Grove Foreman

G. E. Marks
Gayle E. Marks, Ph.D.

December 16, 1988

LABORATORY REPORT

#9704
Page 2 of 13 pa

Cadence Chemical
P.O. Box 770
Michigan City, IN 46360

Attn: Jim Ward

SAMPLE RECEIVED: 11-04-88

TEI NO. 60322
SAMPLE IDENTIFICATION: S Blend #7 10/27/88

1,2,4-Trichlorobenzene	4.5	%
1,2,3 Trichlorobenzene	3.6	%

TEI NO. 60323
SAMPLE IDENTIFICATION: S Blend #8 10/27/88

1,2,4-Trichlorobenzene	4.8	%
1,2,3 Trichlorobenzene	2.9	%

TEI NO. 60324
SAMPLE IDENTIFICATION: K Blend #4 10/26/88

1,2,4-Trichlorobenzene	<50	ppm
1,2,3 Trichlorobenzene	<50	ppm

TEI NO. 60325
SAMPLE IDENTIFICATION: K Blend #5 10/26/88

1,2,4-Trichlorobenzene	<50	ppm
1,2,3 Trichlorobenzene	<50	ppm

TEI NO. 60326
SAMPLE IDENTIFICATION: K Blend #6 10/26/88

1,2,4-Trichlorobenzene	<50	ppm
1,2,3 Trichlorobenzene	<50	ppm

TEI NO. 60327
SAMPLE IDENTIFICATION: K Blend #7 10/27/88

1,2,4-Trichlorobenzene	<50	ppm
1,2,3 Trichlorobenzene	<50	ppm

Chem-Fuel Ash Grove Foreman

Gayle E. Marks, Ph.D.

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TEI ANALYTICAL, INC.
7177 NORTH AUSTIN • NILES, ILLINOIS • 60648 • 312/647-1345

December 20, 1988

LABORATORY REPORT

#9704
Page 4 of 13 pa

Cadence Chemical Resources, Inc.
P.O. Box 770
Michigan City, IN 46360

Attn: Jim Ward

Sample received:
11-04-88

TEI No. 60329 - Sample S Blend #1 - 10/25/88

Heat Value	7470.	BTU/lb
Total Chlorine	5.73	%

TEI No. 60330 - Sample S Blend #2 - 10/25/88

Heat Value	8300.	BTU/lb
Total Chlorine	5.20	%

TEI No. 60331 - Sample S Blend #3 - 10/25/88

Heat Value	9380.	BTU/lb
Total Chlorine	4.33	%

TEI No. 60332 - Sample S Blend #4 - 10/26/88

Heat Value	9420.	BTU/lb
Total Chlorine	5.38	%

TEI No. 60333 - Sample S Blend #5 - 10/26/88

Heat Value	4200.	BTU/lb
Total Chlorine	3.77	%

Chem-Fuel - Ash Grove Foreman

G. E. Marks
Gayle E. Marks, Ph.D.

TEI ANALYTICAL, INC.
7177 NORTH AUSTIN • NILES, ILLINOIS • 60648 • 312/647-1345

December 20, 1988

LABORATORY REPORT

#9704
Page 5 of 13 Page

Cadence Chemical Resources, Inc.
P.O. Box 770
Michigan City, IN 46360

Attn: Jim Ward

Sample received:
11-04-88

TEI No. 60334 - Sample S Blend #6 - 10/26/88

Heat Value	7020.	BTU/lb
Total Chlorine	3.55	%

TEI No. 60335 - Sample S Blend #7 - 10/27/88

Heat Value	8750.	BTU/lb
Total Chlorine	8.31	%

TEI No. 60336 - Sample S Blend #8 - 10/27/88

Heat Value	8520.	BTU/lb
Total Chlorine	7.96	%

TEI No. 60337 - Sample K Blend #4 - 10/26/88

Heat Value	11900.	BTU/lb
Total Chlorine	2.32	%

TEI No. 60338 - Sample K Blend #5 - 10/26/88

Heat Value	13000.	BTU/lb
Total Chlorine	1.87	%

Chem-Fuel - Ash Grove Foreman

Gayle E. Marks, Ph.D.

LABORATORY REPORT

December 16, 1988

#9704
Page 7 of 13 pa

Cadence Chemical
P.O. Box 770
Michigan City, IN 46360

Attn: Jim Ward

SAMPLE RECEIVED: 11-04-88

TEI NO. 60342
SAMPLE IDENTIFICATION: S Blend #1 10/25/88

Ash	40.53	%
Hexavalent Chromium	<2	ppm
Sample Preparation		
Arsenic	5.4	ppm
Beryllium	<3	ppm
Cadmium	24.0	ppm
Lead	5900.	ppm
Mercury	1.6	ppm
Selenium	<2	ppm
Silver	12.2	ppm
Thallium	<5	ppm

TEI NO. 60343
SAMPLE IDENTIFICATION: S Blend #2 10/25/88

Ash	38.84	%
Hexavalent Chromium	4	ppm
Sample Preparation		
Arsenic	4.6	ppm
Beryllium	<3	ppm
Cadmium	32.8	ppm
Lead	5680.	ppm
Mercury	4.7	ppm
Selenium	<2	ppm
Silver	22.2	ppm
Thallium	<5	ppm

Chem-Fuel Ash Grove Foreman

Gayle E. Marks, Ph.D.

December 16,1988

LABORATORY REPORT

#9704
Page 8 of 13 p

Cadence Chemical
P.O. Box 770
Michigan City, IN 46360

Attn: Jim Ward

SAMPLE RECEIVED: 11-04-88

TEI NO. 60344
SAMPLE IDENTIFICATION: S Blend #3 10/25/88

Ash	31.19	%
Hexavalent Chromium	17	ppm
Sample Preparation		
Arsenic	4.2	ppm
Beryllium	<3	ppm
Cadmium	49.0	ppm
Lead	4470.	ppm
Mercury	1.4	ppm
Selenium	<5	ppm
Silver	9.9	ppm
Thallium	<5	ppm

TEI NO. 60345
SAMPLE IDENTIFICATION: S Blend #4 10/26/88

Ash	30.80	%
Hexavalent Chromium	24	ppm
Sample Preparation		
Arsenic	4.3	ppm
Beryllium	<3	ppm
Cadmium	48.1	ppm
Lead	7120.	ppm
Mercury	2.6	ppm
Selenium	<5	ppm
Silver	9.6	ppm
Thallium	<5	ppm

Chem-Fuel Ash Grove Foreman

Gayle E. Marks, Ph.D.

December 16, 1988

LABORATORY REPORT

#9704
Page 9 of 13 pa

Cadence Chemical
P.O. Box 770
Michigan City, IN 46360

Attn: Jim Ward

SAMPLE RECEIVED: 11-04-88

TEI NO. 60346
SAMPLE IDENTIFICATION: S Blend #5 10/26/88

Ash	37.77	%
Hexavalent Chromium	<2	ppm
Sample Preparation		
Arsenic	1.1	ppm
Beryllium	<3	ppm
Cadmium	40.3	ppm
Lead	5870.	ppm
Mercury	3.4	ppm
Selenium	<5	ppm
Silver	10.2	ppm
Thallium	<5	ppm

TEI NO. 60347
SAMPLE IDENTIFICATION: S Blend #6 10/26/88

Ash	38.94	%
Hexavalent Chromium	<2	ppm
Sample Preparation		
Arsenic	5.9	ppm
Beryllium	<3	ppm
Cadmium	39.9	ppm
Lead	5100.	ppm
Mercury	4.7	ppm
Selenium	<5	ppm
Silver	8.4	ppm
Thallium	<5	ppm

Chem-Fuel Ash Grove Foreman

G. E. Marks
Gayle E. Marks, Ph.D.

December 16, 1988

LABORATORY REPORT

#9704
Page 10 of 13 pa

Cadence Chemical
P.O. Box 770
Michigan City, IN 46360

Attn: Jim Ward

SAMPLE
RECEIVED: 11-04-88

TEI NO. 60348
SAMPLE IDENTIFICATION: S Blend #7 10/27/88

Ash	34.49	%
Hexavalent Chromium	<2	ppm
Sample Preparation		
Arsenic	2.4	ppm
Beryllium	<3	ppm
Cadmium	19.1	ppm
Lead	4550.	ppm
Mercury	0.6	ppm
Selenium	<5	ppm
Silver	12.3	ppm
Thallium	<5	ppm

TEI NO. 60349
SAMPLE IDENTIFICATION: S Blend #8 10/27/88

Ash	35.79	%
Hexavalent Chromium	<2	ppm
Sample Preparation		
Arsenic	6.0	ppm
Beryllium	<3	ppm
Cadmium	17.9	ppm
Lead	4550.	ppm
Mercury	1.2	ppm
Selenium	<5	ppm
Silver	12.9	ppm
Thallium	<5	ppm

Chem-Fuel Ash Grove Foreman

Gayle E. Marks, Ph.D.

REFERENCE 2

MULLINS ENVIRONMENTAL TESTING CO., INC.
P.O. Box 598
Addison, Tx 75001
(214) 931-7127

METCO

SOURCE EMISSIONS SURVEY
OF
ASH GROVE CEMENT COMPANY
KILN NUMBER 2 STACK
LOUISVILLE, NEBRASKA

APRIL 1988

FILE NUMBER 88-71

SUMMARY OF RESULTS

Kiln Number 2 Stack

Run Number	1	2	3	4	5	6
Particulate Matter Emissions - lbs/hr	93.8	16.0	6.4	8.0	11.3	8.2
Particulate Matter Emissions - lbs/ton of kiln feed	0.853	0.145	0.058	0.073	0.100	0.070
Hydrogen Chloride Emissions - lbs/hr	14.1	19.3	19.9	13.5	14.3	19.5
Total Hydrocarbon Emissions as Propane - lbs/hr	3.8	13.4	4.9	3.4	2.7	11.6
Lead Emissions - lbs/hr	0.286	0.007	0.004	0.006	0.003	0.005
Chromium Emissions - lbs/hr	0.003	<0.001	<0.001	<0.001	<0.001	<0.001
Barium Emissions - lbs/hr	0.021	0.003	0.003	<0.001	0.002	<0.001
1,1,1-Trichloroethane DRE - %	>99.9999	>99.9999	>99.9999	99.997	>99.9999	>99.9999

SUMMARY OF RESULTS

Kiln Number 2 Stack

Run Number	1	2	3
Stack Flow Rate - ACFM	149,532	148,176	149,905
Stack Flow Rate - DSCFM*	80,123	78,149	79,296
% Water Vapor - % Vol.	16.29	18.41	18.10
% CO_2 - % Vol.	23.0	23.0	22.6
% O_2 - % Vol.	7.6	7.0	7.2
% Excess Air @ Sampling Point	70	61	63
Particulates Probe, Cyclone & Filter Catch grains/dscf*	0.1366	0.0239	0.0095
grains/cf @ Stack Conditions	0.0729	0.0125	0.0050
lbs/hr	93.8	16.0	6.4
Total Catch grains/dscf*	0.1653	0.0542	0.0518
grains/cf @ Stack Conditions	0.0882	0.0285	0.0273
lbs/hr	113.5	36.3	35.2
Kiln Feed - tons/hr	110	110	110
Particulate Matter Emissions - lbs/ton of kiln feed	0.853	0.145	0.058
Hydrogen Chloride Emissions - ppm	31	44	44
Hydrogen Chloride Emissions - lbs/hr	14.1	19.3	19.9

* 29.92 "Hg, 68°F (760 mm Hg, 20°C)

SUMMARY OF RESULTS

Kiln Number 2 Stack

Run Number		1	2	3
Total Lead -	µg	1,080	28	15
Lead Emissions -	lbs/hr	0.286	0.007	0.004
Total Chromium -	µg	11	<3	<3
Chromium Emissions -	lbs/hr	0.003	<0.001	<0.001
Total Barium -	µg	80	12	10
Barium Emissions -	lbs/hr	0.021	0.003	0.003

* 29.92 "Hg, 68°F (760 mm Hg, 20°C)

SUMMARY OF RESULTS

Kiln Number 2 Stack

Run Number		1	2	3
Total Hydrocarbon Emissions as Propane -	ppm	7	25	9
Total Hydrocarbon Emissions as Propane -	lbs/hr	3.8	13.4	4.9

SUMMARY OF RESULTS

Kiln Number 2 Stack

Run Number	4	5	6
Stack Flow Rate - ACFM	153,938	154,392	147,387
Stack Flow Rate - DSCFM*	82,001	78,618	76,751
% Water Vapor - % Vol.	17.40	20.87	17.89
% CO_2 - % Vol.	21.4	22.2	25.0
% O_2 - % Vol.	8.4	8.0	6.0
% Excess Air @ Sampling Point	82	76	49
Particulates <u>Probe, Cyclone & Filter Catch</u> grains/dscf*	0.0114	0.0167	0.0124
grains/cf @ Stack Conditions	0.0061	0.0085	0.0064
lbs/hr	8.0	11.3	8.2
Total Catch grains/dscf*	0.0405	0.0352	0.0409
grains/cf @ Stack Conditions	0.0215	0.0179	0.0212
lbs/hr	28.4	23.7	26.9
Kiln Feed - tons/hr	110	113	117
Particulate Matter Emissions - lbs/ton of kiln feed	0.073	0.100	0.070
Hydrogen Chloride Emissions - ppm	29	32	45
Hydrogen Chloride Emissions - lbs/hr	13.5	14.3	19.5

* 29.92 "Hg, 68°F (760 mm Hg, 20°C)

SUMMARY OF RESULTS

Kiln Number 2 Stack

Run Number		4	5	6
Total Lead -	µg	22	12	18
Lead Emissions -	lbs/hr	0.006	0.003	0.005
Total Chromium -	µg	<3	<3	<3
Chromium Emissions -	lbs/hr	<0.001	<0.001	<0.001
Total Barium -	µg	<5	10	<5
Barium Emissions -	lbs/hr	<0.001	0.002	<0.001

* 29.92 "Hg, 68°F (760 mm Hg, 20°C)

SUMMARY OF RESULTS

Kiln Number 2 Stack

Run Number	4	5	6
Total Hydrocarbon Emissions as Propane - ppm	6	5	22
Total Hydrocarbon Emissions as Propane - lbs/hr	3.4	2.7	11.6

SUMMARY OF RESULTS

DRE

Run Number	1	2	3
1,1,1-Trichloroethane - lbs/hr in fuel	204.0	439.2	443.2
1,1,1-Trichloroethane Emissions - lbs/hr	$<4.51 \times 10^{-5}$	$<6.35 \times 10^{-5}$	$<3.90 \times 10^{-5}$
1,1,1-Trichloroethane DRE - %	>99.9999	>99.9999	>99.9999

SUMMARY OF RESULTS

DRE

Run Number	4	5	6
1,1,1-Trichloroethane - lbs/hr in fuel	415.2	394.0	331.2
1,1,1-Trichloroethane Emissions - lbs/hr	0.012	$<4.63 \times 10^{-5}$	$<3.71 \times 10^{-5}$
1,1,1-Trichloroethane DRE - %	99.997	>99.9999	>99.9999

SUMMARY OF RESULTS

Run Number	1	
Sample	A	B
Total 1,1,1-Trichloroethane - µg	<0.0025	<0.0029
1,1,1-Trichloroethane Emissions - ppm	$<2.20 \times 10^{-5}$	$<3.18 \times 10^{-5}$
Average for Run	$<2.69 \times 10^{-5}$	
1,1,1-Trichloroethane Emissions - lbs/hr	$<3.73 \times 10^{-5}$	$<5.29 \times 10^{-5}$
Average for Run	$<4.51 \times 10^{-5}$	

Run Number	2	
Sample	A	B
Total 1,1,1-Trichloroethane - µg	<0.0035	<0.0032
1,1,1-Trichloroethane Emissions - ppm	$<3.78 \times 10^{-5}$	$<4.05 \times 10^{-5}$
Average for Run	$<3.92 \times 10^{-5}$	
1,1,1-Trichloroethane Emissions - lbs/hr	$<6.13 \times 10^{-5}$	$<6.56 \times 10^{-5}$
Average for Run	$<6.35 \times 10^{-5}$	

SUMMARY OF RESULTS

Run Number	3	
Sample	A	B
Total 1,1,1-Trichloroethane - µg	<0.0024	<0.0025
1,1,1-Trichloroethane Emissions - ppm	$<2.43 \times 10^{-5}$	$<2.30 \times 10^{-5}$
Average for Run	$<2.37 \times 10^{-5}$	
1,1,1-Trichloroethane Emissions - lbs/hr	$<4.00 \times 10^{-5}$	$<3.79 \times 10^{-5}$
Average for Run	$<3.90 \times 10^{-5}$	

Run Number	4	
Sample	A	B
Total 1,1,1-Trichloroethane - µg	1.5017	<0.0041
1,1,1-Trichloroethane Emissions - ppm	0.014	$<3.85 \times 10^{-5}$
Average for Run	0.007	
1,1,1-Trichloroethane Emissions - lbs/hr	0.023	$<6.54 \times 10^{-5}$
Average for Run	0.012	

SUMMARY OF RESULTS

Run Number	5	
Sample	A	B
Total 1,1,1-Trichloroethane - µg	<0.0028	<0.0027
1,1,1-Trichloroethane Emissions - ppm	$<2.60 \times 10^{-5}$	$<3.08 \times 10^{-5}$
Average for Run	$<2.84 \times 10^{-5}$	
1,1,1-Trichloroethane Emissions - lbs/hr	$<4.24 \times 10^{-5}$	$<5.02 \times 10^{-5}$
Average for Run	$<4.63 \times 10^{-5}$	

Run Number	6	
Sample	A	B
Total 1,1,1-Trichloroethane - µg	-------	<0.0025
1,1,1-Trichloroethane Emissions - ppm	-------	$<2.33 \times 10^{-5}$
Average for Run	$<2.33 \times 10^{-5}$	
1,1,1-Trichloroethane Emissions - lbs/hr	-------	$<3.71 \times 10^{-5}$
Average for Run	$<3.71 \times 10^{-5}$	

MULLINS ENVIRONMENTAL TESTING CO., INC.
P.O. Box 598
Addison, Tx 75001
(214) 931-7127

METCO

SOURCE EMISSIONS SURVEY
OF
ASH GROVE CEMENT COMPANY
KILN NUMBER 2 STACK
LOUISVILLE, NEBRASKA

APRIL 1988

FILE NUMBER 88-71

Chloride Analysis

Run Number	1	2	3	4	5	6
Impinger #1 Cl$^-$ (mg)	27.9	51.0	50.1	35.1	37.8	49.4
Impinger #2 Cl$^-$ (mg)	24.1	23.9	26.4	16.8	20.4	26.1
Total Cl$^-$ (mg)	52.0	74.9	76.5	51.9	58.2	75.5
Total HCl (mg)	53.5	77.0	78.7	53.4	59.8	77.6

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TEI ANALYTICAL, INC.
7177 NORTH AUSTIN • NILES, ILLINOIS • 60648 • 312/647-1345

June 3, 1988

LABORATORY REPORT

#8712 - Page 3

CORRECTED PAGE

Ash Grove Cement Co.
P.O. Box 609 Hwy. 50 & 66
Interchange
Louisville, NE 68037

Attn: Douglas R. Jaquier

Samples received:
May 12, 1988

[TEI-56204] Sample 6L

Heat Value, BTU/lb	11200.
Total Chlorine, %	2.60
Arsenic, ppm	LT 1
Barium, ppm	4570.
Cadmium, ppm	7.5
Chromium, ppm	294
Lead, ppm	1130.
Mercury, ppm	LT 0.2
Nickel, ppm	20.0
Toluene, %	18.4
1,1,1 Trichloroethane, %	2.3

⑨ [TEI-56205] Sample 1

Heat Value, BTU/lb	6400.
Total Chlorine, %	4.83
Arsenic, ppm	LT 1
Barium, ppm	4950.
Cadmium, ppm	93.6
Chromium, ppm	1730.
Lead, ppm	7720.
Mercury, ppm	1.89
Nickel, ppm	4730.
Toluene, %	13
1,1,1 Trichloroethane, %	6.3

Gayle E Marks SK
Gayle E. Marks, Ph.D.

CC - Jim Ward - Cadence Chemical E-33
Eric Hansen - Ash Grove

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May 25, 1988 **LABORATORY REPORT** #8712 - Page 4

Ash Grove Cement Co
P. O. Box 609
Louisville, NE 68037

Attn: Douglas R. Jaquier

SAMPLE RECEIVED: 05-12-88

TEI NO. 56206
SAMPLE IDENTIFICATION: 2S

Heat Value	6500.	BTU/lb
Sample Preparation		
Total Chlorine	6.84	%
Sample Preparation		
Arsenic	<1	ppm
Barium	5130.	ppm
Cadmium	56.5	ppm
Chromium	1870.	ppm
Lead	7660.	ppm
Mercury	1.07	ppm
Nickel	905	ppm
Toluene	16	%
1,1,1-Trichloroethane	16	%

TEI NO. 56207
SAMPLE IDENTIFICATION: 3S

Heat Value	6000.	BTU/lb
Sample Preparation		
Total Chlorine	5.24	%
Sample Preparation		
Arsenic	<1	ppm
Barium	5520.	ppm
Cadmium	64.3	ppm
Chromium	1850.	ppm
Lead	7570.	ppm
Mercury	0.40	ppm
Nickel	1060.	ppm
Toluene	5.6	%
1,1,1-Trichloroethane	6.1	%

g. e. Marks
Gayle E. Marks, Ph.D.

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7177 NORTH AUSTIN • NILES, ILLINOIS • 60648 • 312/647-1345

May 25, 1988

LABORATORY REPORT

#8712 - Page 5

Ash Grove Cement Co
P. O. Box 609
Louisville, NE 68037

Attn: Douglas R. Jaquier

SAMPLE RECEIVED: 05-12-88

TEI NO. 56208
SAMPLE IDENTIFICATION: 4S

Heat Value	6700.	BTU/lb
Sample Preparation		
Total Chlorine	7.30	%
Sample Preparation		
Arsenic	<1	ppm
Barium	6600.	ppm
Cadmium	33.4	ppm
Chromium	1650.	ppm
Lead	7330.	ppm
Mercury	1.04	ppm
Nickel	678	ppm
Toluene	11	%
1,1,1-Trichloroethane	20	%

TEI NO. 56209
SAMPLE IDENTIFICATION: 5S

Heat Value	6700.	BTU/lb
Sample Preparation		
Total Chlorine	6.43	%
Sample Preparation		
Arsenic	<1	ppm
Barium	6640.	ppm
Cadmium	34.4	ppm
Chromium	1910.	ppm
Lead	8280.	ppm
Mercury	0.92	ppm
Nickel	560	ppm
Toluene	2.0	%
1,1,1-Trichloroethane	3.5	%

Copy: Mr. Jim Ward/Cadence Chem.
Mr. Eric Hansen/Ash Grove/Overland Pk. KS

G. E. Marks
Gayle E. Marks, Ph.D.

Su Table I

H-W STACK TEST APRIL, 1988
CHEM-FUEL AND CHEM-FUEL-S

Operating Conditions	1	2	3	4	5	6
Feed (TPH)	110	110	110	110	113	117
Chem-Fuel (TPH)	-	5.6	5.2	4.8	5.0	7.2
Chem-Fuel-S (TPH)	1.95	1.95	1.95	1.95	1.95	-
Kiln Coal (TPH)	5.4	-	-	-	-	-
P.C. Coal (TPH)	6.4	6.8	6.8	6.8	6.8	6.7
Particulate lb/hr	93.8	16.0	6.4	8.0	11.3	8.2

DRE of 1,1,1 - Trichloroethane

Run Number	1	2	3	4	5	6
Chem-Fuel Feed Rate lbs/hr	0	11,200	10,400	9,600	10,000	14,400
1,1,1-TCE in Chem-Fuel % wt.		2.1	2.3	2.2	1.9	2.3
1,1,1-TCE in Chem-Fuel lbs/hr		235.2	239.2	211.2	190	331.2
Chem-Fuel-S Feed Rate lbs/hr	3900	3900	3900	3900	3900	0
1,1,1-TCE in Chem-Fuel-S % wt.	5.23	5.23	5.23	5.23	5.23	
1,1,1-TCE in Chem-Fuel-S lbs/hr	204.0	204.0	204.0	204.0	204.0	
1,1,1-TCE in Fuel lbs/hr Total	204.0	439.2	443.2	415.2	394.0	331.2
1,1,1-TCE Emissions lbs/hr	4.51×10^{-5}	6.35×10^{-5}	3.9×10^{-5}	0.012	4.63×10^{-5}	3.71×10^{-5}
DRE	99.9999+	99.9999+	99.9999+	99.997	99.9999+	99.9999+
HC, ppm	7	25	9 ~~[illegible]~~	6	5	22 ~~[illegible]~~
CO Preheater, ppm	1060	1315	1166	1015	1212	1296
CO Bypass, ppm	78	181	459	271	86	264

H-W STACK TEST APRIL, 1988
CHEM-FUEL AND CHEM-FUEL-S

Run Number	1	2	3	4	5	6
Chem-Fuel Feed Rate	0	11,200	10,400	9,600	10,000	14,400
% Cl in Chem-Fuel		2.76	2.26	3.13	2.83	2.60
lb/hr Cl		309.1	235.0	300.5	283.0	331.2
Chem-Fuel-S Feed Rate	3900	3900	3900	3900	3900	0
% Cl in Chem-Fuel-S	4.83	6.84	5.24	7.30	6.43	
lb/hr Cl	188.4	266.8	204.3	284.7	250.8	
Total Chlorine lb/hr	188.4	575.9	439.3	585.2	533.8	331.2
HCl Emissions lb/hr	14.1	19.3	19.9	13.5	14.3	19.5

REFERENCE 3

SUMMARY OF TESTING AT CEMENT KILNS COFIRING HAZARDOUS WASTE

Marvin Branscome, Wayne Westbrook
Research Triangle Institute
Research Triangle Park, NC 27709

Robert Mournighan
U.S. Environmental Protection Agency
Cincinnati, OH 45268

Jon Bolstad, John Chehaske
Engineering - Science
Fairfax, VA 22030

ABSTRACT

The incineration of chlorinated and other liquid organic wastes was investigated in 6- to 9-day test programs at dry- and wet-process cement kilns. Testing was conducted initially under baseline conditions with no burning of waste fuels. During the waste fuel burn, the waste fuel replaced a portion of the coal and coal/coke used as the primary fuel. Different replacement rates were used for each test day. The test program included monitoring for principal organic hazardous constituents (POHCs), products of incomplete combustion (PICs), particulate matter, SO_2, NO_x, HCl, CO, CO_2 O_2, and total hydrocarbons. The fate and distribution of chlorine and metals were also determined.

Test results for POHCs showed that these cement kilns generally could achieve a destruction and removal efficiency (DRE) of 99.99 percent or greater. Most of the additional chlorine introduced with the waste fuel is removed with the kiln's waste dust. An increase in HCl emissions was observed as the quantity of chlorine entering the kiln with the waste fuel increased. The data indicate that waste combustion changes the distribution of lead so a higher percentage of the lead is removed with the waste dust.

At the wet-process kiln, no significant difference in emission rates of particulate matter and PICs was found between the baseline and waste burn test conditions. Toluene and benzene were found in trace quantities and are attributable to coal combustion. Particulate matter results at the dry-process kiln are inconclusive because of a malfunctioning electrostatic precipitator (ESP).

The burning of waste fuel at the wet-process kiln decreased SO_2 emissions from an average of 636 ppm at the baseline to 265 ppm. SO_2 concentrations at the dry-process kiln remained relatively low with a baseline range of 2 to 12 ppm compared to 5 to 38 ppm during the waste burn.

INTRODUCTION

Preliminary feasibility studies and tests have indicated that the high-temperature combustion process of cement kilns may offer an effective alternative to other disposal methods for hazardous waste. The promising characteristics of cement kilns include:

- Existing high-temperature combustion process at 1,350° to 1,650 °C (2,500° to

3,000 °F) with a gas residence time on the order of seconds.

- Numerous plants scattered through out the country, which could handle large quantities of combustible hazardous waste liquids.
- Large-scale equipment in place, including process control and pollution control; relatively small capital investment required.
- Instantaneous temperature excursions unlikely because of the huge thermal inertia.
- The alkaline environment in a cement kiln absorbs HCl from chlorinated waste combustion.
- Kilns are operated under draft (slight vacuum); therefore, there would be little outward leakage of fumes, mostly inward leakage of air.
- Ash may be incorporated into the product.
- Energy savings from substitution of waste fuel for oil, coal, or gas.

PURPOSE

The purpose of this study was to develop additional data on the destruction of hazardous waste in cement kilns. These data will be used, along with data from other tests, to evaluate the environmental impacts of this method of waste disposal. To this end, the test program was designed to:

- Calculate DREs of principal organic hazardous constituents (POHCs).
- Compare baseline operation (no waste fuel burned) to the operation with waste fuel.
- Determine if products of incomplete combustion (PICs) are formed and, if so, identify them.
- Determine the fate and distribution of metals.
- Measure the effect of fuel burning on HCl emissions, and determine the fate and distribution of chlorine through a material balance.
- Examine the effects of waste fuel burning and process conditions on other pollutants (e.g., particulate matter, NO_x, SO_2, and total hydrocarbons).

APPROACH

The primary focus of the sampling efforts was the kiln's electrostatic precipitator exhaust gas. Volatile organics were collected in Tenax® and Tenax®/charcoal sorbent tubes with the volatile organic sampling train (VOST). The sorbent cartridges were thermally desorbed and analyzed by gas chromatography/mass spectroscopy (GC/MS). Less volatile organic compounds were collected by XAD resin in a Modified Method 5 (MM5) sampling train. Both sorbents were analyzed to determine POHCs identified in the waste fuel and were also examined for products of incomplete combustion. Particulate matter emissions were determined from the MM5 sampling train. Metals emissions were estimated from analysis of the MM5 particle catch.

HCl emissions were sampled through a separate sampling train. The impinger solution was analyzed for HCl by ion chromatography. The exhaust gas was analyzed by continuous emission monitors for O_2, CO, CO_2, NO_x, SO_2, and total hydrocarbons.

Process samples taken included the raw material feed, cement product (clinker), ESP dust, primary fuel, waste fuel, and process water. The major process streams were analyzed for metals and chlorine content to attempt a material balance. In addition, the waste fuel and water were analyzed for organic compounds by GC/MS. Process operating parameters were recorded at 15-minute intervals throughout each test period.

The testing sequence first established baseline operating conditions burning only the primary fuel and no hazardous waste. The hazardous waste was then burned at different fuel replacement rates. This sequence permitted comparisons between the baseline and waste fuel test conditions and also provided information on the impacts of waste combustion in the cement kiln.

PROBLEMS ENCOUNTERED

The major problem encountered was

methylene chloride contamination of blank samples at levels roughly equal to those found from stack gas samples. The result is a bias toward high methylene chloride emission rates and a bias toward low DREs. Blank values were relatively low or nil for the other POHCs and yielded meaningful results. For the dry-process kiln test, one set of samples was invalidated because of lengthy storage time, cracks in sorbent tubes, and contamination. The ESP malfunctioned during the test on the dry-process kiln, and no meaningful data on controlled particulate matter emission rates were obtained for this test.

RESULTS

DREs

The designated POHCs for the two tests were methylene chloride, methyl ethyl ketone (MEK), toluene, 1,1,1-trichloroethane (TCE), and 1,1,2-trichloro-1,2,2-trifluoroethane (Freon 113). The concentration of the POHCs in the waste fuel ranged from 0.3 to 4 percent. The waste fuel was spiked with Freon 113 to determine the DRE of a compound that is difficult to destroy by combustion and that was unique to the waste fuel. The DRE results are summarized in Tables 1 and 2. Results for methylene chloride are environmentally conservative and biased low because sample levels and blank levels were about the same. According to the VOST protocol, blank corrections were not applied because blank levels could not be distinguished from sample levels. No significant blank problems were experienced with the other POHCs. DRE calculations for Freon 113, MEK, and 1,1,1-TCE show 4 to over 5 nines. Toluene was shown to originate from coal combustion. Toluene emission rates were unchanged by the cofiring of waste fuel. Therefore, the DRE for toluene entering only with the waste fuel is likely to be much higher than was measured. Even without subtracting the baseline level of toluene, DREs of 99.99 percent or greater were achieved at the dry-process kiln and one day at the wet-process kiln. The highest DREs for both tests were observed for compounds that had the lowest baseline and blank levels (Freon 113 and 1,1,1-TCE) with DREs on the order of 99.999 percent or greater.

The MM5 results from the dry-process kiln test were also examined to determine the DREs of compounds that were not predesignated as POHCs. Styrene, ethylbenzene, o-xylene, and benzaldehyde were present in the waste fuel at concentrations of 10 to 20 g/L. Benzaldehyde was detected in the stack gas for both the baseline and waste burn tests and yielded a DRE of 99.998 percent without correction (subtraction) of the baseline level. None of the other three compounds were found in the stack gas, which resulted in DREs greater than 99.999 percent for each based on detection limit values.

A review of kiln tests indicate that the highest DREs and lowest emission rates were observed when baseline or blank levels of the POHC were clearly not a problem. The two tests with apparently the least interference in measurements were at Rockwell Lime (5) and Stora Vika (1,2), where wastes similar to those previously discussed were burned. At Stora Vika, DREs consistently exceeded 4 nines and included 6-7 nines for several compounds. Similarly, at Rockwell Lime the DREs consistently exceeded 4 nines and were as high as 6 nines for several chlorinated compounds. Background and blank interferences were noted at St. Lawrence Cement (9); however, DREs exceeding 4 nines were obtained on a worst-case basis by not subtracting background levels. The results for the test at Los Robles were limited by method detection limits rather than by interferences, but DREs exceeding 4 nines were generally observed (8). A test with PCBs at Peerless Cement (12) found more PCBs entering with slurry feed (river water) in the cooler end of the kiln than was emitted during the PCB burn. However, DREs of 4 to 5 nines were reported without correction for the contribution from the water.

PICs

Organic compounds that were potential PICs from waste combustion were emitted at similar rates during the waste fuel and baseline tests. At the wet-process kiln, compounds such as toluene, benzene, xylene, biphenyl, naphthalene, and methylnaphthalenes were observed in the stack emissions with coal as the only fuel. During both the baseline and waste burn tests, benzene emission rates ranged from 15 to 50 mg/s. Emission rates of the other compounds were on the order of 1 to 10 mg/s. The highest emission rates were observed on a test day with a kiln upset (ring formation) with coal as the only

TABLE 1. DREs[a] AT THE WET-PROCESS KILN

Compound	Percent DRE at Given Replacement Rate					
	59%	43%	61%	39%	58%	Average
Methylene chloride[b]	99.998	99.995	99.956	99.975	99.993	99.983
Freon 113	------	------	------	>99.999	>99.999	>99.999
Methyl ethyl ketone	99.991	99.978	99.990	99.983	99.997	99.988
1,1,1-Trichloroethane	99.991	99.991	99.996	99.996	99.999	99.995
Toluene[c]	99.952	99.940	99.974	99.951	99.988	99.961

TABLE 2. DREs[a] AT THE DRY-PROCESS KILN

Compound	Percent DRE at Given Replacement Rate		
	25%	37%	Average
Methylene chloride[b]	99.94	99.99	99.96
Freon 113	99.999	99.999	99.999
Methyl ethyl ketone	99.997	99.999	99.998
1,1,1-Trichloroethane	>99.999	>99.999	>99.999
Toluene[c]	99.992	99.998	99.995

[a] Uncorrected for blanks.

[b] Blank values were comparable to sample values for methylene chloride.

[c] Trace quantities of toluene are produced from coal combustion.

TABLE 3. CHLORINE RESULTS FOR THE WET-PROCESS KILN

Condition	Cl in fuel (kg/hr)	HCl emissions (kg/hr)	Cl in dust (%)	Cl in clinker (ppm)
Baseline	6	0.57	0.2	<200
Day 5	32	0.27	0.7	705
Day 6	21	1.0	0.7	<200
Day 7	41	1.5	0.7	<200
Day 8	72	2.3	1.0	<200
Day 9	128	5.4	1.7	<200

TABLE 4. CHLORINE RESULTS FOR THE DRY-PROCESS KILN

Condition	Cl in fuel (kg/hr)	HCl emissions (kg/hr)	Cl in recycle dust (%)	Cl in waste dust (%)
Baseline	10	1.3	0.73	3.5
Day 3	60	2.2	1.3	5.7
Day 4	71	5.5	1.4	6.1
Day 5	72	27.	1.9	8.1

[a] Clinker results were <125 ppm chlorine.

fuel. No statistically significant increase in emission rates was observed when the waste fuel was burned. No polychlorinated dibenzodioxins or dibenzofurans were found in any samples at a detection limit of less than 1 ppb by weight in the stack gas. Similar results were obtained at the dry-process kiln except that the quantity of these compounds was lower (roughly 10 times the detection limit). The emission rates at this kiln were on the order of 0.3 mg/s.

Particulate Matter Emissions

No statistically significant difference was noted in particulate matter emissions between the baseline and waste fuel burn at the wet-process kiln. The control device was an ESP, and emissions averaged about 0.65 lb/ton. The maximum chlorine loading reached 4.7 kg/Mg of clinker.

A review of particulate matter results from kiln tests conducted to date shows similar results for pairs of tests:

- The testing of two kilns equipped with baghouses (San Juan and Rockwell Lime) showed no increase in particulate matter emissions when chlorinated wastes were burned (5,11). Emissions were 0.65 and 0.25 lb/t for the cement and lime kilns, with chlorine inputs of approximately 5.5 and 2.7 kg Cl/Mg product.

- The testing of two kilns equipped with ESPs (St. Lawrence Cement's dry-process kiln and Alpha Cement) showed a decrease in emissions when wastes were burned that were low in chlorine content (3,10). Baseline emissions of 1.1 lb/t decreased to 0.7 and 0.8 lb/t.

- The testing of two kilns equipped with ESPs (the wet-process kiln we tested and Marquette Cement) showed no change in particulate matter emissions when chlorinated wastes were burned at rates of 1.1-4.7 kg Cl/Mg clinker (7). Emissions were 0.65 and <1 lb/t for these two kilns.

- The testing of two kilns equipped with EPSs (St. Lawrence's wet-process kiln and Stora Vika) yielded results for different wastes and different chlorine loadings. Emissions were positively correlated with chlorine loading; however, the extent of the increase in emissions varied for different compounds and different kilns. Chloride accumulation, as evidenced by ring formation and subsequent release or pluggage, begins to occur in the range of 6-9 kg Cl/Mg clinker (1,2,9).

Although increased chlorine loading at the St. Lawrence and Stora Vika kilns increased particulate matter emissions, there was no known attempt to compensate for changes in the dust's resistivity. However, emissions were still comparable to those observed at other tests. Baseline test results at these two kilns ranged from 0.2 to 0.5 lb/t compared to 0.5 to 1.1 lb/t during the cofiring of waste fuels. The results do not include a kiln upset from a chloride ring formation at St. Lawrence Cement when emissions averaged about 3 lb/t. The tendency for chloride rings to form during high chlorine loading provides an incentive to the kiln's operator to limit the chlorine entering the kiln. Limiting the chlorine input may avoid plugging and process disruptions as well as limit chlorine concentrations in the dust going to the ESP. The test data suggest that particulate matter emissions from chlorinated waste combustion are controllable by a properly operating control device and a reasonable limit on chlorine loading to avoid ring formation and excessive dust loading. Adjustments may be required on a site-by-site basis to optimize ESP performance and thus account for changes in dust resistivity.

Fate of Chlorine

Results for chlorine are summarized in Tables 3 and 4 and show that 90 to 99 percent of the chlorine is retained in the process solids. At the dry-process kiln, the waste fuel contained an average of 2 percent chlorine and was fired at an average rate of about 1.2 kg Cl/Mg clinker. The waste fuel at the wet-process kiln contained 1 to 4 percent chlorine and was fired at an average rate of 2.2 kg Cl/Mg clinker (maximum of 4.7). HCl emissions, percent chlorine in the dust, and percent chlorine in the recycled dust increase as the total chlorine input increases. On the first waste fuel test day (second day of waste fuel burning) at the wet-process kiln, HCl emissions were lower than during the baseline period. Chlorine was detected in the clinker. It is possible that an equilibrium chlorine cycle had not been obtained at this point. On the last day of testing at the dry-process kiln, the chlorine cycle evidently shifted to the cooler end of the kiln. More chlorine exited with the stack gas and waste dust than in previous tests, and the chlorine concentration of the recycled dust appeared to increase although the total chlorine input remained unchanged.

A review of other tests showed that during the combustion of highly chlorinated wastes at St. Lawrence Cement, over 99 percent of the chlorine was retained in the process solids and HCl emissions were <1 lb/hr during both the baseline and waste fuel burns (9). The total chlorine input was up to 6.8 kg Cl/Mg clinker. An increase in HCl emissions from 0.6 to 1.0 lb/hr was observed at Los Robles (8), and an increase from 2.4 to 5.8 lb/hr was observed at Alpha Cement (10). An increase from <0.2 to 0.8 lb/hr was observed at San Juan Cement (11), and at Rockwell Lime the increase was from 0.2 to 0.4 lb/hr (5). During the tests at San Juan Cement, the waste fuel was highly chlorinated (up to 35 percent Cl) and was fired at an average rate of 5.5 kg Cl/Mg clinker. Over 99 percent of the chlorine was retained in the process solids, primarily the clinker. For other tests, most of the chlorine was removed with the waste dust. These tests indicate that HCl emissions can increase from chlorinated waste combustion; however, 90 to over 99 percent of the chlorine is retained in the process solids.

Fate of Lead

The lead content of the waste fuel ranged from roughly 100 to 1,000 ppm for both kiln tests. Lead emissions at the wet-process kiln increased from about 1.5 mg/s at the baseline to about 6.9 mg/s during the waste burn. The malfunctioning ESP prevented useful results at the dry-process kiln test, but a previous test at the same kiln with a similar waste fuel showed an increase in lead emissions from 5 to 9 mg/s. A material balance showed that over 99 percent of the lead was retained in the process solids. The lead concentration in the waste dust increased at both kilns. At the wet-process kiln, the increase was from 395 to 1,530 ppm compared to an increase from 116 to 2,650 ppm for the dry-process kiln.

A review of lead emissions during other kiln tests shows varying results. At St. Lawrence Cement, burning lead-contaminated waste oil with a low chlorine content did not affect lead emissions (3). Similarly, burning chlorinated aliphatics did not increase lead emissions, but burning PCBs resulted in an increase from ~1.5 mg/s at the baseline to ~4.6 mg/s (9). Lead emissions appeared to increase also at Alpha Cement (from ~4 to ~17 mg/s) (10) and Rockwell Lime (from <0.4 to 0.47 mg/s) (5). The lead content in the waste dust also increased in most cases.

For perspective, consider that total lead emissions are relatively small and on the order of emissions from several automobiles burning leaded gas. Also consider that over 99 percent of the lead is retained in the process solids. By comparison, a boiler burning used oil emits 50 to 60 percent of the lead, and may emit a higher percentage because of losses during soot blowing (3,6).

SO_2, NO_x, Total Hydrocarbons, and CO Emissions

At the wet-process kiln, SO_2 concentrations decreased from an average of 636 ppm to 265 ppm when the waste fuel replaced the sulfur-containing coal (4.3 percent sulfur). Approximately 60 percent of the total sulfur was retained in the process solids for both test conditions. At the dry-process kiln, SO_2 concentrations were low, with baseline concentrations of 1.5 to 12 ppm. During the waste burn, SO_2 concentrations ranged from 5 to 38 ppm and were shown to be strongly affected by O_2 input. The kiln exit oxygen increased to 6.7, 7.3, and 7.5 percent on successive test days with corresponding SO_2 concentrations of 38, 13, and 5 ppm. Approximately 99 percent of the sulfur entering with the fuel was retained by the process solids at the dry kiln.

Similar results have been observed at other tests, i.e., a reduction in SO_2 from waste combustion. At Alpha Cement (10), SO_2 concentrations decreased from 78 to 33 ppm, from 93 to 18 ppm at Marquette

Cement (7), and were constant at 27 ppm at Los Robles (8).

NO_x concentrations ranged from 370 to 480 ppm at the wet-process kiln and from 600 to 800 ppm at the dry-process kiln. The NO_x concentrations at the dry-process kiln were strongly affected by kiln oxygen input: an increase in kiln exit O_2 from an increased air rate yielded corresponding increases in NO_x. NO_x emissions are not obviously affected by burning waste fuels. Other investigators have found that NO_x concentrations are primarily affected by oxygen input, primary/secondary air ratio, and temperatures (4).

Concentrations of total hydrocarbon ranged from 6 to 7 ppm during three baseline tests at the wet-process kiln and increased to 21 ppm during a kiln blockage for one baseline test. The overall average was 10 ppm compared to an average of 21 ppm (16 to 28 ppm) during the waste fuel burn. The baseline test at the dry-process kiln revealed concentrations of 2 to 4 ppm compared to daily averages of 1, 5, and 9 ppm for the three waste burn tests. Tests at San Juan Cement, Rockwell Lime, and Stora Vika showed that total hydrocarbon concentrations on the order of 10 ppm or less were attained during both the baseline and waste burn test conditions.

Carbon monoxide concentrations at the wet-process kiln averaged 212 ppm (100 to 400 ppm) during the baseline compared to 190 ppm (130 to 340 ppm) during the waste burn. The baseline tests at the dry-process kiln revealed CO concentrations of 35 to 40 ppm compared to an average of 39 ppm during the waste fuel burn. The difference between CO concentrations during the baseline and waste fuel test conditions is not significant.

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REFERENCE 4

EVALUATION OF HAZARDOUS WASTE INCINERATION IN A DRY PROCESS CEMENT KILN

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ABSTRACT

This report presents the preliminary results of a test program conducted by SYSTECH Corporation at the Marquette Cement Plant in Oglesby, Illinois. The objective of this program was to compare the emissions resulting from co-firing low chlorine, high Btu liquid waste and coal in a dry process cement kiln with the emissions resulting from firing coal only.

The characteristics of the liquid waste burned during the test were examined by performance of standard analytical methods, with particular emphasis on organic composition. Destruction and removal efficiencies (DREs) were calculated for four principal organic hazardous constituents (POHCs) of the fuel: methylene chloride; methyl ethyl ketone; 1,1,1-trichloroethane; and toluene. Additional analyses were conducted on the stack gases to determine particulate loading, SO_2, NO_x, total gaseous nonmethane organics (TGNMO), HCl, and metals emissions. The kiln dust was also sampled and analyzed for metals and Extraction Procedure (EP) toxicity.

The results of these tests indicate that the cement kiln may be an ideal method of disposal for low chlorine, high Btu liquid wastes. The burning of liquid wastes in the kiln did not lead to any significant increase in particulate loading, SO_2, NO_x, TGNMO, or HCl over the levels observed during baseline coal-only test periods. Among the metals examined, only lead was found to significantly increase in emission rate during the liquid waste firing. No significant differences were observed in the EP toxicity of the kiln dusts sampled during the liquid waste and baseline tests, and only the concentration of lead was found to significantly increase in the kiln dust. Within the detection limits of the test method employed, the four POHCs measured were completely destroyed in the kiln.

INTRODUCTION

Marquette Company operates a cement plant in Oglesby, Illinois, which produces approximately 450,000 tons of cement yearly. Pulverized coal has been the primary fuel for this facility. Marquette proposes to construct and operate a liquid waste fuels resource recovery system at the Oglesby plant to facilitate the use of select combustible liquid waste materials such as high Btu (10,000 to 14,000 Btu/lb), low chlorine (2 to 5 percent) waste solvents as supplemental fuel in the kiln. The primary fuel will remain coal with an estimated 25 to 40 percent of the heat required by the manufacturing process supplied by the energy content of liquid waste materials. In order to assess the environmental effects of burning liquid wastes in the kiln, Marquette, in conjunction with the U.S. Environmental Protection Agency (EPA), the Illinois Environmental Protection Agency (IEPA), and SYSTECH Corporation performed a series of tests on the cement kiln at Oglesby on October 26 through 31, 1981.

The liquid waste fuels burned at the Oglesby facility were low chlorine, relatively high Btu waste solvents from ink and paint manufacturing and solvent recovery processes. Wastes of this type are classified as hazardous under the Resource Conservation and Recovery Act (RCRA) regulations primarily because of their ignitability, and have generally been considered unsuitable for recycling or reclaiming. Materials of this type have traditionally been disposed in landfill or incinerated without recovering their useful energy content. Incineration of such wastes in a cement kiln has the potential of minimizing any environmental damage from their disposal by destroying their combustibles while simultaneously recovering their useful energy content. Because of the high temperatures (2700° to 3000°F), long gas retention times (approaching 10 seconds), and high alkalinity in cement kilns, even highly toxic wastes such as PCBs have been demonstrated to be effectively destroyed. Earlier tests have demonstrated destruction and removal efficiencies (DREs) of such compounds exceeding 99.99 percent.[1,2]

The primary objective of the tests conducted in this program was to characterize the baseline emissions from the process when only coal was fired and to compare the results from this situation with those obtained when a combination of liquid waste and coal was being fired in the kiln. Specific emphasis was placed on characterizing the DREs of four principal organic hazardous constituents (POHCs) of the liquid wastes: methylene chloride; methyl ethyl ketone; 1,1,1-trichloroethane; and toluene. The experimental design and test methods used were developed to permit a comparison to be made between these two conditions rather than to accomplish a definitive environmental assessment of the burning of liquid wastes in a cement kiln. Therefore, it should be emphasized that the main purpose of this program was to determine whether co-firing liquid wastes increased the emissions over those normally observed during baseline conditions. The only statistically valid conclusions which can be derived from this test program fall into two categories: either the emissions were significantly increased or else no significant increase was observed. Although the mean values of the data collected may at first glance seem to indicate differences, only by considering the numbers of samples taken and the calculated sample standard deviations can statistically valid conclusions be reached. This summary report focuses on system emissions while the final EPA report will include information regarding any effects that the liquid waste may have had on the characteristics of the cement product. These effects are expected to be negligible and should not impact the environmental considerations regarding this project.

METHODS

The test program conducted at the Oglesby facility was designed to collect 2 days of samples and data during both the baseline and liquid waste burns. Because of difficulties encountered in receiving and delivering a sufficient quantity of liquid waste and periodic unscheduled kiln down times, however, only 1 day of testing was accomplished with liquid waste and only 1 1/2 days during baseline conditions.

Figure 1 shows a schematic flow diagram of the dry process cement kiln tested at Oglesby. Samples and data were collected from the sites labeled A through E. Liquid waste was pumped from a storage tanker into the flame of the kiln through a specially designed delivery nozzle.

The liquid waste burned in the test program was sampled at Site A and analyzed for heating value, chlorine, sulfur, nitrogen, and water content by standard ASTM reference methods. Method 8.01 (SW 846 Test Methods for Evaluating Solid Waste: Physical/Chemical Methods) was employed to identify the concentrations of methylene chloride; methyl ethyl ketone; 1,1,1-trichloroethane; and toluene. Other organics were qualitatively identified by a general scanning procedure employing gas chromatography with flame ionization detection (FID). Metals were identified by inductively coupled plasma emission spectroscopy (ICP). Atomic absorption spectroscopy (AA) was employed for mercury analysis.

Stack emissions were sampled at Site C and examined for total gaseous nonmethane organics (TGNMO) by EPA Method 25. Integrated bag samples of stack gases were analyzed by gas chromatography with FID according to EPA Method 23 for methylene chloride; methyl ethyl ketone; 1,1,1-trichloroethane; and toluene (see Federal Register, June 11, 1980, and EPA 600/4-80-003). Particulate emissions were measured by EPA Method 5, and SO_2 was measured by a modified EPA Method 8 procedure employing 3 percent H_2O_2 in the impingers to collect SO_2 and sulfuric acid mist. Metals emissions were determined from an analysis of the Method 5 filters and the acetone probe rinses by ICP spectroscopy. Mercury emissions were determined by AA spectroscopy. Emission of nitrogen oxides was determined by EPA Method 7. A midget impinger train containing sodium hydroxide was used to collect hydrochloric acid emissions. Analysis of the impinger contents was accomplished by a mercuric nitrate titration.

The kiln dust collected at Site D from the last two banks of the electrostatic precipitator (ESP) was analyzed for metals by ICP spectroscopy. Mercury was analyzed by AA spectroscopy. The potential for leaching of metals from this dust was assessed by conducting EP toxicity tests.

RESULTS AND DISCUSSION

Figure 2 illustrates the testing and process operating log for the test period. It is evident that the kiln experienced several periods of down time during the tests. Three tests, designated Test Nos. 1, 2, and 3, were conducted during the liquid waste burns on October 28, 1981. Test Nos. 4, 5, and 6 were conducted during baseline burns on October 30 and 31, 1981. Each test consisted of approximately 2 hours during which samples and data were collected.

The liquid waste used for this test was typical of that which would be specified for a permanent facility operation. The liquid waste was sampled every hour during the test period, and composites were made of the hourly samples to represent the material fired during each of the three co-firing conditions. The results of these analyses are presented in Table 1. The liquid waste had a mean heating value of 12,350 Btu/lb and a mean chloride content of 4.54 percent. The primary metallic constituent of the waste was lead, with a mean concentration of 1,800 ppm. No PCBs were detected in the waste and the POHCs designated for these tests comprised an average of 24.7 percent of the liquid waste. The other organic constituents listed in Table 1 were qualitatively identified by retention time in the GC analysis.

It is anticipated that in normal operation a substitution rate of 25 to 40 percent liquid waste would be used; however, during the test period a limitation on the quantity of liquid waste available precluded firing the waste at these rates. The substitution rates for the liquid waste expressed as a percent of the total heat input of the combined coal and liquid waste stream were 14.0 percent for Test No. 1, 11.2 percent for Test No. 2, and 12.8 percent for Test No. 3.

Stack emissions measured during the test program are shown in Table 2. None of the POHCs measured were detected in the stack gas samples during either co-firing or coal-only combustion. Table 3 shows the DREs of the kiln for the POHCs measured during the liquid waste tests. Since none of the POHCs were detected at the minimum detection limit of the test method (nominally 0.1 ppm), the DREs expressed can be considered minimum values. The efficiency of combustion of organic compounds is also supported by the results of the Method 25 tests which show no significant increase at a 95 percent confidence level in TGNMO emissions during co-firing when compared with baseline results. These results indicate that there is no measurable contribution to the hydrocarbon emissions from the stack due to the addition of liquid waste to the kiln.

In addition to hydrocarbons, Table 2 also presents the particulate, SO_2, NO_x, and HCl emissions under the co-firing condition for Test Nos. 1, 2, and 3 versus the coal condition during Test Nos. 4, 5, and 6. Although unstable operating conditions contributed considerable variability within the data sets, there was no significant increase at a 95 percent confidence level over baseline conditions in particulate, SO_2, NO_x, or HCl emissions while cofiring liquid waste.

Table 4 shows the results of metals analyses of stack particulates sampled during this test. A slight increase in lead emissions over baseline conditions (from .04 to .072 lb/hr) was observed during the co-firing tests. Other metals examined did not increase significantly at a 95 percent confidence level with the burning of the liquid wastes. Table 4 also shows the results of metals analyses of the kiln dust sampled during this test. An increase in the lead concentration in the kiln dust was observed during the liquid waste firing. This increase was from approximately .02 percent during coal-only conditions to .05 percent during the co-firing conditions. The other metals present in the liquid waste were not observed to significantly increase in concentration at a 95 percent confidence level in the kiln dust when the liquid waste was co-fired in the kiln. Further, the leachability of metals from the kiln dust did not increase significantly and remained orders of magnitude below the allowable limits specified by the EPA.

The inclusion of metals in the liquid waste burned in the cement kiln appears to have had a minimal impact on the discharge of metals from the stack or on the amount occurring in the kiln dust. This may indicate that many metals are deposited in the cement clinker and become incorporated in the crystalline structure of the cement product.

CONCLUSIONS

The general conclusion that can be drawn from this test program regarding the the environmental impacts of firing liquid wastes in a cement kiln is that the liquid waste does not significantly increase the emissions of particles, hydrocarbons, SO_2, NO_x, or HCl from the stack. Within the detection limits of the test methods employed, the four POHCs examined were completely destroyed in the kiln. A slight increase in lead in the particulate and kiln dust was observed, but other metals examined did not show a significant increase either in stack emission or in the process collected kiln dust with the burning of the liquid waste. The kiln dust was determined by the EP toxicity test to be nonhazardous and could be landfilled even when liquid wastes are cofired. In general, the use of liquid waste in this test produced only minor changes in the emissions from the kiln and revealed that the kiln may provide a promising waste disposal method for high Btu, low chlorine wastes.

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TABLE 1. WASTE FUEL ANALYSIS

	Test 1	Test 2	Test 3
Heat content (Btu/lb)	12,210	13,012	11,823
Ash (%)*	12.13	7.82	6.85
Chloride (%)	3.56	4.28	5.80
Sulfur (%)	.09	.09	.06
Nitrogen (%)	.13	.10	.20
Water (%)	10.70	10.3	11.80
Metals (ppm)			
Cadmium	3	2	1
Chromium	725	565	446
Copper	195	167	177
Lead	2520	1820	1050
Manganese	47	35	42
Mercury	.076	.104	<.032
Nickel	52	42	107
Zinc	1770	1290	905
Quantified organics (%)	23.88	22.01	28.26
Methylene chloride	2.72	2.94	6.27
1,1,1-trichloroethane	1.86	1.63	1.97
Methyl ethyl ketone	7.51	8.90	8.18
Toluene	11.79	8.54	11.84
PCBs†	N.D.	N.D.	N.D.
Other organics (%)§	53.29	59.87	53.09
Methanol			
Ethanol			
2-Propanol			
Acetone			
Methyl acetate			
Ethylene chloride			
2-ethoxy-ethyl acetate			
Methyl isobutyl ketone			
Butyl acetate			
4-hydroxy-4-methyl-2-pentanone			
Benzene			
Ethyl benzene			
Styrene			
C_9 Alkyl benzenes			
Paraffins (C_6-C_{12})			
Xylene			
Unidentified (2 compounds)			

* All (%) are weight percent.

† None detected at a detection limit of .005 percent.

§ Weight percent of other organics = 100 percent - ash - water - quantified organics. Compounds listed in this category were not quantified.

TABLE 2. OGLESBY EMISSION TEST RESULTS

Run No.	Percent substitution of heat input by liquid wastes	Hydrocarbons		Part. gr/scf	Part. lb/hr	SO_2 ppm	SO_2 lb/hr	NOx ppm	NOx lb/hr	HCl ppm	HCl lb/hr
		POHCs*	TGNMO† ppm C								
Liquid waste co-firing											
1	14	N.D.§	220	0.125	63.8	41	25.3	388	162.5	405	137
2	11.2	N.D.	800	0.101	58.7	8	5.3	590	280.4	232	89
3	12.8	N.D.	390	0.086	52.7	5	3.9	653	328.0	289	119
Coal-only											
4	—	N.D.	1350	0.075	42.9	42	27.7	864	402.9	522	196
5	—	N.D.	670	0.099	50.1	69	40.5	846	350.2	435	145
6	—	N.D.	1740	0.105	55.7	168	103.2	1052	458.7	654	230

* POHCs tested for were: methylene chloride; toluene; methyl ethyl ketone; and 1,1,1-trichloroethane.

† Method 25 hydrocarbons expressed as ppm carbon.

§ None detected at a nominal detection limit of 0.1 ppm.

TABLE 3. DREs CALCULATED FOR THE CO-FIRING TESTS

	Minimum DREs*			
Test numbers	Methylene chloride	Methyl ethyl ketone	1,1,1-trichloroethane	Toluene
1	99.869	99.960	99.718	99.968
2	99.851	99.959	99.604	99.947
3	99.917	99.961	99.710	99.968
Average	99.879	99.960	99.677	99.961

* The DREs indicated have been adjusted by a sensitivity analysis approach to include the impact of random measurement errors on the DRE calculations. The stated values therefore actually represent the minimum DREs observable in the cement kiln by employing the test methods described in this report.

TABLE 4. METALS TEST RESULTS

Kiln Dust Analysis (ppm)

		Liquid waste				Coal only			
Element	Run No.	1	2	3	Avg.	4	5	6	Avg.
Cd		18	16	15	16	19	22	30	24
Cr		23	24	31	26	23	28	24	25
Cu		26	24	25	25	24	30	30	28
Pb		524	511	488	507	173	186	167	175
Mn		632	656	795	694	681	759	655	698
Ni		25	31	31	29	22	27	29	26
Hg		.22	.30	.40	.31	.40	.22	.26	.29
Zn		71	66	70	69	49	57	75	60

Kiln Dust EP Toxicity Test Results (mg/ℓ)

		Liquid waste				Coal only			
	Run No.	1	2	3	Avg.	4	5	6	Avg.
As		<.003	<.003	<.003	<.003	.006	.004	.003	<.005
Ba		.593	1.020	.685	.766	.753	.649	1.020	.807
Cd		.004	.481	<.003	.167	.073	.017	.897	.329
Cr		<.020	.088	.032	.047	<.020	.020	.035	.025
Pb		<.043	.919	<.043	.335	<.043	<.043	.713	.266
Hg		<.0008	<.0008	<.0008	<.0003	<.0008	<.0008	<.0008	<.0008
Se		.215	.343	.179	.246	.350	.414	.502	.422
Ag		<.007	<.007	<.007	<.007	<.007	.013	<.007	<.009

Metals Emissions On Particulates (lb/hr)

		Liquid waste				Coal only			
	Run No.	1	2	3	Avg.	4	5	6	Avg.
Cd		.003	.001	.001	.002	.002	.003	.002	.002
Cr		.075	.030	.054	.053	.020	--	--	.020
Cu		--	--	--	--	--	--	--	--
Pb		.105	.060	.052	.072	.042	.036	.043	.040
Mn		.007	.004	.003	.005	.003	.002	.003	.003
Hg		.0002	.0002	.0001	.002	.0003	.0003	.0003	.003
Ni		.160	.061	.065	.095	.044	.018	.032	.031
Zn		.049	.005	.001	.018	.002	.002	--	.002

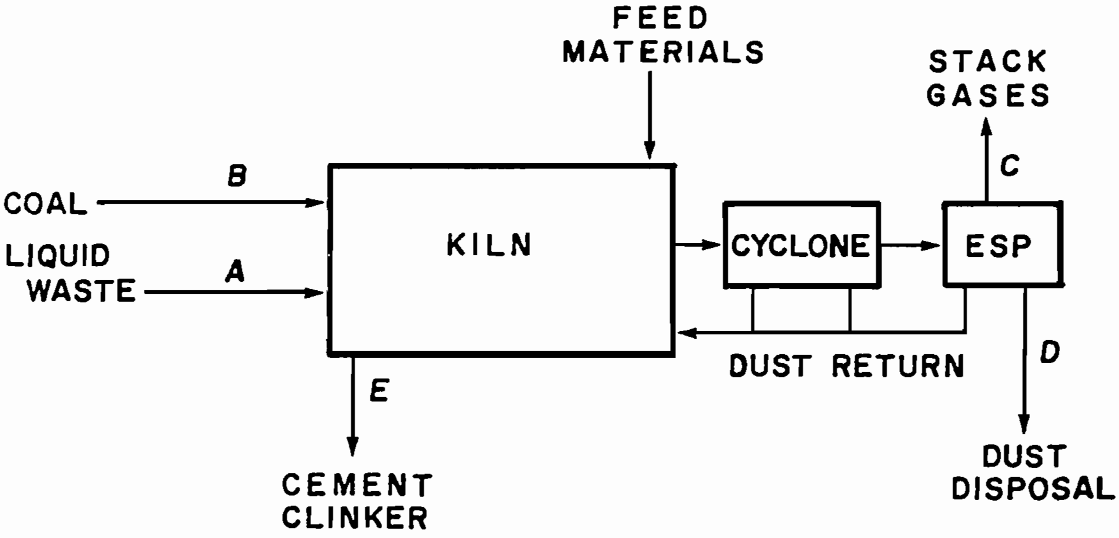

Figure 1. Marquette-Oglesby cement kiln schematic.

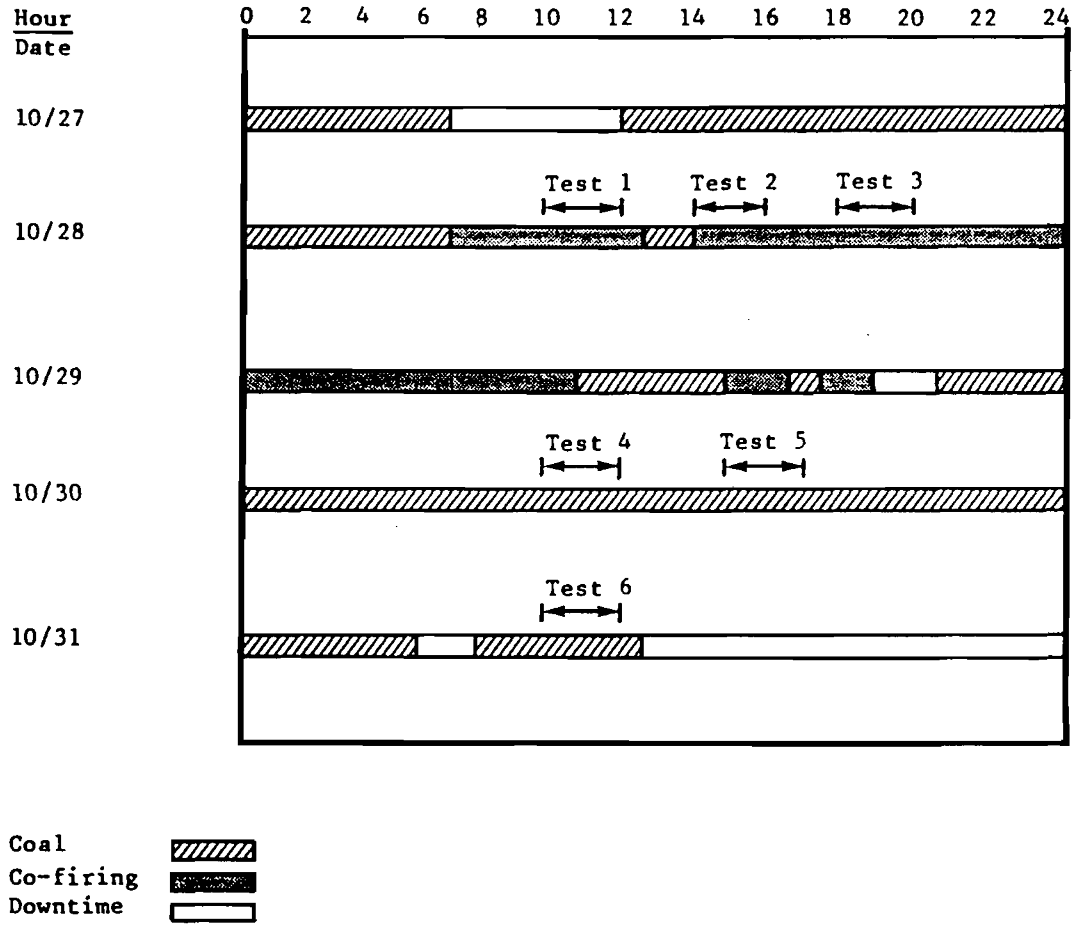

Figure 2. Process operations log.

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THE BEHAVIOR OF METALS IN CEMENT KILNS

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THE BEHAVIOR OF METALS IN CEMENT KILNS

I. INTRODUCTION AND SUMMARY

It is widely recognized that cement kilns represent significant capacity in the management of hazardous wastes. The capacity exists today and cement kilns can, without any adverse side effects, replace 20% to 30% or more of their fuel requirements with hazardous waste fuels. This represents an environmentally sound technology to recover the energy from hazardous wastes while providing an economic incentive for cement manufacturers.

Companies applying for new permits, or permit modifications, to replace a portion of the fossil fuel in a cement kiln with hazardous waste fuels are typically faced with two concerns voiced by the local residents and the environmental agencies: the potential for emission of hazardous organic compounds and emission of metals. This paper will address both concerns. It will provide evidence that combustion conditions required to manufacture Portland cement clinker in rotary kilns result in destruction and removal of organic hazardous compounds. It will show the results of recent tests indicating the complete destruction and removal of hazardous organic compounds (i.e., DRE >99.996%) when those compounds are fed directly to the feed end housing of a preheater kiln. These findings prove that the emission of organic hazardous compounds from cement kilns is not a valid concern.

This paper will also report on extensive investigations made on six preheater and precalciner kilns to determine the behavior of metals. On the basis of these investigations, which were performed on kilns burning conventional and hazardous waste fuels, accurate predictions of metal emissions may be made. The results of these investigations permit responsible management of the metals input to avoid any potential health or environmental risk.

II. DESTRUCTION OF ORGANIC HAZARDOUS COMPOUNDS IN KILNS

A number of tests have been performed to demonstrate the destruction and removal efficiency (DRE) of cement kilns with respect to organic compounds (1). Most of these tests utilized a variety of different hazardous organic compounds input to the burning zone of long wet kilns, while feeding hazardous wastes as replacement fuels.

A more demanding test series was recently performed. Organic hazardous compounds were fed to the burning zone of a preheater kiln as part of the liquid hazardous waste fuel (liquid HWF) supplement. In a second series, organic hazardous compounds were introduced to the kiln inlet of the same preheater kiln in conjunction with automobile tires being used as replacement fuels. A flow sheet of the kiln system in which the tests were performed is shown in Figure 1. The preheater kiln system tested has a clinker capacity of 2350 short tons per day. It's prime fuel is pulverized coal. Due to the waste streams expected to be used as replacement fuels, carbon tetrachloride and trichlorobenzene were used as organic hazardous constituents (POHCs) for DRE testing. These POHCs are difficult to combust and destroy because of their thermal stability. The POHCs were metered to the kiln system while their concentrations in the stack gases were measured. The results of these tests are shown in Table 1.

During test conditions 1 and 2, both POHCs were added to the liquid HWF. This way, the POHCs have to travel through the sintering zone and through the calcining zone of the rotary kiln and through the entire preheater to survive. The results as shown in Table 1 were therefore, in agreement with previous test data indicating destruction and removal efficiencies for carbon tetrachloride exceeding 99.999%. Measured DRE for trichlorobenzene exceeded 99.99%. During the most severe test condition 3, the POHCs were introduced with automobile tires at the inlet of the rotary kiln. The tire feed device utilizes a specially designed feed chute with a double air lock, which allows the tires to slide down the feed shelf into the rotary kiln. The test results given in Table 1 again, as theoretically expected, clearly shows that the DREs are as high as experienced under test *conditions 1 and 2. For carbon tetrachloride, the DRE was measured to be greater than 99.999%, and for trichlorobenzene, DREs greater than 99.996% were measured. It should be noted that these DREs are a result of the detection limits of these constituents in stack gases rather than the result of actual findings of undestroyed POHCs. In essence, no POHCs were actually detected in the stack gases.*

*These results clearly support the claim that the emission of organics from cement kilns burning HWF as a replacement for part of the fossil fuel, is **not** a valid concern.*

III. METALS RETENTION IN KILNS

Sprung, et al (2,3,4) have extensively investigated the reactions of trace amounts of metals in cement kiln systems. In the course of these investigations, both internal and external circulation of the trace metals were measured. Measurements were made on suspension preheater and traveling grate preheater kiln systems. The results of the measurements revealed that most trace metals in the kiln systems behave in a manner similar to the main elements, i.e. Ca, Si, Al, Fe and Mg. As such, most of the trace metals are bound in the clinker and in the dusts discharged from the kiln system. Since most of the dusts are returned to the kiln feed, external circulations of the main and the trace elements develop. This is typical for cement kiln systems. More than 99.9% of the total main and trace element inputs are bound in the solids of the kiln system (2,3).

It is generally accepted that alkali evaporation from the hot zones of the rotary kiln is increased as the halogen content, specifically the chlorine content, of the preheater feed is increased. Increased volatilization should therefore also occur for most metals in the presence of chlorine. Even for chromium, increased volatilization and partitioning in an incinerator was reported after the chlorine content was increased (5).

In an effort to verify the retention and partitioning of metals in cement kilns, detailed systems analyses were performed. The systems analyzed were 3 precalciner kiln systems, 2 conventional preheater kiln systems (one of which was tested with two chlorine input levels) and one long wet kiln. The systems analyses were performed by sampling all incoming and outgoing mass flows on an hourly basis for a period of at least eight hours. The hourly samples were combined in a composite sample. The composite samples were then analyzed for all metals. During the sampling periods, particulate emissions from the stacks were also measured and the particulate catches were analyzed. Based upon the analytical results and the estimated flow quantities, total input and output of metals were balanced. Since cement kilns typically operate in steady state conditions, such balances are reasonably accurate, i.e., better than ± 5% - 10%. As experienced in previous investigations, when attempting to mathematically balance the total input and output of one trace element in cement kilns (6), the accuracy of the balance is determined by the accuracy of the digestion and analysis of the elements rather than by the system stability.

A typical balance for arsenic (one of the trace metals) is given in Table 2. Table 2 represents the individual results as analyzed and calculated for a 4-stage preheater/precalciner kiln system. Listed are the incoming and outgoing mass flows of the system, the analytical results, and the calculated values in units of milligrams of arsenic per kilogram of clinker. The total input into the kiln system from raw materials and fuels is 12.821 milligrams of arsenic per kilogram of clinker. The bulk of the arsenic input results from the raw material. The total output with clinker and through the stack is 13.912 milligrams of arsenic per kilogram of clinker. This is 8.5% higher than the input. A computer program is used to adjust input and output accordingly. The measured emissions were however not subjected to adjustment. It should be noted that the precalciner kiln system, for which the arsenic balance is given, is not equipped with a bypass. Also, all of the dust collected in the kiln baghouse is returned to the preheater feed.

The arsenic balances, as shown in Table 2, for a preheater/precalciner kiln, were compared for all kiln systems investigated. The comparison focused on the total input and total output and on the portion of arsenic bound in the solids, i.e., clinker and dusts. Included in this comparison were 2 conventional preheater kiln systems which were using liquid HWF to replace some of the fossil fuel. It was found that the percentage of arsenic bound or retained in the solids was similar to all systems; 99.88% with a standard deviation of s = ± .29%. This result permits to consider the retention of arsenic in the solids of all kiln systems as a physical characteristic of the arsenic. The origin of the arsenic has no influence on this physical characteristic: the retention of arsenic in the solids is a function of the physical and chemical behavior of the arsenic input into the kiln systems.

Similar comparisons were made for other metals. The results of these comparisons are shown in Table 3. This table gives the input range of each metal in the various kiln systems burning fossil, and in two cases, liquid HWF fuels. The table also indicates the retention of these metals in the solids of the kiln systems i.e., the percentage of the metal locked up in the solids. Excluded from Table 3 are the highly volatile metals, thallium and mercury, which will be dealt with later. All other trace metals fit well into the scheme found for arsenic. Even with a wide input range over approximately one order of magnitude, the retention of a specific metal in the solids of the kiln system is similar for all kiln systems. The retention of each metal, or the portion of the total input of that metal, which is retained and locked up in the solids seems to be characteristic for each metal. Again, for the metals retainage it obviously is not relevant from where the metals originate: a metal input with raw material behaves in the same characteristic way as a metal input with fuel or with HWF. This finding is of specific importance when considering to burn solid HWF using the Cadence technology (7).

It is to be expected that this characteristic portion of the metal retained in the solids may be correlated with the volatility of the metal. This however, is not obvious from the results presented in Table 3. Chromium, which is not highly volatile, shows a retention in the solids of 99.855% of the total chromium inputs while 99.853% of the more volatile lead *input are retained in the solids.*

The lowest retention in this group of metals was observed for cadmium. With inputs ranging from 0.08 to .39 lbs per hour, 99.555% of the cadmium was retained in the clinker and dusts. This result is in line with the known high volatility of cadmium in the temperature ranges of kiln systems.

The retention of metals in the solids of a kiln system was specifically measured with different chlorine input levels on a 4-stage preheater system. The kiln was not equipped with a bypass. The results for lead and cadmium retention, with 1.8 lbs of chlorine per minute and 3.0 lbs of chlorine per minute input, is shown in Table 4. The table shows that the average retention of these selected metals is, within reasonable accuracy, independent of the chlorine input. Increased chlorine input does not decrease the amount of lead and cadmium bound in the clinker and dust. This result may only be valid within the relatively narrow range of chlorine input levels, but measurements at higher chlorine inputs are not possible. Additional chlorine could not be removed from the kiln system through a bypass. The results, given in Table 4, still support the conclusion that the retention of lead and cadmium in the solids of the kiln system is not decreased with increasing chlorine input, as long as the chlorine input levels do not exceed practical operating levels. This finding is important, since it allows to utilize chlorinated waste streams as replacement fuels for fossil fuel as long as the chlorine tolerance levels of the kiln system are not exceeded.

In addition to metals retention in the solids of cement kiln systems, also the metals emissions must be known for sound metals management.

IV. METALS EMISSIONS

The metals retention in the kiln systems were derived from balancing the metals input and output, the emissions were however measured separately. For emissions measurements, the particulate catches (using EPA Method 5) were analyzed. Metals emissions were also *directly measured (using EPA's Draft Multi-Metals Train). Generally, both methods give similar results which demonstrates that none of the metals discussed are emitted as free metals or vapors. The metals are condensed and have at least partly reacted with the feed stock particulates which pass through the baghouse as particulate emissions. This finding is in agreement with the results reported by Sprung et al (3). The preheater off gases are used to dry the raw materials or they are quenched prior to entering the baghouse. The operating temperature range of the air pollution control device does not permit gas temperatures sufficiently high so as to allow metals to exist in vaporized form.*

As in the case of metals retention in solids, the metals emissions of all tested kiln systems were compared for each metal. The comparison was made on the basis of total metals input. The minute amount of the specific metal emitted was determined as percentage of the total metals input. It should be noted that the metals emission most frequently are below the detection limit. In these cases, the detection limit was used as the metals emission, representing the most conservative approach to present emissions data.

The summary for all metals emissions as percentage of the total metals input is given in Table 5. This table shows the mean values of the emissions from the six kiln systems. As pointed out earlier, some of the kiln systems have totally closed dust return loops and only two of the systems tested were burning HWF as a replacement for a portion of the fossil fuel. As can be expected, no differences in the metals emissions between the kiln systems burning HWF and coal and those burning coal only were identified. This confirms the theory that the origin and point of introduction of metals in the kiln system is irrelevant for the retention and emissions of the metals.

The results given in Table 5 indicate that the emission, in percent of the total metals input, is different for certain groups for metals. While only .004 to .048% of the total metals input is emitted as particulates of metals like vanadium, arsenic and nickel up to .44% of the total cadmium input is emitted as particulate. These results are consistent with those reported for cadmium emissions of a cyclone type preheater kiln system by Kirchner (8).

It may, therefore, be concluded that figures given in Table 5 for the metals emissions in percent of the total metals input are reasonably accurate and representative.

In an effort to group the metals in order of their partitioning, Figure 2 was developed. This figure illustrates metals emissions (in a logarithmic scale) for various metals as a percentage of the total metals input. The metals are arranged in decreasing order with respect to emissions. Figure 2 reinforces the theory that cadmium is the most critical metal followed by selenium, antimony, zinc, lead and silver.

Both Table 5 and Figure 2 indicate that cadmium, selenium, antimony, zinc, lead and silver are the metals which demand the kiln operator's attention regardless of whether HWF are supplementing fossil fuels or not. However, cadmium and lead are generally higher in waste derived fuels than in fossil fuels. It is, therefore, necessary to forecast the emissions of these metals prior to actually burning HWF in a kiln to ensure that these emissions pose no risk to human health nor to the environment.

In Figure 2 and Tables 4 & 5, thallium and mercury were not addressed. These metals are considerably more volatile than the others, and they were of course included in the systems analyses and in the emissions measurements. Most of the balances of the inputs and outputs of these two metals performed on the six kiln systems, close well. This indicates that the mass flows and the emissions were accurately measured. However, a significant data scatter exists from kiln system to kiln system. The scatter of the mercury data is larger than that of the thallium data. This data is shown in Table 6. This table is a summary of the retention and emissions data for these two metals. The thallium retention in the solids of the kiln systems averages 90% with a standard deviation of ± 10.7%. Accordingly, 10% to 20% of the total thallium input is emitted. The data scatter increased primarily due to a long wet kiln, which is included in the data base. The figures for mercury show even a greater scatter; 61% of the total mercury input is retained in the solids with a standard deviation of ± 32%. The measured mercury emissions vary between 10% and 90% of the total mercury input. As previously discussed, the emissions *were assumed to be at the detection limit when the stack testing indeed indicated emissions below the detection limit for thallium and mercury. There is insufficient information to explain the scatter of the thallium and even more so the mercury data. Therefore, until more information is available, the most conservative assumptions must be made.*

V. EMISSIONS FORECASTING

Based upon the results reported under 3 and 4 above, it appears valid to predict metals emissions from cement kilns based upon the total metals input into the kiln and upon the average emissions figures given in Table 5 and in Figure 2. It should be pointed out that these forecasts may be applied to kiln systems of different capacities, as long as the total metals input are not significantly different than the ranges given in Tables 4 & 5. This limitation will effectively limit the extrapolation that may have to be applied.

The forecasting calculations as described above have been used to predict emissions of arsenic, beryllium and cadmium for a 4-stage preheater kiln system with a capacity of 2,000 short tons per day. To put the metal emissions predicted into perspective, they were compared with the extremely conservative Emissions Screening Limits (ESL), as published by EPA (9), taking the specific plant data into account. The result of this comparison is given in Figure 3. This figure gives the predicted metals emissions as percent of the emissions screening limits. The calculation was also performed for chromium. Through site specific testing, it was demonstrated that the content of hexavalent chromium is approximately 2% of the total chromium content.

Figure 3 indicates that all of the metals investigated show emission rates significantly less than 10% of the conservative ESL as published by EPA. The input of the other metals were so low that comparative calculations were only performed, but are not shown in Figure 3. Unfortunately, it is too early to compare these emissions forecasts with tests which are presently under way. However, the emissions forecasts compare very well with emissions measured in previous stack tests. It may, therefore, be assumed that the *methodology described provides reasonably accurate results for metals emissions forecasting.*

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Attachments:

Figure 1: *4-Stage Preheater Kiln System*

Table 1: *Destruction And Removal Efficiencies For POHCs Of A 4-Stage Preheater Kiln System*

Table 2: *Balancing Of Arsenic Preheater/Precalciner Kiln System*

Table 3: *Metals Retention In Percent Of Input*

Table 4: *Metals Retentions For Cadmium And Lead With Increased Cl-Input*

Table 5: *Metals Emissions In Percent Of Input*

Figure 2: *Metals Emissions*

Table 6: *Retention And Emissions Of Volatile Metals*

Figure 3: *Metals Emissions And Emission Screening Limits - 4-Stage Preheater Kiln*

4-Stage Preheater Kiln System

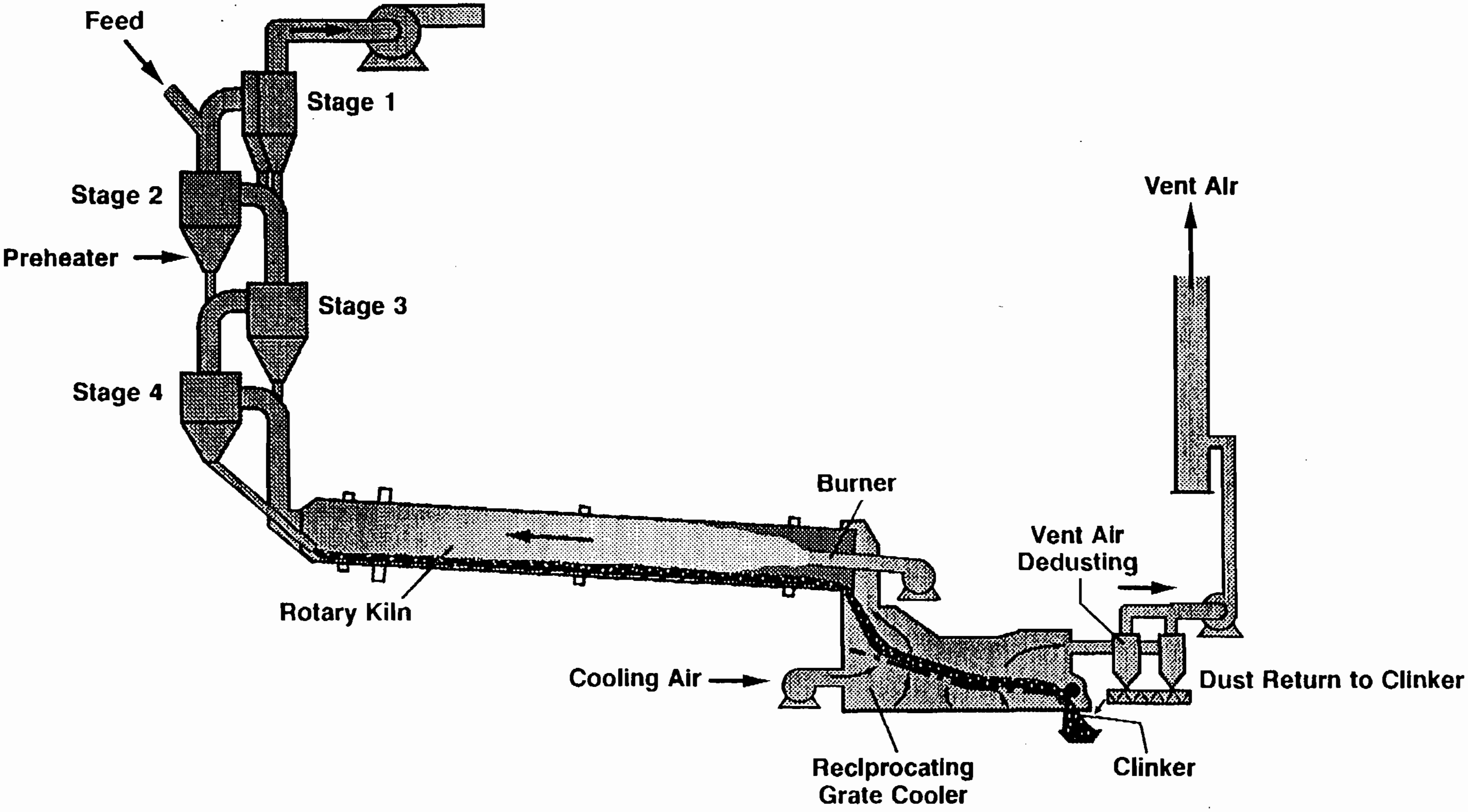

FIGURE 1

TABLE 1

Destruction and Removal Efficiencies For POHCs of a 4-Stage Preheater Kiln System

Principle Organic Hazardous Constituent DRE in %		
Tests of 9/15 - 9/22	Carbontetrachloride	Trichlorobenzene
Condition 1:	POHCs Added with Liquid HWF	
Run 1	99.9996	99.9960
Run 2	99.9996	99.9957
Run 3	99.9996	99.9960
Condition 2:	POHCs Added with Liquid HWF	
Run 1	99.9996	99.9961
Run 2	99.9996	99.9959
Condition 3:	POHCs Added with Tires	
Run 1	99.9996	99.9961
Run 2	99.9996	99.9961
Run 3	99.9996	99.9961

TAB. 2

Balancing of Arsenic Preheater/ Precalciner Kiln System

	Analyzed	Calculated	
	PPM	mg/kg CL	PPM
Raw Materials	8.400	12.689	8.400
Fuels	1.000	0.132	
Preheater Exit		3.379	17.767
Stack Loss	0.012	0.005	
Dust from Baghouse	16.000	3.374	17.743
Preheater Feed	16.064	16.064	9.445
Loss Through Bypass	10.000	0.000	
Kiln Feed	0.000	19.150	14.197
Clinker	14.300		12.816
Total Input	12.821		
Total Output	13.900		

TABLE 3

Metals Retention in Percent of Input

Metal	Input - Lbs/Hr	Retention %
Cr	0.5642 To 10.1974	99.8553 ± 0.3990
Pb	1.5761 To 42.2842	99.8531 ± 0.2008
Ba	33.1177 To 75.9640	99.8781 ± 0.2939
Cd	0.0864 To 0.3945	≥99.5550 ± 0.4418
As	0.0151 To 6.5910	≥99.8868 ± 0.2916
Be	0.0003 To 0.7172	≥99.8681 ± 1.3278
Se	0.0072 To 1.3410	≥95.4002 ± 1.7779
Ag	0.0439 To 0.4975	±99.8420 ± 0.1839
Ni	1.9490 To 5.0261	≥99.9574 ± 0.0108
Sb	0.3532 To 0.6640	≥99.7690 ± 0.0785
Zn	9.1751 To 35.8034	99.7869 ± 0.2598
V	4.9594 To 31.3130	≥99.9922 ± 0.0007

TABLE 4

Metals Retentions for Cadmium and Lead With Increased Cl-Input

Metal	Retention at 100 Lbs of Cl-/Hr	Retention at 180 Lbs Cl-/Hr
Cd	99.55	99.87
Pb	99.85	99.98

TABLE 5

Metals Emissions in Percent of Input

Metal	Input - Lbs/Hr	Emission %
Cr	0.5642 To 10.1974	0.128
Pb	1.5761 To 42.2842	0.167
Ba	33.1177 To 75.9640	0.030
Cd	0.0864 To 0.3945	0.440
As	0.0151 To 6.5910	0.022
Be	0.0003 To 0.7172	0.114
Se	0.0072 To 1.3410	0.298
Ag	0.0439 To 0.4975	0.163
Ni	1.9490 To 5.0261	0.048
Sb	0.3532 To 0.6640	0.266
Zn	9.1751 To 35.8034	0.220
V	4.9594 To 31.3130	0.004

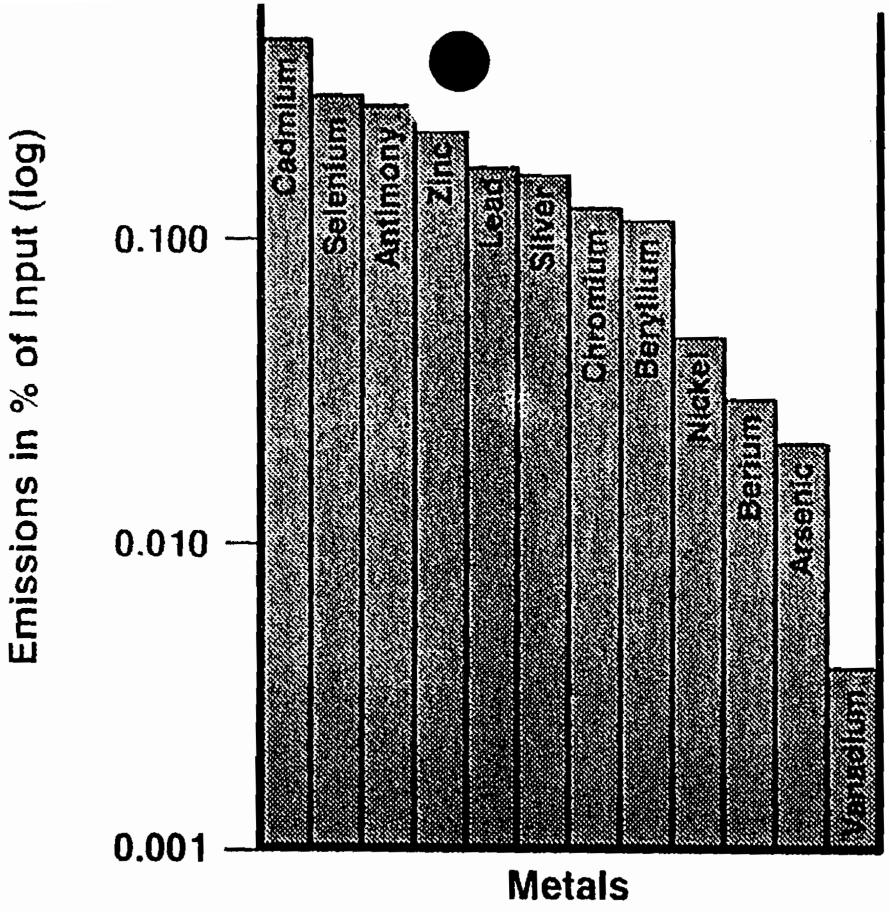
Emissions in % of Input (log)
0.100
0.010
0.001
Cadmium
Selenium
Antimony
Zinc
Lead
Silver
Chromium
Beryllium
Nickel
Barium
Arsenic
Vanadium
Metals

FIGURE 2

Metals Emissions and Emission Screening Limits (ESL)
4-Stage Preheater Kiln

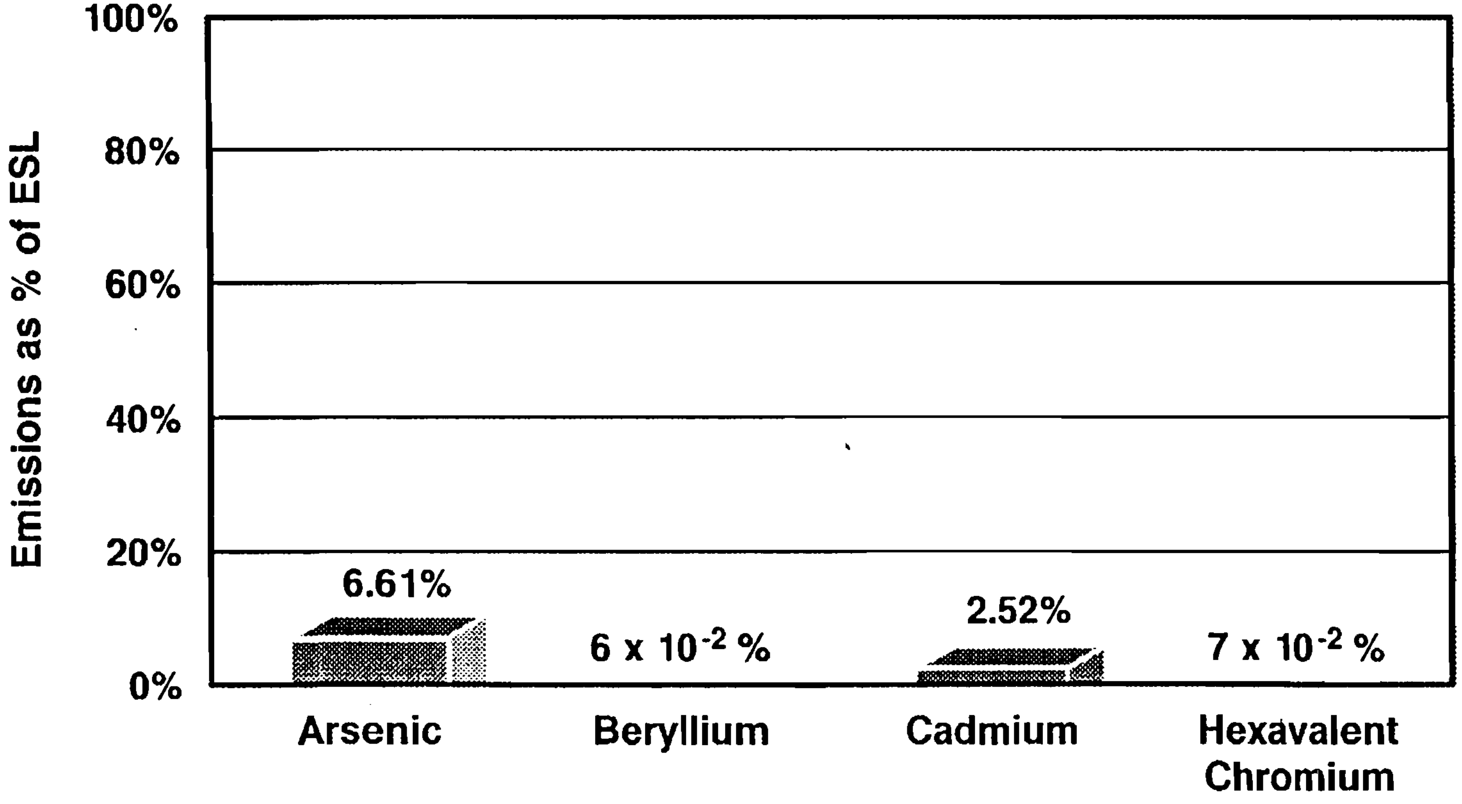

FIGURE 3

REFERENCE 6

METCO
ENVIRONMENTAL
P.O. Box 598
Addison, TX 75001
(214) 931-7127

SOURCE EMISSIONS SURVEY
OF
SOUTHWESTERN
PORTLAND CEMENT COMPANY
KOSMOS CEMENT DIVISION
KILN STACK
KOSMOSDALE, KENTUCKY
VOLUME I

SEPTEMBER 1990

FILE NUMBER 90-111

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SOURCE EMISSIONS SURVEY
SOUTHWESTERN PORTLAND CEMENT COMPANY
KOSMOS CEMENT DIVISION
KILN STACK
KOSMOSDALE, KENTUCKY
FILE NUMBER 90-111

INTRODUCTION

METCO Environmental, Dallas, Texas, conducted a source emissions survey of Southwestern Portland Cement Company, Kosmos Cement Division, located in Kosmosdale, Kentucky, on September 17, 18, 19, 20, 21, 22, 24, and 25, 1990. The purpose of these tests was to determine the concentrations of particulate matter, hydrogen chloride, sulfur dioxide, oxides of nitrogen, carbon monoxide, total hydrocarbons, metals, carbon tetrachloride, and 1,2,4-trichlorobenzene being emitted to the atmosphere via the Kiln Stack.

The sampling followed the procedures set forth in the Appendix to the Code of Federal Regulations, Title 40, Chapter I, Part 60, Methods 1, 2, 3, 3A, 5, 6C, 7E, 9, 10, 23, 25A, and Proposed 26; in "Methodology for the Determination of Metals Emissions in Exhaust Gases From Hazardous Waste Incineration and Similar Combustion Processes;" and in Test Methods for Evaluating Solid Waste, Volume II, Method 0030.

The sampling was observed by Mr. John Bartles and Paul Castagno of the Jefferson County Air Pollution Control District.

SUMMARY OF RESULTS
Kiln Stack

Condition	Particulate Matter Emissions		Hydrogen Chloride Emissions ****		Sulfur Dioxide Emissions		Oxides of Nitrogen Emissions		Carbon Monoxide Emissions		Total Hydrocarbons Emissions		Visible Emissions
	(gr/dscf*)	(lbs/hr)	(ppm)	(lbs/hr)	(ppm)	(lbs/hr)	(ppm)	(lbs/hr)	(ppm)	(lbs/hr)	(ppm)	(lbs/hr)	(% Opacity)
I	0.0025	4.94	3.7	4.90	10	23.7	288	493.5	45	47.2	7	11.8	---**
II	0.0015	3.06	2.0	2.70	23	54.0	383	651.7	131	135.3	6	9.0	0.0
III	0.0012	2.32	2.5	3.36	48	116.6	254	444.7	107	114.4	3	5.6	0.0
IV	0.0013	2.52	2.2	2.89	16	37.4	211	354.6	70	71.2	4	5.7	0.0

Condition	Arsenic Emissions (lbs/hr)	Cadmium Emissions (lbs/hr)	Chromium Emissions (lbs/hr)	Lead Emissions (lbs/hr)	Carbon Tetrachloride Emissions (lbs/hr)	Carbon Tetrachloride DRE (%)	1,2,4-Trichlorobenzene Emissions (lbs/hr)	1,2,4-Trichlorobenzene DRE (%)
I	$<4.48 \times 10^{-4}$	$<8.95 \times 10^{-4}$	<0.004	0.002	$<3.15 \times 10^{-4}$	>99.9993	<0.002	>99.995
II	$<3.81 \times 10^{-4}$	$<7.62 \times 10^{-4}$	0.002	0.001	$<3.60 \times 10^{-4}$	>99.9992	<0.002	>99.995
III	$<3.05 \times 10^{-4}$	$<6.11 \times 10^{-4}$	<0.002	3.34×10^{-4}	$<4.09 \times 10^{-4}$	>99.9992	<0.002	>99.996
IV	$<3.04 \times 10^{-4}$	$<5.17 \times 10^{-4}$	<0.002	0.002	------	-------- ***	------	------- ***

* 29.92 "Hg, 68°F (760 mm Hg, 20°C)
** No data, due to poor observation conditions.
*** Condition IV was baseline coal only, not a DRE run.
**** See page 31.

SUMMARY OF RESULTS
Kiln Stack
Condition I

Run Number	1	3	4
Date	9/18/90	9/19/90	9/19/90
Time	1120-1248	1230-1444	1849-2021
Stack Flow Rate - ACFM	360,335	363,356	361,614
Stack Flow Rate - DSCFM*	236,401	229,541	232,345
% Water Vapor - % Vol.	6.31	6.99	5.75
% CO_2 - % Vol.	10.2	7.6	6.1
% O_2 - % Vol.	14.9	14.8	15.0
% Excess Air @ Sampling Point	301	257	254
Stack Temperature - °F	295	310	307
Stack Velocity - FPM	4,685	4,724	4,702
Percent Isokinetic	97.2	100.7	97.1
Particulates Probe, Cyclone & Filter Catch grains/dscf*	0.0027	0.0019	0.0028
grains/cf @ Stack Conditions	0.0017	0.0012	0.0018
lbs/hr	5.38	3.80	5.64
Visible Emissions - % Opacity	----**	----**	----**
Hydrogen Chloride Emissions - ppm***	3.1	3.5	4.5
Hydrogen Chloride Emissions - lbs/hr	4.15	4.57	5.97

* 29.92 "Hg, 68°F (760 mm Hg, 20°C)
** No data due to poor observation conditions.
*** See page 31.

SUMMARY OF RESULTS

Kiln Stack

Condition I

Ion Chromatography Analyses

Run Number	1	3	4
Chloride - Total µg	7,351.2	8,786.6	10,699.4
Chloride ("Back-half") - µg	5,557.2	6,135.6	7,731.4
Ammonia - Total µg	10,655.8	10,563.4	8,152.1
Ammonia ("Back-half") - µg	10,655.8	10,563.4	8,152.1
Calcium - Total µg	457.0	158.2	349.0
Calcium ("Back-half") - µg	0.0	10.2	0.0
Potassium - Total µg	15.0	0.0	0.0
Potassium ("Back-half") - µg	15.0	0.0	0.0
Sodium - Total µg	763.0	1,056.0	411.0
Sodium ("Back-half") - µg	0.0	0.0	0.0

SUMMARY OF RESULTS
Kiln Stack
Metals
Condition I

Run Number	1	3	4
Date	9/18/90	9/19/90	9/19/90
Time	1340-1600	0948-1201	1540-1805
Stack Flow Rate - ACFM	365,040	386,181	376,676
Stack Flow Rate - DSCFM*	238,959	242,814	238,196
% Water Vapor - % Vol.	6.14	6.47	6.67
% CO_2 - % Vol.	9.4	10.4	6.1
% O_2 - % Vol.	14.8	14.4	15.0
% Excess Air @ Sampling Point	280	261	254
Stack Temperature - °F	297	318	312
Stack Velocity - FPM	4,746	5,021	4,898
Percent Isokinetic	99.4	102.8	96.4
Volume of Dry Gas Sampled - DSCF*	71.975	73.204	67.349
Arsenic - total µg	<1.0	<1.0	<1.0
Arsenic Emissions - lbs/hr	$<4.38\times10^{-4}$	$<4.38\times10^{-4}$	$<4.67\times10^{-4}$
Cadmium - total µg	<2.0	<2.0	<2.0
Cadmium Emissions - lbs/hr	$<8.76\times10^{-4}$	$<8.76\times10^{-4}$	$<9.34\times10^{-4}$
Chromium - total µg	11.0	<6.0	5.5
Chromium Emissions - lbs/hr	0.005	<0.003	0.003
Lead - total µg	6.7	1.8	1.7
Lead Emissions - lbs/hr	0.003	7.88×10^{-4}	7.94×10^{-4}

* 29.92 "Hg, 68°F (760 mm Hg, 20°C)

SUMMARY OF RESULTS

Kiln Stack

Method 23

Condition I

Run Number	1	3	4
Date	9/18/90	9/19/90	9/19/90
Time	1120-1500	0956-1358	1534-1928
Stack Flow Rate - ACFM	363,908	367,297	369,876
Stack Flow Rate - DSCFM*	239,621	238,271	239,327
% Water Vapor - % Vol.	5.23	4.38	5.11
% CO_2 - % Vol.	9.8	9.6	6.1
% O_2 - % Vol.	14.9	14.5	15.0
% Excess Air @ Sampling Point	295	258	254
Stack Temperature - °F	301	311	307
Stack Velocity - FPM	4,732	4,776	4,809
Percent Isokinetic	90.8	105.7	98.3
Volume of Dry Gas Sampled - DSCF*	115.739	122.064	113.963
Total 1,2,4-Trichlorobenzene - µg	<7.42	<6.42	<7.38
1,2,4-Trichlorobenzene Emissions - lbs/hr	<0.002	<0.002	<0.002

* 29.92 "Hg, 68°F (760 mm Hg, 20°C)

SUMMARY OF RESULTS

1,2,4-Trichlorobenzene

DRE

Kiln Stack

Condition I

Run Number	1	3	4
Liquid Hazardous Waste Fuel Feed Rate - lbs/hr	4,003	4,003	4,003
1,2,4-Trichlorobenzene in Liquid Feed - ppm	103	<100	<100
1,2,4-Trichlorobenzene in Liquid Feed - lbs/hr	0.41	0.00	0.00
1,2,4-Trichlorobenzene Injected - lbs/hr	50.1	46.9	50.3
Total 1,2,4-Trichlorobenzene - lbs/hr	50.51	46.90	50.30
1,2,4-Trichlorobenzene Emissions - lbs/hr	<0.002	<0.002	<0.002
1,2,4-Trichlorobenzene DRE - %	>99.996	>99.995	>99.996

SUMMARY OF RESULTS

Kiln Stack

Condition I

Run Number	Volume of Dry Gas Sampled (DSCF*)	Carbon Tetrachloride (total µg)	Carbon Tetrachloride (lbs/hr)	Stack Flow Rate (DSCFM*)
1-A	0.658	<0.013	$<6.25\text{x}10^{-4}$	239,621
1-B	0.645	<0.009	$<4.41\text{x}10^{-4}$	
1-C	0.643	<0.008	$<3.93\text{x}10^{-4}$	
Average			$<4.86\text{x}10^{-4}$	
3-A	0.679	<0.007	$<3.24\text{x}10^{-4}$	238,271
3-B	0.673	<0.006	$<2.80\text{x}10^{-4}$	
3-C	0.678	<0.005	$<2.32\text{x}10^{-4}$	
Average			$<2.79\text{x}10^{-4}$	
4-A	0.652	<0.005	$2.42\text{x}10^{-4}$	239,327
4-B	0.631	<0.001	$<5.01\text{x}10^{-5}$	
4-C	0.642	<0.005	$<2.46\text{x}10^{-4}$	
Average			$<1.79\text{x}10^{-4}$	
		Average	$<3.15\text{x}10^{-4}$	

* 29.92 "Hg, 68°F (760 mm Hg, 20°C)

SUMMARY OF RESULTS

Carbon Tetrachloride

DRE

Kiln Stack

Condition I

Run Number	1	3	4
Liquid Hazardous Waste Fuel Feed Rate - lbs/hr	4,003	4,003	4,003
Carbon Tetrachloride in Liquid Feed - ppm	285	<100	<100
Carbon Tetrachloride in Liquid Feed - lbs/hr	1.14	0.0	0.0
Carbon Tetrachloride Injection - lbs/hr	50.0	46.9	50.2
Total Carbon Tetrachloride - lbs/hr	51.14	46.90	50.20
Carbon Tetrachloride Emissions - lbs/hr	$<4.86\text{x}10^{-4}$	$<2.79\text{x}10^{-4}$	$<1.79\text{x}10^{-4}$
Carbon Tetrachloride DRE - %	>99.9990	>99.9994	>99.9996

SUMMARY OF RESULTS
Kiln Stack
Condition II

Run Number	5	6	
Date	9/20/90	9/20/90	
Time	1303-1447	1925-2049	
Stack Flow Rate - ACFM	370,466	361,067	
Stack Flow Rate - DSCFM*	238,514	229,345	
% Water Vapor - % Vol.	6.77	6.18	
% CO_2 - % Vol.	7.5	8.0	
% O_2 - % Vol.	15.6	15.0	
% Excess Air @ Sampling Point	327	278	
Stack Temperature - °F	301	316	
Stack Velocity - FPM	4,817	4,695	
Percent Isokinetic	100.3	97.9	
Particulates Probe, Cyclone & Filter Catch grains/dscf*	0.0019	0.0011	
grains/cf @ Stack Conditions	0.0012	0.0007	
lbs/hr	3.96	2.15	
Visible Emissions 15-minute Average - % Opacity	------	0.0	
Hydrogen Chloride Emissions - ppm**	1.9	2.1	
Hydrogen Chloride Emissions - lbs/hr	2.62	2.77	

* 29.92 "Hg, 68°F (760 mm Hg, 20°C)

** See page 31.

SUMMARY OF RESULTS

Kiln Stack

Condition II

Ion Chromatography Analyses

Run Number	5	6
Chloride - Total µg	5,978.0	7,567.8
Chloride ("Back-half") - µg	3,506.0	5,286.8
Ammonia - Total µg	9,469.0	18,760.2
Ammonia ("Back-half") - µg	9,469.0	18,760.2
Calcium - Total µg	456.8	324.0
Calcium ("Back-half") - µg	0.0	0.0
Potassium - Total µg	271.2	<0.4
Potassium ("Back-half") - µg	0.0	<0.4
Sodium - Total µg	633.2	596.0
Sodium ("Back-half") - µg	0.0	0.0

SUMMARY OF RESULTS
Kiln Stack
Metals
Condition II

Run Number	5	6	
Date	9/20/90	9/20/90	
Time	1010-1218	1622-1844	
Stack Flow Rate - ACFM	361,910	370,961	
Stack Flow Rate - DSCFM*	241,900	236,119	
% Water Vapor - % Vol.	3.66	5.73	
% CO_2 - % Vol.	7.8	8.3	
% O_2 - % Vol.	15.3	15.5	
% Excess Air @ Sampling Point	301	330	
Stack Temperature - °F	297	318	
Stack Velocity - FPM	4,706	4,823	
Percent Isokinetic	98.7	100.7	
Volume of Dry Gas Sampled - DSCF*	70.013	102.018	
Arsenic - total µg	<1.0	<1.0	
Arsenic Emissions - lbs/hr	$<4.56\text{x}10^{-4}$	$<3.05\text{x}10^{-4}$	
Cadmium - total µg	<2.0	<2.0	
Cadmium Emissions - lbs/hr	$<9.12\text{x}10^{-4}$	$<6.11\text{x}10^{-4}$	
Chromium - total µg	4.8	5.3	
Chromium Emissions - lbs/hr	0.002	0.002	
Lead - total µg	4.7	2.0	
Lead Emissions - lbs/hr	0.002	$6.11\text{x}10^{-4}$	

* 29.92 "Hg, 68°F (760 mm Hg, 20°C)

SUMMARY OF RESULTS

Kiln Stack

Method 23

Condition II

Run Number	5	6	
Date	9/20/90	9/20/90	
Time	1006-1333	1622-1953	
Stack Flow Rate - ACFM	368,456	368,028	
Stack Flow Rate - DSCFM*	239,625	235,422	
% Water Vapor - % Vol.	5.64	5.14	
% CO_2 - % Vol.	7.7	8.2	
% O_2 - % Vol.	15.5	15.3	
% Excess Air @ Sampling Point	320	308	
Stack Temperature - °F	302	319	
Stack Velocity - FPM	4,791	4,785	
Percent Isokinetic	101.0	100.4	
Volume of Dry Gas Sampled - DSCF*	117.253	114.508	
Total 1,2,4-Trichlorobenzene - µg	<8.38	<8.64	
1,2,4-Trichlorobenzene Emissions - lbs/hr	<0.002	<0.002	

* 29.92 "Hg, 68°F (760 mm Hg, 20°C)

SUMMARY OF RESULTS

1,2,4-Trichlorobenzene

DRE

Kiln Stack

Condition II

Run Number	5	6
TDF Feed - lbs/hr	2,495	2,640
1,2,4-Trichlorobenzene in TDF - ppm	0	0
1,2,4-Trichlorobenzene in TDF - lbs/hr	0.00	0.00
Liquid Hazardous Waste Fuel Feed Rate - lbs/hr	4,003	4,003
1,2,4-Trichlorobenzene in Liquid Feed - ppm	<350	<350
1,2,4-Trichlorobenzene in Liquid Feed - lbs/hr	0.00	0.00
1,2,4-Trichlorobenzene Injected - lbs/hr	51.9	45.9
Total 1,2,4-Trichlorobenzene - lbs/hr	51.9	45.9
1,2,4-Trichlorobenzene Emissions - lbs/hr	<0.002	<0.002
1,2,4-Trichlorobenzene DRE - %	>99.996	>99.995

SUMMARY OF RESULTS

Kiln Stack

Condition II

Run Number	Volume of Dry Gas Sampled (DSCF*)	Carbon Tetrachloride (total µg)	Carbon Tetrachloride (lbs/hr)	Stack Flow Rate (DSCFM*)
5-A	0.652	<0.007	<3.40x10^{-4}	239,625
5-B	0.638	<0.006	<2.97x10^{-4}	
5-C	0.648	<0.007	<3.42x10^{-4}	
Average			<3.26x10^{-4}	
6-A	0.618	<0.009	<4.52x10^{-4}	235,422
6-B	0.647	<0.009	<4.32x10^{-4}	
6-C	0.628	<0.006	<2.97x10^{-4}	
Average			<3.94x10^{-4}	
		Average	<3.60x10^{-4}	

* 29.92 "Hg, 68°F (760 mm Hg, 20°C)

SUMMARY OF RESULTS

Carbon Tetrachloride

DRE

Kiln Stack

Condition II

Run Number	5	6
TDF Feed - lbs/hr	2,495	2,640
Carbon Tetrachloride in TDF - ppm	0	0
Carbon Tetrachloride in TDF - lbs/hr	0.00	0.00
Liquid Hazardous Waste Fuel Feed Rate - lbs/hr	4,003	4,003
Carbon Tetrachloride in Liquid Feed - ppm	<350	<350
Carbon Tetrachloride in Liquid Feed - lbs/hr	0.00	0.00
Carbon Tetrachloride Injected - lbs/hr	50.8	48.9
Total Carbon Tetrachloride - lbs/hr	50.8	48.9
Carbon Tetrachloride Emissions - lbs/hr	$<3.26\text{x}10^{-4}$	$<3.94\text{x}10^{-4}$
Carbon Tetrachloride DRE - %	>99.9993	>99.9992

SUMMARY OF RESULTS
Kiln Stack
Condition III

Run Number	7	8	9
Date	9/22/90	9/22/90	9/22/90
Time	1025-1147	1519-1652	2024-2152
Stack Flow Rate - ACFM	373,058	358,079	366,564
Stack Flow Rate - DSCFM*	241,568	231,289	234,384
% Water Vapor - % Vol.	5.12	5.59	5.46
% CO_2 - % Vol.	7.0	7.0	7.5
% O_2 - % Vol.	15.9	15.5	15.7
% Excess Air @ Sampling Point	351	308	338
Stack Temperature - °F	308	304	312
Stack Velocity - FPM	4,851	4,656	4,766
Percent Isokinetic	97.6	99.1	100.7
Particulates Probe, Cyclone & Filter Catch grains/dscf*	0.0014	0.0014	0.0007
grains/cf @ Stack Conditions	0.0009	0.0009	0.0004
lbs/hr	2.84	2.74	1.37
Visible Emissions 15-minute Average - % Opacity	0.0	------	0.0
Hydrogen Chloride Emissions - ppm**	2.7	2.5	2.3
Hydrogen Chloride Emissions - lbs/hr	3.74	3.29	3.05

* 29.92 "Hg, 68°F (760 mm Hg, 20°C)

** See page 31.

SUMMARY OF RESULTS

Kiln Stack

Condition III

Ion Chromatography Analyses

Run Number	7	8	9
Chloride - Total µg	8,285.2	7,531.8	7,783.0
Chloride ("Back-half") - µg	7,112.2	6,356.8	5,991.0
Ammonia - Total µg	12,263.3	14,165.2	16,561.5
Ammonia ("Back-half") - µg	12,263.3	14,165.2	16,561.5
Calcium - Total µg	260.5	171.2	190.4
Calcium ("Back-half") - µg	0.0	5.6	0.0
Potassium - Total µg	0.0	<0.8	0.0
Potassium ("Back-half") - µg	0.0	<0.4	0.0
Sodium - Total µg	2,624.5	210.0	403.6
Sodium ("Back-half") - µg	0.0	0.0	0.0

SUMMARY OF RESULTS
Kiln Stack
Metals
Condition III

Run Number	7	8	9
Date	9/22/90	9/22/90	9/22/90
Time	0730-0940	1223-1432	1727-1941
Stack Flow Rate - ACFM	361,460	372,734	368,850
Stack Flow Rate - DSCFM*	234,356	240,844	237,344
% Water Vapor - % Vol.	5.61	5.06	5.39
% CO_2 - % Vol.	6.5	6.0	7.5
% O_2 - % Vol.	15.5	15.3	15.7
% Excess Air @ Sampling Point	300	275	338
Stack Temperature - °F	302	310	308
Stack Velocity - FPM	4,700	4,846	4,796
Percent Isokinetic	100.7	99.2	102.2
Volume of Dry Gas Sampled - DSCF*	101.308	102.523	104.137
Arsenic - total µg	<1.0	<1.0	<1.0
Arsenic Emissions - lbs/hr	$<3.05\times10^{-4}$	$<3.10\times10^{-4}$	$<3.01\times10^{-4}$
Cadmium - total µg	<2.0	<2.0	<2.0
Cadmium Emissions - lbs/hr	$<6.11\times10^{-4}$	$<6.20\times10^{-4}$	$<6.02\times10^{-4}$
Chromium - total µg	<6.0	3.6	5.4
Chromium Emissions - lbs/hr	<0.002	0.001	0.002
Lead - total µg	0.8	0.7	1.8
Lead Emissions - lbs/hr	2.44×10^{-4}	2.17×10^{-4}	5.41×10^{-4}

* 29.92 "Hg, 68°F (760 mm Hg, 20°C)

SUMMARY OF RESULTS

Kiln Stack

Method 23

Condition III

Run Number	7	8	9
Date	9/22/90	9/22/90	9/22/90
Time	0730-1058	1223-1546	1734-2112
Stack Flow Rate - ACFM	374,725	378,607	373,336
Stack Flow Rate - DSCFM*	244,914	246,593	241,246
% Water Vapor - % Vol.	4.53	4.19	4.43
% CO_2 - % Vol.	6.8	6.5	7.5
% O_2 - % Vol.	15.7	15.4	15.7
% Excess Air @ Sampling Point	325	291	338
Stack Temperature - °F	305	311	313
Stack Velocity - FPM	4,872	4,923	4,854
Percent Isokinetic	98.1	98.2	100.2
Volume of Dry Gas Sampled - DSCF*	116.374	117.327	117.145
Total 1,2,4-Trichlorobenzene - μg	<6.32	<6.94	<8.60
1,2,4-Trichlorobenzene Emissions - lbs/hr	<0.002	<0.002	<0.002

* 29.92 "Hg, 68°F (760 mm Hg, 20°C)

SUMMARY OF RESULTS

1,2,4-Trichlorobenzene

DRE

Kiln Stack

Condition III

Run Number	7	8	9
TDF Feed - lbs/hr	2,640	2,640	2,310
1,2,4-Trichlorobenzene in TDF - ppm	0	0	0
1,2,4-Trichlorobenzene in TDF - lbs/hr	0.00	0.00	0.00
1,2,4-Trichlorobenzene Injected - lbs/hr	51.6	51.6	51.6
Total 1,2,4-Trichlorobenzene - lbs/hr	51.6	51.6	51.6
1,2,4-Trichlorobenzene Emissions - lbs/hr	<0.002	<0.002	<0.002
1,2,4-Trichlorobenzene DRE - %	>99.996	>99.996	>99.996

SUMMARY OF RESULTS

Kiln Stack

Condition III

Run Number	Volume of Dry Gas Sampled (DSCF*)	Carbon Tetrachloride (total µg)	Carbon Tetrachloride (lbs/hr)	Stack Flow Rate (DSCFM*)
7-A	0.692	<0.008	<3.74x10^{-4}	244,914
7-B	0.677	<0.008	<3.82x10^{-4}	
7-D	0.664	<0.001	<4.87x10^{-5}	
Average			<2.68x10^{-4}	
8-A	0.694	<0.008	<3.75x10^{-4}	246,593
8-B	0.662	<0.011	<5.41x10^{-4}	
8-C	0.671	<0.020	<9.70x10^{-4}	
Average			<6.29x10^{-4}	
9-A	0.671	<0.007	<3.32x10^{-4}	241,246
9-B	0.671	<0.003	<1.42x10^{-4}	
9-C	0.674	<0.011	<5.20x10^{-4}	
Average			<3.31x10^{-4}	
		Average	<4.09x10^{-4}	

* 29.92 "Hg, 68°F (760 mm Hg, 20°C)

SUMMARY OF RESULTS

Carbon Tetrachloride

DRE

Kiln Stack

Condition III

Run Number	7	8	9
TDF Feed - lbs/hr	2,640	2,640	2,310
Carbon Tetrachloride in TDF - ppm	0	0	0
Carbon Tetrachloride in TDF - lbs/hr	0.00	0.00	0.00
Carbon Tetrachloride Injected - lbs/hr	51.6	51.6	51.6
Total Carbon Tetrachloride - lbs/hr	51.6	51.6	51.6
Carbon Tetrachloride Emissions - lbs/hr	$<2.68\times10^{-4}$	$<6.29\times10^{-4}$	$<3.31\times10^{-4}$
Carbon Tetrachloride DRE - %	>99.9994	>99.9987	>99.9993

SUMMARY OF RESULTS
Kiln Stack
Condition IV

Run Number	10	11	12
Date	9/24/90	9/24/90	9/24/90
Time	1020-1144	1756-1952	2306-0034
Stack Flow Rate - ACFM	336,691	362,559	356,222
Stack Flow Rate - DSCFM*	217,442	238,171	233,371
% Water Vapor - % Vol.	5.70	5.37	6.57
% CO_2 - % Vol.	7.5	6.5	5.0
% O_2 - % Vol.	15.8	17.5	16.8
% Excess Air @ Sampling Point	349	663	428
Stack Temperature - °F	311	297	289
Stack Velocity - FPM	4,378	4,714	4,632
Percent Isokinetic	96.4	100.1	100.5
Particulates Probe, Cyclone & Filter Catch grains/dscf*	0.0015	0.0012	0.0011
grains/cf @ Stack Conditions	0.0010	0.0008	0.0007
lbs/hr	2.87	2.51	2.19
Visible Emissions 15-minute Average - % Opacity	0.0	0.0	------
Hydrogen Chloride Emissions - ppm**	2.5	2.2	2.0
Hydrogen Chloride Emissions - lbs/hr	3.11	2.93	2.62

* 29.92 "Hg, 68°F (760 mm Hg, 20°C)
** See page 31.

SUMMARY OF RESULTS

Kiln Stack

Condition IV

Ion Chromatography Analyses

Run Number	10	11	12
Chloride - Total µg	9,315.4	6,901.0	6,815.2
Chloride ("Back-half") - µg	5,848.4	5,727.0	5,142.2
Ammonia - Total µg	14,262.6	12,665.5	11,158.3
Ammonia ("Back-half") - µg	14,262.6	12.665.5	11,158.3
Calcium - Total µg	320.0	321.8	308.4
Calcium ("Back-half") - µg	0.0	0.0	0.0
Potassium - Total µg	<0.2	<0.1	0.0
Potassium ("Back-half") - µg	<0.2	<0.1	0.0
Sodium - Total µg	950.0	344.2	399.6
Sodium ("Back-half") - µg	0.0	0.0	0.0

SUMMARY OF RESULTS
Kiln Stack
Metals
Condition IV

Run Number	10	11	12
Date	9/24/90	9/24/90	9/24/90
Time	0733-0942	1230-1714	2022-2232
Stack Flow Rate - ACFM	336,775	360,046	355,466
Stack Flow Rate - DSCFM*	220,886	235,288	233,576
% Water Vapor - % Vol.	5.78	5.27	5.91
% CO_2 - % Vol.	7.1	6.0	5.2
% O_2 - % Vol.	15.9	17.8	16.5
% Excess Air @ Sampling Point	353	744	388
Stack Temperature - °F	298	303	292
Stack Velocity - FPM	4,379	4,681	4,622
Percent Isokinetic	100.3	101.7	101.4
Volume of Dry Gas Sampled - DSCF*	95.122	102.678	101.670
Arsenic - total µg	<1.0	<1.0	<1.0
Arsenic Emissions - lbs/hr	<3.06x10^{-4}	<3.02x10^{-4}	<3.03x10^{-4}
Cadmium - total µg	<2.0	<2.0	1.1
Cadmium Emissions - lbs/hr	<6.13x10^{-4}	<6.05x10^{-4}	3.34x10^{-4}
Chromium - total µg	<6.0	3.4	5.0
Chromium Emissions - lbs/hr	<0.002	0.001	0.002
Lead - total µg	0.3	9.2	9.2
Lead Emissions - lbs/hr	9.19x10^{-5}	0.003	0.003

* 29.92 "Hg, 68°F (760 mm Hg, 20°C)

SUMMARY OF RESULTS

Kiln Stack

Method 23

Condition IV

Run Number	10	11	12
Date	9/24/90	9/24/90	9/24/90
Time	0732-1054	1230-1838	2028-2358
Stack Flow Rate - ACFM	347,772	361,552	360,257
Stack Flow Rate - DSCFM*	227,787	237,877	238,651
% Water Vapor - % Vol.	5.04	4.51	4.95
% CO_2 - % Vol.	7.3	6.3	5.1
% O_2 - % Vol.	15.9	17.7	16.7
% Excess Air @ Sampling Point	357	725	415
Stack Temperature - °F	305	304	294
Stack Velocity - FPM	4,522	4,701	4,684
Percent Isokinetic	99.5	98.3	99.1
Volume of Dry Gas Sampled - DSCF*	109.859	113.328	114.570
Total 1,2,4-Trichlorobenzene - µg	<7.90	<7.12	<7.83
1,2,4-Trichlorobenzene Emissions - lbs/hr	<0.002	<0.002	<0.002

* 29.92 "Hg, 68°F (760 mm Hg, 20°C)

SUMMARY OF RESULTS

Kiln Stack

Condition IV

Run Number	Volume of Dry Gas Sampled (DSCF*)	Carbon Tetrachloride (total µg)	Carbon Tetrachloride (lbs/hr)	Stack Flow Rate (DSCFM*)
10-A	0.721	<0.008	<3.34x10^{-4}	227,787
10-B	0.687	<0.009	<3.94x10^{-4}	
10-C	0.680	<0.009	<3.98x10^{-4}	
Average			<3.75x10^{-4}	
11-A	0.669	<0.007	<3.28x10^{-4}	237,877
11-B	0.684	<0.008	<3.67x10^{-4}	
11-C	0.683	<0.005	<2.30x10^{-4}	
Average			<3.08x10^{-4}	
12-A	0.674	<0.001	<4.67x10^{-5}	238,651
12-B	0.672	<0.001	<4.69x10^{-5}	
12-C	0.680	<0.001	<4.63x10^{-5}	
Average			<4.66x10^{-5}	
		Average	<2.43x10^{-4}	

* 29.92 "Hg, 68°F (760 mm Hg, 20°C)

SUMMARY OF RESULTS

Continuous Monitor Data

Run Number	Date	Time	Oxides of Nitrogen Emissions (ppm)	Oxides of Nitrogen Emissions (lbs/hr)	Carbon Monoxide Emissions (ppm)	Carbon Monoxide Emissions (lbs/hr)	Total Hydrocarbons Emissions (ppm)	Total Hydrocarbons Emissions (lbs/hr)	Sulfur Dioxide Emissions (ppm)	Sulfur Dioxide Emissions (lbs/hr)	Oxygen (% Vol.)	Carbon Dioxide (% Vol.)
1	9/18/90	1120-1220	350	600.8	41	42.9	2.0	3.3	7.8	18.6	14.7	11.2
2		1300-1400	475	815.4	50	52.3	5.5	9.0	17.2	41.0	14.8	10.7
3		1455-1555	430	738.2	58	60.6	7.5	12.3	5.0	11.9	14.5	11.1
4	9/19/90	0940-1040	330	564.5	49	51.0	8.0	13.1	8.5	20.2	16.0	10.8
5		1125-1254	155	265.2	41	42.7	9.0	14.7	1.5	3.6	15.4	8.9
6		1300-1400	190	325.0	37	38.5	11.0	18.0	5.0	11.9	15.2	7.9
7		1600-1900	85	145.4	41	42.7	7.5	12.3	24.5	58.4	16.1	5.0
8	9/20/90	1010-1110	280	476.5	98	101.5	5.5	9.0	17.8	42.1	15.4	7.9
9		1212-1312	225	382.9	130	134.7	5.5	9.0	18.8	44.5	15.3	8.0
10		1318-1418	220	374.4	165	171.0	5.5	9.0	42.5	100.5	15.3	8.0
11		1705-1805	490	833.8	150	155.4	6.0	9.8	10.0	23.7	15.0	9.2
12		1902-2002	700	1,191.1	110	114.0	5.0	8.1	25.0	59.1	15.0	9.3
13	9/22/90	0820-0950	205	358.7	168	179.0	1.5	2.5	7.5	18.2	15.4	7.6
14		1040-1140	230	402.5	68	72.5	3.5	5.9	52.5	127.7	15.5	7.2
15		1230-1400	205	358.7	100	106.6	3.5	5.9	95.0	231.1	15.2	6.6
16		1505-1635	265	463.7	125	133.2	3.5	5.9	20.0	48.7	15.4	8.0
17		1735-1905	300	524.9	120	127.9	4.0	6.7	75.0	182.5	15.5	8.3
18		1910-2110	320	559.9	63	67.1	4.0	6.7	37.5	91.2	15.7	7.9
19	9/24/90	0746-0910	275	462.5	75	76.8	4.5	7.2	27.5	64.3	15.5	8.1
20		1020-1120	280	470.9	73	74.8	5.0	8.0	21.0	49.1	15.3	8.2
21		1530-1700	195	328.0	70	71.7	3.0	4.8	10.0	23.4	16.7	5.2
22		1740-1910	190	319.6	65	66.6	3.5	5.6	12.5	29.2	16.6	5.2
23		2036-2206	175	294.3	67	68.6	3.0	4.8	10.0	23.4	16.7	5.0
24		2316-0016	150	252.3	67	68.6	2.5	4.0	15.0	35.1	16.8	4.7

DISCUSSION OF RESULTS

Condition I

The three tests for particulate matter and hydrogen chloride* appeared to be valid representations of the actual emissions during the tests. The indicative parameters calculated from the field data were in close agreement. The moisture percentages for the three tests were within 10.1 percent of the mean value. The measured flow rates (Q_a) for the tests were within 1.6 percent of the mean value. The rates of sampling for the three tests were well within the specified limits, the greatest deviation being 2.9 percent.

* The hydrogen chloride emissions presented in the summary of results for each condition are based on the sampling and analytical protocol specified in EPA Method 26, Determination of Hydrogen Chloride Emissions from Stationary Sources. The EPA has acknowledged the possibility of anomalous results due to cation interference when EPA Method 26 is used to determined hydrogen chloride emissions from cement kilns. Each EPA Method 26 sample was analyzed for specific cations known to exist in cement kilns. The results of the cations analysis can be found in the summary of results for each test condition. Review of this data substantiates the potential of significant cation interference with the EPA Method 26 hydrogen chloride emissions reported.

The calculated emissions (pounds per hour) of particulate matter for the three tests showed a range of -23.1 percent to +14.2 percent variation from the mean value.

The calculated emissions (pounds per hour) of hydrogen chloride for the three tests showed a range of -15.2 percent to +21.9 percent variation from the mean value.

The three tests for metals appeared to be valid representations of the actual emissions during the tests. The indicative parameters calculated from the field data were in close agreement. The moisture percentages for the three tests were within 4.5 percent of the mean value. The measured flow rates (Q_s) for the tests were within 1.2 percent of the mean value. The rates of sampling for the three tests were well within the specified limits, the greatest deviation being 3.6 percent.

The three tests for 1,2,4-trichlorobenzene appeared to be valid representations of the actual emissions during the tests. The indicative parameters calculated from the field data were in close agreement. The moisture percentages for the three tests were within 10.7 percent of the mean value. The measured flow rates (Q_s) for the tests were within 0.3 percent of the mean value. The rates of sampling for the three tests were within the specified limits, the greatest deviation being 9.2 percent.

Condition II

The two tests for particulate matter and hydrogen chloride* appeared to be valid representations of the actual emissions during the tests. The indicative parameters calculated from the field data were in close agreement. The moisture percentages for the two tests were within 4.6 percent of the mean value. The measured flow rates (Q_s) for the tests were within 2.0 percent of the mean value. The rates of sampling for the two tests were well within the specified limits, the greatest deviation being 2.1 percent.

The calculated emissions (pounds per hour) of particulate matter for the two tests showed a range of -29.6 percent to +29.6 percent variation from the mean value.

The calculated emissions (pounds per hour) of hydrogen chloride for the two tests showed a range of -2.8 percent to +2.8 percent variation from the mean value.

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* See page 31.

The two tests for metals appeared to be valid representations of the actual emissions during the tests. The indicative parameters calculated from the field data were in close agreement. The moisture percentages for the two tests were within 22.0 percent of the mean value. The measured flow rates (Q_m) for the tests were within 1.2 percent of the mean value. The rates of sampling for the two tests were well within the specified limits, the greatest deviation being 1.3 percent.

The two tests for 1,2,4-trichlorobenzene appeared to be valid representations of the actual emissions during the tests. The indicative parameters calculated from the field data were in close agreement. The moisture percentages for the two tests were within 4.6 percent of the mean value. The measured flow rates (Q_m) for the tests were within 0.9 percent of the mean value. The rates of sampling for the two tests were well within the specified limits, the greatest deviation being 1.0 percent.

Condition III

The three tests for particulate matter and hydrogen chloride* appeared to be valid representations of the actual emissions during the tests. The indicative parameters calculated from the field data were in close agreement. The moisture percentages for the three tests were within 5.0 percent of the mean value. The measured flow rates (Q_m) for the tests were within 2.5 percent of the mean value. The rates of sampling for the three tests were well within the specified limits, the greatest deviation being 2.4 percent.

The calculated emissions (pounds per hour) of particulate matter for the three tests showed a range of -40.9 percent to +22.6 percent variation from the mean value.

The calculated emissions (pounds per hour) of hydrogen chloride for the three tests showed a range of -9.2 percent to +11.3 percent variation from the mean value.

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* See page 31.

The three tests for metals appeared to be valid representations of the actual emissions during the tests. The indicative parameters calculated from the field data were in close agreement. The moisture percentages for the three tests were within 5.5 percent of the mean value. The measured flow rates (Q_m) for the tests were within 1.4 percent of the mean value. The rates of sampling for the three tests were well within the specified limits, the greatest deviation being 2.2 percent.

The three tests for 1,2,4-trichlorobenzene appeared to be valid representations of the actual emissions during the tests. The indicative parameters calculated from the field data were in close agreement. The moisture percentages for the three tests were within 4.4 percent of the mean value. The measured flow rates (Q_m) for the tests were within 1.2 percent of the mean value. The rates of sampling for the three tests were well within the specified limits, the greatest deviation being 1.9 percent.

Condition IV

The three tests for particulate matter and hydrogen chloride* appeared to be valid representations of the actual emissions during the tests. The indicative parameters calculated from the field data were in close agreement. The moisture percentages for the three tests were within 11.7 percent of the mean value. The measured flow rates (Q_s) for the tests were within 5.3 percent of the mean value. The rates of sampling for the three tests were well within the specified limits, the greatest deviation being 4.6 percent.

The calculated emissions (pounds per hour) of particulate matter for the three tests showed a range of -13.2 percent to +13.7 percent variation from the mean value.

The calculated emissions (pounds per hour) of hydrogen chloride for the three tests showed a range of -9.3 percent to +7.7 percent variation from the mean value.

The three tests for metals appeared to be valid representations of the actual emissions during the tests. The indicative parameters calculated from the field data were in close agreement. The moisture percentages for

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* See page 31.

the three tests were within 6.8 percent of the mean value. The measured flow rates (Q_m) for the tests were within 3.9 percent of the mean value. The rates of sampling for the three tests were well within the specified limits, the greatest deviation being 1.7 percent.

The three tests for 1,2,4-trichlorobenzene appeared to be valid representations of the actual emissions during the tests. The indicative parameters calculated from the field data were in close agreement. The moisture percentages for the three tests were within 6.7 percent of the mean value. The measured flow rates (Q_m) for the tests were within 3.0 percent of the mean value. The rates of sampling for the three tests were well within the specified limits, the greatest deviation being 1.7 percent.

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February 11, 1991

<u>BY HAND DELIVERY</u>

Carol M. Browner, Secretary
Florida Department of Environmental
Regulation
2600 Blair Stone Road, Room 618
Tallahassee, Florida 32399-2400

Re: Florida Mining & Materials
Brooksville Plant
Hazardous Waste Fuel Proposal

Dear Secretary Browner:

On behalf of Florida Mining & Materials and its parent company Southdown, Inc., I would like to thank you for agreeing to meet this afternoon so that we may provide an update on my client's proposal to burn hazardous waste fuel at the existing Brooksville cement plant. I have enclosed for your information a draft letter outlining an approach for involving Hernando County citizens in implementing a "test burn" of solid hazardous waste derived fuel at the Brooksville plant, along with a Southdown brochure providing background information on the burning of hazardous waste in cement kilns. Representatives of Southdown and Florida Mining will be attending our meeting to provide additional information.

I look forward to seeing you this afternoon.

Sincerely,

Peter C. Cunningham

BrownerLtr:gbb
cc: Steve Smallwood
Rick Wilkins
Kimberly Barr
Enclosures

Edgar J. Marston III
EXECUTIVE VICE PRESIDENT
AND GENERAL COUNSEL

REVISED DRAFT
February 9, 1991

February ___, 1991

Mr. Harold D. Varvel, Chairman
Mr. John Richardson, Vice Chairman
Ms. Virginia Brown-Waite, Second Vice Chairman
Ms. June Ester
Mr. Anthony C. Mosca, Jr.
Board of County Commissioners
Hernando County Government Center
20 North Main Street, Room 460
Brooksville, Florida 34601

Dear Commissioners:

As you probably know, Southdown, Inc. owns the Florida Mining cement plant in northwest Hernando County that can produce over 1.3 million tons of cement per year. Florida Mining's annual payroll for its more than 300 employees in Hernando County exceeds $7 million.

Over the last year or so substantial public attention has focused on whether it is appropriate for Florida Mining to substitute hazardous waste derived fuels for a portion of its fossil fuels requirements. When Florida Mining's cement plant operates at full capacity, it consumes approximately 140,000 tons of coal per year. At a 9% solid hazardous waste fuel substitution rate, Florida Mining would burn approximately 20,000 tons of solid hazardous waste fuel per year and save 15,000 tons of coal or the energy equivalent of 60,000 barrels of oil. This represents less than 4% of the more than 518,000 tons of hazardous waste that were generated in the State of Florida in 1987 according to the Capacity Assurance Plan submitted by the State of Florida to the United States Environmental Protection Agency ("EPA") in October 1989. Furthermore, tests at several cement plants have shown that replacing coal with hazardous waste derived fuels can actually reduce the amount of metals emitted from the stack because of the level of metals naturally occurring in coal.

Southdown, Inc. ▬ 1200 SMITH STREET ▬ SUITE 2400 ▬ HOUSTON, TEXAS 77002 ▬ (713) 650-6200

We are convinced that the burning of hazardous waste derived fuels comprised of spent solvents, paint sludges, used filters and similar industrial residuals in cement kilns will not threaten human health or the environment and, in fact, is the most responsible alternative for the management of hazardous wastes that cannot otherwise be reused or recycled. While we are firmly committed to waste minimization, a certain level of residuals will always exist after industrial waste streams have been recycled or reclaimed to the maximum extent practicable. These residuals of the manufacturing process must be properly treated and disposed of; they should not be buried in the land where they may pose a significant threat to ground water contamination and human health for generations to come.

In the case of most organically contaminated residuals, thermal destruction in either incinerators or cement kilns is widely recognized as the best demonstrated available technology for the treatment of such waste streams. We believe that organic residuals should be recycled to the maximum extent practicable and the balance used as a fuel in the manufacture of cement. By burning hazardous waste derived fuels in cement kilns, we not only reduce the rate at which our nation's irreplaceable reserves of fossil fuels are exhausted but also use existing manufacturing facilities for multiple purposes. Cement kilns can both manufacture cement and effectively manage hazardous waste in an environmentally responsible manner without creating new sources of air emissions or materially altering the nature of the air emissions inherent in the manufacture of cement with fossil fuels.

When burned as a fuel in a cement kiln, the organic constituents of hazardous waste are thermally destroyed and the minor amounts of metals invariably found in all fossil fuels, hazardous waste fuels and many raw materials are, for the most part, incorporated into the cement in a nonleachable form or captured in air pollution control equipment. The dust captured by the air pollution control equipment can then be disposed of in an environmentally responsible manner. A substantial amount of test data shows that the percentage of the metals emitted into the air is minute and complies with the stringent standards prescribed by recent EPA regulations.

In May 1990 the County Commissioners of Hernando County concluded that the emissions generated by the burning of hazardous waste fuels in cement kilns were not then regulated by Florida environmental law. While EPA had proposed a detailed framework for the regulation of such emissions, EPA had not yet finalized its rule. Because of public concern relating to the allegedly unregulated burning of hazardous waste as fuel in cement kilns, the County Commissioners adopted an ordinance ("Ordinance") imposing a moratorium upon the burning of hazardous wastes as fuels in cement kilns, pending finalization of EPA's proposed rule.

EPA has now issued a definitive set of regulations and guidance documents relating to the burning of hazardous waste as fuel in boilers and industrial furnaces, including cement kilns. These regulations and interpretative statements are more than 500 pages long and impose stringent limitations upon the permissible levels of emissions from cement kilns, including total hydrocarbons, hydrochloric acid, carbon monoxide and certain metals such as lead. Under these final rules, cement kilns must certify by mid 1991 that they are in compliance with the emission standards set forth in the rules. Within the following twelve months, cement kilns desiring to burn hazardous waste derived fuels must conduct extensive test burns in order to demonstrate empirically that they are in compliance with the rules. In short, EPA has provided comprehensive standards for the measurement of the performance of cement kilns that burn hazardous waste derived fuels. While we question the enforceability of the Ordinance, we believe that the purposes for which the County adopted the Ordinance have been met and request confirmation from the Commissioners that such is the case.

We believe that it is now appropriate to determine whether the Florida Mining cement plant can meet the applicable Federal standards through a test burn. Since we believe that public familiarity with our plans and public participation in establishing the parameters of any test burn are essential, we suggest that a committee of concerned citizens be appointed to liaison with Florida Mining. The details of our proposal are set forth below for consideration by the County Commissioners of Hernando County:

1. **Applications for membership on Committee**. By publishing suitable notice in the local press, Southdown will invite any interested resident of Hernando County to submit his or her name as a prospective member of a review and advisory committee ("Committee"). Applicants should be prepared to devote substantial time to reviewing data and attending meetings. Anyone wishing to serve on the Committee should write a brief note setting forth his or her name, address, qualifications and reason for desiring to serve on the Committee. These letters should be mailed or delivered to Charles B. Hetrick, County Administrator, Hernando County Government Center, Room 461, 20 North Main Street, Brooksville, Florida 34601 and must be received prior to March 15, 1991.

2. **Composition of Committee**. Southdown requests that the County Commissioners select a chairperson and ten other members of the Committee from among the persons who have applied pursuant to paragraph 1 or who are otherwise qualified and willing to serve on the Committee. We propose that the Commissioners designate an impartial chairperson who has substantial leadership experience in participating in the resolution of complex problems. We also urge that the remaining members be selected by the Commissioners with a view to insuring that the membership reflects a reasonable cross-section of the Hernando County community. The deliberations of and documents generated by the Committee will be subject to Florida's Public Meetings Law and Open Records Law.

3. **Participation in test burn protocol**. The primary function of the Committee will be to review and make recommendations regarding the parameters of a proposed test burn protocol for solid hazardous waste derived fuel at the

Florida Mining facility. The purpose of the test burn is to determine whether the Florida Mining facility can meet the applicable requirements of EPA's boiler and industrial furnace regulations under conditions that satisfy the Florida Department of Environmental Regulation ("DER"). In order to provide technical expertise to the Committee, Southdown will pay the reasonable fees and expenses of an experienced professor of recognized standing in a relevant discipline from a major Florida University. This professor will be selected by the Commissioners promptly following the creation of the Committee. If the Committee members desire to tour Southdown's cement plant in Knoxville, Tennessee that currently burns both liquid and solid hazardous waste derived fuels, Southdown will underwrite the expenses of the tour.

4. **Timing of test burn**. Florida Mining will propose a test burn protocol for review by the Committee. The test will cover only solid hazardous waste fuels. These fuels will be packaged in individual six gallon pails that meet all applicable Department of Transportation regulations for the shipment of hazardous waste. Florida Mining will deliver a draft test burn protocol to the Committee by the end of March. Florida Mining will work closely with the Committee during the months of April and May and will evaluate all comments received from the Committee through May 31, 1991. Of course, final jurisdiction over the terms and conditions of the test burn protocol is vested in DER. During the third week in June, Florida Mining will balance the energy requirements of its kiln by burning concurrently coal and solid hazardous waste derived fuels and during the fourth week in June conduct limited test burns of solid hazardous waste derived fuels. Following completion of the test burns, Florida Mining will cease burning solid hazardous waste derived fuels until the test results are compiled, submitted to DER and reviewed by the Committee, and all required approvals are received from the DER. In order to avoid any confusion, Florida Mining will promptly request DER to hold in abeyance Florida Mining's permit application to burn liquid hazardous waste derived fuels pending satisfactory completion of the trial burn of solid hazardous waste derived fuels and compliance with the other requirements of paragraph 6 below.

5. **Unsatisfactory test results**. If the tests conducted during a one-week trial burn of solid hazardous waste derived fuels fail to meet the applicable requirements of EPA's boiler and industrial furnace regulations under conditions that satisfy DER, Florida Mining will cease its efforts to burn solid and liquid hazardous waste derived fuels at its plant in Hernando County.

6. **Satisfactory test results**. If the tests conducted during the trial burn of solid hazardous waste derived fuels meet the foregoing requirements, Florida Mining will actively pursue the amendment of its air permits to enable it to

burn solid hazardous waste derived fuels. Upon the issuance of a notice that DER intends to modify Florida Mining's air permits to enable it to burn solid hazardous waste derived fuels, any substantially affected person would then have an opportunity to request a hearing and present evidence to the DER on why the permit modifications should or should not be granted. If the requisite air permit modifications are issued, Florida Mining may propose a test protocol for the burning of liquid hazardous waste fuels once the infrastructure necessary to receive shipments of liquid hazardous waste fuel by railroad tank cars is in place. Florida Mining will request that the Committee also participate in determining the parameters of the applicable test burn protocol for liquid hazardous waste derived fuels.

7. **Continuing activities of Committee**. Assuming that the results of the test burn of solid hazardous waste derived fuels at Florida Mining are satisfactory and the requisite air permit modifications are issued by the DER, Southdown will continue to look to the Committee as a citizens' advisory committee. Citizens of Hernando County should be comforted by the fact that a committee of their peers has unfettered access to the plant. Of course, any resident of Hernando County is welcome to tour the plant at any time. We urge all interested residents to tour the plant during the next few months.

8. **Maintenance of status quo**. If the Commissioners approve the procedures described in this letter, Florida Mining suggests that both it and the County Commissioners maintain the status quo until the test burn is completed or abandoned by Florida Mining. Florida Mining will refrain from initiating any litigation relating to the enforceability of the Ordinance and the Commissioners will refrain from altering the scope of the Ordinance or contesting the propriety of the test burn of solid hazardous waste derived fuels. Once the test results are compiled and evaluated, Florida Mining will comply with the terms of either paragraph 5 or 6 above. If Florida Mining fails the test burn, the applicability of the Ordinance to Florida Mining will be mooted because Florida Mining will abandon its efforts to burn hazardous waste derived fuels. If Florida Mining meets the requirements of the test burn, Florida Mining, the Commissioners and any substantially affected party can take such action as they think is appropriate under the circumstances.

Some citizens around the Florida Mining cement plant have criticized our efforts to burn hazardous waste fuels by asserting that we are exposing the local population to air emissions and exporting the profits to Houston. While I do not think this is a fair statement, I understand that some people may find it persuasive. There is no doubt that burning hazardous waste fuels will make Southdown more profitable. It will also make the Florida Mining cement manufacturing operation more competitive in its never ending battle against imported cement that is dumped by foreign producers along Florida's 1,350-mile coast line. To the extent that Florida Mining can stay competitive and prosper, it can continue to pay substantial taxes to Hernando County and employ over 300 persons in valuable industrial jobs. Since the burning of hazardous waste derived fuels at Florida Mining's cement plant may, in the minds of some citizens, necessitate additional emergency response capabilities on the part of Hernando County, Southdown is prepared to discuss with the Commissioners the underwriting by Southdown of its fair share of the additional manpower, facility and equipment costs associated with any enhanced emergency response capability that Hernando County may be required to establish.

I would appreciate the County Commissioners placing this proposal on the agenda for their February 26, 1991 meeting. I plan to attend the meeting and will be available to answer any questions that any of you may have .

Cordially,

Edgar J. Marston III

EJM:jap

cc: Ms. Carol Browner, Secretary
Department of Environmental Regulation

Edgar J. Marston III
EXECUTIVE VICE PRESIDENT
AND GENERAL COUNSEL

REVISED DRAFT
February 9, 1991

February ___, 1991

Mr. Harold D. Varvel, Chairman
Mr. John Richardson, Vice Chairman
Ms. Virginia Brown-Waite, Second Vice Chairman
Ms. June Ester
Mr. Anthony C. Mosca, Jr.
Board of County Commissioners
Hernando County Government Center
20 North Main Street, Room 460
Brooksville, Florida 34601

Dear Commissioners:

As you probably know, Southdown, Inc. owns the Florida Mining cement plant in northwest Hernando County that can produce over 1.3 million tons of cement per year. Florida Mining's annual payroll for its more than 300 employees in Hernando County exceeds $7 million.

Over the last year or so substantial public attention has focused on whether it is appropriate for Florida Mining to substitute hazardous waste derived fuels for a portion of its fossil fuels requirements. When Florida Mining's cement plant operates at full capacity, it consumes approximately 140,000 tons of coal per year. At a 9% solid hazardous waste fuel substitution rate, Florida Mining would burn approximately 20,000 tons of solid hazardous waste fuel per year and save 15,000 tons of coal or the energy equivalent of 60,000 barrels of oil. This represents less than 4% of the more than 518,000 tons of hazardous waste that were generated in the State of Florida in 1987 according to the Capacity Assurance Plan submitted by the State of Florida to the United States Environmental Protection Agency ("EPA") in October 1989. Furthermore, tests at several cement plants have shown that replacing coal with hazardous waste derived fuels can actually reduce the amount of metals emitted from the stack because of the level of metals naturally occurring in coal.

Southdown, Inc. ■ 1200 SMITH STREET ■ SUITE 2400 ■ HOUSTON, TEXAS 77002 ■ (713) 650-6200

We are convinced that the burning of hazardous waste derived fuels comprised of spent solvents, paint sludges, used filters and similar industrial residuals in cement kilns will not threaten human health or the environment and, in fact, is the most responsible alternative for the management of hazardous wastes that cannot otherwise be reused or recycled. While we are firmly committed to waste minimization, a certain level of residuals will always exist after industrial waste streams have been recycled or reclaimed to the maximum extent practicable. These residuals of the manufacturing process must be properly treated and disposed of; they should not be buried in the land where they may pose a significant threat to ground water contamination and human health for generations to come.

In the case of most organically contaminated residuals, thermal destruction in either incinerators or cement kilns is widely recognized as the best demonstrated available technology for the treatment of such waste streams. We believe that organic residuals should be recycled to the maximum extent practicable and the balance used as a fuel in the manufacture of cement. By burning hazardous waste derived fuels in cement kilns, we not only reduce the rate at which our nation's irreplaceable reserves of fossil fuels are exhausted but also use existing manufacturing facilities for multiple purposes. Cement kilns can both manufacture cement and effectively manage hazardous waste in an environmentally responsible manner without creating new sources of air emissions or materially altering the nature of the air emissions inherent in the manufacture of cement with fossil fuels.

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Cordially,

Edgar J. Marston III

EJM:jap

cc: Ms. Carol Browner, Secretary
Department of Environmental Regulation

CROSS/TESSITORE & ASSOCIATES, P.A.
4763 S. CONWAY ROAD, SUITE F
ORLANDO, FLORIDA 32812
407/851-1484

RECEIVED
JAN 24 1991
DER - BAQM

21 January 1991

Mr. John Reynolds
Division of Air Resources Management
Permitting and Standards Section
Florida Department of Environmental Regulation
Twin Towers Office Building
2600 Blairstone Road
Tallahassee, Florida 32399-2400

SUBJECT: Florida Mining and Materials
Kiln No. 2 Auxiliary Sources
Compliance Testing Protocol

C/TA No. F03.175

Dear Mr. Reynolds:

This correspondence is in accordance with our January 17 and 18, 1991, telephone conversations concerning the subject testing. Based on our conversations, it is our understanding that:

You have granted us permission to conduct the subject testing as per the attached Table 1 testing protocol. The testing is tentatively scheduled to commence daily at 0800 from January 25, 1991, to February 1, 1991. If daily multiple source testing is possible, testing may be completed before February 1, 1991.

Should you have any questions, do not hesitate to call.

Sincerely,

Gregory R. Gonzales
Environmental Specialist

GRG:kim
Enc.a/s
cc: Clair Fancy, FDER Tallahassee
Che Sun Lee, FDER SW District
Ralph Shepard, FM&M
George Hawkins, ETI

TABLE 1
FLORIDA MINING AND MATERIALS
Kiln No. 2 Auxiliary Source Testing Protocol
(Testing to be conducted January 25, 1991, through February 1, 1991)

Permit Number	Source Location	Parameter	EPA Test Method & Methodology
AC27-185898	M09; M10; Clinker Handling System L07 Clinker Silo	Particulate	3-1 hour EPA Method 5 test runs on each source location
		Opacity	1-30 minute EPA Method 9 test run on each source location, concurrent with the particulate testing
AC27-185900	N23; N27 Finish Mills	Same as Sources M09; M10; L07	Same as Sources M09; M10; L07
AC27-185901	P05; P07; Q17 Cement Silos	Same as Sources M09; M10; L07	Same as Sources M09; M10; L07
AC27-185902	F17; G11 Blending Silos	Same As Sources M09; M10; L07	Same as Sources M09; M10; L07
AC27-185903	H13 Raw Mill No. 2	Same as Sources M09; M10; L07	Same as Sources M09; M10; L07
AC27-185904	M3514 Cement Bagging	Same as Sources M09; M10; L07	Same as Sources M09; M10; L07
AC27-185905	M2280 Raw Material Pre-Mix Bin	Same as Sources M09; M10; L07	Same as Sources M09; M10; L07
AC27-185906	K09 Clinker Cooler No. 2	Same as Sources M09; M10; L07	Same as Sources M09; M10; L07
AC27-185907	Raw Materials Handling C11A	Same as Sources M09; M10; L07	Same as Sources M09; M10; L07
	C11		1-45 to 60 minute EPA Method 5 Test run during the silo loading cycle. 1-30 minute EPA Method 9 test run concurrent with the particulate testing.